Sustainability transitions of agriculture and the transformation of education and advisory services: convergence or divergence?

Pierre Labarthe

ESEE 2023

26th European Seminar on Extension & Education

Sustainability transitions of agriculture and the transformation of education and advisory services: convergence or divergence?

Toulouse, 10-13 July 2023

BOOK OF ABSTRACTS

26th European Seminar on Extension & Education

"Sustainability transitions of agriculture and the transformation of education and advisory services: convergence or divergence?"

The conference was organised in Toulouse (France), 10-13 July 2023.
More information
https://esee2023.colloque.inrae.fr/esee-2023

The conference was organised by two research laboratories:
AGIR (Agroecology, Innovation, Territories)
and **LEREPS** (Economics, Policies and Social Systems)

The conference benefited from the financial support of
INRAE (National Research Institute for Agriculture, Food and Environment)
and **Science Po Toulouse**

26th ESEE
Book of Abstracts

Authors

VV.AA

Editor

Pierre Labarthe

Publisher

UMR AGIR

INRAE (National Research Institute for Agriculture, Food and Environment)

INP - University of Toulouse

ISBN 978-2-9589569-0-5

This ISBN was provided by the *Agence Francophone pour la Numérotation Internationale du Livre* (AFNIL: the Francophone Agency for the International Numbering of Books)

https://www.afnil.org/

Table des matières

Introduction......12
The ESEE community......13
International Scientific Committee......13
Local organising committee......13
Conference Topics......14
TOPIC 1 – Transitions towards agroecology & circular economy......14
TOPIC 2 – Digitalisation of advisory services and education......14
TOPIC 3 – Learning for innovation and resilience: theory and practice developments......15
TOPIC 4 – Public policies for innovation and the governance of AKIS......15
TOPIC 5 – Inclusion and the social dimension of sustainability......16
Overview of the conference program......17
Keynotes and Roundtables......18
Opening Plenary......18
Roundtable 1......18
Roundtable 2......18
Detailed program......19
TOPIC 1 - Transitions towards agroecology & circular economy:......19
TOPIC 2 - Digitalisation of advisory services and education:......22
TOPIC 3 - Learning for innovation and resilience:......24
TOPIC 4 - Public policies for innovation and the governance of AKIS: how to embed advice & education into strategies of AKIS......29
TOPIC 5 - Inclusion and the social dimension of sustainability......32
Overview of parallel sessions......33
Abstracts......34
The Signpost Programme: Farmers for Climate Action......34
Tom O'Dwyer
TOPIC 1 - Transitions towards agroecology & circular economy......38
Session 1A - AKIS Policy assessment on Agroecology......38
Implications of Global Biodiversity Framework on communication and extension systems......38
Esmail Karamidehkordi
Innovating to enable extension and advisory services to promote agriculture and other nature-based approaches......42
Zofia Krystyna Mroczek, Nevena Alexandrova Stefanova
The greening of agricultural policies in France: a look from within......47
Floriane Clément, Pierre Labarthe, Gaël Plumecocq47
Transitions and disturbances in action: a discursive method of analysis to characterize the impact of change on farmers and their advisors......52
Catherine Milou
The attitude of technical advisors towards professional continuous learning: the case of Italian organic agriculture system......56
Roberta Milardo, Aldo Bertazzoli

Session 1B - Customising advice for sustainable transition (1) 61

Are plantain-based production systems, Agricultural Innovation System in Guadeloupe? 61

Marie Bezard, Carla Barlagne, Valérie Angeon, Maud Capera, Harry Ozier Lafontaine, Jean-Louis Diman, Nadine Andrieu

Agroecological transitions and farmers microAKIS: Case studies from the Global North compared to Global South 67

Ana Fonseca, José Rosário, Carlos P. Marques, Carlos Marques, Lívia Madureira

Customising advice: an attempt to evaluate customer satisfaction of Farm Advisory Services and improve agroecological transition...... 72

Giuseppina Olivieri, Marcello De Rosa, Concetta Menna, Imma Cigliano, Ferdinando Gandolfi, Maria Passari, Teresa Del Giudice

Mapping knowledge circulation in the olive and viticulture sectors in Central Spain: a comparative study...... 80

Jose-Luis Cruz, A. Barrutieta, A. García, B. Sastre, O. Antón, JP Zamorano

Engaging with Monitor Farmers on Farmland Biodiversity Management...... 85

Aoife Leader, Richard O'Brien, James Kinsella

Session 1C - Customising advice for sustainable transition (2) 89

Deliberative processes for co-constructing sustainability transitions using science, society, policy interfaces 89

David Miller, Jorieke Potters, Ellen Bulten, Gerald Schwartz

Participatory workshops' impacts on farmers' intention to adopt climate mitigation farming practices: A randomized controlled trial in Slovenia 94

Živa Alif, Ana Novak, Tanja Šumrada

Visioning as a methodological approach for change in farming and food systems – participants' perceived enablers and barriers for initiating action 98

Vebjørn Egner Stafseng, Geir Lieblein, Anna Marie Nicolaysen, Edvin Østergaard

Assessing capabilities of the hub organisations of Innovation Support Services Ecosystems: an evaluation grid for researchers and practitioners...... 101

Claire Orbell, Aurélie Toillier, Sophie Mignon

Session 1D - The stakes of the transmission of knowledge for the agroecological transition...... 107

The role of formation and social relationships into the traditional knowledge access: comparison between France and Benin 107

Lorine Maretz, Rachel Lévy

Agricultural education and its audiences facing the challenge of climate change. A socio-economic analysis of the contribution of this training device to the implementation of Nature-Based Solutions...... 111

Nina Asloum, Nicola Gallai, Jean-Pierre Del Corso

Agricultural education students as "intermediaries" in the fight against climate change...... 115

Rachel Lévy, Jean-Pierre Del Corso

Training young teachers in teaching agroecology: challenges and opportunities 119

Anne-Emmanuelle Fiamor, Agnès Terrieux

Training of trainers in agroecology based on the teaching of endogenous knowledge 123

Jean-Pierre del Corso, François Fall, Nicola Gallai, Guillaume Guillet, Micheline Marie-Sainte123

TOPIC 2 - Digitalisation of advisory services and education ... 127

Session 2A- Critical perspective on digitalisation and advisory networks ... 127

Making use of system concepts for the analysis of digitalisation in agriculture: Synergies, Clashes or Voids? ... 127

Knierim A., Herrera B., Paulus M., Brunori G., Hortigüela R., Vergamini D., Giagnocavo C.

How does misinformation influence the virtual agri-food advisory service? Multiactor's Perspectives from Sri Lanka ... 136

Ataharul Chowdhury, Khondokar H. Kabir, Kasuni Sachithra Illesinghe Kankanamge

Action-oriented approach to assess digitalization-related risks and trade-offs by advisors ... 141

Nevena Alexandrova Stefanova, Zofia Krystyna Mroczek

Can agricultural knowledge and innovation systems guide the digital transition of short food supply chains? A study in Greece and Italy ... 147

Chrysanthi Charatsari, Anastasios Michailidis, Marcello De Rosa, Evagelos D. Lioutas, Dimitrios Aidonis, Luca Bartoli, Martina Francescone, Giuseppe La Rocca, Luca Camanzi

Session 2B – Designing & Selecting the right digital tool for advisors ... 151

Working with farmer organizations to co-design more user-relevant and responsible digital advisory services? An analysis of motivations and blocking factors. ... 151

Chloé Alexandre, Teatske Bakker

Digitalisation of advisory services and education: The case of remote consulting to overcome the challenge of on farm meeting restrictions for farm advisors, by choosing appropriate digital tools. ... 155

Evi Arachoviti, Laura Palczynski

Transitioning to Agriculture 4.0: the role of the agricultural advisor ... 160

Karen McGrath, Áine Regan, Tomás Russell

Designing with Farmers: A multi-actor framework to include Human-Centred Design in the digitization of farming services and collaboration practices. ... 164

David Hearne, Daniel Wolferts, Gráinne Dilleen

Managing digital cognitive load for farmers and advisory networks in a digital agriculture future ... 168

Callum Eastwood, Paul Edwards, Brian Dela Rue

How can Blockchain impact the Food Traceability Supply Chain? Costs and benefits for the digitalization of the agri-food system. ... 171

Session 2C – Adoption and use of tools ... 174

Factors influencing the use of digital advisory tools and services: insights from user cases across Europe... 174

Lies Debruyne, Charlotte Lybaert, Rani Van Gompel, Tom Kelly

The Potentials of the use of mobile phone to access agricultural information: Which Factors Matter... 180

Martin Bosompem, Pious Ainoo Cudjoe

Can SMS, IVR and apps enhance organic farming practices in Africa?... 181

Selina Ulman, Benjamin Gräub, Faith Maiyo, Lise Dusabe, Dieudonne Sindikubwabo

The digitalization of agriculture and the advisors' support. An analysis through the Multilevel Perspective ... 186

Taiana Homobono, Fabíola Polita, Lívia Madureira

Investigating stakeholder perception of virtual fencing technology to promote sustainable grazing management 192

Juliette Schillings192

Requirements for Adopting Drones by Farmers in Paddy Fields in the Haraz Plain Watershed, Iran 196

Jamileh Aliloo, Enayat Abbasi, Esmail Karamidehkordi, Ebadat Ghanbari Parmehr, Maurizio Canavari

TOPIC 3 - Learning for innovation and resilience 200

Session 3A - Extension Tools (A) 200

Development of an Agricultural Extension Support Tool to Increase Farmer Engagement in Conversations about Climate Change 200

Niamh Dunphy, Sinéad Flannery, Seamus Kearney

A reflective practice framework to support social learning in the context of a multi-actor project setting 205

Sangeun Bae, Andrea Knierim

A sustainable game changer? Systematic review of serious games using for agriculture 209

Sylvain Dernat, Myriam Grillot, Gilles Martel

Combining serious games contributes to changes of farmers' practices 214

Rébecca Etienne, Stéphane Ingrand, Cyrille Rigolot, Sylvain Dernat

Micro-AKIS of new entrants in agriculture 221

Sara Mikolič

Session 3B – Extension Tools (B) 225

The role of boundary objects as a multi-actor and value connector in agricultural programmes 225

Jorie Knook, R. Knopp, G. Beck, K. Mitchelmore, L. Beehre, C. Eastwood

The role of boundary objects and shared governance in the social learning of innovation networks: the case of NEFERTITI 229

Laure Triste, Rebekka Frick, Annie McKee

Supporting collaborative and participative learning through cross-cases quali-quantitative analysis. The case of the European project DiverIMPACTS 234

Margot Leclere, L. Gorissen, Y. Cuijpers, L. Colombo, M. Schoonhoven-Speijer, W.A.H. Rossing

The Eco Analysis: a tool for facilitating co-creative processes 239

Bowine Wijffels and Eelke Wielinga

Art and Agriculture; inspiring learning for sustainability transitions 244

Jorieke Potters

Session 3C – Education 248

Strengthening the future advisors' capacity to support innovation through interactive training 248

Eleni Zarokosta, Alex Koutsouris

Developing the self-positioning Master students' capacity through a collaborative learning on a scientific analysis of the glyphosate controversy 253

Simon Giuliano, Adeline Bouvard, Philippe Cousinié, Alain Rodriguez

What farmers learn for sustainable development through participatory farming system inquiry: a case study of student–farmer action learning projects 260

Åsmund Steiro

Responsible training for responsible agricultural digitalization: Some preliminary remarks 265

Chrysanthi Charatsari, Evagelos D. Lioutas, Anastasios Michailidis

Developing competences for modern rural advisors: Nature connectedness, ethos and professional ethics...269

Ioanna G. Skaltsa, Alex Koutsouris, Katerina Kasimatis

Session 3D – Supporting farmers.. 274

A social cognitive framework for learning processes in communities of practice on integrated pest management 274

Simon Lox

Inquiry, a framework to support the transformation of farmers' activity in agroecological transition 280

Celina Slimi, Marianne Cerf, Lorène Prost, Magali Prost

Exploring the role of knowledge sources in innovation adoption through a farmer typology 285

Mertijn Moeyersons

Focussing on mindset to engage the elite 290

Amy Hughes, Arron Nerbas

How can we support farmers in the management of complex systems? A case study on multi-trophic rice-fish farming systems in Guinea...300

Lucas Fertin, Teatske Bakker

Session 3E – Advisors' competences and training.. 305

Competencies for the innovation advisor in practice..305

Charlotte Lybaert, Lies Debruyne, Eva Kyndt, Fleur Marchand

How Extension Educators' Leadership Competencies Affect the Support for Organizational Change 306

Suzanna Windon

How do rural extension agents really learn? Evidence and proposals from Latin America........310

Fernando Landini

Integrating lifelong learning in practice for advisors in Australia's national extension strategy for the vegetable sector: literature review and research design..314

Elizabeth Koech

Seeing the forest through the trees: A systematic review approach to the compilation of relevant and useful tools and learning materials in support of multi-actor project development.............320

Evelien Cronin, Hanne Cooreman and Elke Rogge

Session 3F – Extension/Advisory Issues... 325

Learning good practices from the experiences of interactive innovation cases 325

Tom Kelly, Līga Cimermane, Linda Sarke, Geoffrey Hagelaar, Dora Lakner, Jos Verstegen, Alex Koutsouris, Patrizia Proietti, Simona Cristiano, András Vér, Sylvain Sturel

The value of actors' topical insights in a transition to a culture of interactive innovation support in advisory services 329

Tom Kelly, J. Kavanagh, R. Clancy, F. Birke, I. Hrovatic, L. Debruyne, S. Sturel

The life-long learning challenge in the context of multi-actor innovation: diversity across community-based approaches to sustainability 334

Áine Macken-Walsh

Organisational Capacity Assessment for Innovation Support: approach and results from tool applications in Cameroon and Madagascar 337

Hycenth Tim Ndah, Andrea Knierim, Sarah Audouin, Nestor Ngouambe, Sarah Crestin-Billet, Narilala Randrianarison, Aurélie Toillier, Ousmane Traoré, Guillaume Fongang, Syndhia Mathé

Improving farm advisory services to stimulate transitions for sustainable agriculture: towards a farmer-centric advice paradigm 345

Ellen Bulten, Boelie Elzen, Jaroslav Prazan

Learning from the world: Using a global review of innovative extension approaches to support the red-meat knowledge and innovation system in Australia 349

Ruth Nettle, Nicole Reichelt, Jana-Axinja Paschen, Helen McGregor, Basil Doonan, Ashley Evans and Leanne Sherriff

Session 3G – Innovation related issues 354

Leverage points in farmer, advisor and researcher interactions 354

Lisa Blix Germundsson, Magnus Ljung

Tailoring technical options: case studies of intangible and tangible supports in advisory approaches in West Africa 359

T. Bakker, T. Cheriere, A. Ganeme, H. Sawadogo, M. Adam, K. Descheemaeker

From practice-based evidence to evidence-based practice: how to close the loop? 363

Nicolas Giraud, Hélène Brives, Laurent Hazard

Understanding anchoring processes in crop diversification initiatives: A middle-range conceptual model 368

Lenn Gorissen, Margot Leclère, Mirjam Schoonhoven-Speijer, Walter A.H. Rossing

Evaluating co-innovation as complexity-aware project governance: creating space for agricultural transformation within Horizon 2020 project DiverIMPACTS 372

Mirjam Schoonhoven-Speijer, Walter A.H. Rossing, Elizabeth Hoffecker, Julie Ingram, Boru Douthwaite, Antoine Messéan, Margot Leclère

Implementing the Knowledge and Innovation System for Bioeconomy (KISB): a new vision from the BIObec project...377

Giacomo Maria Rinaldi

TOPIC 4 - Public policies for innovation and the governance of AKIS: how to embed advice & education into strategies of AKIS 384

Session 4A – New perspectives on AKIS 384

AKIS as a concept: from history to future 384

Eelke Wielinga, Sylvia Burssen

Strengthen the AKIS through the Transformative AKIS Journeys 389

Patrizia Proietti, Simona Cristiano

Climate change and innovation: the role of public policies in a multi-stakeholder approach. ...395

Jose Luis Cruz, A. Barrutieta, I. González, V. Bermejo, JP. Zamorano

Towards a Capacity Development framework for the EIP-AGRI concept 399

Susanne von Münchhausen, Mark Redman, Mikelis Grivins, Lisa van Dijk

Evaluation of Italian Food Districts: preliminary data 402

Francesco del Puente, Concetta Menna, Marcello De Rosa, Giuseppina Olivieri, Piermichele La Sala, Ferdinando Gandolfi[6]; Irene Paola Borrelli, Teresa del Giudice, Alessandro Sapio

A Global Foresight Framework for the transformation of national agricultural extension systems: contribution for renewing AKIS 408

P. Djamen, S. Audouin, N. Alexandrova, P. Van Doren, Z. Mroczek

Session 4B – Integration of innovation support service in the AKIS 416

Towards a framework to assess quality of innovation support services in AKIS: match and mismatch between farmers and providers' perceptions in Madagascar 416

Sarah Audouin, Salomé Valisoa Ranaivomanana, Narilala Randrianarison, Mandranto Nantenaina Andriamanantsoa, Hycenth Tim Ndah, Harilala Andriamaniraka, Syndhia Mathé

What are the specificities of agricultural innovation systems in the South: an approach based on innovation support services 423

Mathé Syndhia, Audouin Sarah, Toillier Aurélie, Temple Ludovic, Ndah H. Tim, Knierim Andrea, Randrianarison Narilala, Traoré Ousmane, Ngouambe Nestor, Guillaume Fongang

Mapping ISS functions as a tool for national policymakers across EU countries 430

Lívia Kránitz, S. Aboelnaga, S. Vágó, Patrizia Proietti, Simona Cristiano

Ecosystem of actors and sectoral governance strategies for agricultural innovation in Cameroon 436

Temple L., Talla SMB., Kamga R., Awah MLA., Mathé S.

Worthy ISS provider functions case as a guide for the national policymakers, through mapping ISS across EU countries. 444

Peter Paree, Somaya Aboelnaga, Lívia Kránitz, Patrizia Proietti, Simona Cristiano

Session 4C – Methods and tools to support policies 450

Assessing performances of advisory services based on their quality: a user-centred evaluation model 450

Simona Cristiano, Patrizia Proietti, Alberto Sturla, Valentina Carta

Measuring the effectiveness of CAP's agri-environmental knowledge transfer: An evaluation framework 460

Ana Novak, Tanja Šumrada

Taking stock of farmers' knowledge and skills needs in Rhineland-Palatinate on light of sustainability transitions. Entry points for the systematic evaluation of AKISs performance 465

Oliver Müller

New directions in changing farmer behaviour: extension lessons from the HerdAdvance project (Welsh Government/AHDB) 471

David Rose, Juliette Schillings, James Breen, Rosie Morrison

The needs of extension and education and governance of AKIS for the revival of chestnut growing in Italy 474

Tatiana Castellotti

Session 4D – The role of public and private advice actors in changes 476

The trusted advisor: a farmer-centric case study in North-West Greece 477

Eleni Pappa, Alex Koutsouris

From farm advisory regimes to KIBS market menageries. Effects of privatisation on technological change in the agricultural sectors of seven European countries. 482

Pierre Labarthe

Local Action Groups and Leader approach in innovation transfer and governance policies: The case of Turkey 487

Mücahit Paksoy, Orhan Özçatalbaş

TOPIC 5 - Inclusion and the social dimension of sustainability.. 488

Session 5A – Social farming 488

The Advisors' role in Social Farming: a case study project 488

Giulia Granai, Francesco Di Iacovo, Alessandra Funghi and Roberta Moruzzo

How is animal well-being affecting employees farmers and extension on large dairy farms ? ...492

Louise Axelson

Social Farming and Animal Assisted Intervention in rural context: a cultural change in social and health services for people 496

Morgana Galardi, Laura Contalbrigo, Roberta Moruzzo

The potentials of an integrated approach to social sustainability in natural resource management – Swedish experiences from 50 land owner groups 499

Magnus Ljung, Lars Johansson499

Theatre-Based Behaviour Change Intervention as an Agricultural Extension Tool for Farm Health, Safety and Wellbeing Training for Farmers..505

Sinead Flannery, Anne Markey

Session 5B – Occupational health, safety and well-being.. 510

Managing Stress on the Farm 510

Suzanna Windon, Carolyn Henzi

The mental wellbeing of young farmers in Ireland and the UK: driving factors, helpseeking and support: Implications for advisory and extension services 512

Deirdre O' Connor

Dying to Farm – understanding the factors affecting famer mental health and the support requirements 515

Tomás Russell, Alison Stapleton, Anne Markey, Louise McHugh

What would a relevant evaluation of occupational safety and health advisory services in agriculture be? Evidence of conflicting perceptions in the French context...518

Pierre Labarthe, Catherine Laurent, Nathalie Jas, Agnès Labrousse

Session 5C – Designing farm advisory services for Hard-to-reach population.. 524

'I was always the farmer': The dynamics of young farmer education choices in Irish agriculture 524

Brian Leonard, Tomás Russell

Institutional Evolution of Gender in Farm Advisory Services: A Canada-France Comparison ..526

Rivellie Tschuisseu

Supporting women's roles within family dairy farms – A case study of an Irish learning initiative 530

Monica Gorman, Beth Dooley, Marion Beecher

How to make Johne's Disease extension strategies more inclusive of 'disengaged' farmers 535

Rosie Morisson, David Rose, Pete Orpin, James Hanks, Emma Taylor

Introduction

The **European Seminar on Extension & Education (ESEE) is a biennial conference about agricultural advice and education.** It has gathered scholars, advisors and educators since 1973. Click here to learn about past conferences organised in Ireland (2021) and Italy (2019).

It aims at supporting discussion between science and practice. Hence, it is open to a diversity of contributions, both academic and practical. ESEE gathers and contrast experiences and findings from all European countries, but also between Europe and other contexts in the global North and global South. The seminar has lead to the publication of several special issues in the *Journal of Agricultural Extension and Education* and other academic publications.

The 2023 conference was organised in Toulouse (France), from July 10th to July 13th. The overall theme of the 26th conference is: "*Sustainability transitions of agriculture and the transformation of education and advisory services: convergence or divergence*?"

Sustainable transition of agriculture is at the forefront of both academic and political agenda, especially in the frame of the next European Common Agricultural Policy. Education and Advisory services are expected to be major drivers of these transitions, by co-producing knowledge with farmers and farm workers, enhancing their competences and supporting their innovation processes. At the same time, advisory services and education face major transformations (digitalisation, privatisation, new governance models, etc.). The relations between these two dynamics - sustainable transition of agriculture and the transformations of advice and education are the matter of debates and controversies. The aim of this conference will be to discuss about concepts, empirical evidence and new methods to support the contribution of advice & education to the various dimensions of sustainability, including social dimensions (inequalities and labour & work conditions) and environmental ones (climate change, biodiversity, water).

The conference addressed more specifically five topics:

- **TOPIC 1 - Transitions towards agroecology & circular economy:** Which actors and approaches of advice and education support, what hinders them?
- **TOPIC 2 - Digitalisation of advisory services and education:** what are the effects of digital technology on the practices, actors and organisation of advice and education?
- **TOPIC 3 - Learning for innovation and resilience:** which theory and practice developments for training, life-long learning and education of farmers, advisors, teachers and facilitators?
- **TOPIC 4 - Public policies for innovation and the governance of AKIS**: how to embed advice & education into AKIS strategies and planning?
- **TOPIC 5 - Inclusion and the social dimension of sustainability**: (how) are these issues acknowledged in advice and education?

This book gathers the abstracts presented during the conference. It also describes the topics of the conference, its overall program, including plenary keynotes and roundtables, and special sessions. Information about the scientific and local committees are also provided. This book was edited by Pierre Labarthe, Research Professor at INRAE.

The ESEE community

The organisation of the 26th ESEE was a collective effort. We take the opportunity to thank all the people who were actively involved in this exciting adventure!

International Scientific Committee

The International Scientific committee plays a key role. Its members are in charge of writing the conference call, identifying topics, reviewing and selecting abstracts, and chairing sessions. The members of the 26th ESEE were:

- **Pierre Labarthe, INRAE (France), President of ESEE International Scientific Committee**
- Simona Cristiano, CREA (Italy)
- Artur Cristovao, University of Trás-os-Montes e Alto Douro (Portugal)
- Maria Gerster-Bentaya, University of Hihenheim (Germany)
- Monica Gorman, Teagasc (Ireland)
- Jozef Kania, University of Krakow (Poland)
- Esmail Karamidehkordi, Tarbiat Modares University (Iran)
- Tom Kelly, Teagasc (Ireland)
- Laurens Klerkx, Wageningen University (Netherlands)
- Alex Koutsouris, University of Athens (Greece)
- Andrea Knierim, University of Hohenheim (Germany)
- Michael Kugler, Chambers of agriculture (Germany)
- Magnus Ljung, Swedish University of Agricultural Sciences (Sweden)
- Livia Madureira, University of Trás-os-Montes e Alto Douro (Portugal)
- Mark Moore, Teagasc (Ireland)
- Peter Paree, ZLTO (Netherlands)
- Patrizia Proietti, CREA (Italy)
- Eelke Wielinga, Link Consult (Netherlands)

Local organising committee

The local organising committee was in charge of organising five field trips that provided interesting case studies to feed discussions about the conference topics. It was also in charge of all the logistics of the conference. The organisation was a joint effort between researchers and management staff of two research laboratories: AGIR (INRAE-University of Toulouse) and LEREPS (University of Toulouse & Sciences Po). The members of the local organising committee were:

- Pierre Labarthe (INRAE)
- Camille Berrier (INRAE)
- Nicolas Gallai (ENSFEA)
- Nathalie Girard (INRAE)
- Héloïse Leloup (INRAE)
- Rachel Levy (ENSFEA)
- Catherine Milou (University of Toulouse)
- Geneviève Nguyen (INPT, University of Toulouse)
- Gaël Plumecocq (INRAE)
- Pierre Triboulet (INRAE)

with the support of

- Christel Moder (INRAE)
- Mathieu Solle (INRAE)
- Clémence Rigal (INRAE)
- Marina Lefebvre (INRAE)
- Anne-Marie Beyssens (University of Toulouse)
- Sophie Regnier (Sciences Po)

Conference Topics

TOPIC 1 – Transitions towards agroecology & circular economy

Which actors and approaches of advice and education support, what hinders them?

Convenors: Esmail Karamidehkordi, Livia Madureira, Eelke Wielinga

The aim of this topic is to discuss whether the new patterns of advice and education support or not the integration of agroecology and circular economy. (How) do the new actors of advice and education (and the relation between these actors) contribute to transitions?

The questions highlighted in the conference call included:

- **Territorial approaches**: How to implement territorial approaches of advice and education to support transitions?
- **Pluralism of suppliers of advice**: How do the fragmentation of advisory landscapes play on sustainability transitions? What strategies do educators and advisors apply to network and cooperate as well as remain competitive in these conditions?
- **Values and political orientations within education and advisory subsystems** - how do impartiality and neutrality of advisors and educators matter?
- **Customising advice**: Education and advisory methods, tools, and skills to respond to increasing heterogeneity in farmers' needs for assessing and implementing agroecological transitions at the farm level.
- **Power relations in supply chains**: How do advisory services reinforce or counterbalance power relations within supply chains?
- **Development of new approaches to support sustainability**: What are the potentialities of network of demonstrations, democratic deliberative processes, living labs, facilitation, etc. ?
- **Organisational and marketing innovations**: Which policy, schemes and skills to support it?

TOPIC 2 – Digitalisation of advisory services and education

Convenors: Laurens Klerkx, Andrea Knierim, Pierre Labarthe

A wide diversity of digital technology is now routinely used in agricultural advice and education. However, we still lack knowledge about how they actually transform the practices, organisations and effectiveness of advice and education.

The questions highlighted in the conference call included:

- **Data governance**: which role of advice and education in supporting the management and governance of data? What are the emerging advisory business models associated with agricultural data? What initiatives can be taken to enable teachers and advisors to support farmers in safe and effective data management?
- **Directionality**: does digitalisation continue to reinforce the industrialisation of agriculture or can it also serve alternative models with new advice and education models and practices?
- **Empowerment**: Can digitisation help advisors and educators reinforce farmers position?
- **Evaluation**: how can we evaluate the uptake and effects of digital tools and technologies ? Can advisory services contribute to this?
- **Tools**: can we showcase examples of education and advisory digital tools that actually support sustainability? How do they impact educators’ and advisors’ practices, skills and organisations?
- **Digital divide in rural areas**: can we highlight successful individual/community/public initiatives to include remote communities?

TOPIC 3 – Learning for innovation and resilience: theory and practice developments

(for training, life-long learning and education of farmers, advisors, teachers and facilitators)

Convenors: Monica Gorman, Alex Koutsouris, Maria Gerster-Bentaya

The traditional approach to education must evolve from being a concentrated period at the start of a career to one where learning is an integral lifelong process that equips individuals and communities with the skills, knowledge and confidence to meet and embrace change.

The questions highlighted in the conference call included:

- **Approaches and tools**: Which approaches and methodologies are appropriate for collaborative, participative and transdisciplinary learning? Development of new and existing tools to promote collaborative, participative and transdisciplinary learning
- **Next generation**: What changes are needed or are happening in the education of the next generation - the nexus of continuity and change (including the digital revolution and the challenges of climate, environment, etc.)
- **Skills**: How are generic and specific skills for advisors, teachers and facilitators (at both individual and collective or organisational level) identified, translated into training programmes, tools and methods, and implemented? Development of frameworks to guide CPD for farmers, advisors, teachers and facilitators
- **Systemic changes**: How to support farm households through (formal & informal) education in view of systemic changes (new climate challenges, sustainability targets, social & health challenges, etc) How to better connect research, education and communities
- **Reaching the hard-to-reach:** How to address/attract people with low/no interest in advisory and education, in EIP agri projects, etc.? How to reach the hard-to-reach?

TOPIC 4 – Public policies for innovation and the governance of AKIS

how to embed advice & education into strategies of AKIS

Convenors: Simona Cristiano, Michael Kügler, Patrizia Proietti

In the EU, Agricultural Knowledge and Innovation Systems (AKIS) have become explicitly a concept for innovation policy, in a context of support of sustainable transition. The aim of this topic is to explore the consequences of this new paradigm, by contrasting experiences in different European countries, but also between Europe and other contexts in the global North and global South.

The questions highlighted in the conference call included:

- **The new CAP**: Support to knowledge exchange and innovation processes are central concerns of the new CAP: How and with what effects are such measures designed and implemented by member states?
- **Governance of AKIS**: How do actors grasp and enact the AKIS concept? What structures and mechanisms are in place for effective and efficient coordination of AKIS stakeholders? Are there new funding schemes within AKIS policy: vouchers, etc.
- **Independent advice**: The notion of "independent" and "impartial" advice is explicit within the new CAP. How can this notion be designed and implemented in a context of increased pluralism of suppliers?
- **Monitoring and Evaluation**: how can the embedeness of advice and education actors be evaluated? How to measure to which extent advisors are interconnected? How can we measure and strengthen knowledge flows?

TOPIC 5 – Inclusion and the social dimension of sustainability

(how) are these issues acknowledged in advice and education?

Convenors: Pierre Labarthe, Mark Moore

Social cohesion is a the forefront of agricultural and rural policies, both in Europe (with for instance the notion of social conditionality of EU support measures), but also in other contexts. A main question is then how do advice and education deal with the diversity of populations they are expected to serve? How can it improve their working conditions?

The questions highlighted in the conference call included:

- **Inequalities**: How to integrate time gaps and heterogeneity in geographic and farming structures: How can advice learn and share customised information about transitions risks, costs and benefits, and avoid inequalities or inequities?
- **Occupational Health**: how are workers' and farmers' health integrated into advice and education? Specific focus on occupational (exposition to pesticides, etc.) or on mental health issues
- **Workers and contractors**: farm populations are changing, more workers (including migrants and precarious), more contractors, new entrants with different business models… how are they acknowledged and served by advice and education?
- **New entrants**: How are new farming (business) models (social farming, solidarity farming, cooperation among farms/ farmers, …) taken up in advisory services and education - specifically in the transition phase? What are the approaches to better link farmers and consumers in view of changing perspectives, attitudes, common understanding
- **Small farms revisited**: are there new approaches to take into account small scale and part-time farmers in advisory and education
- **Gender**: considering women as a specific target group - still necessary of have we move towards gender mainstreaming? How to address pratically gender issues in advice and education?

Overview of the conference program

Monday 10 July	Tuesday 11 July	Wednesday 12 July	Thursday 13 July
Arrival and Registration	**Field trips**	**09:00-10:30** **Roundtable 1:** French and Irish perspectives on new extension methods (farmers' groups and demo) to support sustainability transition	**09:00-11:00** **Parallel session 5**
		10:30-11:00 / Break	11:00-11:30 / Break
		11:00-13:00 **Parallel session 2**	**11:30-13:00** **Roundtable 2 :** Intercontinental exchange about current trends in agricultural extension & education public policies with Andrea Knierim (Germany), Fernando Landini (Argentina), Ruth Nettle (Australia) & Ataharul Chowhudy (Canada)
		13:00-14:00 / Lunch	**13:00-13:30 / Closing & Farewell**
14:00 /14:30 **Official Opening**		**14:00-16:00** **Parallel session 3**	**Departure**
14:30-16:00 /Keynotes (plenary) Julie Ingram (univ. Gloucester.) Katrin Prager (univ. Aberdeen)			
16:00-16:30 / Break		16:00-16:30 / Break	
16:30-18:30 **Parallel session 1**		**16:30-18:30** **Parallel session 4**	
Break		18:30-19:00 Business meeting – Planning ESEE 2025	
From 19:00 **Welcome cocktail**		**From 20:00** **Gala diner**	

Keynotes and Roundtables

Opening Plenary

Monday 10th, 14:30-16:00 – Amphitheater MB 1

- **Advisory services and transition: negotiating new policies, markets and technologies**
  Dr. Julie Ingram, CCRI, University of Gloucestershire
- **Advisors and facilitators as key players in novel agri-environmental contracts**
  Dr. Katrin Prager, University of Aberdeen

Roundtable 1

Wednesday 12th, 09:00-11:00 – Amphitheater MB 1

This roundtable will build on French and Irish perspectives to discuss about the potential and specific caveats of new forms and methods of advice (group advice, signpost farms, demo…), as tools to support agroecological transitions. The questions addressed will include: How to make the groups sustainable over time? How to guarantee the bottom-up functioning of the groups, while maintaining the support of the accompanying structures? What are the skills/knowledge needed from advisors? How to make sure that the benefits of the groups disseminate beyond the direct participants? In terms of governance: how to engage in networks in a multi-actor context?

Participants to the rountable:

- **Calypso Picaud (Regional Chamber of Agriculture, France),** in charge of coordinating and facilitating networks of advisors in charge of farmers' group
- **Nelson Guichet** (chamber of agriculture of Ariège, France) local advisors facilitating local farmers' groups
- **Christophe Mur (DRAAF, France),** policy maker in charge of funding local farmers' group
- **Tom O'Dwyer** (Teagasc, Ireland)

Roundtable 2

Thursday 12th, 09:00-11:00 – Amphitheater MB 1

This roundtable will propose a discussion gathering Intercontinental perspectives on new trends in farm advisory services public policies in a context of sustainable transitions. The challenges addressed will include: Digitalisation, Privatisation, Global issues: carbon markets, climate change

Participants to the roundtable:

- **Ruth Nettle** (Univ. Melbourne, Australia)
- **Fernando Landini** (Conicet, Argentina)
- **Ataharul Chowdury** (Univ. Guelph, Canada)
- **Andrea Knierim** (Univ. Hohenheim, Germany)

Detailed program

TOPIC 1 - Transitions towards agroecology & circular economy:

Convenors: Eelke Wielinga, Esmail Karamidehkordi, Livia Madureira,

---

Session 1A - AKIS Policy assessment on Agroecology
Monday 10th, 16:30-18:30 – Room MB 401

Chair: Gael Plumecocq

— Implications of Global Biodiversity Framework on communication and extension systems
Esmail Karamidehkordi

— Innovating to enable extension and advisory services to promote agriculture and other nature-based approaches
Zofia Krystyna Mroczek, Nevena Alexandrova Stefanova

— The greening of agricultural policies in France: a look from within
Floriane Clément, Pierre Labarthe, Gaël Plumecocq

— Transitions and disturbances in action: a discursive method of analysis to characterize the impact of change on farmers and their advisors
Catherine Milou

— The attitude of technical advisors towards professional continuous learning: the case of Italian organic agriculture system
Roberta Milardo, Aldo Bertazzoli

Session 1B - Customising advice for sustainable transition (1)
Wednesday 12th, 11:00-13:00 – Room MB 401

Chair: Esmail Karamidehkordi

— Are plantain-based production systems, Agricultural Innovation System in Guadeloupe?
Marie Bezard, Carla Barlagne, Valérie Angeon, Maud Caperaa, Harry Ozier Lafontaine, Jean-Louis Diman, Nadine Andrieu

— Agroecological transitions and farmers microAKIS: Case studies from the Global North compared to Global South
Ana Fonseca, José Rosário, Carlos P. Marques, Carlos Marques, Lívia Madureira

— Customising advice: an attempt to evaluate customer satisfaction of Farm Advisory Services and improve agroecological transition
Giuseppina Olivieri, Marcello De Rosa, Concetta Menna, Imma Cigliano, Ferdinando Gandolfi, Maria Passari, Teresa Del Giudice

— Mapping knowledge circulation in the olive and viticulture sectors in Central Spain: a comparative study
Jose-Luis Cruz, A. Barrutieta, A. García, B. Sastre, O. Antón, JP Zamorano

— Engaging with Monitor Farmers on Farmland Biodiversity Management
Aoife Leader, Richard O'Brien, James Kinsella

Session 1C - Customising advice for sustainable transition (2)
Wednesday 12th, 14:00-16:00 - Room MB 401

Chair: Eleke Wielinga

- Deliberative processes for co-constructing sustainability transitions using science, society, policy interfaces
  David Miller, Jorieke Potters, Ellen Bulten, Gerald Schwartz
- Participatory workshops' impacts on farmers' intention to adopt climate mitigation farming practices: A randomized controlled trial in Slovenia
  Živa Alif, Ana Novak, Tanja Šumrada
- Visioning a sustainable urban agriculture
  Vebjørn Egner Stafseng
- Assessing capabilities of the hub organisations of Innovation Support Services Ecosystems: an evaluation grid for researchers and practitioners
  Claire Orbell, Aurélie Toillier, Sophie Mignon

Session 1D- Education and training for agroecology – Insights from France
Wednesday 12th, 16:30-18:30 - Room MB 401

Chair: Rachel Levy

- Agricultural education students as "intermediaries" in the fight against climate change
  Rachel Levy Rachel and Jean-Pierre del Corso
- Agricultural education and its audiences facing the challenge of climate change. A socio-economic analysis of the contribution of this training device to the implementation of Nature-Based Solutions
  Nicola Gallai, Nina Asloum and Jean-Pierre del Corso
- Training young teachers in teaching agroecology: challenges and opportunities
  Anne-Emmanuelle Fiamor and Agnès Terrieux
- The role of formation and social relationships into the traditional knowledge access: comparison between France and Benin
  Lorine Maretz, Rachel Levy
- Training of trainers in agroecology based on the teaching of endogenous knowledge
  Jean-Pierre del Corso, François Fall, Guillaume Gillet and Micheline Marie-Sainte

Session 1E – Thursday 13th, 09:00-11:00 - Room MB 401

Special Session: Emerging soil carbon policies and markets: the implications for advisory services

Chair: Julie Ingram, Katrin Prager, Beth Dooley

This session aimed to bring together researchers and practitioners interested in the implications of an emerging soil carbon economy for advisory services and the wider AKIS. There is high expectation as regards transformative potential of agricultural practices to sequester carbon. Carbon farming to mitigate climate change is of growing interest to policy makers at a European level (EU, 2021) through a number of mechanisms (e.g. EU Soil Observatory, Soil Mission, Horizon Europe, CAP instruments), and internationally (Fleming et al., 2019). Meanwhile natural capital mechanisms offer new revenue streams for farmers, supply chain, intermediaries and financial institutions within an emerging bioeconomy (Reed et al., 2020; Buck 2022; Black et al., 2022; EU, 2021). Specifically, rewards for farmers to use land management practices that sequester soil carbon, through policy instruments or voluntary soil carbon markets, represent a new soil carbon economy. Although these are appealing instruments for policy makers and markets, there are multiple challenges to implementing them, including: standardising methods for monitoring, reporting and verifying the gains or losses in carbon sequestered across initiatives and organisations (Elliot et al., 2022); lack of consensus in the scientific community; and uncertainty and risk aversion in the farming and advisory community. This emphasis on soil carbon also potentially disrupts existing services, practices, markets and institutions, with new actors entering the AKIS, traditional roles and relationships redefined, and power asymmetries potentially reinforced. Meanwhile, new concepts, metrics and methodologies challenge farmer and adviser understanding and demand new skills and competencies as well as capacities in the innovation support services (Frelih-Larsen et al., 2020; Mattila et al., 2022). This carbon-centric focus also potentially negates existing knowledge of managing soil health and wider soil ecosystems services (Kennor et al., 2021).

The session comprised a workshop and applied participatory methods to draw on participants' knowledge and experiences to:

- map the scope and nature of soil carbon farming policies and soil carbon markets emerging across Europe and internationally
- understand the opportunities and challenges these markets and policies present for farmers and advisory systems and services
- collectively identify and prioritise a set of propositions that will provide the foundations for a research agenda for ESEE scholars

The following questions were specifically addressed:

- What are the implications of this emerging soil carbon economy in terms of actors (farmers, advisers, new intermediaries etc) knowledge, capacities and understanding?
- What are the new reconfigurations of actors (old and new) and their power relations and the implications of these changes?

Session 1F – Thursday 13th, 09:00-11:00 - Room MB 407

<u>Special Session</u>: Serious games exhibition for agricultural education & extension

Chairs: Sylvain Dernat, Julie Rychawy et Guillaume Martin

In a context of interconnected environmental changes (climate change and biodiversity loss among others), the agricultural sector and the entire food system are under pressure. This calls for sustainability transitions that are systemic and complex by essence due to the multiple dimensions to be taken into consideration, but also to the diversity of possible pathways (agroecology, bioeconomy, digital and precision farming...). Simultaneously, the use of serious game is growing significantly around the world (Plass et al., 2015, Flood et al., 2018). This is not only a movement around video games as all game modalities are concerned, especially analog games: board games, card games, escape games... (Bayeck, 2020; Rogerson & Gibbs, 2018). The present special session proposal builds on this trend. In the field of agricultural extension and education, serious games have long been identified as a useful method of horizontal knowledge sharing compared to traditional top-down models (Hernandez-Aguilera et al., 2020). The development and use of such games have gained momentum over the past years as evidenced by numerous publications (for example: Berthet et al., 2016; Dernat et al., 2022; Martin, 2015; Meunier et al., 2022; Ryschawy et al., 2022). Such games aim at helping to better understand complex phenomena, transmitting or sharing knowledge and skills, encouraging the design and experimentation of new ideas and practices, or the adaptation of old ones, support collective decision making, assess systems, practices or actions... In particular, it can be noted that the majority of these games, especially in France, are analogues (Dernat et al., 2021). However, games in agriculture are still lacking visibility by a large part of the R&D community, as evidenced by their limited use in agricultural extension and education. This session will therefore aim to introduce attendees to serious games applied to sustainability transitions in agriculture and food systems to help them to discover this useful tool for agricultural development.

The session took place in two dedicated rooms. In the first room, various game creators presented his/her game to the interested ESEE conference attendees whenever possible with the game itself. Collectives specialised in serious games (research teams or firms) also presented their work (development, use or use assessment of serious games).The second room was dedicated to game sessions where games could be played. This format allowed attendees to discover and experience the games..

TOPIC 2 - Digitalisation of advisory services and education:

Convenors: Andrea Knierim, Laurens Klerkx and Pierre Labarthe

---

Session 2A- Critical perspective on digitalisation and advisory networks

Monday 10th, 16:30-18:30 – Room MB 402

Chair: Pierre Labarthe

- Making use of system concepts for the analysis of digitalisation in agriculture: Synergies, Clashes or Voids?
  A. Knierim, B. Herrera, M. Paulus, G. Brunori, R. Hortigüela, D. Vergamini, C. Giagnocavo
- How does misinformation influence the virtual agri-food advisory service? Multiactor's Perspectives from Sri Lanka
  Ataharul Chowdhury, Kabir Khondokar Humayun, Kasuni Sachithra Illesinghe Kankanamge
- Action-oriented approach to assess digitalization-related risks and trade-offs by advisors
  Nevena Alexandrova Stefanova, Zofia Krystyna Mroczek-
- Can agricultural knowledge and innovation systems guide the digital transition of short food supply chains? A study in Greece and Italy
  Chrysanthi Charatsari, Anastasios Michailidis, Marcello De Rosa, Evagelos D. Lioutas, Dimitrios Aidonis, Luca Bartoli, Martina Francescone, Giuseppe La Rocca, Luca Camanzi
- Perspective from an advisor from a local French Chamber of agriculture
  Guillaume Laplace
- Perspective from an advisor of a local Farmers' machinery cooperative
  Marie-Flore Doutreleau

Session 2B – Designing & Selecting the right digital tool for advisors

Wednesday 12th, 11:00-13:00 – Room MB 402

Chair: Ataharul Chowdhury

- Working with farmer organizations to co-design more user-relevant and responsible digital advisory services? An analysis of motivations and blocking factors.
  Chloé Alexandre, Teatske Bakker
- Digitalisation of advisory services and education: The case of remote consulting to overcome the challenge of on farm meeting restrictions for farm advisors, by choosing appropriate digital tools..
  Evi Arachoviti, Laura Palczynski
- Transitioning to Agriculture 4.0: the role of the agricultural advisor
  Karen McGrath, Áine Regan, Tomás Russell
- Designing with Farmers: A multi-actor framework to include Human-Centred Design in the digitization of farming services and collaboration practices.
  David Hearne, Daniel Wolferts, Gráinne Dilleen
- Managing digital cognitive load for farmers and advisory networks in a digital agriculture future
  Callum Eastwood, Paul Edwards, Brian Dela Rue

Session 2C – Adoption and use of tools

Wednesday 12th, 14:00-16:00 - Room MB 402

Chair: Andrea Knierim

- Factors influencing the use of digital advisory tools and services: insights from user cases across Europe
  Lies Debruyne, Charlotte Lybaert, Rani Van Gompel, Tom Kelly
- The Potentials of the use of mobile phone to access agricultural information: Which Factors Matter
  Martin Bosompem, Pious Ainoo Cudjoe
- Can SMS, IVR and apps enhance organic farming practices in Africa?
  Selina Ulman, Benjamin Gräub, Faith Maiyo, Lise Dusabe, Dieudonne Sindikubwabo
- The digitization of agriculture and the advisors' support. An analysis through the Multilevel Perspective
  Taïana Hobonobo, Fabiola Polita, Lívia Madureia
- Investigating stakeholder perception of virtual fencing technology to promote sustainable grazing management
  Juliette Schillings
- Requirements for Adopting Drones by Farmers in Paddy Fields in the Haraz Plain Watershed, Iran
  Jamileh Aliloo, Enayat Abbasi, Esmail Karamidehkordi, Ebadat Ghanbari Parmehr, Maurizio Canavari

Session 2D - Wednesday 12th, 16:30-18:30 - Room MB 402

Special session: Securing the future of data driven services and digital advisory tools: consolidating the legacy of FAIRshare with behavioral innovation insights from Ploutos

Facilitator Aine Macken Walsh.

Contributions from Tom Kelly, Peter Paree, Patricia Fry, Raquel Ferreira

The EU H2020 project which supports the wider use of digital advisory tools and services by making them Findable, Available, Interoperable, Reusable and Shareable (FAIRshare). It was a five year Renaissance – Coordination and Support Action "Enabling the farm advisor community to prepare farmers for the digital age" The project has two main actions firstly engaging advisors and other relevant actors through an inventory digital advisory tools and services, good practices and training resources in a permanent networking facility (PNF). Secondly, it funds 42 advisory digital tool and services development initiatives, including strategic alignment of their strategy, business case and advisor support to improve advisors access to digital tools, digital skills and the motivation to use digitalised services. (5 mins)

In this session three key questions were addressed in a participatory workshop format.

- How to maintain and continue the PNF. How will advisors find, compare and share better digital tools and services in future? With 300 digital tools and services already described in the inventory how could these be maintained and improved.
- How will be the impact of the 42 user cases, what was learned by different actors, how effective were they in setting, reviewing and achieving their digitalisation goals and business objectives, were advisors adequately motivated by the process.
- How effective is training in engaging advisors and building their confidence and motivating the day-to-day use of digital tools and services what was learned about advisors and farmers attitudes to digitalisation.

TOPIC 3 - Learning for innovation and resilience:

Convenors: Monica Gorman, Alex Koutsouris, Maria Gerster-Bentaya

---

Session 3A - Extension Tools (A)

Monday 10th, 16:30-18:30 – Room MB 403

Chair: Monica Gorman

- Development of an Agricultural Extension Support Tool to Increase Farmer Engagement in Conversations about Climate Change
  Niamh Dunphy, Sinéad Flannery, Seamus Kearney
- A reflective practice framework to support social learning in the context of a multi-actor project setting
  Sangeun Bae, Andrea Knierim
- A sustainable game changer? Systematic review of serious games using for agriculture
  Sylvain Dernat, Myriam Grillot, Gilles Martel
- Combining serious games contributes to changes of farmers' practices
  Rébecca Etienne Stéphane Ingrand, Cyrille Rigolot, Sylvain Dernat
- Micro-AKIS of new entrants in agriculture
  Sara Mikolič

Session 3B – Extension Tools (B)

Wednesday 12th, 11:00-13:00 – Room MB 403

Chair: Sinead Flannery

- The role of boundary objects as a multi-actor and value connector in agricultural programmes
  Jorie Knook, R. Knopp, G. Beck, K. Mitchelmore, L. Beehre, C. Eastwood
- The role of boundary objects and shared governance in the social learning of innovation networks: the case of NEFERTITI
  Laure Triste, Rebekka Frick, Annie McKee
- Supporting collaborative and participative learning through cross-cases quali-quantitative analysis. The case of the European project DiverIMPACTS
  Margot Leclere, L. Gorissen, Y. Cuijpers, L. Colombo, M. Schoonhoven-Speijer, W.A.H. Rossing
- The Eco Analysis: a tool for facilitating co-creative processes
  Bowine Wijffels and Eelke Wielinga
- Art and Agriculture; inspiring learning for sustainability transitions
  Jorieke Potters

Session 3C – Education

Wednesday 12th, 14:00-16:00 – Room MB 403

Chair: Rachel Lévy

— Strengthening the future advisors' capacity to support innovation through interactive training
Eleni Zarokosta, Alex Koutsouris

— Developing the self-positioning Master students' capacity through a collaborative learning on a scientific analysis of the glyphosate controversy
Simon Giuliano, Adeline Bouvard, Philippe Cousinié, Alain Rodriguez

— What farmers learn for sustainable development through participatory farming system inquiry: a case study of student–farmer action learning projects
Åsmund Steiro

— Responsible training for responsible agricultural digitalization: Some preliminary remarks
Chrysanthi Charatsari, Evagelos D. Lioutas, Anastasios Michailidis

— Developing competences for modern rural advisors: Nature connectedness, ethos and professional ethics
Ioanna Skaltsa, Alex Koutsouris, Katerina Kasimatis

Session 3D – Supporting farmers

Wednesday 12th, 16:30-18:30 – Room MB 403

Chair: Nathalie Girard

— A social cognitive framework for learning processes in communities of practice on integrated pest management
Simon Lox

— Inquiry, a framework to support the transformation of farmers' activity in agroecological transition
Celina Slimi, Marianne Cerf, Lorène Prost, Magali Prost

— Exploring the role of knowledge sources in innovation adoption through a farmer typology
Mertijn Moeyersons

— Focussing on mindset to engage the elite
Amy Hughes, Arron Nerbas

— The impacts of time perspective on farmers' resilience to climate change: A challenge for agricultural extension
Masoud Bijani, Maryam Shariatzadeh, Negin Fallah Haghighi

— How can we support farmers in the management of complex systems? A case study on multi-trophic rice-fish farming systems in Guinea
Lucas Fertin, Teatske Bakker

Session 3E – Advisors' competences and training

Thursday 13th, 09:00-11:00 - Room MB 403

Chair: Alex Koutsouris

— Competencies for the innovation advisor in practice
Charlotte Lybaert, Lies Debruyne, Eva Kyndt, Fleur Marchand

— How Extension Educators' Leadership Competencies Affect the Support for Organizational Change
Suzanna Windon

— How do rural extension agents really learn? Evidence and proposals from Latin America
Fernando Landini

— Integrating lifelong learning in practice for advisors in Australia's national extension strategy for the vegetable sector: literature review and research design
Elizabeth Koech

— Seeing the forest through the trees: A systematic review approach to the compilation of relevant and useful tools and learning materials in support of multi-actor project development?
Evelien Cronin, Hanne Cooreman, Elke Rogge

— How can we better pass on the expertise of organic farm advisors to the next generation of advisors?
Anne Glandières

Session 3F – Extension/Advisory Issues

Thursday 13th, 09:00-11:00 - Room MB 402

Chair : Tomas Russel

— Learning good practices from the experiences of interactive innovation cases
Tom Kelly, Līga Cimermane, Linda Sarke, Geoffrey Hagelaar, Dora Lakner, Jos Verstegen, Alex Koutsouris, Patrizia Proietti, Simona Cristiano, András Vér, Sylvain Sturel

— The value of actors' topical insights in a transition to a culture of interactive innovation support in advisory services
Tom Kelly, J. Kavanagh, R. Clancy, F. Birke, I. Hrovatic, L. Debruyne, S. Sturel

— The life-long learning challenge in the context of multi-actor innovation: diversity across community-based approaches to sustainability
Áine Macken-Walsh

— Organisational Capacity Assessment for Innovation Support: approach and results from tool applications in Cameroon and Madagascar
Hycenth Tim Ndah, A. Knierim, S. Audouin, N. Ngouambe, S. Crestin-Billet, N. Randrianarison, A. Toillier, O. Traoré, G. Fongang, S. Mathé

— Improving farm advisory services to stimulate transitions for sustainable agriculture: towards a farmer-perspective paradigm
Ellen Bulten, Boelie Elzen, Jaroslav Prazan

— Learning from the world: Using a global review of innovative extension approaches to support the red-meat knowledge and innovation system in Australia
Ruth Nettle, Nicole Reichelt, Jana-Axinja Paschen, Helen McGregor, Basil Doonan, Ashley Evans and Leanne Sherriff

Session 3G – Innovation related issues
Wednesday 12th, 16:30-18:30 – Room MB 406

Chair : Aine Macken-Walsh

- Co-agency as a leverage point in farmer, advisor and researcher interactions
  Lisa Blix Germundsson, Magnus Ljung
- Tailoring technical options: case studies of intangible and tangible supports in advisory approaches in West Africa
  T. Bakker, T. Cheriere, A. Ganeme, H. Sawadogo, M. Adam, K. Descheemaeker
- From practice-based evidence to evidence-based practice: how to close the loop?
  Nicolas Giraud Hélène Brives, Laurent Hazard
- Understanding anchoring processes in crop diversification initiatives: A middle-range conceptual model
  Lenn Gorissen, Mirjam Schoonhoven-Speijer, Walter A.H. Rossing
- Evaluating co-innovation as complexity-aware project governance: creating space for agricultural transformation within Horizon 2020 project DiverIMPACTS
  Mirjam Schoonhoven-Speijer, Walter Rossing, Margot Leclère, Elizabeth Hoffecker, Julie Ingram, Boru Douthwaite
- Implementing the Knowledge and Innovation System for Bioeconomy (KISB): a new vision from the BIObec project
  Giacomo Maria Rinaldi

Session 3H – Monday 10th, 16:30-18:30 – Room MB 407

Special session: ClimateSmartAdvisors: an EU advisory network on climate smart farming

Chairs: Laure Triste, Evelien Cronin, Jorieke Potters, Ellen Bulten, Lies Debruyne

ClimateSmartAdvisors is a Horizon Europe funded project, which will run from April 2023 – March 2030. The key objective of the project is to form a network of advisors, and support advisors' capacity building in providing targeted climate smart advice to farmers. More specifically, we aim to support capacity building of 1500 climate smart advisors, through a combination of dedicated trainings and extensive peer-to-peer learning activities in the form of advisory communities of practice. Three key elements of the project were outlined: first, Communities of Practice as main unit for capacity building of advisors involved in the project; second, the connection and exchange between ClimateSmartAdvisors, and its' two sister projects (Climate Farm Demo - network of pilot demonstration farmers, and ClimateSmartExperiments (TBC) – network of research stations); and third, the monitoring, evaluation and learning approach that will be implemented in connection to the various capacity building activities. Through an early connection and engagement with the ESEE community, it is expected to optimize and finetune our current outlined approaches for each of these key elements and provide an inspiring discussion on strengthen advise for climate smart agriculture.

The format was an interactive discussion session. each of the key elements was introduced by a short presentation on the planned approach, followed by a facilitated discussion. During this facilitated discussion, the 6 thinking hats of de Bono[1] was used, to reflect on the approach for each of the key elements. The Six Thinking Hats technique allowed to invite the participants to look at each of the approaches in six different ways, jointly exploring a range of perspectives: 1) the factual hat: what do we know, what don't we know and how will we get the information we need; 2) the feelings hat: represents feelings and instincts, without the need for logical justification; 3) the optimist's hat: looking at the approaches in a positive light, focusing on benefits and added value; 4) the judge's hat: focus on critical judgement, being cautious and assessing risks, giving clear explanations for those concerns; 5) the creative hat: focuses on exploring ideas, alternatives and possibilities; and 6) the conductor's hat: managing the decision-making process and planning for action.

Session 3I – Wednesday 12th, 11:00-13:00 – Room MB 407

Special session: Good practices in multi-actor collaboration for joint innovation projects

Chairs: Mikelis Grivins, Evelien Cronin, Susanne von Münchhausen

The session aimed to give participants and organisers the possibility to share experiences from project proposal development. These were either lessons learnt from own writing processes or the assessment of others. The idea was to collect both good practices, that led to the granting of multi-actor projects and experiences from unsuccessful submissions. These insights raised awareness and advance the understanding of preparing successful multi-actor project proposals. The discussion was triggered by a short presentation of key aspects identified by the precedent EU project LIAISON (see How-to-Guide 'Coming together' and 'Good planning'). This set the scene and trigger the exchange of participants' experiences allowing everybody engaged to form a deeper understanding of how various challenges related to multi-actor collaboration can play out in practice, and how they can be addressed. This session allowed representatives of the PREMIERE project to receive feedback on the selection of core areas of concern for the work ahead.

The session was organised as a World Café. After an initial introductory presentation illustrating the first results of the work conducted under the Premiere project (around 10 minutes), the participants were divided into three groups each dealing with a particular aspect of preparing a multi-actor proposal: a) proposal writing, b) consortium building, and c) administrative and technical management. For each group, a set of cards listing potential critical points regarding these aspects was prepared. Participants reflected on the list provided and add any issues that they might have encountered while preparing project proposals. After that, participants grouped the critical points and finally – arrange them according to their relevance for success. For this task 20 minutes was given. After this, the same groups moved to discuss the next aspects of co-creation where the process was repeated. Finally, the last 20 minutes were dedicated to presenting the results of the session and discussing them in plenary.

Complementarily participants were offered the possibility to identify and register on a case-study board good practices of multi-actor proposal preparation that can feed further stages of the PREMIERE project.

TOPIC 4 - Public policies for innovation and the governance of AKIS: how to embed advice & education into strategies of AKIS

Convenors: Simona Cristiano, Michael Kügler, Patrizia Proietti

---

Session 4A – New perspectives on AKIS

Monday 10th, 16:30-18:30 – Room MB 404

Chair: Simona Cristiano

- The evolution of AKIS as a concept
  Eelke Wielinga
- Strengthen the AKIS through the Transformative AKIS Journeys
  Patrizia Proietti, Simona Cristiano
- Climate change and innovation: the role of public policies in a multi-stakeholder approach.
  Jose Luis Cruz, A. Barrutieta, I. González, V. Bermejo, JP. Zamorano
- Towards a Capacity Development framework for the EIP-AGRI concept
  Susanne von Münchhausen, Mark Redman, Mikelis Grivins, Lisa van Dijk
- Evaluation of Italian Food Districts: preliminary data
  Francesco del Puente; Concetta Menna; Marcello De Rosa; Giuseppina Olivieri; Piermichele La Sala; Ferdinando Gandolfi; Irene Paola Borrelli; Teresa del Giudice; Alessandro Sapio
- A Global Foresight Framework for the transformation of national agricultural extension systems: contribution for renewing AKIS
  P. Djamen, S. Audouin, N. Alexandrova, P. Van Doren, Z. Mroczek

---

Session 4B – Integration of innovation support service in the AKIS

Wednesday 12th, 11:00-13:00 – Room MB 404

Chair: Syndhia Mathé

- Towards a framework to assess quality of innovation support services in AKIS: match and mismatch between farmers and providers' perceptions in Madagascar
  Sarah Audouin, S. Valisoa Ranaivomanana, N. Randrianarison M. Nantenaina Andriamanantsoa, H. Tim Ndah, H. Andriamaniraka, S. Mathé
- What are the specificities of agricultural innovation systems in the South: an approach based on innovation support services
  Syndhia Mathé, S. Audouin, A. Toillie, L. Temple, T.H. Ndah H, A. Knierim, N. Randrianarison, O. Traoré, N. Ngouambe, G. Fongang
- Mapping ISS functions as a tool for national policymakers across EU countries
  Lívia Kránitz, S. Aboelnaga, S. Vágó, Patrizia Proietti, Simona Cristiano
- Ecosystem of actors and sectoral governance strategies for agricultural innovation in Cameroon
  Temple Ludovic, Talla SMB, Kamga R., Awah MLA., Mathé S.
- Worthy ISS provider functions case as a guide for the national policymakers, through mapping ISS across EU countries.
  Peter Paree, Somaya Aboelnaga, Lívia Kránitz, Patrizia Proietti, Simona Cristiano

Session 4C – Methods and tools to support policies

Wednesday 12th, 14:00-16:00 – Room MB 404

Chair: Michael Kügler

— Assessing performances of advisory services based on their quality: a user-centred evaluation model
Simona Cristiano, Patrizia Proietti, Alberto Sturla, Valentina Carta

— Measuring the effectiveness of CAP's agri-environmental knowledge transfer: An evaluation framework
Ana Novak, Tanja Šumrada

— Taking stock of farmers' knowledge needs in Rhineland-Palatinate. Entry points for the systematic evaluation of AKISs performance
Oliver Müller

— New directions in changing farmer behaviour: extension lessons from the HerdAdvance project (Welsh Government/AHDB)
David Rose, Juliette Schillings, James Breen, Rosie Morrison

— The needs of extension and education and governance of AKIS for the revival of chestnut growing in Italy
Tatiana Castellotti

Session 4D – The role of public and private advice actors in changes

Wednesday 12th, 16:30-18:30 – Room MB 404

Chair: Patrizia Proietti

— The trusted advisor: a farmer-centric case study in North-West Greece
Eleni Pappa, Alex Koutsouris

— From farm advisory regimes to KIBS market menageries. Effects of privatisation on technological change in the agricultural sectors of seven European countries.
Pierre Labarthe

— Analyzing the role of agricultural extension and education in improving the agricultural startups ecosystem
Norouzi, H. Sadighi, E. Abbasi, H. Shabanali Fam, H. Mokhtari Aski

— Local Action Groups and Leader approach in innovation transfer and governance policies: The case of Turkey
Mücahit Paksoy

Session 4E – Thursday 13th, 09:00-11:00 - Room MB 404

<u>Special Session</u> **Promoting evidence-based, participatory and foresight-informed policy-making for extension and advisory services to innovate and achieve transformative outcomes**

Chairs: Nevena Alexandrova-Stefanova (FAO), Patrice Djamen (CIRAD), Sarah Audouin (CIRAD), Zofia Krystyna Mroczek (FAO)

This session aimed to demonstrate the use of the first global EAS foresight scenarios in decision-making related to AIS/AKIS aspects, provide country examples and explore Europe-wide EAS futures against the background the FAO innovation policy lab approach (IPL) for policy co-innovation. IPL as instrument to address implementation failures in agrifood innovation, characterised with novelty, complexity, lack of previous experience, and high expected impact (e.g. EAS and AIS/AKIS policies) were discussed. The session drew conclusions on EAS foresight implications in EAS and education policy making to take targeted measures by navigating uncertainties, promoting inclusion, fostering formulators and implementers' cohesion, building consensus and capacities to achieve transformative outcomes. Finally, the session sought guidance on the conducive governance elements to make the evidence-based, foresight-informed and co-created IPL approach "a new normal", especially in cases of complex systems and knowledge-intense innovations with social impact.

The session combined short classical communications with interactive exercises that allowed the active involvement of the audience.

The outlines of the session were the following

- **Introduction** (by Nevena Alexandrova-Stefanova)
  - Innovation Policy Lab as a tool for participatory and future-informed EAS and AIS/AKIS decision-making
- **Interactive session** "IPL value addition and experiences in Europe" (mentimeter and discussion, facilitated by Zofia Krystyna Mroczek). Questions addressed:
  - How national policies are being made currently?
  - Can you provide examples of IPL elements implemented in your country? In which agrifood innovation domains do you see the IPL making greater impact?
- **Presentation of the Global EAS Foresight**: framework and scenarios (by Patrice Djamen)
- Lessons learned from applying EAS foresight and backcasting in Madagascar, Liberia, Azerbaijan in support to ongoing EAS policy processes (by Sarah Audouin and Nevena Alexandrova-Stefanova)
- **Interactive session** "Towards an EAS preferred future for Europe" (mentimeter and discussion facilitated by Sarah Audouin). Question addressed:
  - What scenarios for EAS do you see already happening in your country?
  - What EAS future do you prefer the most?
  - What EAS future do you like to avoid in any case?
  - Are there important drivers and white signals missed?
  - Co-construction of a preferred AKIS-embedded EAS Future for Europe
- **Conclusions** on the conducive governance elements and next steps (by Nevena Alexandova-Stefanova)

TOPIC 5 - Inclusion and the social dimension of sustainability

Convenors: Mark Moore and Pierre Labarthe

Session 5A – Social farming

Monday 10th, 16:30-18:30 – Room MB 406

Chair: Mark Moore

- The Advisors' role in Social Farming: a case study project
  Giulia Granai, Francesco Di Iacovo, Alessandra Funghi and Roberta Moruzzo
- How is animal well-being affecting employees farmers and extension on large dairy farms ?
  Louise Axelson
- Social Farming and Animal Assisted Intervention in rural context: a cultural change in social and health services for people
  Morgana Galardi, Laura Contalbrigo, Roberta Moruzzo
- The potentials of an integrated approach to social sustainability in natural resource management – Swedish experiences from 50 land owner groups
  Magnus Ljung, Lars Johansson
- Theatre-Based Behaviour Change Intervention as an Agricultural Extension Tool for Farm Health, Safety and Wellbeing Training for Farmers
  Sinead Flannery, Anne Markey

Session 5B – Occupational health, safety and well-being

Wednesday 12th, 11:00-13:00 – Room MB 406

Chair: Mark Moore

- Managing Stress on the Farm
  Suzanna Windon, Carolyn Henzi
- The mental wellbeing of young farmers in Ireland and the UK: driving factors, help-seeking and support: Implications for advisory and extension services
  Deirdre O'Connor
- Dying to Farm – understanding the factors affecting famer mental health and the support requirements
  Tomás Russell, Alison Stapleton, Anne Markey, Louise McHugh
- Good farmers are safe farmers? Understanding the role of normative beliefs' in shaping farmers' safety behaviours.
  Mohammad Mohammadrezaei, David Meredith and John McNamara
- What would a relevant evaluation of occupational safety and health advisory services in agriculture be? Evidence of conflicting perceptions in the French context.
  Pierre Labarthe, Catherine Laurent, Nathalie Jas, Agnès Labrousse
- How to deal with pesticide exposure and pest reduction.
  Marine Pithon, a perspective from a advisor for a local chamber of agriculture

Session 5C – Designing farm advisory services for Hard-to-reach population
Wednesday 12th, 14:00-16:00 – Room MB 406

Chair: Pierre Labarthe

— 'I was always the farmer': The dynamics of young farmer education choices in Irish agriculture
Brian Leonard, Tomás Russell

— Institutional Evolution of Gender in Farm Advisory Services: A Canada-France Comparison
Rivellie Tschuisseu

— Supporting women's roles within family dairy farms – A case study of an Irish learning initiative
Monica Gorman, Beth Dooley, Marion Beecher

— How to make Johne's Disease extension strategies more inclusive of 'disengaged' farmers
Rosie Morisson, David Rose, Pete Orpin, James Hanks, Emma Taylor,

Overview of parallel sessions

ROOM	Monday 10th 16:30-18:30	Wed. 12th 11:00-13:00	Wed. 12th 14:00-16:00	Wed. 12th 16:30-18:30	Thurs. 13th 09:00-11:00
1-MB 401 (44 people max)	**1A –** Agroecology & Advisory policies	**1B –** Customising advice for transition 1	**1C -** Customising advice for transition 2	1D – Education policy for agroecology	**1E -** Special Session Carbon markets
2-MB 402 (30 people max)	**2A** - Critical perspective on digitalisation	**2B** - Designing & selecting digital solutions	2C - Farmers Adoption & Use of digital technologies	**2D-** Special session Fairshare	3F – New advisory issues
3-MB 403 (38 people max)	3A – Extension tools (1)	3B - Extension tools (2)	3C - Education	3D – Supporting farmers	3E – Advisors' competences & training
4-MB 404 (40 people max)	4A – New perspectives on AKIS	4B – Policy for innovation support services	4C – New methods & tools for policy	4D – Public & Private advice	4E Special session FAO
5-MB 406 (30 places)	**5A -** Social farming	**5B-** Health & Safety	**5C-** Hard to reach	3G – New innovation issues	1F - Special Session Serious games
6-MB 407 (38 places)	3H - Special Session Climate Smart	3I - Special Session Multi-Actor			

Abstracts

The Signpost Programme: Farmers for Climate Action

Tom O'Dwyer,

Teagasc

Note: this presentation was part of the first roundtable of ESEE 2023

Introduction

The Signpost Programme is a new, Teagasc-led, whole-of-industry approach to lead and support Irish farmers in climate action. It was launched in May 2021. The programme aims to "bridge the gap" between knowledge producers on the one side and knowledge users on the other side. Our priority is to bring science to practice, initially on our network of Signpost Farms (demonstration farms), bridging the so-called "valley of death" for new technologies. Research to date has put "tools in the toolbox", has identified a range of mitigation actions for use on Irish farms. Ongoing and future research will bring forward further solutions. We now need to work with and support farmers to ensure uptake of the identified mitigation measures at "pace and scale", while continuing with new research.

A partnership approach

One of the innovative aspects of the Signpost Programme is the whole of industry partnership approach to climate action. The Signpost Programme has 62 partners, including all of our major milk and meat processors, all of the major farm organisations, other agri-food industry bodies, the Department of Agriculture, Food and the Marine and Bord Bia. A number of the partners also provide funding for the project, and overall our partners have committed to providing funding of €7m for the programme. You could also describe the Signpost Programme as an example of the Irish AKIS in action, united in its attempts to meet the climate challenge.

Figure 1: The Signpost Programme partners

The three parts of the programme

There are three parts to the overall programme. Firstly, a network of 125 demonstration farmers has been created. These farmers – our Signpost Farmers - have been identified for all of the main farming enterprises, including dairy, suckler beef, dairy calf to beef, sheep, tillage, pigs and poultry. Secondly, Teagasc has just recently launched its Signpost Advisory Programme. This new service will provide training opportunities (to enhance farmer knowledge and skills and facilitate farmer-to-farmer learning) and targeted follow-up one-to-one support to farmers, leading to the creation of farm specific action plans. Both these elements will support Irish farmers in their efforts to reduce GHG emissions by facilitating real-life demonstrations of climate solutions in practice (on the Signpost Farms) and providing tailored, farm-specific solutions to individual farmers (through the Signpost Advisory Programme). The third element of the overall Signpost Programme is the National Agricultural Soil Carbon Observatory (NASCO). This on-farm research project aims to deepen the understanding of soil carbon sequestration, with the Signpost Farms forming an integral part of this Observatory.

Farmers at the centre of the programme

We have deliberately placed farmers at the core of our programme, so as to leverage the opportunities for farmer-to-farmer learning. Our Signpost Farmers, supported by our on-the-ground advisors, will be amongst the first to adopt climate adaptation and mitigation technologies, while they will also play a pivotal role in the overall programme in sharing their experiences with other farmers through farm walks, events, articles, videos, media etc. Farmers were selected to be demonstration farmers through our advisory network, and in consultation with industry partners. Selection criteria relating to both the farm and the farmer were considered, and included:

- The farmer: mindset, willingness (to be a demo farmer); relationship with Teagasc/ local advisor; membership of a farmer discussion group; commitment (to the objectives of the programme); communication skills; reputation; and progressive
- The farm: size; system of production; location; accessibility; facilities, including farmyard; landscape/ biodiversity; average or above average current performance

Each demonstration farmer is supported by a dedicated Signpost Programme advisor, who works closely with 10 to 12 demonstration farmers. The three key roles for each Signpost Farmer to (1) engage with their farm adviser; (2) implement appropriate adaptation and mitigation actions; and (3) share their experiences with other farmers. As well as supporting and guiding the Signpost Farmer, their advisor is also responsible for ensuring that the lessons learned and the key messages from the demonstration farmer are shared with other advisors, industry partners and other farmers, using a range of communications channels, including on-farm demonstration events. Teagasc utilises our demonstration farmers for a range of on-farm demonstration events, with various audience sizes from 15 farmers (discussion group meeting) to 100 farmers plus (farm walk, open day, demonstration event etc.). Two key features of all events are, firstly, that the host farmer is placed at the core of both the organisation and delivery of these events, and secondly, that farmer learning is facilitated by a skilled advisor. Farmer-to-farmer learning is a key part of our demo events.

Under our Signpost Advisory Programme, our advisors will facilitate farmer-to-farmer learning through farmer workshops, while also guiding farmers in the creation of farm specific action plans, identifying pathways to lower GHG emissions. The climate solutions will be selected by the individual farmer.

Change as a process of continuous improvement

It is useful to consider on-farm change as a cycle of continuous improvement.

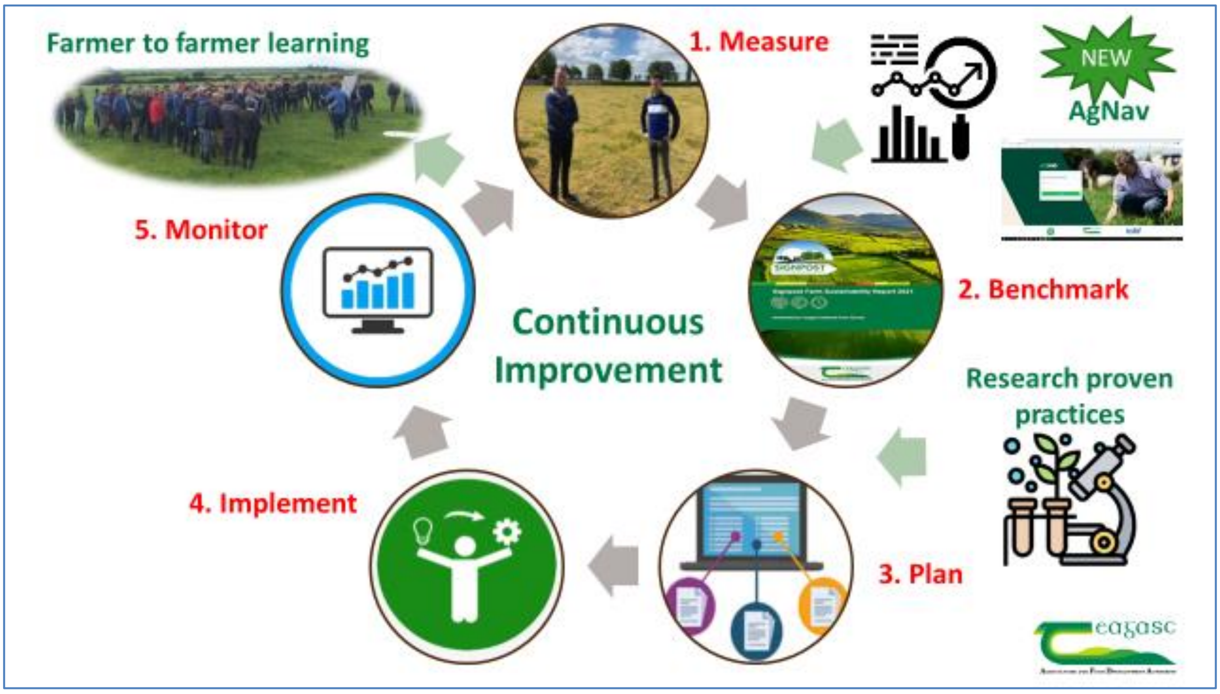
The cycle starts with measurement. For the Signpost Farms, the methodology employed by the Teagasc National Farm Survey is used, including data recorders validating farm data, to generate individual farm results. This provides each Signpost Farmer with an individual measure of their GHG emissions (as well as other production, economic, social and environmental KPI's).

The second step involves benchmarking an individual farm's results against relevant and known targets, or the previous year's performance on the same farm. In this way, the adviser and farmer identify gaps, weaknesses or areas for improvement, before formulating and agreeing a tailored, farm specific plan (step 3).

Once the plan is agreed, implementation becomes the responsibility of the farmer.

And finally, both the farmer and adviser monitor progress against the plan over time, using various tools.

Figure 2: Change as continuous improvement of Signpost Farms



There are two important inputs which feed into this process. Teagasc, is currently collaborating with Bord Bia and the Irish Cattle Breeding Federation (ICBF), to develop and make available the AgNav digital platform. This will allow every Irish farmer, and their adviser, understand their current GHG emissions profile, and to identify opportunities to reduce emissions. In time the platform will be further developed to account for GHG removals and enable the farmer to identify actions to enhance such removals.

An important input in the planning process is the adviser's technical knowledge – their awareness of research proven climate adaptation and mitigation solutions, many of which have been researched extensively by Teagasc colleagues.

There is also one important output from the process. Sharing the story of the continuous improvement journey is a key role for any demonstration farmer. Working with their farm advisor, the demonstration farmer can share their experiences – both positive and negative – with other farmers, backing up their experiences, observations, feelings, with robust measurement data.

Demonstration farms at EU level

The role of demonstration farmers is recognised at EU level also, with EU funded projects such as PLAID and AgriDemo exploring the role of demonstration farms. Currently, the Horizon Europe funded project, ClimateFarmDemo, aims to create a European wide network of pilot (demonstration) farmers implementing and demonstrating climate smart solutions for a carbon neutral Europe. The project has an ambition to identify and support 1,500 demonstration farms across 27 EU countries, and to ensure that these farmers contribute to the advisory efforts to support farmers in taking climate action. Further details of the project are available on the project website: https://climatefarmdemo.eu/.

Summary

Demonstration farmers are a key component of the overall Teagasc advisory approach. They are amongst the first to adopt new technologies, and to then share their experiences with other farmers. They have formed a central component of joint programmes with industry partners, including the Signpost Programme. And their role is more than just as a location for on-farm demonstration events; Signpost Farmers are featured in media articles, videos, case studies; they provide locations for staff training events; they are invited speakers at conferences and large Open Days etc. Farmer selection and a dedicated advisor are key components of a demonstration farm programme. Finally, Teagasc is convinced of the role of demonstration farmers as a component of our overall advisory approach.

TOPIC 1 - Transitions towards agroecology & circular economy

Session 1A - AKIS Policy assessment on Agroecology

Implications of Global Biodiversity Framework on communication and extension systems

Esmail Karamidehkordi[1]

[1]**Associate Professor of Agricultural Extension and Rural Development, Department of Agricultural Extension and Education, Faculty of Agriculture, Tarbiat Modares University, Tehran, Iran. e.karamidehkordi@modares.ac.ir**

Short abstract

The Parties of the Convention on Biological Diversity have developed and approved the Kunming-Montreal global biodiversity framework since December 2022, which emphasizes the requirement of effective knowledge and innovation systems for achieving biodiversity governance. This paper discusses how communication and extension systems can contribute to this framework, based on the author's participant observation during negotiations in working groups and COP15 and a conceptual research methodology. The framework is built on the vision of "a world of living in harmony with nature" and four goals by 2050, which emphasizes the valuation, conservation, restoration, and sustainable use of biodiversity and maintaining ecosystem services, including benefits for all people. Governments at all levels with the involvement of all of society should take urgent and transformative actions to halt and reverse biodiversity loss to put nature on a path to recovery for the benefit of people and the planet through 23 targets by 2030. Effective knowledge and innovation systems can recognize and integrate scientific and traditional knowledge systems. Moreover, innovative communication and extension systems are required to enhance knowledge and skills, social learning, and participation, and recognize diverse values and knowledge systems of indigenous peoples and local communities, including women and youth.

Keywords: Global biodiversity, extension, communication, local community, knowledge and innovation systems.

Extended abstract

Purpose

Addressing the challenges of sustainable environment and natural resources management has increasingly grown as a new area or issue for knowledge and innovation systems (Buck & Scherr, 2009; Ghazinoory et al., 2021; Karamidehkordi, 2007), including extension and rural advisory services systems (Swanson & Rajalahti, 2010). Biodiversity governance is also a socio-ecological issue that has recently attracted the research interests of social sciences, extension education, and development studies (Lockie, 2023). Following the deep concerns raised by studies and the Convention on Biological Diversity (CBD) on biodiversity loss and the failure of past efforts, the Parties of CBD started to develop the post-2020 global biodiversity framework in 2019, which was approved as the Kunming-Montreal global biodiversity framework through a historical agreement in December 2022 (Convention on Biological Diversity, 2022). The framework emphasizes the requirement of effective knowledge and innovation systems, communication, education, and public awareness for achieving biodiversity governance, including the conservation, restoration, and sustainable use of biodiversity. This paper discusses how communication and extension systems can contribute to this framework.

Design/Methodology/Approach

The study was conducted using a qualitative approach and a conceptual research methodology. The data were collected through participant observations during the negotiations of five open-ended working group meetings of the post-2020 global biodiversity framework, the Fifteen Conference of Parties (COP 15) of the Convention on Biological Diversity, and a systematic literature review. During these events, the representatives of 196 nations and states, called Parties, non-governmental organizations (NGOs), businesses and companies, other environmental conventions, scientists, and united nations organizations. The author, as an expert, attended five open-ended working group meetings, an informal group, and two Cop 15 meetings, which took place in Nairobi (Kenya), Rome (Italy), virtual, Kunming (China), and Montreal (Canada).

Findings

Biodiversity is basic for human well-being and a healthy planet and provides ecosystem services to all people and earth, including food, medicine, energy, clean air and water, soil conservation, and cultural services. Sustainable ecosystem services interlinked with conserved and restored biodiversity (Bullock et al., 2011; Harrison et al., 2014; Maes et al., 2012). Despite considerable efforts at global, national, and local levels, biodiversity is deteriorating worldwide (Hauck et al., 2013). According to Ipbes (2019), approximately 25% of species are threatened and about one million species already face extinction, which is already at least tens to hundreds of times higher than it has averaged over the past 10 million years. Ecosystems are also degrading and the diversity within species, between species, and of ecosystems are declining. In addition to direct drivers of change in nature, such as land and sea use, direct exploitation of organisms, climate change, pollution, and invasion of alien species, the indirect drivers of change, underpinned by social values and behaviours, have caused biodiversity loss. This has led to the initiation of the global biodiversity framework. Following the COP14 decision (14/34) for the development of the Post-2020 Global Biodiversity Framework, an open-ended inter-sessional working group was established and organized through five meetings and informal groups between 2019 and 2022 to prepare the documents for final negotiation in the COP15 meetings, which took placed in two parts in Kunming and Montreal and led to the adoption of the Kunming-Montreal global biodiversity framework. The framework is built on the vision of "a world of living in harmony with nature" and four goals by 2050, which emphasizes the valuation, conservation, restoration, and sustainable use of biodiversity and maintaining ecosystem services, including benefits for all people. Governments at all levels with the involvement of all of society should take urgent and transformative actions to halt and reverse biodiversity loss to put nature on a path to recovery for the benefit of people and the planet through 23 targets by 2030.

The framework has emphasized effective knowledge and innovation systems, innovative communication, education, and extension systems to achieve its goals and targets. Based on the author's participant observations and interviews with the representatives of the Parties during negotiations, the representatives showed their intention and agreement on communication and informal and formal education much more than other aspects and targets of the framework, which led to the agreements in the fourth and fifth meetings of the open-ended working group, before COP15. The ideas of communication and extension interventions have directly or indirectly been reflected in the framework as follows in Table 1.

Table 1. Reflection of communication and extension interventions in the Kunming-Montreal global biodiversity framework

Section, goal, target	Description
Section C. Considerations for the implementation of the framework	Such as collective effort towards the targets, gender equality and empowerment of women and girls and reducing inequalities, science and innovation, formal and informal education, and rights and participation of indigenous people and local communities, including their traditional knowledge.
Goal D of the framework	Adequate means of implementation, including financial resources, capacity-building, technical and scientific cooperation, and access to and transfer of technology to fully implement the framework are secured and equitably accessible to all Parties, especially developing countries.
TARGET 11	Restore, maintain and enhance nature's contributions to people ….
TARGET 14	Ensure the full integration of biodiversity and its multiple values into policies, regulations, planning and development processes, poverty eradication strategies, strategic environmental assessments, …. within and across all levels of government and across all sectors, ……
TARGET 16	Ensure that people are encouraged and enabled to make sustainable consumption choices including by establishing supportive policy, …, improving education and access to relevant and accurate information and alternatives, and by 2030, ….

TARGET 20	Strengthen capacity-building and development, access to and transfer of technology, and promote development of and access to innovation and technical and scientific cooperation, including through South-South, North-South and triangular cooperation, to meet the needs for effective implementation, particularly in developing countries, fostering joint technology development and joint scientific research programmes for the conservation and sustainable use of biodiversity and strengthening scientific research and monitoring capacities, commensurate with the ambition of the goals and targets of the framework.
TARGET 21	Ensure that the best available data, information and knowledge, are accessible to decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of biodiversity, and to strengthen communication, awareness-raising, education, monitoring, research and knowledge management and, also in this context, traditional knowledge, innovations, practices and technologies of indigenous peoples and local communities should only be accessed with their free, prior and informed consent, in accordance with national legislation.
TARGET 22	Ensure the full, equitable, inclusive, effective and gender-responsive representation and participation in decision-making, and access to justice and information related to biodiversity by indigenous peoples and local communities, respecting their cultures and their rights over lands, territories, resources, and traditional knowledge, as well as by women and girls, children and youth, and persons with disabilities and ensure the full protection of environmental human rights defenders.
TARGET 23	Ensure gender equality in the implementation of the framework through a gender-responsive approach where all women and girls have equal opportunity and capacity to contribute to the three objectives of the Convention, including by recognizing their equal rights and access to land and natural resources and their full, equitable, meaningful and informed participation and leadership at all levels of action, engagement, policy and decision-making related to biodiversity.
Section K. Communication, education, awareness and uptake	Enhancing communication, education, and awareness on biodiversity and the uptake of this framework by all actors is essential to achieve its effective implementation and behavioural change, promote sustainable lifestyles and biodiversity values, including by: (a) Increasing awareness, understanding and appreciation of the knowledge systems, diverse values of biodiversity and nature's contributions to people, including ecosystems functions and services and traditional knowledge and worldviews of indigenous peoples and local communities as well as of biodiversity's contribution to sustainable development; (b) Increasing awareness on the importance of conservation and sustainable use of biodiversity and of the fair and equitable sharing of the benefits arising out of the utilization of genetic resources for sustainable development, including improving sustainable livelihoods and poverty eradication efforts and its overall contribution to global and/or national sustainable development strategies; (c) Raising awareness among all sectors and actors of the need for urgent action to implement the framework, while enabling their active engagement in the implementation and monitoring of progress towards the achievement of its goals and targets; (d) Facilitating understanding of the framework, including by targeted communication, adapting the language used, level of complexity and thematic content to relevant groups of actors, considering their socioeconomic and cultural context, including by developing material that can be translated into indigenous and local languages; (e) Promoting or developing platforms, partnerships and action agendas, including with media, civil society and educational institutions, including academia, to share information on successes, lessons learned and experiences and to allow for adaptive learning and participation in acting for biodiversity; (f) Integrating transformative education on biodiversity into formal, non-formal and informal educational programmes, promoting curriculum on biodiversity conservation and sustainable use in educational institutions and promoting knowledge, attitudes, values, behaviours and lifestyles that are consistent with living in harmony with nature; (g) Raising awareness on the critical role of science, technology and innovation to strengthen scientific and technical capacities to monitor biodiversity, address knowledge gaps and develop innovative solutions to improve the conservation and sustainable use of biodiversity.

Practical Implications

Effective knowledge and innovation systems can recognize and integrate scientific and traditional knowledge systems. Moreover, innovative communication and extension systems are required to enhance knowledge and skills, social learning, and participation, and recognize diverse values and knowledge systems of indigenous peoples and local communities, including women and youth.

Theoretical Implications

The ideas of communication, education, public awareness and knowledge systems which have been included in the global biodiversity framework can provide opportunities for the researchers of extension and advisory services and knowledge and innovation systems to define and develop their empirical research about how to implement these ideas it national and local levels and the evaluation of their achievements.

References

Buck, L. E., & Scherr, S. J. (2009). Building innovation systems for managing complex landscapes. In K. M. Moore (Ed.), *The Sciences and Art of Adaptive Management: Innovating for Sustainable Agriculture and Natural Resources Management*. Soil and Water Conservation Society. https://www.swcs.org/static/media/cms/AdaptiveChapter8_85149C5D81942.pdf

Bullock, J. M., Aronson, J., Newton, A. C., Pywell, R. F., & Rey-Benayas, J. M. (2011). Restoration of ecosystem services and biodiversity: conflicts and opportunities. *Trends in Ecology & Evolution*, *26*(10), 541-549. https://doi.org/10.1016/j.tree.2011.06.011

Convention on Biological Diversity. (2022). *Kunming-Montreal Global biodiversity framework*.

Ghazinoory, S., Khosravi, M., & Nasri, S. (2021). A Systems-Based Approach to Analyze Environmental Issues: Problem-Oriented Innovation System for Water Scarcity Problem in Iran. *The Journal of Environment & Development*, *30*(3), 291-316. https://doi.org/10.1177/10704965211019084

Harrison, P. A., Berry, P. M., Simpson, G., Haslett, J. R., Blicharska, M., Bucur, M., Dunford, R., Egoh, B., Garcia-Llorente, M., Geamănă, N., Geertsema, W., Lommelen, E., Meiresonne, L., & Turkelboom, F. (2014). Linkages between biodiversity attributes and ecosystem services: A systematic review. *Ecosystem Services*, *9*, 191-203. https://doi.org/https://doi.org/10.1016/j.ecoser.2014.05.006

Hauck, J., Görg, C., Varjopuro, R., Ratamäki, O., & Jax, K. (2013). Benefits and limitations of the ecosystem services concept in environmental policy and decision making: Some stakeholder perspectives. *Environmental Science & Policy*, *25*, 13-21. https://doi.org/https://doi.org/10.1016/j.envsci.2012.08.001

Ipbes. (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Zenodo. https://doi.org/10.5281/ZENODO.6417333

Karamidehkordi, E. (2007). *Knowledge and information systems in watershed management: a study of Bazoft watershed and relevant institutions in Chaharmahal and Bakhtiari Province, Iran* University of Reading].

Lockie, S. (2023). Sociologies of climate change are not enough. Putting the global biodiversity crisis on the sociological agenda. In (Vol. 9, pp. 1-5): Taylor & Francis.

Maes, J., Paracchini, M. L., Zulian, G., Dunbar, M. B., & Alkemade, R. (2012). Synergies and trade-offs between ecosystem service supply, biodiversity, and habitat conservation status in Europe. *Biological Conservation*, *155*, 1-12. https://doi.org/https://doi.org/10.1016/j.biocon.2012.06.016

Swanson, B. E., & Rajalahti, R. (2010). *Strengthening agricultural extension and advisory systems: Procedures for assessing, transforming, and evaluating extension systems, Paper No. 45*. World Bank. https://openknowledge.worldbank.org/handle/10986/23993

Innovating to enable extension and advisory services to promote agriculture and other nature-based approaches

Zofia Krystyna Mroczek[1], Nevena Alexandrova Stefanova[1]

[1]Food and Agriculture Organisation (FAO, Rome)

Short abstract:

The agrifood systems of today are affected by multiple challenges that if not properly addressed, may lead to significant environmental, social and economic impacts on farmer and consumer communities around the world. There is a global consensus that business-as-usual is not an option. Complex issues require innovative and sustainable solutions, transformative systems thinking and paradigm shifts. Agroecology is increasingly seen as one of the innovative approaches that can contribute to food security, conservation of biodiversity, save resources and energy and ultimately support the sustainable agrifood systems transformation. Pluralistic Extension and Advisory Services (EAS) are best positioned to facilitate and accelerate innovations and transformative processes at the hearth of rural communities, bridging communities, organizations and decision-makers.

This abstract draws extensively from the FAO brief on extension and advisory services (EAS) and agroecology which was written by the authors of this abstract. As such, this abstract is meant to propose concrete actions that EAS actors should undertake to transform themselves to be able to promote agrocological innovative approaches and support farmers and other actors.

Extended abstract

Purpose

The agrifood systems of today are affected by multiple challenges that if not properly addressed, may lead to significant environmental, social and economic impacts on farmer and consumer communities around the world. There is a global consensus that business-as-usual is not an option. Complex issues require innovative and sustainable solutions, transformative systems thinking and paradigm shifts. Agroecology is increasingly seen as one of the innovative approaches that can contribute to conservation of biodiversity, save resources and energy and ultimately support the sustainable agrifood systems transformation. Agroecology has also a huge potential when it comes to food and nutrition security as it helps produce healthier, more diversified and more nutritious food. Furthermore, it helps diversify farming activities, increasing thus farmers' resilience and independence from volatile inputs and outputs markets.

Pluralistic Extension and Advisory Services (EAS) are best positioned to facilitate and accelerate innovations and transformative processes at the heart of rural communities, bridging communities, organizations and decision-makers. In order to do so, EAS need to bring and use evidence- and science-based information when promoting agroecology, e.g. to use facts for convincing both farmers and policy-makers.

The transition towards nature-based solutions does not imply that the external inputs should be completely replaced with agroecological approaches. External inputs are still vitally needed in many settings where farmers struggle to deal with poor soil quality, depend on erratic weather trends and have low yields. Agroecology, coupled with science-based solutions can be seen as one of the approaches to promote biodiversity, reduce the emissions and enhance pollination etc.

Agroecology, however, does not come without the tradeoffs. For traditional and public sector EAS systems, agroecology may be seen as knowledge intensive as they have traditionally embarked on external input supply and setting area under specific crops and yield targets. It requires also a significant time and labour investment on the side of farmers. These tradeoffs should be carefully addressed by EAS to successfully accompany farmers in adopting more innovative and sustainable practices.

This abstract draws extensively from the [FAO brief on extension and advisory services (EAS) and agroecology] which was written by the authors of this abstract. As such, this abstract is meant to propose concrete actions that EAS actors should undertake to transform themselves to be able to promote agrocological innovative approaches and support farmers and other actors in the agri-food system. These actions include policy options, development of extensionists' capacities, a change of paradigms from exclusive production increase to a holistic sustainable ecosystem approach, while taking into consideration also social aspects, such as equity, poverty reduction and voicing farmers' demsnds and concerns, including the most vulnerable and harder-to-reach groups, such as women, youth, landless, indigenous peoples etc.

Design/Methodology/Approach

Agroecology consists of principles and concepts designed to optimize interactions between plants, animals, humans and the environment, cognizant of the socio-economic aspects required for a sustainable and fair agri-food system. It posits a comprehensive system centred on smallholder and family farmers (including fisher folk and pastoralists), building on their collective knowledge to identify problems, innovate for specific ecological and cultural contexts and develop long-term solutions for transformational change. Agroecological transition simultaneously addresses climate change adaptation and mitigation, works towards decent rural employment, creates opportunities for rural women and youth, and responds to growing public demand for diversified healthy food, thus helping to address persistent malnutrition. It also promotes different levels of governance and an inclusive economy. Food and Agriculture Organization of the United Nations (FAO) member nations have agreed on ten interdependent and interconnected Elements of Agroecology: diversity; synergies; efficiency; resilience; recycling; co-creation and sharing of knowledge; human and social values; culture and food traditions; responsible governance; and circular and solidarity economy. Agroecological principles contribute ecologically, economically, and socially to achieving multiple Sustainable Development Goals (SDGs), especially No Poverty (SDG 1), Zero Hunger (SDG 2) and Life on Land (SDG 15). EAS providers can play a key role in this transition. To this end, beyond acquiring new technical and functional skills, they need to undergo a paradigm shift – to transcend the narrow narrative of increasing food production and commercialization, while prioritizing the experience and knowledge of rural producers, providing evidence-based solutions and looking at agroecosystemic sustainability.

In the world where EAS system as a whole is enabled to promote agroecology and other nature-based solutions, EAS providers adopt a territorial approach, provide wide-ranging advice on agroecological practices, bridge modern science and practice with traditional and local knowledge, and promote horizontal exchanges that empower producers to co-create knowledge and identify locally derived and appropriate solutions. This leads to integrative farmer-led and community-led extension support programs. Diversified farming systems contribute to the achievement of food sovereignty, social and economic equity, and environmental sustainability

Findings

Agroecology is gaining importance and it is currently being acknowledged by a diversity of agricultural organizations, including by the Food and Agriculture Organization of the United Nations (FAO). There are numerous civil society organizations, with La Via Campesina at the frontline, which promote agroecology and actively support farmers in adopting agroecological approaches. However, the main trend of most of the extension providers is still focused on increasing the agricultural production and commercialization. While this is still important, further efforts to promote agroecology and other nature-based approaches are crucial to allow for sustainable transformation of the agri-food systems. Currently, these efforts are often scattered and uncoordinated, while the tendency for the top-down approach persist. As mentioned before, civil society organizations involved with agroecology exist, but they are still too few to reach all the farmers, which is in line with general trend of farmers lacking the access to any advice at all. Therefore, there is a dire need not only for more providers reorienting themselves towards agroecology, but also for the national EAS systems as a whole to take on agroecological lenses and transform themselves from within.

Practical Implications

In the FAO brief "Enabling extension and advisory services to promote agroecology" authors researched and identified the key actions needed for the EAS system to take on the agenda of the agroecological transition. These actions include (i) changing the paradigm; (ii) creating an enabling environment; and (iii) adapting roles and services.

With regards to the (i) change of the paradigm, the brief outlines the following:

- Adoption of the ten Elements of Agroecology as the philosophy. Adoption of a holistic approach, including sustainable livelihoods, market access, environmental protection and social inclusion, rather than measuring success only in terms of productivity, single commodities and market prices.
- Moving from linear technology transfer and one-size-fits-all approaches towards co-creation and sharing of knowledge, as well as practices adapted to and derived from local conditions. Agroecology is knowledge-intensive and builds on local, traditional and indigenous knowledge, as well as modern multidisciplinary science.
- Prioritizing producers, and empowering them to experiment, exchange and innovate in developing appropriate solutions. All producers, including women, youth, migrants, indigenous people and other vulnerable groups need to participate in the design of extension and advisory services focused on agroecology, thus paving the way for participatory farmer-to-farmer approaches, involving farmer leaders, community-based organizations etc.
- Transforming the relationship with the territory towards respectful symbiosis and co-production rather than exploitation. Learning from indigenous and traditional approaches is essential.
- Empowering producers to gain autonomy from credit, inputs and markets. While access to these remains key, agroecology facilitates sustainable production using available on-farm resources and surrounding ecosystems, without over-reliance on unpredictable external factors.
- Partnering with a broad range of stakeholders. Agroecology requires diverse expertise, and thus involves diverse ministries and organizations (e.g. in charge of environment, social affairs, markets, civil society and grassroots organizations, associations of women, indigenous peoples, etc.)

With regards to the (ii) creating enabling environment, the proposed actions include:

- Advocating for evidence-based policies, which promote agroecology by supporting territorial approaches, governance at landscape scale, and diversification, while factoring in the external costs and benefits of ecosystems such as biodiversity conservation and restoration. Advocate against investment schemes, which promote high-input, resource-intensive farming systems.
- Providing information on the situation on the ground and on producers' needs and challenges. Promoting the Tool for Agroecology Performance Evaluation (TAPE), developed by FAO and partners to present evidence and entry points for agroecology's contribution to achieving the SDGs.
- Acting to move agroecology up the research agenda and promote it in agricultural education curricula. Including training programmes on agroecology for EAS and institutionalize the co-creation of multistakeholder approaches (innovation and community-based platforms, farmer field schools (FFS), science-technology backyards etc).
- Seeking to adjust sanitary and phytosanitary measures. Agroecologically produced food can be more diverse, healthier and more nutritious but formal food safety requirements can be challenging for smallholders. EAS can support risk assessment and control systems and help actors devise solutions.
- Empowering producers and their organizations (including associations of women and indigenous peoples) to engage in policy processes and innovative markets, including value addition.
- Investing in the co-creation and sharing of local, traditional knowledge, e.g. by creating innovation and knowledge sharing platforms.

  - Mobilizing funds towards community level. Agroecology can also interest new type of donors from environmental and climate sectors, or working with indigenous peoples etc. Engaging with the private sector.

In terms of the (iii) adapting roles and services, the brief proposes:

- Provision of advice on agroecological practices. This requires territorial approaches and knowledge combining different expertise (e.g. forestry and crops; social and natural sciences).
- Supporting farmers and indigenous peoples to document and share their traditional knowledge, which is often transmitted orally and is at great risk of being lost. However, such knowledge is sometimes used without honouring its ownership by indigenous peoples. They must be supported to protect their rights by giving related advice, strengthening their leadership and negotiation skills, mediating with companies and raising their awareness on of their rights.
- Ensuring that producers participate in action-oriented, locally relevant research to develop solutions for problems on farm, community, and food system levels.
- Promoting women empowerment: agroecology can only happen via equal access to land, knowledge, resources. Gender equality lies at the core of agroecology.
- Promoting education on agroecology for children and youth.
- Adoption of the FFS approach, which sees agroecology is an intrinsic cornerstone in facilitating a paradigm shift, empowering FFS groups to participate in multi-stakeholder dialogues and frame collective policies.
- Shortening market circuits by bringing together producers and consumers in local and ecological markets (including informal ones), e.g. through facilitating community-supported agriculture schemes, e-commerce and participatory guarantee schemes. Linking to agroecological public procurement schemes is also beneficial both for producers and consumers.
- Promotion of farmers' seed systems: advising on local seeds, helping producers breed and select their own varieties, organizing seed fairs and seed saving, seed banking and exchange networks, peasant-owned cooperatives that multiply and distribute local seed varieties. This increases biodiversity and resilience and helps producers become self-reliant.
- Facilitating networks and exchanges among producers. Support to existing and nascent producer organizations.
- Helping producers secure access to land and rights. Agroecology requires time and labour investment; producers thus need guarantees they will not lose their land.

Theoretical Implications

Transition of the EAS systems to agroecology has several theoretical implications, mainly related to the paradigm shift. This implies not only adding a few services but a profound rethinking of the EAS systems as a whole. A focus should switch from merely improving production and incomes, to giving rural producers, smallholders and vulnerable groups including, a voice so that they are empowered to articulate their demands and be at the center of the EAS design, delivery and evaluation. Their traditional knowledge should be valued and scaled up, while coupled with scientific achievements. The EAS actions should aim at achieving three dimensions of sustainability, namely environmental, social and financial sustainability. The EAS should support producers to become self-resilient rather than depending on external inputs and volatile markets. They should empower them to participate in policy and social dialogues and become strong players so that they can defend their interests and voice their concerns.

In order for this to happen, the EAS providers need to abandon the traditional top down approach and treat farmers as equal partners. This require a whole new set of capacities for EAS, such as coaching, facilitation, innovation brokering, understanding territorial approaches and similar but also new and strenghtened capacities of farmers with the active role of EAS. The EAS should also acquire capacities to advocate for the policy change, partner with other actors such as those working with women, indigenous populations, environmentalists etc.

The agroecological transition of the EAS should take place at system, organizational and individual level.

References

Barrios, E., Gemmill-Herren, B., Bicksler, A., Siliprandi E., Brathwaite, E., & Moller, E. 2020. The 10 Elements of Agroecology: enabling transitions towards sustainable agriculture and food systems through visual narratives. Taylor & Francis Journal. (also available at https://www.tandfonline.com/doi/full/10.1080/26395916.2020.18 08705) FAO. N.d. Agroecology

FAO. 2022. Enabling extension and advisory services to promote agroecology. FAO. Rome. (https://www.fao.org/3/cb8221en/cb8221en.pdf)

Knowledge Hub [webpage]. In: FAO [online]. https://www.fao.org/agroecology/policies-legislations/en FAO. 2017. Enabling Institutionalization of The Farmer Field School Approach. Policy Brief. Rome. FAO. 2018a. FAO'S Work on Agroecology: A pathway to achieving the SDGs. Rome. (http://www.fao.org/3/I9021EN/i9021en.pdf) FAO. 2018b. The 10 Elements of Agroecology: Guiding the transition to sustainable food and agricultural systems. Rome. (http://www.fao.org/3/i9037en/I9037EN.pdf) FAO. 2018c. Upscaling Climate Smart Agriculture: Lessons for Extension and Advisory Services. Rome. Italy. (also available at https://www.fao.org/3/I9209EN/i9209en.pdf) FAO. 2020. Agroecology in Europe and Central Asia - An overview. Budapest. (also available at https://doi.org/10.4060/ca8299en) Gliessman, S.R. 2015. Agroecology: the Ecology of Sustainable Food Systems. 3rd ed. Boca Raton, FL, USA, CRC Press, Taylor & Francis Group. FAO, CIMMYT (International Maize and Wheat Improvement Center), Friends of the Earth International, ICRAF (World Agroforestry), IFOAM (International Federation of Organic Agriculture Movements), La Vía Campesina. N.d. Tool for Agroecology Performance Evaluation (TAPE) [webpage]. In: FAO [online]. https://www.fao.org/ agroecology/tools-tape/en

The greening of agricultural policies in France: a look from within

Floriane Clément[1], Pierre Labarthe[2], Gaël Plumecocq[2]

[1]UMR DYNAFOR, INRAE Toulouse Occitanie
[2]UMR AGIR, INRAE Toulouse Occitanie

Short abstract:

For the last three decades, public agricultural policies in France and in Europe have progressively integrated environmental objectives through a wide range of instruments. In this research, we have explored how farm advisors from different types of organisations deal with the tensions that they may face when navigating between policy goals, professional norms, and their personal beliefs and values. Drawing on plural qualitative methods, we focus on the implementation of two national public agroecological schemes in southwest France, which support the emergence and facilitation of farmers' groups engaged towards agroecology. We find that organizational strategies and professional values vary across organisations and affect the tensions that advisors face and their ability to manage these tensions. The type of policy instrument also matters in the forms of creative bricolage that farm advisors develop. It is even more critical for farm advisors to maintain relationships with farmers in the case of organizational-based instruments based on farmers' participation. If such instruments enlarge the creative space of farm advisors, compared to their role of "subsidy optimizer", the schemes we examined also hold in-built limitations in empowering farm advisors as they fail to address the structural constraints that shape agroecological transitions.

Extended abstract

Purpose and context

Over the past three decades, agricultural public policies in France and Europe have progressively integrated environmental objectives through a wide range of instruments. A large body of research has examined the extent to which the greening of agricultural policies has influenced farmers' decisions and practices. Fewer studies have focused on the tensions that these normative policy orientations can create within the agricultural administration, and in particular for local farm advisors who act as interface bureaucrats. In this study, we explored how farm advisors from different types of organisations deal with the tensions they may face when navigating between policy objectives, professional norms and personal values. Using different qualitative methods, we examined these tensions in the implementation of two national agro-ecological policy schemes in the French region of Occitania: the "*Economic and Environmental Interest Groups*" (GIEE) and the "*30 000 groups*".

The "GIEE" have been enacted through the 2014 French Law for the Future of Agriculture, Food and the Forest, and the "30,000 farms", launched under the 2015 French Ecophyto plan II. The former marks a significant environmental turn in French agricultural policies by introducing agroecology as the new model for French agricultural production systems. The latter is the national implementation of the European Directive 2009/128 on the sustainable use of plant protection products (PPP). Both GIEE and 30,000 farms can be categorized as organizational, agreement-based and incentive-based policy instruments (Hood, 1986; Lascoumes & Le Galès, 2004). They rely on farmers' voluntary engagement to form a group, committed to work collectively towards agroecological practices, in the case of GIEE, or towards the reduction of PPP for the 30,000 farms. Farmers do not receive any financial support to engage in these groups, but are entitled to free advisory and facilitation services provided to the group as well as trainings and small equipment for trials. The labelling "GIEE" or "30,000 farms" also facilitates farmers' access to the CAP second pillar subsidies or may increase the level of subsidy provided. A wide range of para-agricultural organizations, driven by different visions and strategies, provides advisory and facilitation services to these groups, thanks to the public funds dedicated to these agroecological schemes.

Design/Methodology/Approach

The data collection, conducted in West Occitanie, relied on a mix of qualitative methods and spanned across two years. We conducted in 2019 around 15 qualitative semi-structured interviews with farmers, and around

10 interviews with farm advisors and officers[1] (see table below). In a second stage, we organized two public debates in late 2019/early 2020, gathering around 30 participants including farmers, farm advisors, local elected representatives, civil servants, watershed technicians and agricultural students. The local debate was structured into group discussions about three issues: what was their vision for agriculture, the types of changes needed to reach that vision, and the type of advisory support needed to make these changes. Farmers and advisors were assigned to different groups to compare their perceptions. In the regional debate, around 20 participants exchanged on their perceptions about the policy instruments that they perceived as the most effective to support the agroecological transition – the GIEE scheme was one of them. The objective was to assess the perceived legitimacy of different types of policy instruments (regulatory, economic, organizational, information, discursive) by different actors (farmers, farm advisors, state regional and department-level bureaucrats, elected government officials). Deliberation allowed participants to hear other points of views and to develop arguments to defend their own perspective.

We used manual coding, using a semi-inductive approach, to analyse the data. We largely relied on a bottom-up approach, creating codes as they emerged from the data, but we grouped them into themes that seemed relevant to us from the literature review we had conducted, e.g. practices, institutions, meaning, etc.

Research stage (related project name)	Farm advisors		Officers from agricultural organizations		State functionaries	
	Female	Male	Female	Male	Female	Male
Round 1 of interviews (COTERRA)	3	2	1	1	0	5
Local public debate (COTERRA)	3	4	/	/	/	/
Regional public debate (COTERRA)	1	5	1	1	2	1
Round 2 of interviews (TERRAE)	6	4	1	1	/	/
Total	**12**	**18**	**3**	**3**	**2**	**2**

Findings

Strategies

The agency of farm advisors is embedded in the diverse strategies of advisory organisations, which can have a strong impact on the type of tensions advisors may encounter in the implementation of policy schemes. Many organisations are very proactive in forming groups. There is a strong challenge for the Chambers of Agriculture to reaffirm their position and maintain their image as a key player in agricultural advice. These schemes are also an interesting funding opportunity in a context of decreasing recurrent funding for the Chambers of Agriculture and for alternative/organic farming associations (easier funding to manage than EAFRD projects...). The chambers have the capacity to cumulate sources of funding: e.g. they form 30,000 groups with farmers already involved in a MAEC or in the '*Bulletin de santé du végétal*', thus optimising their advisor's time. Cooperatives pursue other strategies, e.g., to maintain technical legitimacy in the face of contemporary challenges and to make their territories governable by aligning the farmers in their territories with economic strategies.

[1] The interviews targeted agricultural advisors, from different advisory structures: CDAs, cooperatives, organic farming organizations and associations. Questions addressed the history of the group emergence, the influence of their organization's strategies and institutions in the emergence and in the group facilitation. We also asked their perceptions of the schemes objectives and of the rules for group facilitation, monitoring and evaluation, their agency to influence the scheme implementation and manoeuvring margin, their daily practices in group facilitation, the issues and tensions they had faced, what they liked and disliked in facilitating the groups, and the relationships they had developed with farmers and other actors as part of their group facilitation. We also interviewed one technical head of a cooperative and one contracts/partnership officer in a CDA to explore how organizational strategies may affect farm advisors' agency.

Giving meaning

The GIEE and 30000 schemes provide an opportunity for advisors to give meaning to their profession, which has become largely technocratic over the last ten years. They develop multiple subjectivities when playing the role of facilitator of this group. However, this engagement may also induce tensions and frustrations related to different advisory activities:

- *For technical expertise*: the schemes enhance the role as technical experts in the advisors' work, but many early-career professionals with general agricultural engineering backgrounds find themselves at a loss to provide farmer with specialized knowledge. Not everyone has the same capacity to seek out expertise. This depends in particular on the strategies of the organisations: some of them prefer to reserve funding for their own staff time rather than involving outside experts.
- *When supporting*: beyond providing technical expertise, many advisors see their role as supporting farmers in redesigning their system towards agroecology, through a long-term relationship. Many advisors are emotionally committed to agroecology; they may face resistance or frustration when not seeing farming practices evolving as much as they had envisioned.
- *Transforming the system*: some advisors expressed frustration at not being able to change the economic and political system at a broader scale, pointing to the limitations of the 30000 group scheme in particular, as it focuses on changing practices at a micro level.

Maintaining relationships

Maintaining relationships with farmers is a particularly strong challenge for the advisors facilitating the groups, as they have to keep the group motivated for 3-6 years. They have to develop a "do-it-yourself" approach to keep the group motivated, while meeting the administrative requirements of the schemes and finding motivation themselves.

Theoretical Implications: bridging advisors' agency and organisations' strategies

Several scholars have called for a renewed approach of policy analysis to address the challenges of contemporary environmental governance (Hajer & Wagenaar, 2003). As environmental governance in Europe has increasingly relied on participatory, contractual and project-based approaches, policy implementation has become more diffuse and ambiguous, raising new questions of environmental justice related to everyday micro-politics (Munck af Rosenschöld & Wolf, 2017; Paloniemi et al., 2015). For instance, Paloniemi et al. (2015) observe across several European countries that, in the case of biodiversity governance, these approaches tend to include specific powerful actors and exclude other social groups, silencing conflicting opinions. This context makes the analysis of the mundane practices of interface bureaucrats in the context of environmental and agri-environmental governance particularly pertinent. However, as this research evidenced, we also need to link the analysis of these ordinary practices with organizational strategies and values, as these may significantly vary and affect how policies get translated on the ground. For instance, the early strategies of some organizations to pro-actively form farmers' groups have resulted in the creation of groups with lower initial level of motivation and cohesion, requiring in turn more creative bricolage and affective labour from group facilitators to keep their work meaningful and to maintain groups alive.

Our findings resonate with earlier research on the role and daily practices of interface bureaucrats involved in environmental governance. We find that agricultural advisors face tensions related to managing conflicting visions, values and interests and rely on pragmatic decisions to manoeuvre among these policy implementation dilemmas (Funder and Mweemba, 2019). They perform multiple and contradicting subjectivities (see Nightingale, 2018) as they simultaneously reproduce dominant policy discourses on agroecology while translating these discourses on the ground according to their own personal values, or play the role of administrative scheme officer while relying on creative bricolage to bend formal rules. The originality of our results lies in the type of policy instrument that we have examined, i.e. an organizational instrument based on farmers' participation. The forms of creative bricolage that farm advisors develop in this context are not disruptive vis-à-vis the scheme – on the contrary, their manoeuvrings usually aim at keeping farmers on-board, which aligns well with the overall scheme objective. For them, keeping farmers motivated is not so much a matter of showing success to the government – the latter has little means of monitoring and control in the case of the GIEE. Rather, it is a crucial component of farm advisors' job satisfaction and a way to maintain good relationships with farmers in their working area. What this study evidenced is that facilitating such groups requires farm advisors to invest a significant amount of affective labour to negotiate between multiple values and build social relationships. The agroecological transition has been largely framed as a technical endeavour based on farmers' adoption of new techniques and practices, but there is a need to better consider the role of affects in such transition, both as a barrier and as a powerful driver for social movements (van den Berg et al., 2022).

Practical Implications: how to foster inclusiveness of participatory schemes?

Participatory schemes led by contracted semi-public or private organizations also raise questions of social justice. In the Occitanie region, where the research was conducted, around 2% of farmers are engaged in GIEEs. In turn, facilitating these farmers' collectives require considerable time investment from farm advisors and thus strongly affects their availability to support other farmers. This is far from being neutral. Although there is no available quantitative data on this, our interviews indicate that farmers who engage in these schemes are often already involved in other schemes or programs, or hold local power positions, e.g. in local farmers associations, cooperatives or machinery cooperatives. This scheme accumulation partly results from farmers' personal motivation and values, and from a virtuous circle of access to networks and opportunities. However, this virtuous circle is also ultimately reinforced by the strategies of advisory structures who try to optimize the time spent by their advisors across multiple schemes. One could defend that since farmers' participation in the schemes is voluntary, there is a natural form of exclusion of those who explicitly defend intensive forms of agriculture. They however may also de facto exclude farmers who prefer 'proto-agroecological ' approaches (van der Ploeg et al., 2019), farmers who are less vocal or who do not have the capacity to engage in these groups, e.g. farmers in debt trap, or socially marginalized farmers, e.g. like female farmers. According to our estimation, the GIEEs labelled in 2015 in Occitanie included 9% of female farmers, which is largely below the average percentage of female farmers in Occitanie (28.5% in 2020). In turn, this dynamic reinforces another virtuous (or vicious) cycle. The GIEEs embody the public face of agroecology in France and render agroecology visible and alive in the eyes of the state (e.g. see: https://collectifs-agroecologie.fr) and in the eyes of many other actors (including researchers). As the "virtuous farmers" are identified, the territories become more governable, e.g. for cooperatives as evidenced in this study, and may facilitate the implementation of agricultural development schemes and research projects, which are likely to target the same farmers. There is thus a strong risk of marginalization of certain voices and values that deserves further research and attention. Unequal access to advisory services is a common issue for other agricultural policies, at the European level, where the question of hard-to-reach populations has been recently raised (Labarthe et al., 2022), even though a clear monitoring of the distributive effects of innovation policies still lacks.

References

Funder, M., & Mwemba, C. E. (2019). Interface bureaucrats and the everyday remaking of climate interventions: Evidence from climate change adaptation in Zambia. *Global Environmental Change, 55*, 130–138.

Hood, C. (1986). *The Tools of Government*. Chatham: Chatham House.

Hajer, M. A., & Wagenaar, H. (Eds.). (2003). *Deliberative Policy Analysis: Understanding Governance in the Network Society*. Cambridge:: Cambridge University Press.

Labarthe, P., Sutherland, L.-A., Laurent, C., Nguyen, G., Tisenkopfs, T., Triboulet, P., . . . Redman, M. (2022). Who are Advisory Services Leaving Out? A Critical Reflection on 'Hard to Reach' Farmers. *EuroChoices, 21*(1), 50-55.

Landini, F., Turner, J. A., Davis, K., Percy, H., & Van Niekerk, J. (2022). International comparison of extension agent objectives and construction of a typology. *The Journal of Agricultural Education and Extension,* 28(4), 415-437.

Lascoumes, P., & Le Galès, P. (Eds.). (2004). *Gouverner par les Instruments*. Paris: Presses de Sciences Po

Munck af Rosenschöld, J., & Wolf, S. A. (2017). Toward projectified environmental governance? *Environment and Planning A: Economy and Space, 49*(2), 273-292.

Nightingale, A. J. (2018). The socioenvironmental state: Political authority, subjects, and transformative socionatural change in an uncertain world. *Environment and Planning E: Nature and Space, 1*(4), 688-711.

Paloniemi, R., Apostolopoulou, E., Cent, J., Bormpoudakis, D., Scott, A., Grodzińska-Jurczak, M., . . . Pantis, J. D. (2015). Public Participation and Environmental Justice in Biodiversity Governance in Finland, Greece, Poland and the UK. *Environmental Policy and Governance, 25*(5), 330-342.

van den Berg, L., Teixeira, H. M., Behagel, J. H., Verschoor, G., Turnhout, E., Cardoso, I. M., & Botelho, M. I. V. (2022). From managing transitions towards building movements of affect: Advancing agroecological practices and transformation in Brazil. *Geoforum*, 131, 50-60.

Transitions and disturbances in action: a discursive method of analysis to characterize the impact of change on farmers and their advisors

Catherine Milou[1]
[1]Lereps, ENSFEA, Toulouse (France)

Short abstract

Public agricultural policies are driven by societal demand for the transition of agri-food systems towards agro-ecology, based on natural processes rather than the use of chemical inputs. However, this change in practices creates disturbances or "contradictions" in the activities of agricultural actors. This study aims to identify these contradictions, which can only be detected through their discursive manifestations. We apply a content analysis method to the discourses of farmers and technicians of an agricultural cooperative involved in agroecological approaches. We proceeded in two steps, first an analysis focused on contradictions, then a transversal analysis. The results show that all the actors interviewed expressed contradictions and that they converge around common themes. We identify several ways to resolve these contradictions, such as collective learning between actors.

Extended abstract

Context

During the 1990s, public agricultural policy shifted from a system of production incentives to aid linked to environmental protection. This evolution took place through several Common Agricultural Policy measures, which were initially top-down and then increasingly left to Member States to interpret and adapt to national and territorial issues. In France, this approach was reflected in the advent of the “CTE” territorial farming contract, the “MAEt” territorialised agri-environmental measures, etc. France continued this movement with the "Agro-ecological Project for France" in 2012, focusing on collective systems such as the economic and environmental interest group “GIEE”, which aims to support farmers' projects surrounded by partners.

However, the 'agro-ecological transition' that these policies are intended to achieve has met with resistance. It calls for a paradigm shift between a production system developed after the Second World War, based on the industrialisation of agriculture, and an agro-ecological system that must free itself from standardised prescriptions. (Prost et al., 2017).

To accompany both the post-war productive transition and the current agroecological transition, the French Ministry of Agriculture relies on a key territorial economic actor: agricultural cooperatives (Nicolas, 1988; Valiorgue et al., 2020). In particular, the French Ministry of Agriculture emphasizes their function as an interface between public policy, production, the market and society, and their role "in the development of techniques and production systems" [...]. By aiming to "consolidate agricultural production in terms of quantity and quality, limiting the impact on the environment [...]".

However, these public policies remain limited in scope. The European Court of Auditors (2017; 2020) is highly critical of the effectiveness of European agricultural policies, and the General Council for Food, Agriculture and Rural Areas (CGAAER) also deplores a lack of appropriation of French agro-ecological policies by local actors (Allimant et al., 2020).

In this social context, which calls for a profound transformation of agricultural practices, we are interested in the case study of an agricultural cooperative in Southwest France that has been involved in several agro-ecological approaches since the early 2000s (development of organic farming, pulses sector, etc.) and has used several public policies to support them (CTE, MAEt, GIEE, etc.). As such, this cooperative seems to be a pilot cooperative for change in favour of agroecology, in line with the expectations of the French Government.

Through our study, we seek to (i) determine whether the members of this cooperative and the adviserss who support them perceive a significant change in their activity in recent years and, if so, (ii) determine the nature of their relationship to change. In this way, we aim to better understand what can facilitate or, on the contrary, hinder the transformation of agricultural practices.

Design/Methodology/Approach

To address this question of change, we mobilise the contributions of old institutionalism. These theories show how institutions, defined as rules and habits, structure social interactions and normalise individual action (Hodgson, 2006; Veblen, 1899). However, because the social context is constantly evolving, institutions, as legacies of the past, are never perfectly adapted to current conditions. They represent a factor of inertia that resists change. Commons (1934) emphasises the role of conflict and its collective resolution as a driver of social change. He explains that change requires the definition of new rules, but that this revision creates conflicts of interest. He also points out that in the face of a changing context, individuals are exposed to uncertainty, which forces them to negotiate new social arrangements and new rules to secure economic practices.

To further explore this question of the disruptions generated by change in individuals' actions, we are interested in the contributions of cultural-historical theories (Vygotski, 2019) and their recent declensions in activity theory. Engeström and Sannino (2011) explain how changes in an activity or an organisation are likely to generate disturbances or "contradictions". These contradictions can be problematic for individuals but they can also provide a creative opportunity to transform their practices (activity). For these authors, however, these contradictions can only be recognised by their manifestations. They distinguish four of them, all of which are revealed at the discursive level: dilemmas, conflicts, critical conflicts, and double binds.

In our study, we used the analysis grid proposed by these authors to identify the manifestations of contradictions in the discourse of farmers and technicians of the cooperative. We added a contradiction, uncertainty, which appears in institutionalist theories as both a cause and a consequence of institutional change.

We carried out a thematic content analysis by applying a theoretical categorisation, i.e. by using a pre-established coding grid to extract themes, followed by an induced categorisation to extract sub-themes (Bernard, 2006). In this way, we analysed 32 interviews, the number necessary to observe information saturation according to the principle of Glaser and Strauss (1967).

The farmers, all members of the cooperative, in the organic or conventional field crop sector, were selected for their specificity to stand out as drivers and influencers in their area. The profiles of the advisers also concerned the two sectors. The same interview grid was used for all the profiles, asking about their relationship to change, the information channels used in their activity, their relationship with the cooperative, their opinion on the development of pulses, etc

Findings

We observed the manifestation of the five types of contradictions among the actors. After describing them one by one, we proceeded to group them thematically the contradictions related to recurrent causes. Four main themes summarise several types of contradictions (uncertainty, conflict, critical conflict, double constraint, dilemma) felt in the activity. They are related to:

- Changes in practices. What could appear to be a tautology confirms that the actors interviewed feel affected by changes that generate disturbances in their activity. These changes in practices are part of the pool of agro-ecological expectations - plant cover, organic farming, lower inputs, etc. This area is linked to the creation of uncertainties and dilemmas.

- An accentuation of the phenomenon of the industrialisation of agriculture. This can be seen in the loss of economic efficiency of farms and the decline in motivation of farmers. It evokes the loss of social ties between farmers and between farmers and consumers. It is also evident in the evocation of an organic agriculture that is becoming industrialised and breaking with its original values. This theme is strongly linked to critical conflicts and contradictions.

- An increasingly competitive environment. It is the result of increasing industrialisation, which has led to the concentration of structures. It has exacerbated rivalries between agricultural organisations in the region and led to aggressive commercial strategies. This area is exclusively associated with conflicts.

- Standards and regulations. These standards highlight the incompatibility between industrial and agro-ecological expectations. The notion of quality invoked by the actors brings this ambivalence according to whether it is the object of an "industrial" or an "agroecological" logic.

Implications

Through this method of discursive analysis, we reveal the disruptions caused by the institutional change represented by the agro-ecological transition in the actions of the actors. But also linked to the increasing industrialisation of agriculture, which generates a loss of meaning for the actors. The conflicts and tensions generated by this change are also played out through the apparent unity represented by the collective action embodied by the cooperative. In a way, the cooperative is located at the intersection of two institutional logics. One is based on agroecology and promotes the development of new practices, and the other remains attached to a traditional mode of development based on productivism, creating internal tensions.

Tensions between actors' points of view, even when they are united around the same project of developing organic agriculture in a region, have also been observed by Arnaud and Triboulet (2022). Like these authors, we can ask whether these disagreements hinder or encourage innovation. These tensions and conflicts, which reveal an ongoing institutional transformation, are not incompatible with the achievement of the transition. On the contrary, by confronting different points of view, they are able to stimulate innovation in the region (Torre & Wallet 2016). However, these confrontations need to be expressed in spaces of exchange and debate that can support collective learning among actors (Duru et al., 2016).

The cooperative's board of directors, the section assemblies, can represent these different points of view and open spaces for exchange (Saïsset, 2016). Nevertheless, power and information asymmetries can disrupt the democratic nature of these arrangements (Joffre & Simon, 2011). The lack of mobilisation of members in the governance structures of the cooperative can also undermine this functioning (Amichi et al., 2021).

The adviser, considered a pivot of practice change, is also a source of learning for farmers (Del Corso et al., 2017; Filippi & Frey, 2012). However, we find that he himself is subject to contradictions in his activity. Collective exchanges, sometimes even deliberative, between farmers and advisors, favoured by public mechanisms (MAEt, GIEE) are possible ways of collective learning. The trust then built up between participants (between farmers and between farmers and advisers), the experimentation of new practices within these groups, supports the collective validation of new rules of action (Del Corso et al., 2015, 2017).

Our study proposes an interesting method for identifying and characterising the disruptions caused by change among different categories of actors, farmers and advisers. However, it should be tested in other situations, for example by including other actors who can also be considered as resource persons for farmers, such as advisers from chambers of agriculture or independent consultants. It would also be useful to be able to study the trajectories of individuals, i.e. to study the strategies they adopt over time and their impact on the resolution of these disruptions.

References

Allimant, P., Jourdier, G., & Ruiz, J. (2020). Déclinaison régionale du Projet Agro-Écologique pour la France (PAEF) (No 19077; p. 81). CGAAER.

Amichi, H., Henninger, M.-C., & Peltier, C. (2021). Comment mobiliser les jeunes adhérents dans la gouvernance des coopératives Agricoles? Mise en pratique d'une démarche d'accompagnement au sein d'une coopérative du Sud-Ouest français. Développement durable et territoires, Vol. 12, n°1. https://doi.org/10.4000/developpementdurable.18548

Arnaud, C., & Triboulet, P. (2022). L'Agriculture biologique, une innovation territoriale au service du développement rural: Le cas du Gers: Revue d'Économie Régionale & Urbaine, April (2), 183-208. https://doi.org/10.3917/reru.222.0183

Bernard, H. R. (2006). Research methods in anthropology: Qualitative and quantitative approaches (4th ed). AltaMira Press.

Commons, J. R. (1934). Institutional Economics. Transaction Publishers.

European court of auditors. (2017). Greening: A More Complex Income Support Scheme, Not yet Environmentally Effective. https://www.eca.europa.eu/Lists/ECADocuments/SR17_21/SR_GREENING_EN.pdf.

European court of auditors. (2020). Biodiversity on Farmland: CAP Contribution Has Not Halted the Decline. European Union. https://www.eca.europa.eu/Lists/ECADocuments/SR20_13/SR_Biodiversity_on_farmland_EN.pdf.

Del Corso, J.-P., Nguyen, G., & Kephaliacos, C. (2017). Acceptance of a Payment for Ecosystem Services Scheme: The Decisive Influence of Collective Action. Environmental Values, 26(2), 177-202. https://doi.org/10.3197/096327117X14847335385517

Duru, M, Therond O, et Fares M. « Designing Agroecological Transitions; A Review ». Agronomy for Sustainable Development 35, nº 4 (2015): 1237-57. https://doi.org/10.1007/s13593-015-0318-x.

Engeström, Y., & Sannino, A. (2011). Discursive manifestations of contradictions in organizational change efforts: A methodological framework. Journal of Organizational Change Management, 24(3), 368-387. https://doi.org/10.1108/09534811111132758

Filippi, M., & Frey, et O. (2012). Le conseiller, une pièce maîtresse sur l'échiquier de la coopérative agricole. Revue d'Études en Agriculture et Environnement, 96(03), 439-466. https://doi.org/10.4074/S1966960715003033

Hodgson, G. M. (2006). What are institutions? Journal of Economic Issues, 40(1). https://kelembagaandas.wordpress.com/pengertian-kelembagaan/geoffrey-m-hodgson-2/

Joffre, O., Simon, E. (2011). Système de gouvernance et émergence de pratiques socialement responsables dans la coopération agricole: Gestion 2000, Volume 28(2), 33-49. https://doi.org/10.3917/g2000.282.0033

Prost, L, Berthet E., Cerf M., Jeuffroy MH, Labatut J, et Meynard JM. « Innovative Design for Agriculture in the Move towards Sustainability: Scientific Challenges ». Research in Engineering Design 28, nº 1 (janvier 2017): 119-29. https://doi.org/10.1007/s00163-016-0233-4.

Saïsset LA, Riviere-Giordano G., Amadieu P. The key role of stakeholders on wine cooperatives governance and performance. International Cooperative Alliance: New Strategies for Co-operatives: Understanding and Managing Co-operative Creation Conference, International Co-operative Alliance (ICA). BEL., May 2016, Alméria, Spain. ⟨hal-02742867⟩

Torre, A, Frédéric W. Regional Development in Rural Areas. Springer Nature. Springer Briefs in Regional Science. Switzerland: Springer International Publishing, 2016.

Veblen, T. (1899). The Theory of the Leisure Class. An economic study of institutions (M. Banta, Éd.). Oxford university press.

Vygotsky, L. Thought and Language. 2nd Revised edition (original edition published in 1934). Cambridge, Mass: MIT Press, 1986.

The attitude of technical advisors towards professional continuous learning: the case of Italian organic agriculture system

Roberta Milardo[1], Aldo Bertazzoli[1]

[1]Department of Agricultural and Food Sciences, University of Bologna.

Short abstract:
The European Union has demonstrated its willingness to create a sustainable agricultural system by investing in knowledge and innovation. In this context, agricultural technical advisors and extension services constitute an essential source of knowledge. Considering the topic of horizontal professional training of technicians widely addressed by the literature, the present research aims to strengthen the technical advisors' profile in organic farming systems by considering their current professional learning activities. These topics were the object of this paper, based on an online survey addressed to technical advisors and inspectors. Identifying technicians' opinions on continuous professional learning activities and job satisfaction has made it possible to identify and define a model according to which the probability that a technician has difficulty following professional updates is a function of specific explanatory variables. The refinement of this research could contribute to improving the training frameworks foreseen for technicians and promoting the sustainability of their work.

Extended abstract

Purpose

In recent years, the European Union has shown a willingness to achieve an efficient and effective agricultural system by investing in knowledge and innovation. These principles fit perfectly with all the agricultural policy objectives to produce competitiveness, environmental sustainability, and development of rural areas (Bonfiglio, 2003). Research shows that sustainable agriculture includes practices that draw on various knowledge heritages (Ayoub, 2023), and farmers seek knowledge from different actors (Gava et al., 2017). These include agricultural advisors and extension services, whose contributions provide an essential source of knowledge as an innovative response to environmental challenges.

As many authors point out, the figure of the agricultural advisors is undergoing a mutation to adapt to the new challenges in agriculture and to enhance the national agricultural heritage. For this reason, training is a priority and must be parallel to the economic and technological development of the agriculture sector. The choice of an appropriate formation path must consider the needs of the farmer, who lives daily with the variability of the agri-food sector and frequently has shown dissatisfaction with the advisory services provided to him. As Filler (2011) pointed out, many organic farmers attribute their dissatisfaction to the lack of farm-specific references, specialisation, and practical experience of advisors. In this regard, the literature addresses the issue of horizontal professional education of technicians through different perspectives. In general, innovation support services should:

- Increase the specialisation of skills (e.g. technical knowledge), the awareness of innovative tools, certifications and environmental objectives (Landini, 2015; Nettle et al., 2018);
- Stimulate a process of empowerment and awareness, i.e. greater understanding, exchange of knowledge and improvement of skills in the long term (Knierim, 2017);
- Increase intermediary services building capacities, improve access to resources and institutional support for niche innovation (Cristiano & Proietti, 2019).

Specifically, Lybaert et al. (2022) highlighted some specific attitudes of agricultural advisors, and the results of their research led to the construction of the "innovation consultant competence profile". Different groups of competencies represent the skills profile, and here we report the most relevant ones for this paper. The first group is about fundamental dispositions, i.e. self-awareness, personal drive, sensitivity and trustworthiness. The second group concerns knowledge, which derives mainly from the background and training of the individual. The third group concerns methodological skills, and the fourth concerns reflection, learning and personal development. In the latter group, authors also analysed the attitude for lifelong learning, on which we focus in this paper, and stated that the agricultural advisor should actively seek training opportunities to "learn, acquire new experiences and know how to find new information".

Scholars propose several methodological alternatives, considering how training aims to increase work effectiveness and improve performance and job satisfaction (Alotaibi et al., 2021; Anesukanjanakul et al., 2019; Desjeux et al., 2012). Landini & Brites (2018) evaluate a reflective and participatory training process aimed at agricultural extension services, through which four factors (existence of a coordinator, horizontal sharing of experiences, feedback between theory and practice, and critical reflection on practical job activities) were identified as generating greater satisfaction with the training methodology. Considering higher education, Gorman (2019) develops research aimed directly at young agricultural advisors, which could be applied to their early career and professional development. In this context, the present research aims to strengthen the profile of technicians (advisors and inspectors) involved in organic agriculture systems considering their current professional learning activities. The goal is to use the research results regarding opinions on professional continuous learning activities and job satisfaction to improve and stimulate the daily training of technicians.

Design/Methodology/Approach
In order to reach the set objectives, we based the research activity on an online survey questionnaire addressed to organic agriculture technical advisors and inspectors of the Italian association ATBio (National Association of Technical Consultants and Inspectors for Organic Production).

One hundred sixteen technicians responded to the electronic survey that included 42 questions.

Here, we focus our analysis on the variables which, based on the literature review, could be related to the attitude of the interviewees to carry out continuous professional learning. Sixteen variables were extracted from the questionnaire and the resulting database. Of these, one (PCLdiff) has a dichotomous nature and highlights whether or not the interviewees have difficulty in carrying out their professional continuous learning activities. Three variables are aimed at characterising previous educational courses (EduLevel, EduField, EduConsistency). The fourth variable (WHours) quantifies how much the technician's activities in support of organic agriculture weigh on their work activities. The fifth variable (YExperience) measures the number of years of operational experience of each technician. The sixth variable (JobSpec) detects whether the technician carries out their activity concerning only one or more production chains, which could imply the need to carry out fewer or more professional updates respectively.
Finally, nine variables relating to the degree of satisfaction of the interviewees with their work were extracted. These variables, measured using a Likert scale, were aimed at detecting financial satisfaction with one's needs and efforts (Pay4Needs, Pay4Efforts), satisfaction with the usefulness of one's work (Purpose), with the degree of autonomy in managing work (Autonomy), for the personal fulfilment (PFulfil), for the possibility of expressing one's personal and professional qualities (Express), but also to detect the perceived level of stress (Stress) and responsibility (Responsibility), as well as the levels of socialisation (Isolation) connected to the work activities performed.
The data analysis was developed in successive phases, starting from straightforward methodologies and then gradually deepening the analysis according to the results of the previous phases. Overall, however, the analysis was exploratory, aimed at understanding whether the considerations suggested by the literature review are confirmed by technicians supporting the organic farming production system. In particular, we develop the analysis through four phases.

Phase 1. Bivariate analysis. Crosstabs were created, and the variable relating to professional updating (PCLdiff, dichotomous) was cross-referenced with the other fifteen variables. We calculated statistical indicators to test the significance of the degree of association between the variables, choosing the most appropriate to the nominal, dichotomous or ordinal nature of the variables crossed with PCLdiff.

Phase 2: Logistics regression. The results of the first phase, which will be illustrated in the next paragraph, have suggested evaluating the possibility of estimating the probability that a technician complains of difficulty in carrying out professional updating activities according to their training background, their degree of satisfaction with working activity and, in general, with the variables previously illustrated.

Phase 3: Dimension reduction. Based on the literature and the previous phases' results, the satisfaction level with one's work activity significantly influences the quality of the work performed and the greater or lesser attitude to carry out the training activities. The variables illustrated above regarding job satisfaction allow us to highlight its various facets of "satisfaction" but make it challenging to have an overall assessment. To this end, the categorical principal component analysis technique was applied to reduce the number of variables necessary to effectively describe the overall level of satisfaction with the work of each of the technicians interviewed.

Phase 4: One-way ANOVA. The object scores attributed to each interviewee based on the principal components identified in the previous phase represent numerical variables, the values of which can be compared, considering separately the two subsets of interviewees, represented by those who have or have not complained of difficulties in carrying out the updating activities.

3. Findings

The technicians who "encounter difficulties in complying with the training obligations established by the legislation" are 26 out of 116 interviewed, i.e. over 22%. This percentage is relatively high if one considers that the legislation relating to training obligations provides for relatively rigid procedures, at least since 2012. Continuing training is, therefore, still struggling to be fully included among the "normal" activities that a significant proportion of technicians integrate into their work organisation. The reasons for these difficulties are complex, and the variables analysed certainly cannot fully represent them. As anticipated in the paragraph relating to the methodology, however, the available data were processed using various statistical techniques, with results of some interest.

Phase 1: Bivariate analysis. Four of the six variables relating to the characteristics of the interviewees and their work activities did not show any significant association with the variable relating to professional training (PCLdiff). The variables relating to the consistency of the activities carried out with previous educational experience (EduConsistency) and that relating to the incidence of technician activities in support of organic farming on the total work activities (WHours) show some association with the PCLdiff variable instead, even if the significance is somewhat modest or even uncertain. On the other hand, the results relating to the variables that testify to the interviewees' satisfaction level with their work are more attractive. Nearly all variables indeed show significant or highly significant levels of association. PCLdiff variable is significantly associated with the variables relating to economic satisfaction with the efforts (Pay4Efforts), with the degree of autonomy (Autonomy), with the feeling of personal fulfilment (PFulfil) and with the valorisation of their commitment and skills (Express). A significant association level was also observed with the variable relating to excess stress (Stress).

Phase 2: Logistics regression. The analysis made it possible to define a model based on which the probability that a technician complains or does not complain of difficulties in carrying out professional updating (PCLdiff) is a function of the abovementioned explanatory variables. In particular, various forward and backward algorithms have been used. In all cases, the estimated model highlights how PCLdiff can be considered a function of only two variables, i.e. satisfaction with the feeling of personal accomplishment (PFulfil) and the perception of excessive stress levels (Stress). Overall, the model shows a high significance, even if its explanatory capacity is relatively modest, which confirms that the topic must be studied further by collecting more information. The coefficients of the two variables are in line with expectations:
- as the level of perceived personal fulfilment increases, the probability that the technician complains of difficulties in professional updating decreases;

- the higher the perception of work stress, the greater the probability that the technician complains of difficulties in professional updating.

In absolute value, the coefficient of the variable PFulfil is higher than that of the variable Stress. Then, the difficulties complained of in carrying out the professional updating are determined to a greater extent by the dissatisfaction towards work rather than perceived stress.

Phase 3: Dimension reduction. As mentioned in the paragraph relating to the methodology, the reference to different ways of understanding satisfaction or dissatisfaction with the work activity had some advantages but made it more complicated to evaluate overall job satisfaction. We have tried to overcome this limit by applying the categorical principal component analysis. The first dimension extracted accounts for slightly less than 42% of the overall variance of the sample. The values of component loadings are positive for the first six variables and negative for the remaining, thus representing an adequate representation of the overall satisfaction of the interviewees.

Phase 4: One-way ANOVA. Finally, the ANOVA results highlighted how the two groups of respondents, defined based on their attitude towards PCL, actually differ in the values assumed by the object scores determined in phase 3. The test values are highly significant for the first dimension, which, therefore, can be effectively interpreted as an explanatory variable of the complained difficulties in fulfilling the training obligations by the technician interviewed.

Practical Implications

The results of this research show how the technicians often experience difficulties in performing their professional updating activities. Furthermore, as the results and the literature highlight, the technicians' dissatisfaction with their work largely influences the difficulties associated with professional updating. Identifying these factors and characteristics, triggering phenomena of reduced satisfaction, could serve as a basis for enhancing training strategies for technicians.

At the same time, actively including them in designing an appropriate training path could lead to more communication between the different actors, improving their skills in a specific area of their current job (Landini & Brites, 2018). Participatory and discussion paths should be designed with a practical utility. Considering the complexity and variability of the agri-food sector, the interventions of stakeholders with experience in different sectors could stimulate a flow of different knowledge and skills, fill any deficiencies of the technicians, and encourage the active pursuance of their educational path. Indeed, Landini and Brites (2018) state that "the diversity of experiences, knowledge and perspectives is considered an enrichment".
The study of the literature and the direct opinions of the technicians establish how important it is for the work management of the technicians to invest in horizontal lifelong professional training to provide: 1) acquisition of new technical skills and new technologies or methodologies; 3) understanding business processes and solving work-specific problems; 4) increasing technicians' motivation and satisfaction.
Deepening the present research could contribute to improving the training frameworks foreseen for technicians and promoting their work sustainability. Relevant issues could be specialist knowledge, improved quality of service, increased work efficiency and career growth opportunities. With particular reference to the Italian context, the need emerged to accelerate the implementation of investments in the training sector, allowing each actor to face their training obligations serenely. As reported in the National Strategic Plan (MASAF, 2022), the Italian government plans to strengthen the current training system for advisors, introducing some non-required rural development actions (exchange of knowledge and dissemination of information), even if not shared by all Regions.

Theoretical Implications

The results highlighted in the previous paragraphs are consistent with the literature. A similarity emerged with the research results of Lybaert et al. (2022). These highlight how the ideal profile of an agricultural innovation consultant also includes skills that require a particular commitment on a personal level that derives from the person's nature. This issue has been confirmed in our results, where the increase in technicians' realisation is correlated to a reduction in the difficulties in carrying out their professional continuous learning activities, compared to the other tested variables. So, we hypothesise that the acquisition of technical skills is not the only one aimed at full training of the agricultural technician and extension services, the contribution of individual and human characteristics being equally important in this case (Landini, 2015). By the way, our final recommendation is to encourage the improvement of the quality of training by sharing models and experiences between different countries, as suggested by Gorman (2019), to revitalise and renew the paths of agricultural expansion and consultancy. Finally, we emphasise the usefulness of developing direct surveys with agricultural technicians in the various countries of the European Union to compare experiences and best practices in continuous training.

References

- Alotaibi, B.A. et al. (2021) Extension Agents' Perceptions of the Role of Extension Services in Organic Agriculture: A Case Study from Saudi Arabia. *Sustainability*, 13, 4880.
- Anesukanjanakula, J. et al., (2019) Factors That Influence Job Performance of Agricultural Workers, *International Journal of Innovation, Creativity and Change*, 7(2), 71 – 86.
- Ayoub, M. (2023) One size does not fit all: The plurality of knowledge sources for transition to sustainable farming. *Journal of Rural Studies*, 97, 243-254.
- Bonfiglio, A. (2023) La digitalizzazione nel Piano Strategico Nazionale della PAC 2023-2027. Centro di ricerca Politiche e Bioeconomia – CREA, PianetaPSR, 120. http://www.pianetapsr.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/2851
- Cristiano, S. & Proietti, P. (2019) Agricultural education and extension tuned on innovation for sustainability, ESEE 2019 Proceedings. Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria - Politiche e Bioeconomia.
- Desjeux, Y., Faure, G. & Gasselin, P. (2012) New Challenges in Agricultural Advisory Services from a Research Perspective: A Literature Review, Synthesis and Research Agenda. *J. Agric. Educ. Ext.*, 18(5). 461-492.
- Filler G., Müller U. & Baumbach, U. (2012) Extension services in organic farming in Germany and prospects for Saxony. *Zeitschrift für Agrarpolitik und Landwirtschaft,*90(2), 258 – 282.
- Gava, O., et al. (2017) Knowledge networks and their role in shaping the relations within the Agricultural Knowledge and Innovation System in the agroenergy sector. The case of biogas in Tuscany (Italy). *Journal of Rural Studies*, 56, 100–113.
- Gorman, M. (2019) Becoming an agricultural advisor – the rationale, the plan and the implementation of a model of reflective practice in extension higher education, *J. Agric. Educ. Ext.*, 25(2), 179-191.
- Knierim, A., et al. (2017) Pluralism of agricultural advisory service providers—Facts and insights from Europe. *Journal of Rural Studies*, 55, 45–58.
- Landini, F. & Brites, W. (2018) Evaluation and impact of a reflective training process for rural extension agents, *J. Agric. Educ. Ext.*, 24(5), 457-472.
- Landini, F. (2015) How to be a good rural extensionist. Reflections and contributions of Argentine practitioners. *Journal of Rural Studies,* 43, 193–202.
- Lybaert, C., et al. (2022) Competencies for Agricultural Advisors in Innovation Support. *Sustainability,* 14, 182.
- MASAF (2022) Italy CAP Strategic Plan. https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/24037
- Nettle, R., Crawford, A. & Brightling, P. (2018) How private-sector farm advisors change their practices: An Australian case study. *Journal of Rural Studies,* 58, 20–27.

Session 1B - Customising advice for sustainable transition (1)

Are plantain-based production systems, Agricultural Innovation System in Guadeloupe?

Marie Bezard[a], Carla Barlagne[b], Valérie Angeon[c], Maud Caperaa[a], Harry Ozier Lafontaine[b], Jean-Louis Diman[a], Nadine Andrieu[d]

[a]INRAE, UE PEYI, F-97170 Petit Bourg, France ; [b] INRAE, UR ASTRO, F-97170 Petit Bourg, France ; [c] INRAE, UR Ecodéveloppement, Centre de Recherche Provence-Alpes Côte d'Azur Domaine Saint Paul, Site Agroparc, F-84914 Avignon, Cedex 9, France ; [d] CIRAD, UMR Innovation, Station de Neufchâteau, F-97130 Capesterre-Belle-Eau, France

Short abstract:

This paper analyses to what extent agroecological innovations in plantain-based production systems in Guadeloupe emerge in the perspective of the agroecological transition. By using the analytical grid of Agricultural Innovation System (AIS), we shed lights on the importance of knowledge that circulates through interactions among a diversity of actors to make the AIS innovative. Social networks play then a core role in the diffusion of innovations. A mixed research method crossing the quantitative indicators of Social Network Analysis (SNA) with a Knowledge Mapping (KM) (farmers verbatim) is mobilized to explore the properties of networks (in terms of structure and functions). Findings show a disconnect between AIS structure (actors and organizations) and functions (resources flows that circulate among actors) that hinders the agroecological transition. The results also confirm the core role of farmers knowledge, learning capacities embedded in social networks to design innovative systems. In that sense, farmers fulfill themselves different functions to compensate for deficiencies.

Extended abstract

Purpose

Faced with the limits of the dominant and conventional system, the development of agroecology appears promising. This opens up avenues for social and economic sciences to promote alternative systems. In particular, the literature emphasizes the mobilization and circulation of knowledge to design agroecological systems that require innovative processes of interactions among farmers and their environment (Touzard et al. 2015). Therefore, it is now recognized that innovations depend on combination of tangible and immaterial assets (*i.e.* skills, knowledge, cultural norms etc.) embedded in a social context (Rip and Kemp 1998). As a matter of fact, technology lies within organizations and networks. In that sense, a comprehensive analysis of the determinants of innovations adoption and diffusion requires to shed light on organizational and social features. In this respect, the innovation system approach is relevant and especially Agricultural Innovation System (AIS) approach. Some studies have specifically defined the key functions underpinning agricultural innovation processes within Agricultural Innovation Systems (AIS) while others have focused on identifying essential resources instead, without accounting for the functions (Klerkx et al., 2012). The AIS functions and structure are often studied separately and knowledge gaps remain with regards to their articulation within AIS and how it impacts the agroecological transition of those AIS.

Based on the example of Guadeloupe, a French Outermost island Region in the Caribbean, and specifically on plantain-based production systems, which are mostly grown by smallholder farmers (Bezard et al. 2023), this study aims to better understand how do current AIS support or hinder the agroecological transition.

Design/Methodology/Approach

Case study

Guadeloupe is a French outermost region, located in the Caribbean. Two export crops dominate Guadeloupean agriculture: sugar cane and Cavendish banana. Plantain banana is a crop intended to local consumption and produced by farmers engaged at different levels of the agroecological transition with growing practices related to strong ecological modernization (in a logic of redesign) and practices linked to weak ecological modernization corresponding to efficiency or substitution logic (Hill and MacRae 1996; Horlings and Marsden 2011; Duru et al. 2015). In particular, this dichotomy was identified for the growing practices related to plant preparation, soil amendment and crop fertilization (Bezard et al. 2023) (Table1).

Table 1 : Agroecological farming practices as alternative to conventional ones in plantain farming systems.

Type of practice	Plant preparation	Fertilization	Amendment
Conventional	Mechanically and chemically cleaned suckers	Synthetic Fertilizer	Synthetic Amendment
Weak ecological modernization	• PIF	• Organic on farm • Organic Local	• Organic on farm
Strong ecological modernization	• Vitroplants	• Organic Imported	• Organic Local • Organic Imported

A network analysis to question the effectiveness of the plantain AIS in Guadeloupe

A mixed research methods approach that combined a Social Network Analysis (SNA), for the quantitative data and a Knowledge Mapping (KM) for the qualitative data was adopted. Plantain farmers were interviewed using a snowball sampling to approximate the boundaries of the networks. Interviews were conducted according to the sequence of interventions on the plantain crop, from soil preparation to commercialization and a focus was made on the three types of practices presented in table 1 (plant preparation, organic fertilization and amendment). At each step, we identified who the farmer interacted (the 'nodes') with as well as the resource (the 'ties') that was used. The 'nodes' correspond to the actors and infrastructures of the plantain AIS. More specifically, the 'egos' correspond to the farmers interviewed and the 'alters' to the others actors or infrastructure they are connected with. The ties correspond to the resources flow (AIS functions) (Figure 1).

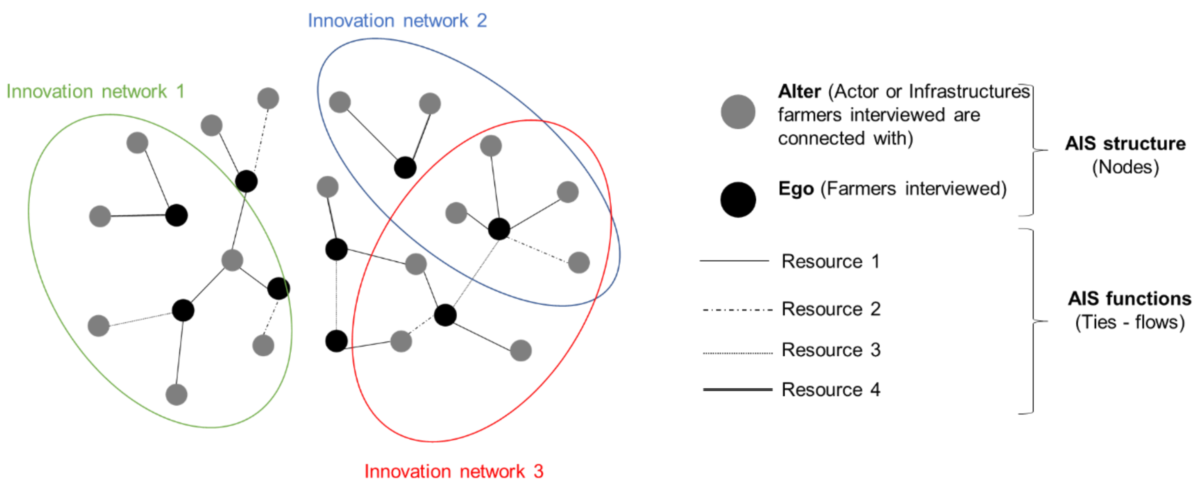


Figure 3: Links between AIS structure and functions and network analysis concepts

Each interview was fully transcribed and analyzed using the NVivo software (QSR International Pty Ltd 2020). Two quantitative indicators were used to provide insights into the structure of the networks out-degree centrality and betweenness centrality. Out-degree centrality corresponds to the number of ties sent by a node. The more an actor is central, the higher the number of ties sent out by that actor (Borgatti et al. 2022). Betweenness centrality is how often an actor is linked to two other actors. It is an indicator of critical links between actors and allows the identification of actors important to take into account for long term planning and problem solving (Prell et al. 2009). Following Prell et al., (2009), we identified the first ten central actors and considered that an actor was central if the out-degree was equal or greater than 10. For betweenness centrality, we identified the first ten broker actors (Prell et al. 2009) and considered that an actor was in brokerage position if betweenness centrality was equal or greater than 1000 (Brandes 2001).

Findings

Composition of plantain AIS

69 plantain farmers were interviewed. 503 alters connected to the plantain farmers interviewed were mentioned. Most of them were other farmers. 15 categories of actors and infrastructures emerged from the interviews, highlighting the diversity of actors and roles within the plantain AIS. Four material and immaterial resources flowing between the nodes were identified during the interviews: the financial resources, the material resources, the knowledge / skills and the manpower (labor).

Two types of network according the structure at the node level & the central role of farmers

More than 50% of the actors involved in each flow of resources whether for out-degree centrality and betweenness centrality are farmers even if the centrality scores are not necessarily above the threshold's values (10 for the out-degree and 1000 betweenness centrality). This means that for the four resources flows, farmers are central and potentially brokers.

Focusing on the actors with betweenness centrality higher than the score of 1000, two types of networks, composing two sub-systems, were identified with regard to their structure: networks with central actors superimposed to export banana networks and networks with few central actors. The networks, not superimposed to the export banana networks, are defined as alternative networks as practices used in export banana derive from the dominant technology in a logic of technological package (Angeon and Bates 2020). The sub-system 'plantain and export' is composed by three networks which concentrate central actors and are built around practices related to weak ecological modernization (vitroplants, imported organic fertilization and local organic amendment). The sub-system 'local plantain' is composed by three alternative networks with few central actors. These alternative networks, not superimposed to export banana networks are related to practices supporting strong ecological modernization (PIF, organic on farm fertilization and amendment and organic local fertilization).

Unfulfilled functions by central actors within the sub-system 'Plantain and export'

The interviewed farmers mentioned a number of not fulfilled functions (availability of material resources, financial support, knowledge providing), by the central actors (input suppliers, cooperatives, vitroplant nursery, decentralized service of the (French) Ministry of Agriculture). The unfulfilled functions, carried out by central actors, and therefore linked to the structure of the AIS, are source of bottlenecks (technical, organizational, informational and financial).

A disconnect between structure and functions of plantain AIS limiting the agroecological transition

These unfulfilled functions led to mistrust and negative perception of some of the central actors from the farmers interviewed. This mistrust is reinforced by the fact that the supports proposed by the central actors are disconnected from the farmers' strategies and in particular farmers who are carrying out a strong agro-ecological transition. As a result, farmers pondered decisions related to the implementation of costly innovative technics such as the use of imported organic fertilizers, deciding, in some cases, not to implement them. Finally, these unfulfilled functions, which are supposed to accompany and support the agroecological transition, are responsible for the non-choice of agroecological practices. To counterbalance the failure of central actors to perform these functions, farmers have organized themselves to try to fulfill the functions. Leader farmers also central actors, presidents of two key farmers associations and were referred as knowledgeable and provide material resources to many other farmers. Both of the brokers farmers went abroad to be trained in agroecological practices. These two farmers have privileged links with the other farmers and thus have a key role in the peer-to-peer learning. They produced, on their own, knowledge adapted to the territory and to their reality. In a way, they are the ones who allow the adaptation of exogenous knowledge to the territory (Angeon and Caron, 2009; Giroux et al., 2023; Sutherland and Labarthe, 2022). These two farmers, in position of brokers or champions, as defined by Klerkx et al., (2010), also exchange in a privileged way with the other actors such as the Research centers, the Extension services and the Input suppliers, and influence on their environment. They are in a position of mutual embeddedness as defined by Klerkx et al., (2010). In the networks, related to strong ecological modernization and without central actors, farmers have developed collective organization to tackle the bottlenecks they face (time require and material resources supply especially) to set up the agroecological practices.

Practical Implications

In the sub-system 'local plantain', the absence of central actors does not impede collective action to occur. The farmers rely on their own networks and focus on peer-to-peer interactions. These results are consistent with the conclusion of Borgatti et al., (2022) who estimate that the absence of central actor reinforce the actors' autonomy of the actors. Information flow better between close farmers (Mekonnen et al. 2022) and the networks where knowledge is co-created and shaped within famers' networks were defined through the concept of Micro AKIS (Micro Agricultural Knowledge Innovation System) by Sutherland and Labarthe (2022). Therefore, this spontaneous organizational capacity appears as a real lever to foster the agroecological transition.

Theoretical Implications

We combined Social Network Analysis and knowledge mapping to examine the diffusion of knowledge and information within the plantain AIS. We focused on a set of innovations at the plot level and our entry point was the technical itinerary which farmers could relate to. This method proved to be an efficient way to structure SNA interviews which can sometimes be dauting for farmers. Next, the joint structural and functional study of the AIS highlighted the importance of considering these two aspects jointly in order to highlight the barriers and levers for the agroecological transition. It calls for a more in-depth analysis of the lack of innovation, including organizational innovation, and the link with the export banana system, with a dynamic analysis of the AIS, in order to achieve a strong ecological modernization.

References

Angeon V, Bates S (2020) Mettre en œuvre la transition agroécologique : une analyse des règles de décision dans les systèmes bananiers aux Antilles françaises. Rev Econ Reg Urbaine 3:503–529. https://doi.org/10.3917/reru.203.0503

Angeon V, Caron A (2009) Dossier « Économie de la proximité » – Quel rôle joue la proximité dans l'émergence et la pérennité de modes de gestion durable des ressources naturelles ? Nat Sci Soc 17:361–372. https://doi.org/10.1051/nss/2009065

Bezard M, Barlagne C, Diman J-L, et al (2023) Co-designing innovative plantain cropping systems to support the diversity of agroecological pathways in Guadeloupe. Agron Sustain Dev in press: https://doi.org/10.1007/s13593-023-00879-8

Borgatti SP, Everett MG, Johnson JC, Agneessens F (2022) Analyzing Social Networks Using R. SAGE

Brandes U (2001) A faster algorithm for betweenness centrality*. J Math Sociol 25:163–177. https://doi.org/10.1080/0022250X.2001.9990249

Duru M, Therond O, Martin G, et al (2015) How to implement biodiversity-based agriculture to enhance ecosystem services: a review. Agron Sustain Dev 35:1259–1281. https://doi.org/10.1007/s13593-015-0306-1

Faure G, Chiffoleau Y, Goulet F, et al (2018) Renouveler les regards sur l'innovation dans les systèmes agricoles et alimentaires. In: Innovation et développement dans les systèmes agricoles et alimentaires, Quae. pp 3–16

Geels FW, Schot J (2007) Typology of sociotechnical transition pathways. Res Policy 36:399–417. https://doi.org/10.1016/j.respol.2007.01.003

Giroux S, Kaminski P, Waldman K, et al (2023) Smallholder social networks: Advice seeking and adaptation in rural Kenya. Agric Syst 205:103574. https://doi.org/10.1016/j.agsy.2022.103574

Godin B (2015) Innovation Contested. Routledge

Hall A, Janssen W, Pehu E, Rajalahti R (2006) Enhancing Agricultural Innovation. How to go beyond the strenghtening of research systems. The World Bank, 1818 H Street NW Washington DC 20433

Hermans F, Stuiver M, Beers PJ, Kok K (2013) The distribution of roles and functions for upscaling and outscaling innovations in agricultural innovation systems. Agricultural Systems 115:117–128. https://doi.org/10.1016/j.agsy.2012.09.006

Hill SB, MacRae RJ (1996) Conceptual Framework for the Transition from Conventional to Sustainable Agriculture. J Sustain Agric 7:81–87. https://doi.org/10.1300/J064v07n01_07

Horlings LG, Marsden TK (2011) Towards the real green revolution? Exploring the conceptual dimensions of a new ecological modernisation of agriculture that could 'feed the world.' Glob Environ Change 21:441–452. https://doi.org/10.1016/j.gloenvcha.2011.01.004

Hulst FJV (2016) Creating capabilities for sustainable smallholder agriculture. University of Greenwich

Klerkx L, Aarts N, Leeuwis C (2010) Adaptive management in agricultural innovation systems: The interactions between innovation networks and their environment. Agric Syst 103:390–400. https://doi.org/10.1016/j.agsy.2010.03.012

Klerkx L, Leeuwis C (2009) Establishment and embedding of innovation brokers at different innovation system levels: Insights from the Dutch agricultural sector. Technol Forecast Soc Change 76:849–860. https://doi.org/10.1016/j.techfore.2008.10.001

Klerkx L, van Mierlo B, Leeuwis C (2012) Evolution of systems approaches to agricultural innovation: concepts, analysis and interventions. In: Darnhofer I, Gibbon D, Dedieu B (eds) Farming Systems Research into the 21st Century: The New Dynamic. Springer Netherlands, Dordrecht, pp 457–483

Lamprinopoulou C, Renwick A, Klerkx L, et al (2014) Application of an integrated systemic framework for analysing agricultural innovation systems and informing innovation policies: Comparing the Dutch and Scottish agrifood sectors. Agric Syst 129:40–54. https://doi.org/10.1016/j.agsy.2014.05.001

Mekonnen DK, Yimam S, Arega T, et al (2022) Relatives, neighbors, or friends: Information exchanges among irrigators on new on-farm water management tools. Agr Syst 203:103492. https://doi.org/10.1016/j.agsy.2022.103492

Prell C, Hubacek K, Reed M (2009) Stakeholder Analysis and Social Network Analysis in Natural Resource Management. Society & Natural Resources 22:501–518. https://doi.org/10.1080/08941920802199202

QSR International Pty Ltd (2020) NVivo

Rajalahti R, Janssen W, Pehu E (2008) Agricultural Innovation Systems: From Diagnostics toward Operational Practices. The World Bank 105

Rip A, Kemp R (1998) Technological changes. In: S. Rayner, & E.L. Malone (Eds). Battelle Press, pp 327–399

Spielman DJ, Ekboir J, Davis K (2009) The art and science of innovation systems inquiry: Applications to Sub-Saharan African agriculture. Technol Soc 31:399–405. https://doi.org/10.1016/j.techsoc.2009.10.004

Sutherland L-A, Labarthe P (2022) Introducing 'microAKIS': a farmer-centric approach to understanding the contribution of advice to agricultural innovation. J Agric Educ Ext 28:525–547. https://doi.org/10.1080/1389224X.2022.2121903

Touzard J-M, Temple L, Faure G, Triomphe B (2015) Innovation systems and knowledge communities in the agriculture and agrifood sector: a literature review: IJIMES n°17:117–142. https://doi.org/10.3917/jie.017.0117

Agroecological transitions and farmers microAKIS: Case studies from the Global North compared to Global South

Ana Fonseca[1], José Rosário[1,2], Carlos P. Marques[1], Carlos Marques[2], Lívia Madureira[1]

1 Centre for Transdisciplinary Development Studies (CETRAD), University of Trás-os-Montes e Alto Douro (UTAD), Quinta de Prados, Vila Real, Portugal. Email: anaftfonseca@hotmail.com; 2 josevictorino1@gmail.com; 3 lmadurei@utad.pt;
2 Mediterranean Institute for Agriculture, Environment and Development (MED), Universidade de Évora, Apartado 94, 7006-554 Évora, Portugal. Email: cmarques@uevora.pt

Short Abstract:
Sustainable agricultural practices are part of the solution if we want to achieve agriculture capable of feeding the world's growing population, without putting pressure on resources such as water, soil and biodiversity. However, the level of adoption of such practices is low. Comparative research was carried out to understand the role of socio-psychological factors in the intention to adopt sustainable agricultural practices in regions of the Global North compared to the Global South, analyzing empirical evidence from the case of the practice of Cover crop in Portugal and the adoption of biopesticides in Huambo province of Angola. Two theoretical models were used, selected according to the context of each region: Model of Goal Direct and the extended TAM for Portugal and Angola respectively. The results show that positive emotions related to the practice of grassing have an important role in the intention of adopting that practice in the Northeast of Portugal. For both contexts the perception of available resources contributes to higher levels of intention, but for Huambo province the main antecedents of the intention to adopt were the level of satisfaction of the farmer's basic needs, as an extra construct inserted in the model, as well as the perceived compatibility of practices as a TAM construct. These results highlight farmers' perception that they need additional knowledge resources and difficulties in accessing it. These results evidence limitations in farm level microAKIS that results from the weaknesses of local and regional AKIS in supplying knowledge and innovation services needed by small-scale farmers.

Key words: agroecological transition, AKIS, Farmer microAKIS, sustainable agriculture, adoption modelling, farm advice.

Extended Abstract

Purpose

Despite the recognized benefits of adopting sustainable agricultural practices such as biopesticides for annual crops in tropical regions of Angola and cover cropping for perennial crops in Mediterranean regions in Portugal, the adoption rate of these practices remains low in both countries, despite the availability of financial incentive programs to incentivize adoption of agroecological practices in Europe, including Portugal. Small farmers in African countries find chemical pesticides and fungicides to be prohibitively expensive and environmentally harmful (Mutyasira et al., 2018). Indeed, crop losses due to insect pests in African countries are estimated at a staggering 49% of the total expected crop yield each year (FAO, 2021). The low adoption rates of sustainable agricultural practices in both the Global North and the Global South suggest that access to knowledge and advisory services may be a critical factor in promoting the successful implementation of such practices. Thus, the present paper aims to examine the role of socio-psychological factors in the intention to adopt sustainable agricultural practices, using empirical evidence from the adoption of biopesticides in Huambo province in Angola, and the practice of cover cropping in the region of Trás-os-Montes e Alto Douro (TMAD) in the North of Portugal. Build on empirical data collection, using the microAKIS framework (Madureira et al. 2022) we aim to demonstrate the importance of knowledge access in promoting ecological transition (Polita & Madureira, 2022), with implications for policymakers, farmers, and ther stakeholders in both the Global North and the Global South.

2. Design/Methodology/Approach

In the first case study the Goal-directed behavioural model (Perugini & Bagozzi, 2001) was selected and to evaluate this model, a quantitative approach was adopted, with a correlational and crosssectional study with structural equation models. Farmers from representative crops for the Mediterranean upland dry region of Trás-os-Montes e Alto Douro (TMAD), which encompass vineyards, olive yards, almond and chestnut orchards (perennial non-irrigated crops), were interviewed in person between in 2019. A total sample of 253 valid interviews were collected. The questionnaire was structured into three sections, with the first section focusing on the characterization of the agricultural exploitation, the second section composed of measures of latent variables, and the third section containing characteristics of the respondents. The data were analysed using IBM SPSS version 25 for descriptive statistics and SmartPLS version 3.2.8 for scale validation, convergent and discriminant validity, and estimating the relationships between constructs.

The second case, in the Global South, is case-study conducted in the province of Huambo, situated in the central plateau of Angola. In these region with 2 million of inhabitants, 52.3% dwell in rural territories. This region serves as a prominent agricultural hub of Angola and aptly represents the Global South, despite its characteristic low soil fertility and unfavorable ecological conditions that impede the successful cultivation of typical crops such as corn, beans, sweet potatoes, and cassava, which sustain its populace. Notably, the agricultural practices of rainfed and irrigated cultivation can be observed throughout sub-Saharan Africa (Katyavala, 2020). In case of Huambo the Technology Acceptance Model (TAM) is a theoretical framework used to explain the adoption of new technology (Davis & Venkatesh, 1996). It includes the concepts of perceived usefulness and perceived ease of use, which influence intention to use a technology and ultimately usage behaviour. A structured questionnaire was developed to measure these constructs, as well as sociodemographic characteristics of small-scale farmers in Huambo province. Several hypotheses were proposed, including the effects of attitude, perceived usefulness, and perceived ease of use on intention to adopt biopesticides, as well as the positive effects of need satisfaction on attitude and intention. The questionnaires were elaborated according to the underlying theoretical models and the specificities of the case studies, with the variable selected based on a thorough consideration of several factors, such as the context and literature review. Further details on variables and scale source employed are available in table 1, indicating that the common variables for both cases include Attitude, Perceived Resources, and Intention. Anticipatory Negative Emotions, Perceived Control, and Anticipatory Positive Emotions are different variables for each case Perceived Benefits/usefulness is validated by Perceived Ease of Use (PE). Climate Change and Networks are validated variables for the two cases. Perceived Costs and Self-Resources are validated variables for one case, while Basic Needs Satisfaction is only validated for the other.

Table 1. Summary of similar and dissimilar variables used in the questionnaires

Similar variables	Source of Scale validation	Distinct variables	Source of scale validation
Attitude	Adapted from (Ajzen, 1991)	Anticipatory Negative Emotions	Baumgartner et al., 2008
Perceived Resources	(Zeweld et al., 2017)	Anticipatory Positive Emotions	
Perceived Benefits/usefulness	(Davis & Venkatesh, 1996)	Perceived Control	(Ajzen, 1991)
Climate change	(Nyantakyi-Frimpong, 2020)	Perceived Ease of Use (PE)	(Davis & Venkatesh, 1996)
Perceived Costs	(Tama et al., 2021)	(Social) Networks	(Zeweld et al., 2017)
Intention	(Perugini & Bagozzi, 2001)	Self-Resources	(Zeweld et al., 2017)
		Basic Needs Satisfaction	-

Main findings

The findings of the comparative research are valuable as they provide insight into the role of sociopsychological factors in the adoption of sustainable agricultural practices in different regions. By using different theoretical models in each context, the study was able to take into account the unique cultural, social and economic conditions that exist in both regions.

In the Study 1 (TMAD, Portugal, Global North):
Farmers consider that the resources they have are insufficient for changing their practices. They assign a high value to the access to proximity extension services. Positive emotions related to the practice of cover cropping play an important role in the intention to adopt the practice. Perceived costs do not influence the intention to adopt the practice. Hence, the data suggest that incentives to the adoption of sustainable agricultural practices must be encompass the access to knowledge services, advisory or extension services, and to be contextualised according to the socio-cultural and agroecological regional contexts.

Table 2. Total effects on Intention

Variable	Estimate	t	P
Overall attitude	0.294	3.789	<0.001
Personal efficacy	0.272	3.820	<0.001
Positive anticipated emotions	0.210	3.217	0.001
Benefits	0.201	3.638	<0.001
Positive anticipatory emotions	0.181	3.578	<0.001
Networks	0.169	3.178	0.001
Personal resources	0.154	2.890	0.004
Negative anticipatory emotions	-0.059	2.664	0.008
Climate change	-0.052	2.642	0.008
Negative anticipated emotions	0.067	1.140	0.254

In the study 2 (Huambo, Angola, Global South):
The extended TAM model was validated, and the variables that most influence the intention of small farmers in Huambo to adopt biopesticides are Attitude, Perceived Resources, and Perceived Usefulness. Farmers consider that they have insufficient resources: labour and knowledge to apply the sustainable practices.

Both studies highlight the importance of taking into account the specific context of small farmers and the need for measures that go beyond just financial incentives to promote sustainable agricultural practices. Additionally, study 1 shows that emotional and psychological factors, such as positive emotions towards a particular practice, can play an important role in the adoption of sustainable agricultural practices. This suggests that the way in which farmers perceive the benefits of these practices, and the perceived ease with which they can be integrated into their existing farming systems, play a critical role in their decision to adopt.

Practical Implications

The practical implications of the Global North suggest that efforts to promote sustainable agricultural practices among small farmers should consider the availability of advisory services that are accessible and convenient for farmers. Financial incentives alone may not be sufficient to promote the adoption of sustainable practices, and other measures that consider socio-cultural and agro-ecological contexts may be necessary.

In terms of the Global South, the practical implications suggest that interventions to promote the adoption of biopesticides among small farmers in Huambo should focus on improving their attitude towards the technology, their perceived resources, and their perceived usefulness of the technology. Extension services and training programs could be developed to provide farmers with information and support for the use of biopesticides. In addition, efforts to address the basic needs of small farmers, such as access to resources and services, may also be necessary to facilitate the adoption of sustainable agricultural practices.

Overall, both studies highlight the importance of understanding the socio-cultural and contextual factors that influence the adoption of sustainable agricultural practices. Interventions and policies should consider these factors and address the barriers and challenges that small farmer face in adopting sustainable practices.

Theoretical Implications

The theoretical implications of the North Global case study suggest that emotions play a significant role in farmers' intention to adopt sustainable practices. This finding can contribute to the development of theoretical models that consider the emotional aspects of decision-making in the context of sustainable agriculture. Additionally, the lack of perceived resources among farmers highlights the need for a more comprehensive understanding of the socio-economic factors that affect farmers' decision-making regarding sustainable practices.

The theoretical implications of the Global South case study confirm the validity of the TAM model in predicting farmers' intention to adopt biopesticides. The study also identifies the key factors that influence farmers' intention to adopt, which can contribute to the development of effective interventions and policies to promote the adoption of sustainable agricultural practices. Furthermore, the study highlights the need to consider contextual factors, such as socio-cultural and agro-ecological contexts, in designing effective policies and interventions to promote sustainable agriculture.

Concluding remarks

Our findings have important implications for agroecological transitions. The North Global for Mediterranean regions highlights the importance of proximity advisory services and the insufficiency of resources for the average farmer to change their practices. This suggests that there is a need for support systems and resources, “agroecological transition AKIS” that can enable farmers to transition to agroecological practices. Additionally, the study underscores the significance of considering ociocultural and agroecological contexts when designing support programs for agroecological transitions.

The study from the Global South, where food security is critical for farmers and rural population survival, identifies the key factors that influence farmers' intention to adopt biopesticides, which can be a crucial component of agroecological practices. The study highlights the importance of attitudes, perceived resources, and perceived usefulness in shaping farmers' intentions to adopt biopesticides. This suggests that efforts to promote agroecological practices need to focus on addressing farmers' attitudes and perceptions of resources and usefulness to encourage adoption of sustainable practices. Overall, both studies point to the need for a holistic approach to agroecological transitions that takes into account the social, cultural, and ecological context of farming communities, while providing resources, advisory services, and incentives that can facilitate the transition to sustainable practices. verall, the studies provides important lessons for policymakers and practitioners working to promote the adoption of sustainable agricultural practices. By understanding the socio-psychological factors that influence the intention to adopt, it is possible to design policies and programs that are more effective in encouraging widespread adoption of these practices, thereby contributing to the creation of more sustainable and equitable food systems and a sustainable transition.

References

Ajzen, I. (1991). The Theory of Planned Behavior.
Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191
Chin, H.-C., Choong, W.-W., Wan Alwi, S. R., & Mohammed, A. H. (2019). A PLS-MGA analysis of farming characteristics on the intentions of smallholder oil palm planters to collect palm residues for biofuel production. Biomass and Bioenergy, 120, 404–416. https://doi.org/10.1016/j.biombioe.2018.11.012
Davis, F., & Venkatesh, V. (1996). A critical assessment of potential measurement biases in the technology acceptance model : three experiments. International Journal of Human-Computer Studies, 45, 19–45.
Extended Abstract for the 26th ESEE conference
Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. In European Business Review (Vol. 31, Issue 1, pp. 2–24). Emerald Group Publishing Ltd. https://doi.org/10.1108/EBR-11-2018-0203

Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: Updated guidelines. Industrial Management and Data Systems, 116(1), 2–20. https://doi.org/10.1108/IMDS-09-2015-0382
Jimenez, I. A. C., García, L. C. C., Marcolin, F., Violante, M. G., & Vezzetti, E. (2021). Validation of a tam extension in agriculture: Exploring the determinants of acceptance of an e-learning platform. Applied Sciences (Switzerland), 11(10). https://doi.org/10.3390/app11104672
Madureira, L., Labarthe, P., Marques, C. S., & Santos, G. (2022). Exploring microAKIS: farmer-centric evidence on the role of advice in agricultural innovation in Europe. The Journal of Agricultural Education and Extension, 28(5), 549-575. https://doi.org/10.1080/1389224X.2022.2123838
Mutyasira, V., Hoag, D., & Pendell, D. (2018). The adoption of sustainable agricultural practices by smallholder farmers in Ethiopian highlands: An integrative approach. Cogent Food and Agriculture, 4(1). https://doi.org/10.1080/23311932.2018.1552439
Nyantakyi-Frimpong, H. (2020). What lies beneath: Climate change, land expropriation, and zaï agroecological innovations by smallholder farmers in Northern Ghana. Land Use Policy, 92. https://doi.org/10.1016/j.landusepol.2020.104469
Perugini, M., & Bagozzi, R. P. (2001). The role of desires and anticipated emotions in goal-directed behaviours: Broadening and deepening the theory of planned behaviour. British Journal of Social Psychology, 40(1), 79–98. https://doi.org/10.1348/014466601164704
Polita, F., & Madureira, L. (2022). Transitions Towards Sustainability in Corporate Agriculture: agroecological innovation in Douro viticulture, Portugal. Revista de Economia e Sociologia Rural, 60(2), 1–21. https://doi.org/10.1590/1806-9479.2021.236238
Sarkar, A., Azim, J. A., Asif, A. al, Qian, L., & Peau, A. K. (2021). Structural equation modeling for indicators of sustainable agriculture: Prospective of a developing country's agriculture. Land Use Policy, 109, 105638. https://doi.org/10.1016/j.landusepol.2021.105638
Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Partial Least Squares Structural Equation Modeling. In Handbook of Market Research (pp. 1–40). Springer International Publishing. https://doi.org/10.1007/978-3-319-05542-8_15-1
Tama, R. A. Z., Ying, L., Yu, M., Hoque, M. M., Adnan, K. M., & Sarker, S. A. (2021). Assessing farmers' intention towards conservation agriculture by using the Extended Theory of Planned Behavior. Journal of Environmental Management, 280. https://doi.org/10.1016/j.jenvman.2020.111654
Zeweld, W., van Huylenbroeck, G., Tesfay, G., & Speelman, S. (2017). Smallholder farmers' behavioural intentions towards sustainable agricultural practices. Journal of Environmental Management, 187, 71–81. https://doi.org/10.1016/j.jenvman.2016.11.014

Customising advice: an attempt to evaluate customer satisfaction of Farm Advisory Services and improve agroecological transition

Giuseppina Olivieri[a], Marcello De Rosa[b], Concetta Menna[c], Imma Cigliano[d], Ferdinando Gandolfi[d], Maria Passari[d], Teresa Del Giudice[a]

[a] *University of Naples - Federico II (IT), giuseppina.olivieri@unina.it*
[b] *University of Cassino and Southern Lazio (IT), mderosa@unicas.it*
[c] *CREA – Center of Political and Bioeconomy, Naples (IT), concetta.menna@crea.gov.it*
[d] *Upfront Advisory S.r.l. - Naples, Italy,, i.cigliano@upfrontadvisory.com*
[d] *Campania Region – Department of Agriculture, Naples (IT), ferdinando.gandolfi@regione.campania.it*
[d] *Campania Region – Department of Agriculture, Naples (IT), maria.passari@regione.campania.it*
[a] *University of Naples - Federico II, (IT), teresa.delgiudice@unina.it*

Short Abstract:
Among the challenges faces by European Union for the achievement of medium-long term rural development strategy, the Agricultural and Knowledge Innovation System (AKIS) plays a central role in the recovery of economic growth after the severe global crisis. The role of the agricultural advisory services in detecting farm needs and creating link among production, research, consumption, and public institutions is important to achieve these objectives. The study focuses on an innovative approach to evaluate advisory services through customer satisfaction analysis. The research area is Campania Region. The results show that advisory services are able to support farmers to solve complex problems, to facilitate the adoption of innovations and digitization of farms and to support the agricultural system in the transition to sustainable production models. To provide different advices and suggestions and the expertise and quality of advisors involved are strategic dimensions.

Extended Abstract

Purpose

The role of research in terms of innovation development and diffusion has been underestimated over the years. Nowadays, established thinking holds that research actors should elicit the needs of the economic and social systems by carrying out coherent study activities. Among the European Union challenges, the Agricultural and Knowledge Innovation System (AKIS) plays a central role in the future economic development after the severe global crisis. Farm advisory services are only one component within the larger Agricultural Knowledge and Innovation System (AKIS). In the 2014-2022 programming period, considerable effort has been made to raise awareness of the importance of AKIS and to emphasize the need for greater dissemination of innovative solutions among farms. In addition, efforts had been made to strengthen the links between research and agricultural system by enhancing advisory services.

The support to the adoption of innovations through AKIS has been one of the main issues addressed by the European Union's structural policies for the development of farms and rural areas in terms of competitiveness and sustainability.

In this context, the concept of innovation linked to that of Agricultural Development Services has evolved and continues to be one of the primary objectives of the European Union, which entrusts it with the task of enabling the coexistence of production and sustainability, use of environmental resources and resilience, improvement of quality of life and reduction energy use.

One of the issues that always goes with innovation concerns the methods of diffusion, which must necessarily involve multiple actors (researchers, trainers, trade bodies, commercial workers, technicians) that reinforce from various points of view the activity of adopting innovations. This means that for there to be innovation, therefore, research alone is not enough: it is the set of interactions that make it become the result of networks of collaborations in which information is exchanged and a learning process takes place.

In the 2014-22 Campania Rural Development Plan (RDP), the knowledge system measures (Measures 1 "Knowledge transfer and information actions," 2 "Advisory, replacement and management assistance services to farms," and 16.1.1 " Support for establishment and operation of EIP GOs on agricultural productivity and sustainability," and, 16.1.2 "Support for EIP GOs to implement projects to disseminate innovations in the context of strengthening the Campania AKIS") were designed and implemented considering the relational value they all in various ways express. Measures 1 and 2 through training and advisory proposals that are characterized by having been shared with stakeholders and by being characterized by a great richness of content; measure 16 through the interaction of operational groups members with each other, facilitates the achievement of the common goal related to the dissemination of innovations.

The study focuses on an innovative approach to evaluate farm advisory services (FAS) through customer satisfaction analysis in Campania region. The survey focused on farmers who benefit from FAS financed by Measure 2 of RDP 2014-2020[2]. The aim is to improve the quality of services offered by Campania Region and to evaluate farmers satisfaction for Measure 2 RDP 2014-2022. Different dimensions of farmers satisfaction were investigated. Advisory activities were organized, by Campania Region, into 83 macro-modules covering: eco-friendly agriculture, environment and energy, livestock activities, forestry activities, management control and farm enterprise development, diversification and multifunctionality, agricultural production and quality systems. Farmers could choose FAS typology that best fit their advice needs.

Design/Methodology/Approach

The attribute based customer satisfaction measurement technique used in this study is based on a questionnaire to gather data on farmers satisfaction with the service supplied and was first suggested by Cicia et al. (2010). This method identifies several dimensions that the farmers perceive and look for in order to obtain satisfaction. It is a development of the Multicriteria Satisfaction Analysis (MUSA) proposed by Siskos and Grigoroudis (2002), which was focused on the assessment of the critical satisfaction dimensions and has been the object of different versions during the years. In detail, "the evaluation of customers' satisfaction level, both globally and partially for each of the characteristics of the provided service; the supply of a complete set of results that analyze in depth customers' preferences and expectations, and explain their satisfaction level and the development of a decision tool with emphasis on the understanding and the applicability of the provided results" are the main objectives of the MUSA method (Grigoroudis and Siskos, 2002; p. 149).

[2] Measure 2 in RDP 2014-2020 is made up of 3 sub-measures that support a wide range of operations for advisory services well connected to different European priorities for rural development. This Measure also promotes the training of advisors in order to improve the quality and effectiveness of the advice offered and to better meet farmers' needs.

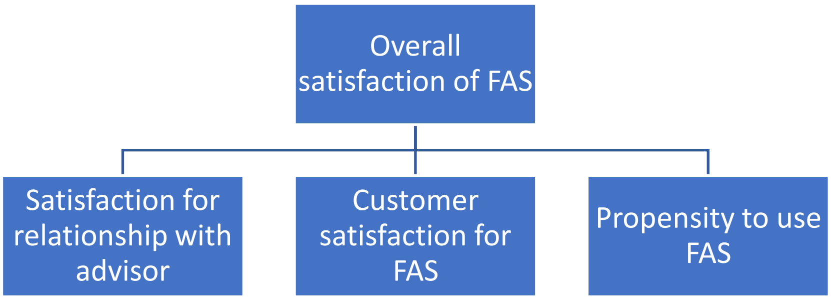
In order to analyse the main aspects of FAS in Campania region the survey questionnaire was made mandatory by the administrative procedures relating to Measure 2. Data were collected through face-to-face interviews with 149 farmers between June 2019 and September 2022.

The sample is composed by farmers that received at least one advice chosen among the 83 consulting activities offered. For each service, there were at least 3 farm visits, a final advice report and the satisfaction survey to know the opinions, needs, requirements and expectations of the farmers for future public interventions.

The interview was structured to detect: farm characteristics, advisory company, farmers satisfaction regarding the service provided, outcome of advisory services, use of other public-private advisory, satisfaction regarding the relationship with the advisor, satisfaction and general perception of the advisory service and propensity for advisory services (figure 1).

In the first stage of the analysis, the interviews were read to get an overview and a general understanding of the themes. In the second stage, the text was divided into smaller parts that retained their original meaning (Elo & Kyngäs, 2008; Graneheim & Lundman, 2004). Data have been analysed using Wordstat text analysis software, that helps to analyse many document types eg.customer surveys, political speeches, academic papers and find common topics, themes and hidden meanings in unstructured text data.

Figure 1: Customer satisfaction dimensions.



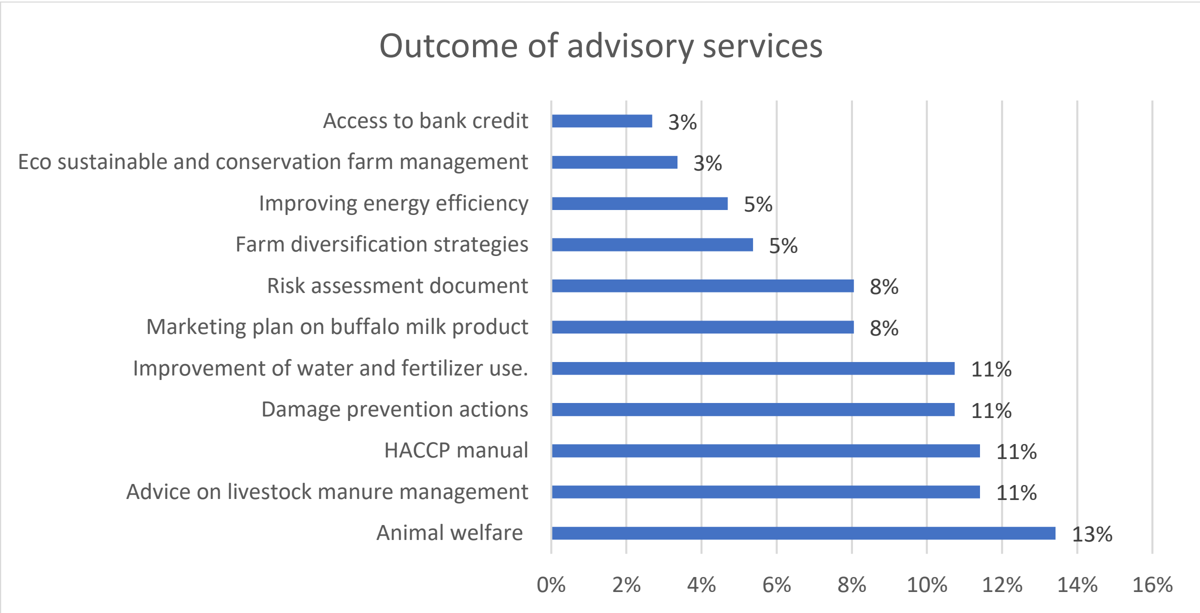
Findings
To facilitate Measure 2 utilization and knowledge flow a repertoire of advisory activities has been structured by Campania Region. It was organized into 83 macro-modules covering: eco-friendly agriculture, environment and energy, livestock activities, forestry activities, management control and farm enterprise development, diversification and multifunctionality, agricultural production and quality systems. Each user had to choose the module that best fit their advice needs. The farmer was asked to assign a score, on a Likert scale ranged from 1 to 5, where 1 corresponded to "not at all satisfied" and 5 to "completely satisfied".

This analysis looked at the: a) modules requested by farms; b) results obtained from using the farm advisory service; c) additional public or private advisory services; d) level of customer satisfaction.

From the analysis, the most frequently requested modules were those related to animal welfare (15%), those for farm diversification strategies (13%) and those for agricultural production (11%). A group of modules requested with the same frequency were for environmental protection and agricultural production safety.

The main results obtained by FAS adoption (figure 2) concern health status of the animals and livestock manure management. Specifically, farmers obtained reports on health status of the animals with solution to improv it. Advice for actions to prevent sudden and adverse weather events along with advice for HACCP manuals and better management of water resources and chemical fertilizers were results obtained with equal intensity by respondents. Marketing plan on buffalo milk product, risk assessment document, farm diversification strategies were reported as less important advice outcomes.

Figure 2: Outcomes of advisory services



Almost all respondents (99%) didn't use other public advisory services, while 47% had used other private advice. Private advice was predominantly in the veterinary and fiscal fields. The overall satisfaction degree (figure 3) and perceptions of the service was evaluated thanks to 20 questions that covered the service characteristics, motivation and involvement of the advisor, modernity of service, adequacy of solutions to business problems. All respondents provided high service satisfaction ratings and agreed that FAS was not limited to providing information for problem solving but was structured to provide an effective response with an overview of farm management and considering the real needs of the farm. Another important aspect is the propensity toward farm advisory services, assessed on the basis of questions that investigated the general perception of farm advisory services and the willingness to participate in future programs involving farm advisory services. Again, all respondents provided values between three and five, indicating a high level of propensity to use agricultural advisory services (figure 4).

Figure 3: Degree of overall satisfaction

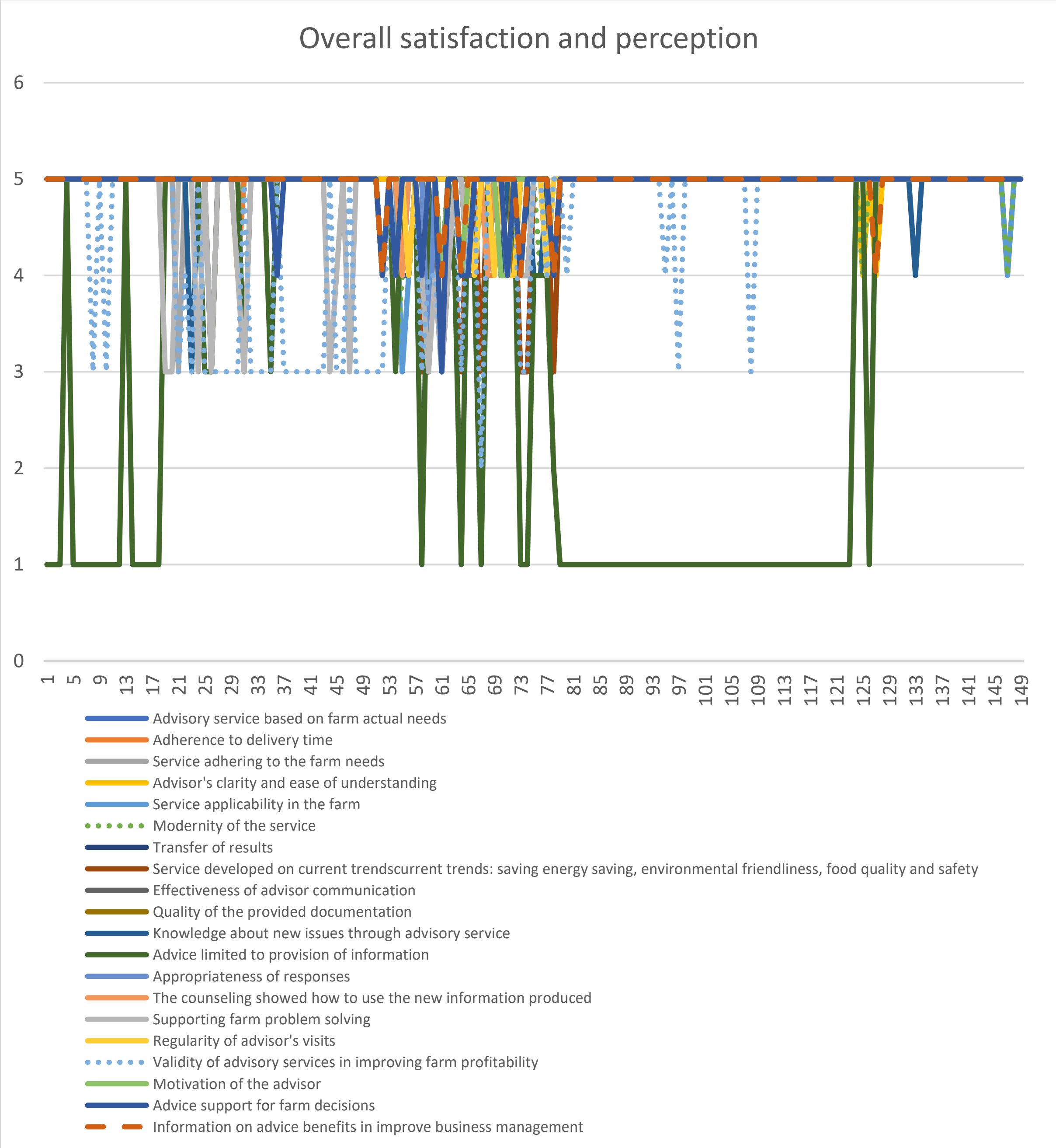
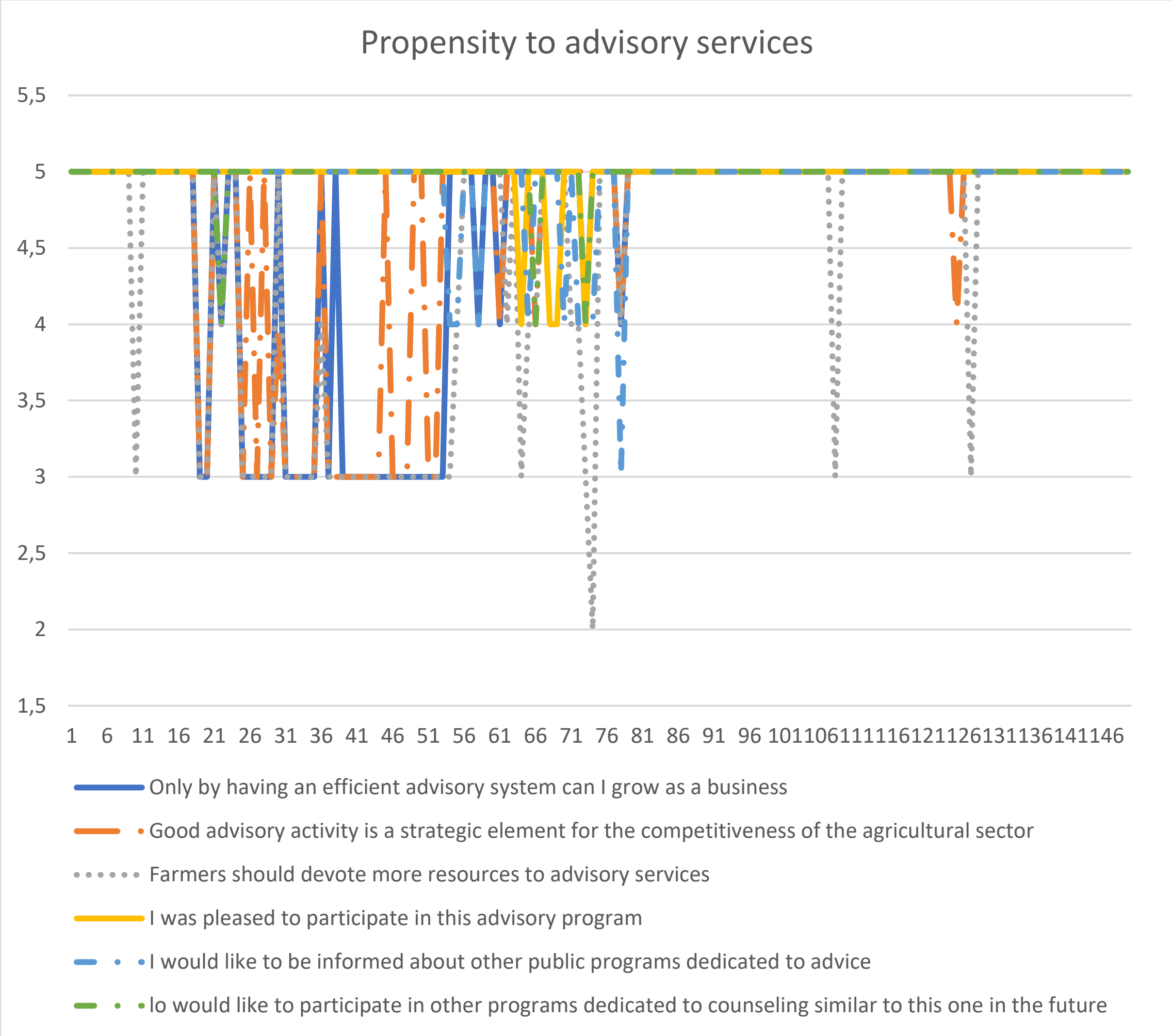


Figure 4: Propensity toward farm advisory services



Practical Implications

The results show that advisory services in terms of both the number of types of consulting offered (83) and the variety and expertise of professional figures involved are able to interact with farmers to solve complex problems. This aspect is becoming more important due to the pandemic and war impacts.

The level of satisfaction was high for all aspects of the advisory service analysed: overall satisfaction is connected with the aspect related to the provision of an accurate service tailored to farms needs and related to suitable information transfer into farms management.

The results obtained from the use of the advisory service demonstrate that it is effective in bringing about change on the farm. Most of the participants requested modules concerning management of livestock manure, fight against climate change, management of natural resources, obtaining information on the actions to be taken for the prevention and protection against adverse climatic events, implementation of HACCP manuals that guarantee food safety and livestock manure management actions.

The ability of the agricultural advisors to provide appropriate advisory services, be available and use modern means in providing the service is demonstrated by the high score obtained by the aspects that evaluated the relationship with the agricultural advisors.

The propensity to use agricultural advisory services was high for all respondents. Advisory service as a strategic element to increase the farms competitiveness and the resilience is recognized by all the interviewees, who however believe they need more resources and opportunities, just as the willingness to participate in future initiatives was given by all the interviewees.

Farm advisory system to help farmers and to reach EU standards for the environment, public and animal health, animal welfare, and good agronomic and environmental conditions is well designed by Campania region. The structure of interventions in this programming period (2023-2027) includes how the continuity in the provision of services, through the implementation of multi-year advisory programs.

Theoretical Implication

Connection between agricultural sector and EU's rural areas with the development of human capital and research, along with strengthening support for innovation, are identified by the European Commission as central aspects of the strategy to achieve the goals of sustainability and social welfare. The new CAP 2023-2027 has further enhanced synergies with research and innovation policy. Therefore, it is clear that an efficient and structured farm advisory service is a priority and an essential component within strategies to increase the effectiveness of the CAP. Providing an evaluation methodology for agricultural advisory services that are multifaceted and complex is not easy. These are characterized by the provision of intangible assets such as knowledge capital, human resources and innovative skills (Gadrey, 2000). For this reason, it is not easy to valuate service outcomes and provide an assessment of impacts. This study represents a first attempt to evaluate the advisory service by considering the farmer's perception and satisfaction of the advisory services and provide a contribution in scientific literature. Farmers are increasingly interested in issues concerning environmental protection and natural resource protection, and the advisory service has proven effective to inform farmers about innovations and provide effective responses to accompany rural and agricultural transition. In the future, the service satisfaction assessment procedure could be improved by implementing a digitized procedure to eliminate the bias because the advisor could see the result of the interview.

References

Cicia, G., Cembalo, L., Giudice, T.D., 2010. Consumer preferences and customer satisfaction analysis: a new method proposal. J. Food Prod. Mark. 17, 79-90.

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. Journal of advanced nursing, 62(1), 107-115.

Gadrey, J. (2000). The characterization of goods and services: an alternative approach. *Review of income and wealth*, *46*(3), 369-387.

Graneheim, U. H., & Lundman, B. (2004). Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. Nurse education today, 24(2), 105-112.

Grigoroudis, E., Siskos, Y., 2002. Preference disaggregation for measuring and analysing customer satisfaction: the MUSA method. Eur. J. Operational Res. 143 (1), 148-170.

Prager, K., Labarthe, P., Caggiano, M., & Lorenzo-Arribas, A. (2016). How does commercialisation impact on the provision of farm advisory services? Evidence from Belgium, Italy, Ireland and the UK. *Land Use Policy*, *52*, 329-344.

Siskos, Y., Grigoroudis, E., 2002. Measuring customer satisfaction for various services using multicriteria analysis. In: Aiding Decisions with Multiple Criteria. Springer, US, pp. 457-482.

Mapping knowledge circulation in the olive and viticulture sectors in Central Spain: a comparative study

Jose-Luis Cruz, A. Barrutieta, A. García, B. Sastre, O. Antón, JP Zamorano

Short abstract (200 words):

The transition towards agroecology and circular economy entails innovation. The European Commission promotes the Agricultural Knowledge and Innovation Systems (AKIS) approach to support agricultural innovation. The AKIS approach stablishes a useful framework but it is necessary to specify the main AKIS actors and their relationships in each region and for each crop. The present communication compares these elements in Central Spain (region of Madrid, RM) and for two of its main crops: grapevines and olives. Two woody crops that occupy a large area in the RM, and with associated recognized or under development quality schemes, but with a very different linked socioeconomic reality.

We have performed 48 interviews to farmers in order to identify the main stakeholders in knowledge circulation associated to both crops. We have also asked about their relationships and sources of knowledge. Finally, we have translated this information into maps of knowledge. The comparison of these maps shows the knowledge nodes, as well as the weaknesses and strengths of the knowledge circuit in the wine and olive sector in the RM. From a practical point of view, strategies for knowledge generation and circulation are only one part of the innovation process - supporting policies aimed at changing practices, and providing financial support and accompaniment are key complementary elements.

Extended abstract

Purpose:
The aim of this paper is to compare the knowledge nodes and structure of knowledge circulation associated to two of the main crops in Central Spain (region of Madrid, RM): grapevines and olives. These two woody crops occupy a large area, and have recognized or under development quality figures, but with a very different linked socioeconomic reality.

Design/Methodology/Approach:
The study has focused on the RM, which is a territory that is consolidateing its wine and olive sectors.

A methodology that combines qualitative and quantitative methods was used to achieve the results. The central axis has been semi-structured interviews. These interviews combine open questions with closed questions aimed at quantifying and systematizing very specific aspects of the topic addressed. The winegrowers' perceptions were gathered from semi-structured interviews (n= 27) conducted by telephone with winegrowers with (n=11) and without wineries (n=16). Fieldwork was conducted between April and May 2022. We assumed that there are differences between winegrowers with and without a wineryand that the type of activity, knowledge required, innovation orientation and stakeholders are different and therefore that the knowledge map would reflect these differences. In the case of olive growers, none of which transform their olives into oil, 21 semi-structured interviews were conducted during October of 2021.

Based on the semi-structured interviews, knowledge maps were drawn up to analyse the AKIS in the RM. These maps are a type of analysis focused on identifying the relationships established between subjects and between networks of subjects (Francés et al., 2015). This analysis was performed with two software programmes: UCINET and NetDraw.

Research funded by IMIDRA (Project FP21-CONAGRO). A.B. received a fellowhisp funded by IMIDRA.

Findings

The following maps show the relationships between the different stakeholders in the RM vinegrape and olive sectors. The main stakeholders are placed in the centre of these maps. These stakeholders represent the most important knowledge nodes. The comparison shows some common stakeholders in both sectors: farmers, research centres, farmer organizations, universities and public advisors. However, the relationship and the position in the maps change according to the sector. Some stakeholders have many relationships and are central in one sector, but the number of their relationships and their position in the map are different in the other. Additionally, in the grapevine sector relevant differences between winegrowers with and without wineries were found.In the case of the olive groves, the map is highly centralized (Figure 1). The number of stakeholders involved in knowledge circulation is relatively low, considering that olives require significant processing for oil production. Peer learning, contact with other farmers, tradition and experience are the main source of knowledge. A key element in the knowledge map is the Association for Integrated Treatments in Agriculture (ATRIA). It is a central node to which the different stakeholders turn to solve doubts, obtain information or request support related to olive groves in the RM. ATRIA is therefore a key partner to bring new knowledge into the sector, as well as to gather traditional knowledge and the needs of olive growers. On the other hand, the research centre IMIDRA is another key player on the map. This institution, besides the Escuela de la Vid (a public centre providing academic technical specialisation on vine, olive and other food crops), are the two main non-university centers that provide training in olive growing. The importance of public advisory services is limited.

The olive sector in the RM includes some big farms, but the mayority of olive gowers farms are small inherited plots with only a small production for self-comsuption. For this majority, tradition is more important than profitability, Iinnovation is not a priority and they just demand solving specific doubts. This context can explain the relatively simple map of knowledge. Additionally, there is currently a voluntary product quality scheme applicable to oil manufactured from olives cultivated in the RM. A PDO scheme is in proccess and, probably, it will entail important changes in this map of knowledge.

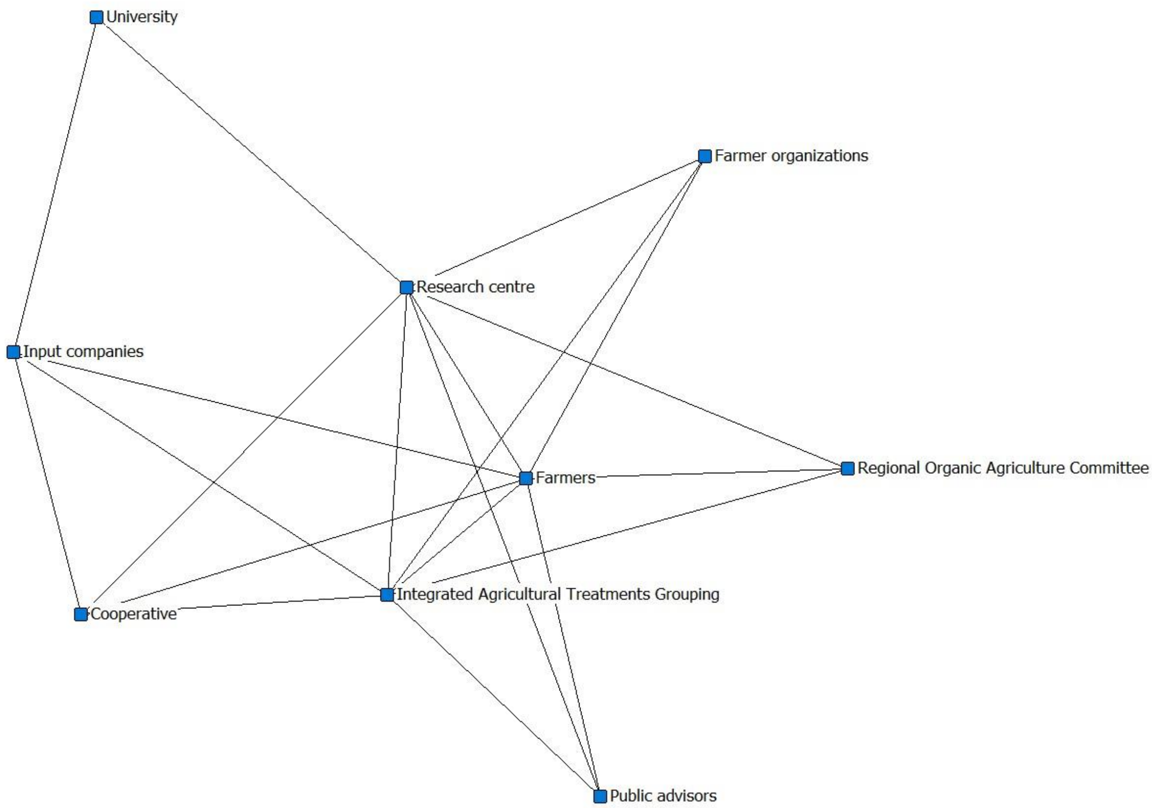


Figure 4. Knowledge map of the olive sector in the region of Madrid.

In the case of the wine sector, the knowledge map shows the importance of three central actors: the PDO Vinos de Madrid control body, IMIDRA and winegrowers. The PDO Vinos de Madrid control body supports farmers when they have doubts. Their technicians visit the plots to answer the farmers' questions on the ground. IMIDRA offers training to farmers and has experts and researchers to support them. Finally, per to per learning is the traditional source of knowledge.

It is possible to point out some differences between the maps for winegrowers with and without their own winery. On the one hand, for winegrowers without winery (Figure 5), the connections with cooperatives and farmers' associations are very important. In fact, many of the winegrowers are part of cooperatives, to which they sell their production. On the other hand, for winegrowers with wineries (Figure 6), their relationships with food distribution companies are important, as they need them to sell their wines. It is also interesting to note that these winegrowers are no longer linked to farmers' associations or cooperatives. Finally, in both maps we can see that other actors such as private consultants or financial institutions do not have very intense relationships with the other actors, so they do not appear on the map. Public advisors, despite the indications of the AKIS model promoted by the European Union and the CAP, are of limited importance.

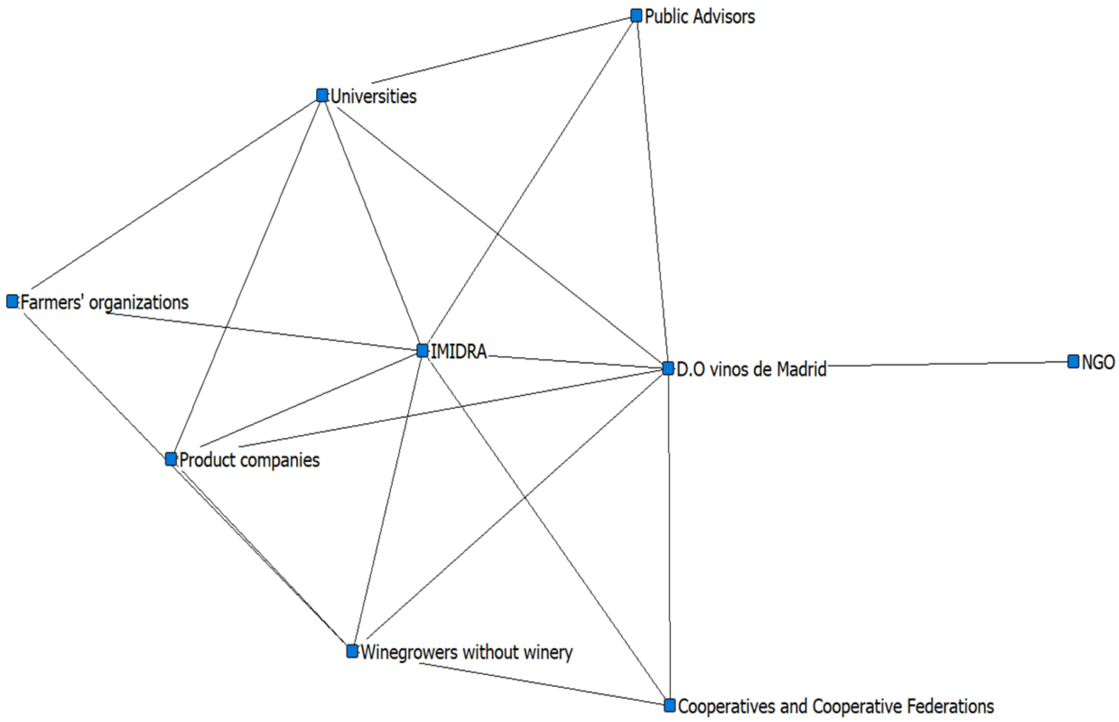


Figure 5. Knowledge map of the vineyard sector in the Madrid Region (winegrowers without winery).
IMIDRA= regional agricultural research centre
NGO= non-governmental organizations

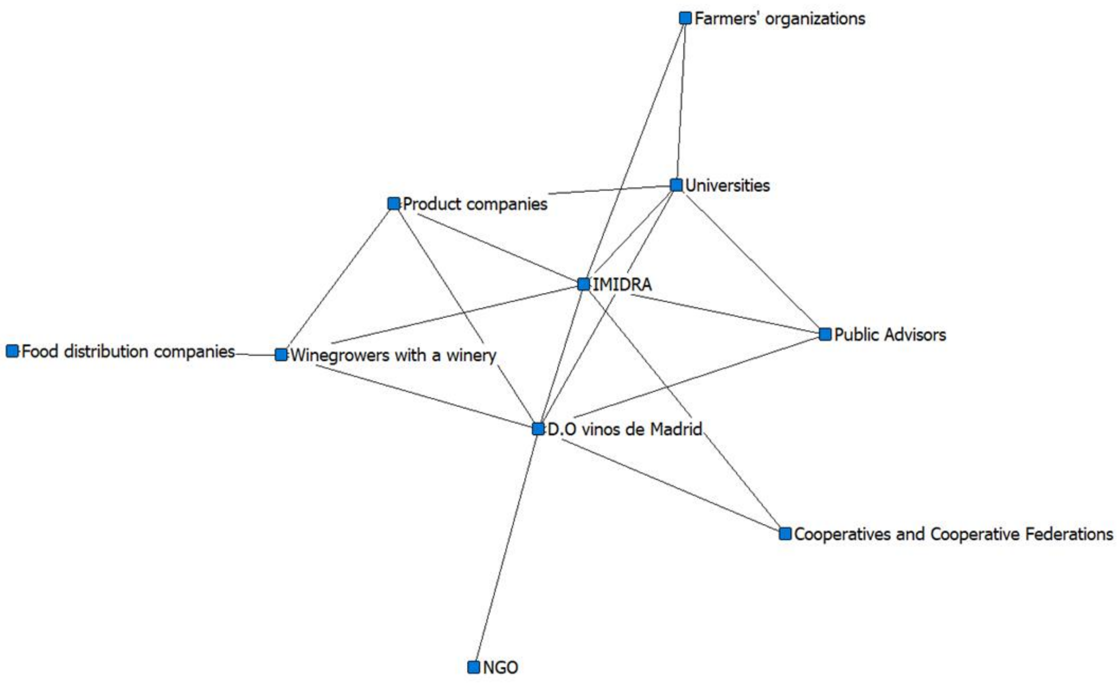


Figure 6. Knowledge map of the vineyard sector in the region of Madrid (winegrowers with winery)
IMIDRA= regional agricultural research centre
NGO= non-governmental organizations

When analysing the density of the networks, it is observed that both have a similar number of links (38 for that of winegrowers with winery, 36 for that of winegrowers without winery). Their degrees of density are also very similar (0.29 and 0.27, respectively). It is interesting to note that these percentages show low density networks, since, although the number of actors is not very high, the links are limited. On the other hand, the degree of centrality is 0.41 for the first network and 0.43 for the second, i.e. presented as a percentage, this means 41% and 43% of centrality, respectively. This degree of centrality implies a small number of nodes that are important as sources of information. In this sense, the most important knowledge nodes shown in terms of their centrality are IMIDRA (which has 7 links) and the PDO Vinos de Madrid control body (which has 6 links). Likewise, both have a degree of centrality of 0.636.

Practical Implications:

This mapping of actors and their relationships is of particular importance because it makes possible to visualize the actors and social groups present in a territory, locating those who act as "bridges" or "hubs" of knowledge.

Showing the nodes of knowledge, as well as the weaknesses and strengths of the information circuit in the wine and olivar sector in the RM is very relevant to develop strategies aimed at supporting innovation. From a practical point of view, strategies for knowledge generation and circulation are only one part of the innovation process - support policies aimed at changing practices, financial support and accompaniment are key complementary elements.

Theoretical Implications

Each crop and region have their specific associated AKIS. This communication contributes to a better understanding of AKIS. Our results suggest that the complexity of knowledge circulation highly depends on the fate of the crop, with knowledge maps being simpler in the olive sector probably because most olive growers in the RM focus on oil production for self-consumption. Additionally, if a production entails complex knowledge its map will also be complex. The transition towards agroecology and circular economy in the cultivation of vineyards and olive groves needs these kind of maps and analyses in order to adapt and to accelerate the innovation process, particularly under an AKIS approach.

References

Francés García, FJ; Alaminos Chica, A; Penalva Verdú, C; Santacreu Fernández, O. (2015) La investigación participativa: métodos y técnicas. Cuenca, Ecuador: PYDLOS Ediciones, ISBN 978-9978-14-316-2.

SCAR AKIS (2019) Preparing for future AKIS in Europe. 4th Report of the Strategic Working Group on Agricultural Knowledge and Innovation Systems.

Engaging with Monitor Farmers on Farmland Biodiversity Management

Aoife Leader[a,b], Richard O'Brien[b], James Kinsella[a]

[a] School of Agriculture and Food Science, University College Dublin, Dublin, Ireland, [b] Teagasc Advisory Office, Kilkenny, Ireland.

Short abstract (200 words):

Improved biodiversity management on farms can enhance biodiversity status and subsequently benefit overall sustainability, a challenge currently faced by agriculture. This study engaged 11 Irish dairy monitor farmers in farmland biodiversity management practice improvement through communication activities which included biodiversity feature mapping and biodiversity management planning, individual farm visits, a dedicated WhatsApp group, integration of biodiversity into an on-farm group meeting and integration of biodiversity into online group meetings. The study used a participatory action research approach. Face-to-face communication activities were identified as most influential in monitor farmer's decisions to make on-farm biodiversity management practice change yet the need for varied communication that satisfies monitor farmer heterogenicity was also evidenced. This paper provides a foundation and guidance for implementing activities to support communication on farmland biodiversity management with a broader cohort of dairy farmers.

Extended abstract

Purpose

The adoption of practices that protect natural resources can contribute to the improvement of biodiversity and thus to sustainability as a whole (Sizemore, 2015). Such practices include those that lead to reduced inputs such as fertiliser and pesticides and those that promote the maintenance and creation of biodiversity features such as hedgerows, field margins, watercourses, woodland, and ponds (Kleijn, et al., 2011 and Bianchi, et al., 2013). If farmers are to contribute to the protection biodiversity, they must be supported through agricultural extension services (Norton et al, 2020). In Irish agricultural extension, the position of monitor farms is well established as evidenced in the Teagasc AKIS Cascade Model (Teagasc, 2019) and Signpost Programme. Previous research has highlighted learning, experimentation, practice change (Prager and Creaney, 2017), and improved productivity and profitability (Campion, Lynch, and Diskin, 2018) on monitor farms achieved through monitor farm programmes. The purpose of this paper is to present communication activities that were implemented to engage monitor farmers in biodiversity management and to present the influence of these communication activities on monitor farmer biodiversity management decision-making and practice change.

Design/Methodology/Approach

A participatory action research (PAR) approach was used. This involved an iterative cycle of data collection, action, and reflection across four intersecting phases. The first phase of the study, *Initiation and Baseline Establishment (October 2019 – June 2020)*, began with the identification of the communication focus (biodiversity management), communication activities and implementation plan. In addition, baseline establishment involved research orientated semi-structured interviews and the biodiversity feature mapping communication activity. The second phase of the study, *Biodiversity Management Plan Development (April – July 2020),* involved the development of a biodiversity management planning tool followed by the implementation of the biodiversity management planning communication activity. The third phase of the study, *Additional Communication (April 2020 – April 2021),* which intersected with the first and second phase, involved the implementation of four communication activities which included the integration of biodiversity into online group meetings, a dedicated WhatsApp group, the integration of biodiversity into an on-farm group meeting and individual farm visits. A summary of the six communication activities that were implemented in these three phases is presented in Figure 1. The fourth phase, *Measure of Change (April & May 2021),* involved semi-structured interviews to identify practice change and evaluate the communication activities.

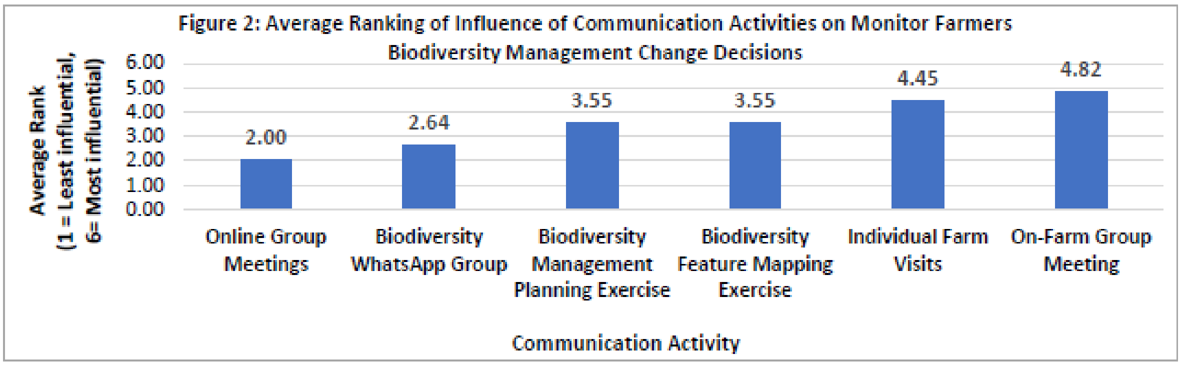
A number of actors, fulfilling different roles were involved in this study. The 11 dairy monitor farmers associated with the Teagasc-Tirlán Joint Programme were involved in all phases. In Ireland, dairy joint programmes are farm development and knowledge transfer programmes run by Teagasc with the support of local milk processors, in this case Tirlán. The Teagasc-Tirlán Joint Programme was launched in 2019 with the objective of supporting dairy farmers in improving the sustainability of their farms and equipping them with the necessary knowledge and skills to bring about change on their farms. These 11 monitor farmers are supported by a Teagasc-Tirlán joint programme coordinator, a Teagasc dairy business and technology advisor, who provides them with advice on farm decision-making and planning and carries out monthly visits to each farm. The joint programme coordinator was the initiator of the study and provided practical support throughout all phases. In addition, the research supervisor, and the Teagasc Countryside Management Specialist, supplied guidance and knowledge needed to give shape to the study. The study was managed by the researcher who worked closely with all of the above actors throughout the phases.

Figure 1: The six communication activities implemented over the study period (April 2020 – April 2021)

Communication Activity	Description of the Communication Activity and Actors involved
Integration of Biodiversity into Online Group meetings	To maintain contact with the monitor farmers under Covid-19 circumstances a number of online group meetings covering topics such as grassland management, breeding, and finance were held. Biodiversity management communication was integrated into six of these meetings and involved study updates, sharing of group figures, biodiversity management improvement guidance and group member examples. Actors: 11 monitor farmers, researcher, joint programme co-ordinator
Biodiversity WhatsApp Group	A dedicated WhatsApp group was used to send information on biodiversity and its management through messages, links, pdfs, videos, pictures, events notifications, and probing questions and was positioned as a platform for the farmers to share their experiences and discuss biodiversity management. Actors: 11 monitor farmers, researcher, joint programme co-ordinator
Biodiversity Feature Mapping	A remote, co-creative activity. Draft maps of the biodiversity features were digitised by the researcher and sent to each farmer for review. An explanatory video was provided via the WhatsApp group. Reviewed maps were returned for edits and final digitisation. Actors: 11 monitor farmers, researcher
Biodiversity Management Planning	A remote, co-creative activity carried out between the researcher and monitor farmers individually. An explanatory video was provided, and an explanatory session was integrated into an online group meeting. The activity involved a map, baseline figures and biodiversity management practices review (Keena, 2020), and co-creation of farm specific, biodiversity management plans through target and action identification. A hardcopy plan was provided. Actors: 11 monitor farmers, researcher
Integration of Biodiversity into an On-Farm Group Meeting	The on-farm group meeting was hosted by one of the monitor farmers. Space for biodiversity management was created, alongside financial, milk production, breeding and grass management and soil fertility topics, within the meeting agenda and handout, and during the farm walk. Actors: 11 monitor farmers, researcher, joint programme co-ordinator
Farm Visits	Two farm visits were carried out over the study period. Initial visits coincided with a monthly visit by the monitor farm programme coordinator. The second was a solo visit to each farmer by the researcher. Actors: 11 monitor farmers, researcher, joint programme co-ordinator

Findings

The farmers reflected positively on the overall experience in particular on their interactions with monitor farmer peers and the researcher as well as the farm-focused decision-making support and information provision. Figure 2 presents the average rank assigned to the communication activities by the 11 monitor farmers in terms of how influential each activity was on their decision to make changes to the management of biodiversity. The on-farm group meeting afforded the monitor farmers the opportunity to see biodiversity management actions-in-action and was supported by host farmer enthusiasm. Individual farm visits created a comfortable space and outlet for farmers to engage on a personal, farm-focused level. The biodiversity feature mapping activity bestowed a sense of ownership and moments of realisation on the stock of biodiversity features on their farms while the biodiversity management planning activity functioned as a thought-provoking catalyst for farm-focused discussion and decision-making. The dedicated WhatsApp group was useful in the provision of information, however consistent and engaging interaction was difficult to generate. Lack of interaction and on-farm examples, and fatigue with online meetings in general were noted as reasons why biodiversity integration into online zoom group meetings was ranked as least influential. Biodiversity management practice change occurred on each of the monitor farms over the course of the study including the improvement of practices related to existing features such increased hedge cutting height, removal of livestock drinking points from watercourses and retention of wider margins when cultivating. Some monitor farmers also created new habitats including hedges, tree groves, pollinator patches, and fenced margins.



Practical Implication

In as much as it is not feasible to expect that a "one-size-fits-all" approach, with a definitive set of management practices, can be prescribed to all farmers (Snapp, 2017), the same is true in relation to communication aimed at influencing monitor farmers in biodiversity management practice change. Although an intensive communication intervention with intersecting activities, as implemented in this study, may be practical when working closely with a select group of farmers the same may not be true when targeting the wider farmer cohort. This paper provides foundation and guidance for communicating on biodiversity management with farmers and also raises the question – how can an extension organisation deliver this level of communication on farmland biodiversity management to a larger farmer cohort?

Theoretical Implications

This study adds to the literature on influencing monitor farmer practice change which to date has largely focused on the improvement of productivity and profitability (Mulkerrins et al., 2022). Although, the results presented in this paper align with previous research that has highlighted the impact of on-farm biodiversity advice (Gabel, et al., 2018), the heterogeneity of farmers and the notion that there is no single definitive approach to effective extension, and therefore, a mix of communication methods are required is also upheld (Vanclay, 2004). A preference for traditional, face-to-face activities is evident, while the foundational role of biodiversity feature mapping and biodiversity management planning which develop farmer buy-in and initiate an expansion of farm planning scope is also highlighted (Maseyk, Dominati, and Mackay, 2019).

References

Bianchi, F.J.J.A., *et al.* (2013) 'Opportunities and limitations for functional agrobiodiversity in the European context', *Environmental Science and Policy*, 27, pp. 223-231.

Campion, F., Lynch, C. O., and Diskin, M. G. (2018). 'A Case Study on the Adoption of Grazing Skills and Technologies on the Teagasc BETTER Sheep Farms', In European Grassland Federation: Sustainable Meat and Milk Production from Grasslands, Horan B., *et al.* (eds.) pp. 941–943.

Gabel, V. *et al.* (2018) 'The influence of on-farm advice on beliefs and motivations for Swiss lowland farmers to implement ecological compensation areas on their farms. The Journal of Agricultural Education and Extension', 24(3), pp. 233-248.

Keena, C. E., (2020). 'An examination of biodiverisity management practices on Irish farms and how this can be measured: the case of dairy farmers in County Waterford'. PhD thesis. National University of Ireland.

Kleijn, D., *et al.* (2011) 'Does conservation on farmland contribute to halting the biodiversity decline?', *Trends in Ecology & Evolution*, 26, pp. 474–481.

Maseyk, F. J., Dominati, E. J., and Mackay, D. A. (2019). More than a 'nice to have': integrating indigenous biodiversity into agroecosystems in New Zealand. *New Zealand Journal of Ecology*, 43(2), 1-12.

Mulkerrins, M. J., *et al.* (2022) 'Could the influence of monitor farm programmes on practice change be BETTER? Lessons from sheep farmers and advisors in Ireland', *The Journal of Agricultural Education and Extension*, pp. 1-26.

Norton, D.A., *et al.* (2020) 'Achieving win-win outcomes for pastoral farming and biodiversity conservation in New Zealand', *New Zealand Journal of Ecology*, 44(2), pp. 1-9.

Prager, K. and Creaney, R. (2017) 'Achieving on-farm practice change through facilitated group learning: Evaluating the effectiveness of monitor farms and discussion groups'. *Journal of Rural Studies*, 56, pp. 1-11.

Sizemore, G. (2015) 'Accounting for biodiversity in the dairy industry'. *Journal of Environmental Management*, 155, pp. 145-153.

Snapp, S. (2017) 'Designing for the long-term: sustainable agriculture'. In Snapp, S., and Pound, B. (eds.) *Agricultural Systems (Second Edition)*. Academic Press.

Teagasc. (2019). Teagasc Customer Action Plan. [Online] Available at: https://www.teagasc.ie/publications/2019/teagasc-customer-action-plan-2019-2021.php

Vanclay, F. (2004). 'Social Principles for Agricultural Extension to Assist in the Promotion of Natural Resource Management', *Australian Journal of Experimental Agriculture*, 44, pp. 212–222.

Session 1C - Customising advice for sustainable transition (2)

Deliberative processes for co-constructing sustainability transitions using science, society, policy interfaces

David Miller[1], Jorieke Potters[2], Ellen Bulten[2], Gerald Schwartz[3]

[1]James Hutton Institute, Aberdeen, United Kingdom, [2]Wageningen University and Research, Lelystad, The Netherlands, [3]Thünen-Institute of Farm Economics, Braunschweig, Germany

Short abstract:

Public policy and expert groups advocate transdisciplinary and partnership working for developing and delivering transition pathways to sustainability for agriculture and food systems. This paper describes science, society, policy interfaces and deliberative democratic processes at multiple levels of governance for co-constructing recommendations for policy and research to facilitate transitions to sustainable agriculture, including the roles of education, training and co-learning.

Findings reflect lessons learnt from using Multi-Actor Platforms (MAPs) in two EU funded projects on Sustainable Hub to Engage into Rural Policies with Actors (SHERPA) and Understanding and improving the sustainability of agro-ecological farming systems in the EU (UNISECO), with a total of 55 MAPs at local or national levels, in 21 countries. Central elements in operating the MAPs were monitoring and evaluation processes, enabling adaptive learning, and capturing and reporting issues arising which inform modifications to the approach. The outcomes of these projects show how transdisciplinary structures can empower rural communities, build capacity and drive sustainability transitions. Implications on the ground are the facilitation and professionalisation of new food and farming systems that include increasing the knowledge and skills of actors involved, and the teachers, trainers, mentors and peers in peer to peer learning.

Extended abstract:

Introduction

The High Level Panel of Experts (HLPE, 2019) report on agroecological and approaches for sustainable agriculture and food systems note that 'transition pathways combine technical interventions, investments, and enabling policies and instruments, involving a variety of actors at different scales'. Such pathways require working in partnership with those impacted upon by the transition (Zawalińska *et al.*, 2022). FAO (2018) summarise what distinguishes agroecology from other farm systems, noting the basis of "bottom-up and territorial processes", delivering contextualised solutions to local problems, and that it is based upon "the co-creation of knowledge, combining science with the traditional, practical and local knowledge of producer." Gliessman (2016) proposes a roadmap to transitions which includes interactions between consumer and producer, and consideration within food systems of issues of 'equity, participation, democracy, and justice'.

This paper describes such deliberative processes in two EU funded projects which align with the characteristics set out by HLPE, FAO and Gliessman. SHERPA (Sustainable Hub to Engage into Rural Policies with Actors) and UNISECO (Understanding and improving the sustainability of agro-ecological farming systems in the EU) create science, society and policy interfaces for actors to co-construct sustainable futures. These processes lead to recommendations for policy and research at multiple levels of governance, including proposals for education and learning as part of their realisation.

Purpose

Transdisciplinary forums for facilitated multi-way engagement between actors are well established in programmes of research funded at European Union and national levels. The Multi-Actor Approach, advocated by the European Commission's Strategy for Agricultural Research and Innovation (European Commission, 2016), has an aim of 'boosting demand-driven innovation and the implementation of research', and increasing impacts through a process of genuine co-creation of knowledge, focusing on real problems and opportunities. In the EU SHERPA and UNISECO projects, the Multi-Actor Platforms (MAPs) facilitate multi-way exchanges of ideas for co-learning and co-creation of knowledge with actors at European and regional levels. It is from these forums that requirements for education and training are identified to facilitate transitions to sustainable agriculture.

The purpose of this paper is to illustrate the potential of deliberative democratic processes for learning for agroecology and sustainability, in science, society, policy interfaces. Such learning is of the process as well as the outputs and outcomes of the discussion. As noted by HLPE (2019), FAO (2018) and Gliessman (2016), transitions to agroecology are characterised by bottom-up processes, informed by knowledge on the ground in local areas. The experiences in the forums in SHERPA and UNISECO provide additional evidence of the effectiveness of such deliberative processes, and some of the issues that require to be overcome in future transdisciplinary research programmes or platforms such as the forthcoming Horizon Europe Partnership on Agroecology (SCAR-Agroecology, 2023).

Methodology

The SHERPA and UNISECO projects have enabled action research into the processes of deliberative democratic processes. The Multi-Actor Approach enabled bottom-up identification of transition pathways to agroecology. Combined, the two projects comprise a total of 55 MAPs at local or national levels, in 21 countries, based upon existing governance structures or creating new ones, and two at EU level to enable cross-country engagement and learning (e.g. for SHERPA, Wieliczko *et al.*, 2021). MAP membership is drawn from representatives of policy, practice, civil society and research communities, following structured selection criteria and complying with research ethics (e.g. Zawalińska *et al.*, 2022).

Each project had processes of local MAPs debating issues affecting rural areas of Europe, from which papers were produced on topics such as long term visions for rural areas, transitions to agroecology, climate change and land use, and landscape features and biodiversity. These were reviewed and augmented by views from the EU level MAPs to produce final sets of positions and recommendations, of which the development of human capital, training and education were shared priorities.

Central to operation of the MAPs has been monitoring and evaluation processes, enabling adaptive learning, and capturing and reporting of issues to inform modifications to the approach. In each project the process used formal surveys of MAP members, and evaluations of their opinions on topics such as their effectiveness, inclusiveness, and credibility in terms of allowing new ideas to emerge.

In SHERPA, reflections sessions of the facilitators and monitors of the MAPs (meetings of clusters of MAPs tackling similar topics) have enabled the sharing of experiences across MAPs on topics being addressed, and issues linked to processes. Such sessions, typically two per topic cycle, also help new facilitators and monitors to learn from the experiences of those already undertaking the processes, and thus the capabilities of those running the MAPs. In UNISECO the reflections within each MAP took place at the end of engagement activities and were across MAP organisers at 6-monthly project events.

Findings

The experiences in UNISECO and SHERPA show that the potential of deliberative democratic processes should be understood in four domains: i) improving policy; ii) boosting connectivity; iii) enriching rural dialogue; and iv) supporting action on the ground. Each of these domains is summarised below.

Firstly, the science, society, policy interfaces in SHERPA and UNISECO were designed to engage rural actors in policy processes that shape their reality. The MAP approach used enriches the means of learning and informs real decision making with the perspectives of citizens, and or local communities. Such an approach requires to be transparent and explicable, with visible evidence of how local discussion and position papers translate into discussion at EU level, and subsequent articulation of recommendations for policy and research.

The experience on the ground shows how citizens and stakeholders in rural areas can be empowered to co-construct recommendations for policy and research (Schwarz *et al.*, 2022). MAP members debated topics that focus on rural areas, including climate change and environmental sustainability, climate change and land use, and transitions to agroecology, and co-authored discussion and position papers that feed into processes of local, regional and EU level policy making. Outputs included recommendations for the implementation of new governance structures for tackling rural issues (e.g. Regional Land Use Partnerships, Scotland, UK), and of policies at regional (e.g. "*This is very helpful for our thinking on where CNPA can contribute most effectively to tackling the climate emergency*", UK National Park) and EU levels (e.g. Long Term Vision for Rural Areas; "*It is by combining different perspectives that we find the most promising solutions*", EU DG Agri).

The MAP approach has had an empowering effect, sparking local interest in policy processes, with the prospects of building capacity to driving sustainability transitions. This all contributes to depolarization and bridging gaps between local, regional, national and EU policy making.

Secondly, connectivity encompasses linking individual MAP members, together with policy levels and sectoral domains. The MAPs provide connectivity across science, society and policy, focusing on particular topics. The processes have enabled links across levels of governance, and their importance for learning from engagement at level and between levels (e.g. presentations of local MAPs to EU level MAPs). They have brought together different types of groupings of individuals, or organisations they represent, to debate evidence and co-construct new ideas and strengthen new meaning making. An important opportunity of such deliberative processes is learning to understand different realities, and to translate perspectives between domains and between levels of policy making.

Thirdly, the MAPs offer the potential of providing facilitated less politicized spaces for rural dialogue. In UNISECO, feedback from participants in the MAPs identified the importance of the design of forums to stimulate positive feelings amongst participants. *'One of the main contributions of this project was the very good and open exchange of views in the various workshops. This is an important trust-building measure and maybe this is even the main impact of the project' (male, farmer)* (Zawalińska *et al.*, 2022). The MAPs enrich the dialogue by capitalising on research findings. The process of summarizing and translating research findings into language appropriate for MAP settings has been a challenge. However, providing safe spaces helped initiate science-informed dialogue based on common ground.

Fourthly, building on the content, spaces for dialogue and new connections, the MAPs identified concrete actions for rural development and sustainable agriculture. Producers, consultants and administration formed a "Learning Community" to search for solutions such as improved access to infrastructure and machinery that would otherwise have been unfeasible, and joint processing and storage facilities for produce from agroecological farming. MAP member organisations from civil society also became partners in subsequent EU funded projects.

Through the MAP processes, actors identified the relevance and needs of enhanced human capital for realising transitions to agroecology and objectives of achieving climate neutrality, as part of a strategy for revitalising rural areas. The importance of education, training and life-long learning, is identified, including: i) on-farm peer to-peer learning; ii) actor-led knowledge and innovation and active sharing of place-based knowledge; iii) principles and practices of agroecology in school curricula covering principles of food production and consumption, agricultural practices, and social responsibility.

The design and implementation of education, training and reskilling as part of a wider strategy for sustainability transitions would align with aims of the LTVRA Action Plan flagship under *Increasing environmental, climatic and social resilience.* It also delivers on Principle 1 of the European Pillars of Social Rights, of Education, Training and life-long learning of maintaining and acquiring … "skills that enable them to participate fully in society and manage successfully transitions in the labour market." At an EU level, the strategy would contribute to the EU Youth Strategy, building "a bridge between the EU and young people to regain trust and increase participation." (European Union, 2018).

Practical Implications

The potential of deliberative democratic processes for contributing to sustainable agriculture and transitions to agroecology through the four domains of policy, dialogue, connectivity and action require recognition and wider understanding. The lessons learned in SHERPA and UNISECO indicate the conditions and approaches required for this potential to be realised. The following recommendations can help to harness such potential for creating agroecology transitions: i) create facilitated non politicised spaces for rural dialogue; ii) invite and empower local actors to share their perspectives; iii) organise good facilitation for dialogue; iv) facilitate the translation of research findings to content relevant to local actors. Most importantly, the experiences stress the value and significance of listening to the diverse range of rural people who, with their actions, are shaping sustainable futures.

In relation to transitions to agroecology and sustainability, findings from the MAPs show recognition of need for creating new services of delivering training through progressive integration of climate related topics in education curricula of schools in line with their governance in countries and regions. This should lead to professionalising components of new food and farming systems through reviewing programmes of

Continuing Professional Development (CPD) in sectors relevant to tackling climate change, and identification of skills required for delivering transitions. Teachers and trainers have to be equipped with relevant knowledge and skills to understand and communicate approaches to transitioning to climate neutrality. Beyond their own professional qualification and training, CPD and life-long learning will be critical for developing capacities of those responsible for teaching and training, and the 'peers' providing 'peer to peer' learning. Actors also identified the need for voluntary mentoring systems for all types of actors, providing one-to-one access for sharing experiences, with coordination by recognised bodies (e.g. farmers unions; NGOs).

Research Implications

Findings from the transdisciplinary forums described provide evidence of how they can co-construct knowledge and recommendations, and identify pathways for the creation of required outcomes and impacts. Observations on the process of participatory agenda setting shows the types of insights that deliberative democratic processes can provide on what is needed in rural areas and their citizens.

Such research agendas reflect local knowledge and priorities. They point to the needs for systems thinking in designing policy and research agendas. Examples of gaps in knowledge identified in SHERPA and UNISECO structures are: i) how knowledge is transferred within and between countries and regions, at different levels of governance, and the types of models which might be most impactful in agriculture and more broadly, as per findings of Olvermann *et al.* (2023) and Potters *et al.* (2022); ii) the levels of risk of where and what types of actors may be left behind during transitions in crop and farming systems; iii) the roles of training and education in identifying opportunities, and designing and implementing activities that facilitate transitions to sustainable agriculture (Schwarz *et al.*, 2022).

The SHERPA and UNISECO projects focussed on MAPs as science, society, policy interfaces. In this paper we illustrate the potential of such approaches to contribute to transitions to agroecology. Other forms of multi-actor approaches exist, each with particular merits. For example, Living Labs (Feurstein *et al.*, 2008) have roles in agroecology research. Identifying and assessing the significance of commonalities and differences between such approaches would inform the conceptualisation of their uses, planning and operation, with a view to enhancing joint learning process for sustainable futures.

Acknowledgements

Thanks to the members of the MAPs in SHERPA, UNISECO and AGRILINK, the contributions of which informed this paper. SHERPA is funded from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No. 862448, UNISECO under Grant Agreement No. 773901 and AGRILINK under Grant Agreement No. 727577.

References

European Commission (2016) *A Strategic Approach to EU Agricultural Research & Innovation: Final Paper*. European Commission, DG Agri, EIP-Agri, Brussels.

FAO (2018) The 10 Elements of Agroecology Guiding the Transition to Sustainable Food and Agricultural Systems. FAO, pp15.

Feurstein, K., Hesmer, K.A, Hribernik, K-D, *et al.* (2008) Living Labs: A New Development Strategy. In European Living Labs – A new approach for human centric regional innovation, Eds. J. Schumacher & V-P Niitamo. Berlin: Wissenschaftlicher Verlag Berlin, 2008:1-14.

HLPE (2019) *Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition*. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.

Gliessman, S. (2016) Transforming food systems with agroecology, *Agroecology and Sustainable Food Systems*, 40(3):187–189.

Olvermann, M., Hornung, J., Kauffield, S. (2023) "We Could Be Much Further Ahead" - Multidimensional Drivers and Barriers for Agricultural Transition. *Journal of Rural Studies*, 97:1533-166.

Potters, J., Collins, K., Schoorlemmer, H., *et al.* (2022) Living Labs as an Approach to Strengthen Agricultural Knowledge and Innovation Systems. *EuroChoices*, 21:23-29. doi.org/10.1111/1746-692X.12342

SCAR-Agroecology (2023) The Agroecology Partnership's Strategic Research and Innovation Agenda. https://scar-europe.org/agroecology-documents.

Schwarz, G., Vanni, F., Miller, D., *et al.* (2022) Exploring Sustainability Implications of Transitions to Agroecology: A Transdisciplinary Perspective. *EuroChoices*, 21:37-47. doi.org/10.1111/1746-692X.12377

Shaffers, H., Santoro, R. (2010) The Living Labs Concept Enhancing Regional Innovation Policies and Instruments. IEEE International Technology Management Conference (ICE) Conference, doi:10.1109/ICE.2010.7477035

Wieliczko, B., Kurdyś-Kujawska, A., Floriańczyk, Z. (2021) EU Rural Policy's Capacity to Facilitate a Just Sustainability Transition of the Rural Areas. *Energies* 2021, *14*, 5050. doi.org/10.3390/en14165050

Zawalińska, K., Smyrniotopoulou, A., Balazs, K., *et al.* (2022) Advancing the Contributions of European Stakeholders in Farming Systems to Transitions to Agroecology. *EuroChoices*, 21:50-63. doi.org/10.1111/1746-692X.12378

Participatory workshops' impacts on farmers' intention to adopt climate mitigation farming practices: A randomized controlled trial in Slovenia

Živa Alif, Ana Novak, Tanja Šumrada
University of Ljubljana, Biotechnical faculty, Jamnikarjeva ulica 101, SI-1000 Ljubljana

Short abstract:

Agricultural greenhouse gas emissions (GHG) contribute to around 10% of EU's total GHG emissions. Effective knowledge transfer is believed to be among the critical policy instruments to change farmers' behaviour and increase the adoption of new technologies. Recently, there has been a shift in the agricultural knowledge transfer from a linear, top-down learning model, where farmers usually have a passive role as recipients of knowledge, towards more participatory approaches, such as workshops, that emphasise peer-to-peer and group learning. However, limited evaluation of their effectiveness is available. Our study aims to test the impacts of participatory workshops based on the case of cattle breeding practices that reduce GHG emissions. A group of 438 cattle breeders from two Slovenian regions participated in the randomised controlled trial. After attending the participatory workshops, farmers had a statistically higher knowledge of climate change and mitigation measures and a higher intention to perform more measures in the future than the control group. The workshops also had a significant positive effect on attitudes, social norms, climate change beliefs, psychological distance and perceived behavioural control. The results provide promising new insights into the behaviour change mechanisms, which can be facilitated with innovative knowledge transfer approaches in agriculture.

Extended abstract

Purpose

Agricultural greenhouse gas emissions (GHG) accounted for around 10-12% of the total GHG emissions in 2007 (Smith et al., 2007) and currently, together with forestry and other land uses, contribute to 21 % of all emissions (Nabuurs et al., 2022). However, projections show that agricultural GHG are still increasing in the developing countries due to the increasing animal-sourced food demand (Tubiello, 2019) and are unlikely to decrease by 2040 even in some developed countries, such as the EU (EEA, 2021). Among the different agricultural sectors, livestock management is the largest source of GHG emissions and ammonia, accounting for 70% of emissions (Nabuurs et al., 2022; Tubiello, 2019). Livestock farming has particularly high potential for reducing its emissions through various mitigation measures, including by optimising cattle diet (Hristov et al., 2013) and improving manure storage and fertilisation (United Nations Economic Commission for Europe, 2015). However, despite the plethora of available mitigation measures, they are often not taken up by farmers even when they would require limited investment or even net positive effects (Wreford et al., 2017). This is due to various barriers that include educational, structural, financial and institutional obstacles that need to be targeted specifically (Smith & Olesen, 2010). Insufficient education and training have been identified as one of the critical barriers in the adoption of climate change mitigation measures (Feliciano et al., 2014). Therefore, improved information sharing on climate-friendly farming practices is important for reducing agricultural GHG emissions.

To date, knowledge transfer process in agriculture has mainly taken the form of one-way or linear training, where farmers have a passive role as recipients of knowledge (Black, 2000; Dockès et al., 2019). As this approach has been criticised due to its inadequate attention to long-term impacts and possible reinforcement of social inequalities (Black, 2000), the paradigm has recently shifted to participatory approaches that promote peer-to-peer and group learning (Prager & Creaney, 2017). The benefits of participatory approaches include the recognition of local knowledge, support for local adaptation, understanding of complex issues at both the landscape and farm scales, and facilitating farmer dialogue and cooperation (Black, 2000; Carr, 1995; Cornwall et al., 1993). Previous studies indicated that participatory approaches can be successful in not only changing farming practices, but also in influencing values and beliefs, which can further increase the practice change persistence (Knook & Turner, 2020). Despite their potentially greater effectiveness compared to linear training, the participatory approaches have been relatively rarely used in disseminating agricultural practices that can contribute to climate change mitigation (Knook & Turner, 2020). In addition, few studies have focused on evaluating participatory approaches in the developed world (Knook, 2020), and to our knowledge, only one study so far used an experimental approach for impact evaluation (Guo et al., 2015).

Our study focused on examining the effectiveness of a participatory workshop for cattle farmers on climate-friendly soil and manure management in Slovenia, with regard to participants' knowledge, attitudes, and behavioural intention. As the prevailing knowledge transfer approach in Slovenia is still linear and top-down method, the participatory approach presents an important innovation. We use a randomized control trial experimental design and base our study on an extended Theory of Planned Behaviour (Ajzen, 1991) to determine other factors that influence farmers' intention to adopt climate change mitigation measures on their farm.

Methodology

We invited cattle farmers with 10 or more cattle from two Slovenian regions, Central Slovenia and Podravje to participate in our study, in total 1,875 farms. We randomly invited half of the selected farmers, the experimental group, to participate in the workshop, while the other half, the control group, just received our questionnaire by post. The randomization was done at individual level but was stratified by training location. We organised 16 workshops, led by an expert on manure management, and consisted of a brief introductory lecture about different climate mitigation measures, followed by a discussion about how to implement the measures on typical farms in the area. At the end of each workshop, participants filled out a survey. The first workshop, which 19 farmers attended, was used as a pilot. In total we gathered 438 questionnaires, 225 from experimental group and 213 from control group. The data were collected in November and December 2022.

The questionnaire began with a short knowledge test about agricultural emissions, mitigation measures and manure management. Next, participants were asked whether they currently perform and intend to perform seven climate mitigation measures that were also discussed in the workshop. Other constructs from the Theory of Planned Behaviour (attitude, social norms, perceived behavioural control and beliefs about climate change) and psychological distance were assessed using 7-point Likert scale. A single multiple-choice question was used to determine the innovativeness level. The questionnaire ended with a series of demographic and farm-related questions.

We removed 32 questionnaires due to >20% missing data. In five cases imputed data sets were produced for further analysis (Buuren & Groothuis-Oudshoorn, 2011). Balancing tests were performed between control and experimental group. To acquire a knowledge score and habit score, we summed the total number of correct and yes responses, respectively, while to obtain intention score we summed the total Likert scale points. We used confirmatory factor analysis (CFA) to reduce the dimensionality of all other constructs. The effect of the training on attitudes, perceived behavioural control, intention, knowledge and social norm, was tested running separate linear regressions for all variables with participation in the training as the explanatory variable. We used backwards stepwise model selection based on AIC for selecting the final linear model of predictors of intention, where the maximal model included all constructs and socio-demographic variables. We used the lavaan (Rosseel, 2012) and semTools (Jorgensen et al., 2022) packages for SEM in R version 4.2.1 (R Core Team, 2022).

Findings

Farmers from experimental group on average answered 5.51 out of 10 knowledge questions correctly, while the control group's average was 4.41, with a statistically significant difference of medium effect size ($t = 4.13$, $df = 405$, p-value < 0.001, $d = 0.50$), after controlling for differing socio-demographic variables (rearing type, income, future prospects and age). While farmers from the two groups did not differ in the average number of practices they are currently performing (experimental group = 0.86, control group = 0.95, $t = 0.74$, $df = 328.12$, p-value = 0.457), the experimental group had a statistically significantly higher intention to perform more measures in the future (control group = 5.06, experimental group = 5.43, maximum number of points = 7, t = 4.05, $p < 0.001$) after controlling for differing socio-demographic variables, with a medium size effect (d = 0.55).

Participation in the training had a significant positive effect on attitude (Est = 0.34, SE = 0.10, t = 3.44, $p < 0.001$), social norms (Est = 0.48, SE = 0.09, t = 5.27 $p < 0.001$), climate change beliefs (Est = 0.25, SE = 0.09, t = 2.72, p = 0.007), psychological distance (Est = 0.21, SE = 0.09, t = 2.31, p = 0.021) and perceived behavioural control (Est = 0.27, SE = 0.14, t = 2.81 , p = 0.005), after controlling for rearing type, age, income and future farm prospects. Social norms, psychological distance, habit, attitude and knowledge had a positive and statistically significant effect on intention, while the positive effect of climate change was close to significant. Planning to reduce or abandon their farms along with better knowledge of CAP had a very large and statistically significant negative effect on intentions to implement the climate-friendly measures on their farms.

Implications

Our study provides evidence on the effectiveness of participatory workshops for changing climate-related behaviour in farmers. Our results show that the current level of knowledge and implementation of climate-friendly farming practices in Slovenia is low. With the knowledge transfer intervention, we improved attitudes, perceived social norms, perceived behavioural control, knowledge, psychological distance and intentions to perform selected manure management measures that decrease GHG and ammonium emissions.

The effect of training on knowledge is of medium size, which, given the short duration of the training, we consider a good result that shows the effectiveness of participatory approaches also in climate change education. Other studies focusing on the evaluation of climate change participatory extension programmes in the developed world have also shown positive effects of attendance on the adoption of mitigation practices regarding soil management (Yang & Knook, 2021), renewable energy (Knook, 2020) and general sustainability and nutrient management (Yang & Wang, 2022).

Previous studies evaluating the impact of climate change participatory knowledge transfer approaches mainly assessed the effect of trainings on knowledge and adoption of mitigation practices, while not examining indirect effects the trainings have on behaviour. Here, we also examined the effect that the training had on attitudes, social norms, perceived behavioural control and climate change beliefs. To our knowledge, only one qualitative study has so far examined how participatory approached affect farmers' beliefs and values surrounding sustainability (Knook & Turner, 2020). By examining the effect of these constructs on intention, a deeper understanding of behaviour change mechanisms is achieved.

References

Ajzen, I. (1991). The theory of planned behaviour. Organizational Behaviour and Human Decision Processes, 50, 179–211.

Black, A. W. (2000). Extension theory and practice: A review. Australian Journal of Experimental Agriculture, 40(4), 493.

Buuren, S. van, & Groothuis-Oudshoorn, K. (2011). mice: Multivariate Imputation by Chained Equations in R. Journal of Statistical Software, 45, 1–67.

Carr, A. (1995). Innovation of diffusion: Landcare and information exchange. Rural Society, 5(2–3), 56–66.

Cornwall, A., Gujit, I., & Welbourn, A. (1993). Acknowledging process: Challenges for agricultural research and extension methodology. Discussion Paper - Institute of Development Studies, University of Sussex.

Dockès, A.-C., Chauvat, S., Correa, P., Turlot, A., & Nettle, R. (2019). Advice and advisory roles about work on farms. A review. Agronomy for Sustainable Development, 39(1), 2.

Feliciano, D., Hunter, C., Slee, B., & Smith, P. (2014). Climate change mitigation options in the rural land use sector: Stakeholders' perspectives on barriers, enablers and the role of policy in North East Scotland. Environmental Science & Policy, 44, 26–38.

Guo, M., Jia, X., Huang, J., Kumar, K. B., & Burger, N. E. (2015). Farmer field school and farmer knowledge acquisition in rice production: Experimental evaluation in China. Agriculture, Ecosystems & Environment, 209, 100–107.

Hristov, A.N., Oh, J., Lee, C., Meinen, R., Montes, F., Ott, T., Firkins, J., Rotz, A., Dell, C., Adesogan, A., Yang, W., Tricarico, J., Kebreab, E., Waghorn, G., Dijkstra, J. & Oosting, S. 2013. Mitigation of greenhouse gas emissions in livestock production – A review of technical options for non-CO2 emissions. Edited by Pierre J. Gerber, Benjamin Henderson and Harinder P.S. Makkar. FAO Animal Production and Health Paper No. 177. FAO, Rome, Italy

Jorgensen, T. D., Pornprasertmanit, S., Schoemann, A. M., Rosseel, Y., Miller, P., Quick, C., Garnier-Villarreal, M., Selig, J., Boulton, A., Preacher, K., Coffman, D., Rhemtulla, M., Robitzsch, A., Enders, C., Arslan, R., Clinton, B., Panko, P., Merkle, E., Chesnut, S., … Johnson, A. R. (2022). semTools: Useful Tools for Structural Equation Modeling (0.5-6).

Knook, J. (2020). The evaluation of a participatory extension programme focused on climate friendly farming. Journal of Rural Studies.

Knook, J., & Turner, J. A. (2020). Reshaping a farming culture through participatory extension: An institutional logics perspective. Journal of Rural Studies, 78, 411–425.

Nabuurs, G.-J., Mrabet, R., Hatab, A. A., & Bustamante, M. (2022). Agriculture, Forestry and Other Land Uses (AFOLU) (Climate Change 2022: Mitigation of Climate Change). IPCC.

Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. Journal of Statistical Software, 48, 1–36.

Smith, P., & Olesen, J. E. (2010). Synergies between the mitigation of, and adaptation to, climate change in agriculture. The Journal of Agricultural Science, 148(5), 543–552.

Tubiello, F. N. (2019). Greenhouse Gas Emissions Due to Agriculture (p. 11).

United Nations Economic Commission for Europe. (2015). Framework Code for Good Agricultural Practice for Reducing Ammonia Emissions. https://unece.org/sites/default/files/2021-06/Ammonia_SR136_28-4_HR_0.pdf

Wreford, A., Ignaciuk, A., & Gruère, G. (2017). Overcoming barriers to the adoption of climate-friendly practices in agriculture (OECD Food, Agriculture and Fisheries Papers No. 101; OECD Food, Agriculture and Fisheries Papers, Vol. 101).

Yang, W., & Knook, J. (2021). Spatial evaluation of the impact of a climate change participatory extension programme on the uptake of soil management practices*. Australian Journal of Agricultural and Resource Economics, 65(3), 539–565.

Visioning as a methodological approach for change in farming and food systems – participants' perceived enablers and barriers for initiating action

Vebjørn Egner Stafseng[1], Geir Lieblein[1], Anna Marie Nicolaysen[1], Edvin Østergaard[2]
[1]Department of Plant science, Norwegian University of Life Science, Norway
[2]Department of Educational Science, Norwegian University of Life Science, Norway

Short abstract

In this study we explored the workshop element of the visioning approach for change in farming and food systems in Norway. We conducted four workshops with communities and projects where the aim was to develop a shared desired future state (a vision) and develop action plans for how to reach this vision. Our experience shows that a challenge with these workshops is to go from insight and new knowledge to action. For this reason, we interviewed participants from the workshops about what they experience as enabling factors and barriers for initiating change as a continuation of the workshop. We found that enabling factors include a feeling of shared understanding and optimism from participation in the workshop. Barriers include individual personality traits, participants' social position, and time available to initiate change processes. This is a contribution to the literature on visioning as a methodological approach for change specifically and transdisciplinary research approaches in general.

Extended abstract

Purpose

To deal with the current and future sustainability challenges, we need a combination of new basic knowledge, ability to apply this knowledge, and political action (Spangenberg, 2011). This also applies to challenges in farming and food systems. According to Sellberg et al. (2020, p. 275) «[t]ransformations of the dominant food system trajectories are needed to increase the resilience of the landscapes in which food is produced and maintain the resilience of the Earth System. Understanding transformation processes therefore becomes a key interest for research on food system resilience." In the search for new approaches to support sustainability transitions, the methodological approach called visioning has been proved to have great potential (Wiek & Iwaniec, 2014). The visioning approach includes tools to help communities agree on a shared desired future state of their organization or project and use this to guide action in the present. In this study, we have conducted two – and will conduct two more – visioning workshops with initiatives and projects in the farming and food system in Norway.

It is a transdisciplinary approach in the sense – defined by Brandt et al. (2013) – that it includes multiple disciplines, focus on shared problems and actively involves practitioners in the process. We see a transdisciplinary approach as "the immediate and obvious way to start an effective and multidimensional exploration and change-oriented process (Francis et al., 2012, p. 73). We see a need to continue the development of transdisciplinary methods to help empower actors in the farming and food system and contribute to positive change. Here visioning is a key approach.

Previous research on visioning includes development of methodological frameworks in terms of what it takes from researchers to succeed (McKee et al., 2015), stakeholder participation (Quist & Vergragt, 2006), and a full methodological framework (Pereira et al., 2018). Additionally, visioning has been used in various fields such as sustainable household practice and sustainability learning (Davies et al., 2012; Doyle & Davies, 2013), sustainable and resilient food systems (Sellberg et al., 2020) and how to improve human relations in the food system (Lieblein et al., 2001), sustainable carbon sequestration in farmland (Li Johansson et al., 2022), and sustainable communities and urban regeneration (Deakin, 2011; Deakin, 2012).

The challenge for improved impact of the visioning approach, as we see it, is how to induce change. Inclusion of a visionary approach is vital to set the direction for change but must be followed up by a plan for action that can lead to action – and not be a goal in itself. One example is Sellberg et al. (2020) where they, through a participatory visioning workshop and a survey, came up with a set of positive future elements for the local food system and identified barriers and opportunities. But it is unclear how action steps are initiated. Who among the actors in the food system take the first steps? The Seed for the Good Anthropocene method (applied by (Sellberg et al., 2020)) does not include an action-planning element. In our approach to visioning workshops – inspired by Pool and Parker (2017) and the Soft systems methodology of Checkland and Poulter (2006) – we include action planning exercises at the end of the workshops (see Lieblein et al., 2001). However, our assumption is that the agreed upon action steps rarely are executed by the actors. There is a need for a better understanding of how workshop participants can move from insight and inspiration to action. Thus, for this study we ask the questions: *(1) Why are action plans – produced through a participatory visioning approach – not acted upon? (2) What do participants perceive as enabling factors and barriers for taking the first steps of the action plan?* To answer these questions, we present insights from a series of visioning workshops conducted with actors in the farming and food system of Norway.

Design/Methodology/Approach

The workshops we conducted were designed by the researchers in close collaboration with actors in the projects or initiatives. Our aim was for the workshops to be as relevant as possible for the involved actors. One workshop was organized for a research project whose aim is to increase Norwegian grown plant proteins in the Norwegian value chain. Participants were farmers, processers, distributors, researchers, and students. The other workshop – as well as the remaining two workshops – was conducted with public access urban gardens in Oslo. Participants include urban gardeners, volunteers, municipal officials, SMEs, NGOs and representatives of other public services. The aim of these workshops was to develop a shared vision for the actors involved, explore hindering and supporting forces for reaching this vision and start thinking about action steps each actor could take to contribute to a move towards the vision. Our approach for this study is phenomenological, in the sense that we aim to understand the lived experience of the people involved. It is also participatory, as we involve the relevant stakeholders in the knowledge-creation. We conducted – and will conduct more – semi-structured lifeworld interviews with a selection of our participants about their experience of participating in a visioning workshop. The focus of these interviews was on the potential for action, and what they perceived as enablers and barriers for action.

(Preliminary) findings

All data is not yet collected, but from conversations with participants during and after workshops, and reflection on previous experiences, we have some assumptions about what enablers and barriers the participants experienced during and after the workshops. Examples of enablers are: (1) through participation in the workshop, they experienced a sense of optimism through the development of desired future state. (2) They also realized that on the higher scale, they agree, more or less on desired futures with actors they in advance believed to disagree with. Some barriers are: (1) Personality: to initiate change can be considered outside of people's comfort zone. The person must be responsible for the initiated change, whether it turns out to be a success or a failure. People with an entrepreneurial mindset might not be too concerned with this, whereas others can consider it a large barrier. (2) Social position can also be an important factor for implemented change or not. There is a big difference in the potential impact of the actions of the various workshop participants, and for the actions that require a change in policy. (3) Time available: for some participants, action steps that were developed in the workshops are part of their paid job (such as for government officials and representatives of the industry). Other participants, such as farmers, have little time for initiating change on top of their already full schedules.

Practical Implications

Our findings give facilitators of transformative processes a better understanding of how to achieve positive change. In particular, the people involved in change processes in farming and food systems. In the design of visioning projects, researchers and practitioners can design the methods to accommodate for the barriers identified in this study. One implication of this is that a workshop is not enough, more follow-up and involvement from facilitators/researchers is needed. To participate in workshops and the co-construction of visions can have several positive benefits for participants, such as a wider view and better understanding of the topic in question. Additionally, an improved insight into enablers and barriers for initiating action can help expand these positive benefits and give transdisciplinary methods more impact.

Theoretical Implications

The young and growing academic fields of transdisciplinary research in general and visioning approaches in particular need more theorizing based on empirical experiences. Similar to the practical implications, our findings can contribute to an improved transdisciplinary method that e.g. Brandt et al. (2013) called for in the literature. Our findings also contribute to the expressed need for research on transdisciplinary workshops specifically (Lawrence et al., 2022).

1. References

Brandt, P., Ernst, A., Gralla, F., Luederitz, C., Lang, D. J., Newig, J., Reinert, F., Abson, D. J. & von Wehrden, H. (2013). A review of transdisciplinary research in sustainability science. *Ecological Economics*, 92: 1-15. doi: 10.1016/j.ecolecon.2013.04.008.

Checkland, P. & Poulter, J. (2006). *Learning for action : a short definitive account of soft systems methodology and its use for practitioners, teachers, and students*. Chichester: Wiley.

Davies, A. R., Doyle, R. & Pape, J. (2012). Future visioning for sustainable household practices: spaces for sustainability learning? *Area*, 44 (1): 54-60. doi: 10.1111/j.1475-4762.2011.01054.x.

Deakin, M. (2011). Meeting the challenge of learning from what works in the development of sustainable communities. *Sustainable Cities and Society*, 1 (4): 244-251. doi: 10.1016/j.scs.2011.07.006.

Deakin, M. (2012). The case for socially inclusive visioning in the community-based approach to sustainable urban regeneration. *Sustainable Cities and Society*, 3: 13-23. doi: 10.1016/j.scs.2011.12.001.

Doyle, R. & Davies, A. R. (2013). Towards sustainable household consumption: exploring a practice oriented, participatory backcasting approach for sustainable home heating practices in Ireland. *Journal of Cleaner Production*, 48: 260-271. doi: 10.1016/j.jclepro.2012.12.015.

Francis, C., Breland, T. A., Østergaard, E., Lieblein, G. & Morse, S. (2012). Phenomenon-based learning in agroecology: a prerequisite for transdisciplinarity and responsible action. *Agroecology and Sustainable Food Systems*, 37: 60-75. doi: DOI: 10.1080/10440046.2012.717905.

Lawrence, M. G., Williams, S., Nanz, P. & Renn, O. (2022). Perspective Characteristics, potentials, and challenges of transdisciplinary research. *One Earth*, 5 (1): 44-61. doi: 10.1016/j.oneear.2021.12.010.

Li Johansson, E., Brogaard, S. & Brodin, L. (2022). Envisioning sustainable carbon sequestration in Swedish farmland. *Environmental Science & Policy*, 135: 16-25. doi: 10.1016/j.envsci.2022.04.005.

Lieblein, G., Francis, C. A. & Torjusen, H. (2001). Future Interconnections Among Ecological Farmers, Processors, Marketers, and Consumers in Hedmark County, Norway: Creating Shared Vision. *Human Ecology Review*, 8 (1): 60-71.

McKee, A., Guimaraes, M. H. & Pinto-Correia, T. (2015). Social capital accumulation and the role of the researcher: An example of a transdisciplinary visioning process for the future of agriculture in Europe. *Environmental Science & Policy*, 50: 88-99. doi: 10.1016/j.envsci.2015.02.006.

Pereira, L. M., Hichert, T., Hamann, M., Preiser, R. & Biggs, R. (2018). Using futures methods to create transformative spaces: visions of a good Anthropocene in southern Africa. *Ecology and Society*, 23 (1). doi: 10.5751/es-09907-230119.

Pool, A. & Parker, M. (2017). *Creating Futures that Matter Today: Facilitating Change Through Shared Vision*. Durango, CO: Executive Savvy.

Quist, J. & Vergragt, P. (2006). Past and future of backcasting: The shift to stakeholder participation and a proposal for a methodological framework. *Futures*, 38 (9): 1027-1045. doi: 10.1016/j.futures.2006.02.010.

Sellberg, M. M., Norstrom, A. V., Peterson, G. D. & Gordon, L. J. (2020). Using local initiatives to envision sustainable and resilient food systems in the Stockholm city-region. *Global Food Security-Agriculture Policy Economics and Environment*, 24. doi: 10.1016/j.gfs.2019.100334.

Spangenberg, J. H. (2011). Sustainability science: a review, an analysis and some empirical lessons. *Environmental Conservation*, 38 (3): 275-287. doi: 10.1017/s0376892911000270.

Wiek, A. & Iwaniec, D. (2014). Quality criteria for visions and visioning in sustainability science. *Sustainability Science*, 9 (4): 497-512. doi: 10.1007/s11625-013-0208-6.

Assessing capabilities of the hub organisations of Innovation Support Services Ecosystems: an evaluation grid for researchers and practitioners

Claire Orbell[1,2], Aurélie Toillier[2], Sophie Mignon[1]

[1]Univ Montpellier, MRM, Montpellier, France; [2]CIRAD, UMR INNOVATION F-34398, Montpellier, France

Short abstract

Transition towards agroecology is an issue both complex and compulsory to tackle. Innovation will be key to respond to the different challenges of this transition and innovators need support to bring their innovation to their full potential. In sub-Saharan Africa, a wide range of organisations provide Innovation Support Services but collaboration between them is still scarce even if some organisations see the potential interest of gathering to provide a more adequate service offer to innovators. These gatherings of services providers are usually orchestrated by one of its members called the hub organisation.

We assume that this organisation relies on specific capabilities to create a fully functioning ecosystem of innovation support services. Identifying the hub organisation and being able to characterize its capabilities would allow to enhance weak capabilities and make the ecosystems more efficient in their service offer thus creating a more favourable environment for innovation. We propose an evaluation grid of the hub organisation capabilities, based on literature review and interviews.

This tool will be useful for development projects and members of hub organisations to characterise their capabilities and implement the necessary activities to enhance them. It will also be useful for researchers to deepen knowledge on hub organisations, identifying the necessary capabilities for their functioning.

Extended abstract

Purpose

Transition towards agroecology is absolutely necessary yet difficult to support: problematics are complex, actors are diverse with both different objectives and skills, the problem is global but solutions need to be found at different scales, solutions need to be found through collaborative innovation, etc. (Côte et al., 2019; A. Toillier et al., 2019). Innovation will be a key component of this transition (technical innovation but also social and organisational). However, the- level of innovation in the global South remains insufficient and innovators need a wide variety of services to support them in the innovation process. These services are called Innovation Support Services (ISS) (Faure et al., 2019; Mathé et al., 2016; Ndah et al., 2020). Innovators can turn to a large range of organisations providing these ISS (incubators, research centres, development projects, etc.). Actors and organisations supporting this agroecological transition seek to work together in order to improve their service offer but meet various issues: lack of time and resources, difficulties to gather around a common objective, difficulties to overcome rivalries and competition in order to work together, etc.

Throughout times, these gathering of organisations have been described differently in the literature: as networks, communities, meta-organisations, ecosystems, etc. But one aspect is found in every theoretical stream: the need for one of the organisations to take a leading role, orchestrating the relationships in the ecosystem and the activities conducted. We call it the hub organisation of the ecosystem.

We believe that the notion of ecosystem is the most relevant to describe the phenomenon we observe in ISS for agriculture in Africa. The term was first used by Moore (1993) making an analogy with biological ecosystems in order to describe business ecosystems. These ecosystems are very heterogeneous in terms of members (big companies, start-ups, universities, institutions, projects, etc.), which are gathered around a common objective of increasing value of their products and services (Fréry et al., 2012) around a vision and ideas (Moore, 2006). Ecosystems consider better the dynamic aspect (actors coming in and going out) than network theories (Frow et al., 2016), interaction between members and collaboration in ecosystems are more thorough than in communities. To study these interactions, we will therefore rely on previous work on services ecosystems (Vargo & Lusch, 2011) that we will complement with relevant inputs from the other theoretical trends (networks, communities, meta-organisations, platforms, etc.). Business ecosystems theories were also enriched by Teece (2007) who associates ecosystems with the notion of dynamic capabilities, considering that ecosystems evolve capabilities over time and align them with the vision of the ecosystem.

In a business ecosystem, firms can be working in different fields of activity but they usually gather around a leader (often called keystones firms or pivotal organization) who succeeds in imposing its technology (Daidj, 2011) or his commercial vision (Torrès-Blay, 2000). These organizations have specific roles in the ecosystem: they connect members of the ecosystem, they animate it, they have bigger power in decisions made by the ecosystem and usually have a role in representing the ecosystem to politicians and donors. It is important to identify which organisation can undertake this role of orchestrator because supporting this organisation and leaning on it would allow to improve efficiency of the use of funds and development projects. Moreover, hub organisations in sub-Saharan Africa could usually benefit from capabilities enhancement: it is thus necessary to have an evaluation grid allowing to assess the capabilities of hub organisations. This is the main contribution of this paper.

Design/Methodology/Approach

We conducted a review of scientific and grey literature to identify the different methods used to assess capabilities of organisations and the classifications of capabilities. We then added some capabilities identified during field work and that we thought were lacking (for example the performance of the services provided to innovators like the capacity to support several innovators, to provide numerous and diversified types of innovation support services, etc.).

In a second step, we consulted with the professionals and hub organisations that we previously identified to collect their opinion on the grid (were there any missing capabilities, is the choice of words understandable to practitioners, which member of the organisations would be the most appropriate to answer questions about the organisation's capabilities of, etc.). Finally, we tested the grid with several hub organisations in western Africa.

Findings

Literature review allowed us to divide the capabilities of organisations in three different groups: the capabilities related to the internal organisation of the institution, the ones related to production and delivery of services for innovators and finally those related to the way the organization relates to other members of the ecosystem. Each group includes several subgroups (cf *Figure 7*), themselves including several dynamic capabilities (cf *Table 1*). For example, the group "internal organisation" gathers the subgroups "leadership", "investment from the staff and in the staff", "structure", "culture", "missions and vision", "resources management" and "internal communication"; and the subgroup "leadership" includes the dynamic capabilities "manage power balance between members", "anticipate and manage competition", "having an inspiring leadership", "capacity to share governance", "capacity to make governance evolve".

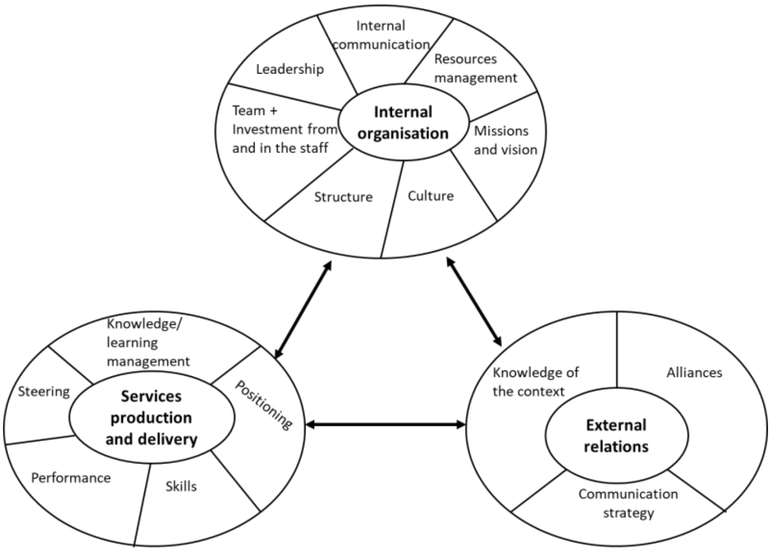


Figure 7: Groups and sub-groups of dynamic capabilities of the hub organisation of innovation support services ecosystems

Group	Sub-group	Capability	Reference
Organising	Leadership	Manage power balance between members of the ecosystem	Author
		Anticipate and manage competition (financial) between members	3
		Have an inspiring leadership	12
		Capacity to share governance	Author
		Capacity to make governance evolve	6
	Team + Investment from and in the staff	Capacity to choose members and partners of the ISSE	3 ; 7
		Complementarity between members	7 ; 12
		Capacity to face organizations coming in and going out of the ISSE	Author
		Generate interest from the staff of the member organisations	12
		Implement policies of skill enhancement in the ISSE	12
		Ensure appropriation of activities and decisions by the members of the ISSE and their employees	12
	Culture	Learn from experience	3 ; 12; 13
		Culture of collaboration and partnerships	12
		Culture of risk taking	12
		Align members' culture and ways of working	8
	Resources management	Capacity to identify capacities and resources at each partner	9
		Capacity to identify resources of the ISSE and look for financing	Author
		Capacity to allocate resources between members in an acceptable way	7

Group	Sub-group	Capability	Reference
Organising	Mission and vision	Build and implement a strategic vision	9 ; 10
		Make the strategy available and sensitize members	12
	Structure	Capacity to modify the functioning of the ISSE to make it work better	2 ; 7

		Capacity to choose an adequate functioning for the ISSE (and the type of relations between members and with other partners)	1 ; 4; 8
	Internal communication	Agree on division of roles and tasks between members of the ISSE	7
		Efficient communication to reduce risks of misunderstandings between members	7
		Capacity to transfer relevant information to other members	7
Service production and delivery	Positioning	Capacity of the ISSE to propose services "at the right time"	9
		Identify unmet needs in support / services	2 ; 3 ; 5 ; 7; 8 ; 9 ; 12
		Identify existing services (at other members of the ISSE or in the environment)	5 ; 9
		Monitor services provided by other ISSEs in other countries	3 ; 5 ; 6 ; 8
	Skills	Make the service range evolve	Author
		Organise and implement new services (without redundancies)	3 ; 6; 7
		Redesign the service offer (by unit, in package, etc.)	3 ; 7
		Capacity to involve beneficiaries in the innovation process	5 ; 8 ; 10 ; 12;
	Knowledge/ learning management	Implement mechanisms of co-learning, document lessons learned	3 ; 12
		Enhance skills by other members of the ISSE or others	Author
		Implement feedback mechanisms / monitoring and evaluations	6; 12
		Capacity to adapt after feedback	12
		Formalise knowledge (through manuals, decision tools, etc.)	13
	Steering	Exercise flexibility of innovation financing	2
		Implement mechanisms to test innovation and prototypes, etc.	2
	Performance	Capacity to support a large number of innovators	Author
		Capacity to provide several ISS	Author
		Capacity to provide several types of ISS	Author
External relations	Communication strategy	Implement mechanisms of communication towards beneficiaries	Author
		Implement mechanisms of lobbying and advocacy	2 ; 9
		Implement mechanisms to upscale the ISSE model	Author
		Make relevant choices of communication media	12
	Knowledge of the context	Being aware of the institutions supporting innovation in the country	8 ; 12
		Being aware of organisations / ISSE providing similar services	8 ; 12
		Anticipate evolutions of the environment	Author
	Alliances	Capacity to identify and mobilize new partners and structures able to support ISSE (networks, donors, etc.)	3; 6 ; 7 ; 12
		Participate to strategic events	8 ; 12
		"Contractualise" services absent of the organisation	6 ; 12

Table 1 : Dynamic capabilities of the hub organisation of innovation support services ecosystems (adapted from: 1. Argyres & Mayer, 2007; 2. Day & Schoemaker, 2016; 3. den Hertog et al., 2010; 4. Hennart & Zeng, 2005; 5. Kindström et al., 2013; 6. Lichtenthaler & Lichtenthaler, 2009; 7. Linde et al., 2021; 8. Lütjen et al., 2019; 9. Nenonen et al., 2018; 10. A. Toillier & Kola, 2018; 11. A. (OINR) Toillier et al., 2020; 12. Wopereis-Pura et al., 2019; 13. Zollo & Winter, 2002)

First, our results confirm the applicability of the different domains of capabilities that were explored. Meetings with hub organisations allowed us to add new capabilities and refine capabilities from the literature. Moreover, some capabilities were found to be more important than others in order to act as a hub organisation of an innovation support services ecosystem.

Practical Implications

This evaluation grid was designed to be useful to a wide range of actors: researchers who will be able to determine the necessary capabilities to endorse the role of hub organisation, donors who will then be able to identify the best organisation to rely on and support, and managers of development projects who will be able to identify capabilities needing enhancement and provide adequate activities to do so.

This evaluation grid will also be made available directly to hub organisations and their members in order for them to self-evaluate their capabilities and identify actions for capability enhancement and actors able to support them in this process.

Theoretical Implications

Different types of literature have been used to design this dynamic capabilities evaluation grid: the combination of scientific and grey literature allowed us to build an integrative framework of the different ways to analyse dynamic capabilities (DC). Moreover, theoretical streams of service ecosystems and dynamic capabilities have yet rarely been used jointly, this tool will thus allow us to deepen previous works on hub organizations by characterizing the necessary dynamic capabilities for the ecosystem to function and their level of mastering by organisations.

References

Argyres, N., & Mayer, K. J. (2007). Contract design as a firm capability : An integration of learning and transaction cost perspectives. *Academy of Management Review*, *32*(4), 1060-1077. https://doi.org/10.5465/amr.2007.26585739

Côte, F.-X., Rapidel, B., Sourisseau, J.-M., Affholder, F., Caron, P., Deguine, J.-P., Faure, G., Hainzelin, E., Malézieux, E., Poirier-Magona, E., Roudier, P., Scopel, E., Tixier, P., Toillier, A., & Perret, S. (2019). Agroecological transition of agriculture in the countries of the Global South : Taking stock and perspectives. In F.-X. Côte, E. Poirier-Magona, S. Perret, P. Roudier, B. Rapidel, & M.-C. Thirion (Éds.), *The agroecological transition of agricultural systems in the Global South* (Quae, p. 327-349). éditions Quae. https://doi.org/10.35690/978-2-7592-3057-0

Daidj, N. (2011). Les écosystèmes d'affaires : Une nouvelle forme d'organisation en réseau ? *Management & Avenir*, *n° 46*(6), 105-130. https://doi.org/10.3917/mav.046.0105

Day, G. S., & Schoemaker, P. J. H. (2016). Adapting to Fast-Changing Markets and Technologies. *California Management Review*, *58*(4), 59-77. https://doi.org/10.1525/cmr.2016.58.4.59

den Hertog, P., van der Aa, W., & de Jong, M. W. (2010). Capabilities for managing service innovation : Towards a conceptual framework. *Journal of Service Management*, *21*(4), 490-514. https://doi.org/10.1108/09564231011066123

Faure, G., Knierim, A., Koutsouris, A., Ndah, H. T., Audouin, S., Zarokosta, E., Wielinga, E., Triomphe, B., Mathé, S., Temple, L., & Heanue, K. (2019). How to Strengthen Innovation Support Services in Agriculture with Regard to Multi-Stakeholder Approaches. *Journal of Innovation Economics*, *28*(1), 145. https://doi.org/10.3917/jie.028.0145

Fréry, F., Gratacap, A., & Isckia, T. (2012). Les écosystèmes d'affaires, par-delà la métaphore. *Revue française de gestion*, *38*(222), 69-75. https://doi.org/10.3166/rfg.222.69-75

Frow, P., McColl-Kennedy, J. R., & Payne, A. (2016). Co-creation practices : Their role in shaping a health care ecosystem. *Industrial Marketing Management*, *56*, 24-39. https://doi.org/10.1016/j.indmarman.2016.03.007

Hennart, J.-F., & Zeng, M. (2005). Structural determinants of joint venture performance. *European Management Review*, *2*(2), 105-115. https://doi.org/10.1057/palgrave.emr.1500034

Kindström, D., Kowalkowski, C., & Sandberg, E. (2013). Enabling service innovation : A dynamic capabilities approach. *Journal of Business Research*, *66*(8), 1063-1073. https://doi.org/10.1016/j.jbusres.2012.03.003

Lichtenthaler, U., & Lichtenthaler, E. (2009). A Capability-Based Framework for Open Innovation : Complementing Absorptive Capacity. *Journal of Management Studies*, *46*(8), 1315-1338. https://doi.org/10.1111/j.1467-6486.2009.00854.x

Linde, L., Sjödin, D., Parida, V., & Wincent, J. (2021). Dynamic capabilities for ecosystem orchestration A capability-based framework for smart city innovation initiatives. *Technological Forecasting and Social Change*, *166*, 120614. https://doi.org/10.1016/j.techfore.2021.120614

Lütjen, H., Schultz, C., Tietze, F., & Urmetzer, F. (2019). Managing ecosystems for service innovation : A dynamic capability view. *Journal of Business Research*, *104*, 506-519. https://doi.org/10.1016/j.jbusres.2019.06.001

Mathé, S., Faure, G., Knierim, A., Koutsouris, A., Ndah, T., Temple, L., Triomphe, B., Wielinga, E., & Zarakosta, E. (2016). *AgriSPIN Deliverable 1.4 : Typology of innovation support services*. 19.

Moore, J. F. (1993). Predators and Prey : A new ecology of competition. *Harvard Business Review*, *71*(3), 75-86.

Moore, J. F. (2006). Business Ecosystems and the View from the Firm. *The Antitrust Bulletin*, *51*(1), 31-75. https://doi.org/10.1177/0003603X0605100103

Ndah, H. T., Knierim, A., Gerster-Bentaya, M., Mathé, S., Audouin, S., Crestin-Billet, S., Randrianarison, N., Toillier, A., Melachio, M., Fongang, G., & Temple, L. (2020). *Guidelines for applying the methodology and tools for characterizing innovation support services and providers, SERVInnov project, Deliverable 1.2* (p. 33). Universität Hohenheim.

Nenonen, S., Gummerus, J., & Sklyar, A. (2018). Game-changers : Dynamic capabilities' influence on service ecosystems. *Journal of Service Management*, *29*(4), 569-592. https://doi.org/10.1108/JOSM-02-2017-0025

Teece, D. J. (2007). Explicating dynamic capabilities : The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, *28*(13), 1319-1350. https://doi.org/10.1002/smj.640

Toillier, A., & Kola, P. (2018). *Renforcer les capacités des organisations fournissant des services support à l'innovation*. CDAIS.

Toillier, A., Kola, P., Mathé, S., Tsafak, S., Dabiré, D., & Triomphe, B. (2019). The ecologisation of agriculture through the prism of collaborative innovation. In F.-X. Côte, E. Poirier-Magona, S. Perret, P. Roudier, B. Rapidel, & M.-C. Thirion (Éds.), *The agroecological transition of agricultural systems in the Global South* (QUAE, p. 251-270). éditions Quae. https://doi.org/10.35690/978-2-7592-3057-0

Toillier, A. (OINR), Sempore, A., Kola, P., Segda, Z., & Yameogo, G. (2020). *Developing capacities for the agricultural innovation system in Burkina Faso : Outputs and outcomes of the CDAIS project* (p. 38). FAO - MESRI - CIRAD.

Torrès-Blay, O. (2000). *Économie d'entreprise : Organisation et stratégie à l'aube de la nouvelle économie*. Paris : Economica, DL 2000, cop. 2000.

Vargo, S. L., & Lusch, R. F. (2011). It's all B2B…and beyond : Toward a systems perspective of the market. *Industrial Marketing Management*, *40*(2), 181-187. https://doi.org/10.1016/j.indmarman.2010.06.026

Wopereis-Pura, M., Kola, N. P., Toillier, A., Ekong, J., Hawkins, R., Eshetu, S., & Dobson, H. (2019). *Organisational strengthening—A Guide to the coaching process* (p. 52) [Manuals and Guidelines / CDAIS]. Agrinatura, FAO. https://cdais.net/publications/guides-manuals/

Zollo, M., & Winter, S. G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science*, *13*(3), 339-351. https://doi.org/10.1287/orsc.13.3.339.2780

Session 1D - The stakes of the transmission of knowledge for the agroecological transition

The role of formation and social relationships into the traditional knowledge access: comparison between France and Benin

Maretz[1] Lorine, Levy[2] Rachel
[1] LEREPS, University of Toulouse
[2] LEREPS, ENSFEA

Short abstract

This article aims to determine the place of social relations to access to agricultural knowledge and more specifically to access to endogenous knowledge toward agroecology in France and Benin. It proposes a study of the relationships mobilized by farmers through the method of relational chains. This work is based on the analysis of fifty semi-structured interviews conducted with farmers inside the two countries. It aims to know if the farmers of the two countries mobilize the same types of relations in the access to this knowledge and the importance of these relations in the maintenance and the transmission of agroecological practices. Our results show that if training is one of the main sources of access to endogenous knowledge, it is however often accompanied by exchanges with the family, and always accompanied by exchanges with other producers. These exchanges between producers often focus on feedback and are possible mainly thanks to the relationships created during the training or organized grouping times. At the end of the training, the personal relationships mobilized, although different depending on the country, remain one of the main sources of access to endogenous knowledge and agroecological practices present in the territories.

Extended abstract

Purpose

Currently, agriculture faces many challenges and particularly, it must ensure global food security by maintaining quality production in sufficient quantity and secondly, it must preserve the natural resources on which it depends and adapt to climate change and its consequences. All this while reducing its greenhouse gas emissions and its impact on biodiversity by maintaining regulatory ecosystem services. To meet these challenges, many governments are turning to agroecological models and lending them virtues that can reduce poverty and fight global food insecurity (Besse and Del-Corso, 2021). Agroecology is also a means of achieving regular agricultural results, particularly in small-scale production systems intended for food production. Agroecological transition therefore appears to be an appropriate alternative to productivist agriculture.

Agroecological transition corresponds to a set of virtuous practices for the environment that have sometimes been present for many years. This concept concerns both the scientific world and both the actors in the field, who have a body of knowledge that can be decisive for the environment. Thus, many initiatives have been set up, both on the initiative of researchers and actors in the field, aimed at developing knowledge around agroecological practices. It therefore becomes necessary to take an interest in existing knowledge and its method of transmission in the context of an agroecological transition. Agroecological approaches based on exchanges and the pooling of experiences between farmers have been inaugurating new forms of collective learning in recent years. This collective learning is sometimes based on endogenous knowledge to support innovation while limiting technical and economic risk-taking. Traditional agricultural knowledge played a decisive role in maintaining rural ecosystems before they were challenged by the green revolution and the industrialization of the agricultural world. Nevertheless, to achieve this transition we need to better understand the resources which are mobilized to access agroecological practices mobilizing these traditional knowledge in different contexts (France and Africa) and in particular what is the role of training in the transmission of this knowledge.

Theoretical Implications

The term agroecology is not new, however its use in many scientific fields is quite recent. It was only in the 1990s that agroecology spread in the scientific world and then experienced several attempts at definition. For Altieri (1992) it is a mode of production based on reducing the environmental impact of agriculture by reducing chemical inputs and approaching an agro-ecosystem vision of agriculture. According to Gliessman (2018), agroecology first emerged as a form of resistance and an alternative to the green revolution and the industrialization of agricultural production. This term is used both in science and both as a description of a movement or alternative agricultural practices (Wezel et al. 2009). However, all the authors therefore agree that agroecology is an alternative to intensive or productivist agriculture and aims to respect the environment and the agro-ecosystem through practices and a production system that are more respectful of resources. The agroecological transition corresponds to the process of transformation of the agricultural system, going through a “change of model to implement the principles of agroecology” (Hazard et al., 2017). Changes in the agrarian system concern both the values of the actors and the techniques used by them and the duration of transformation can vary from one actor or system to another. Transition designating the process of transformation, it is more particularly the stages leading to a more sustainable agriculture and respecting the principles of agroecology (Hazard et al., 2017).

The dissemination and dissemination on a larger territorial scale of agroecological approaches, however, comes up against significant socio-cognitive obstacles. Indeed, the adoption of agroecological practices is conditioned in particular by significant mental transformations in agriculture: the need to break with the well-established habit of the systematic use of products. To achieve these objectives, particularly in the territories of the countries of the South, the mobilization of endogenous or local knowledge may be a response to the agroecological transition. Bambridge and Le Meur (2018) define endogenous knowledge as being historical products, resulting from the knowledge of societies. Sambo (2018) defines endogenous knowledge as forms of local and community knowledge that can be mobilized by actors to reduce the vulnerability and increase the resilience of agro-pastoralists in the face of the consequences of climate change. There are many definitions for these terms, however there is no consensus around the definition of the concept and thus a great polysemy of the concept. However, these type of knowledge has tended to disappear in many countries, mainly due to changes in production methods but also changes in production varieties. But, many authors have sought to study endogenous knowledge as a solution or strategy for adapting to climate change among farmers (Sambo, 2018). Many works have proposed specific case studies in different fields, particularly in Africa, with the aim of identifying the endogenous knowledge mobilized. Indeed, endogenous knowledge is therefore seen today as a solution for adaptation and reduction of the impacts of climate change, however their implementation depends initially on the beliefs of farmers but also on the sometimes fluctuating cropping calendars (Séhouéto, 2006). Our main hypothesis is therefore that endogenous knowledge is a means of accessing an agroecological transition, both in the countries of the South as Benin but also in the countries of the North as France.

It is therefore important to take an interest in existing social relations and mobilized within the framework of an agroecological transition. Indeed, endogenous knowledges are transmitted through the personal relationships of individuals, in particular with transmission from an early age, from parents or previous generations to children (Roué, 2012). Social relations allow access into many agricultural resources, whether material or immaterial (Lin, 1995). It is also important to specify that local knowledge is essential intangible resources for agriculture and in particular surrounding issues of adaptation to climate change and agro-ecological or alternative practices. According to E. Lazega (2014), social relations are both a "channel for the transfer or exchange of resources" (Lazega, 2007) and both a "commitment to the partners of the exchange (Lazega, 2007). These relationships also include a “utility dimension”, they are not just about the pleasure of being together and sharing moments of sociability. Social relationhips can be a means of accessing certain resources necessary for the individual and these can have as their objectives certain resources to establish relations.

Design/Methodology/Approach

This article is based on a semi-structured interview survey carried out as part of a research project on endogenous knowledge and agroecology in Africa and Occitania. The aim of the project was to map endogenous knowledges, as well as the actors of agroecology and the obstacles and levers to the agroecological transition in Occitania and West Africa. The interviews were carried out with farmers engaged in a collective or individual agroecological approach in the different territories both in France and in Benin. In France, the field of study is the Occitanie region, located in the South / South-West of France and comprising 13 departments. In Benin, the study area is located in the municipality of Abomey-Calavi, bordered by two watersheds, of which nearly ¾ of the area is drained towards the Ouémé River and the remaining quarter towards the Zou River.

This article is based on a field survey using semi-structured interviews. Prior to the interviews, we carried out a common grid focusing on the different endogenous knowledge used by the farmers, their origin, the different resources necessary for their activity and the funding allowing them, as well as their origins. We have also analyzed the interviews using the method of relational chains, by coding the results using relational maps (Wellman and Berkowitz 1988, Lazega (2014) in order to be able to make a quantitative treatment. We started from the relationships cited during the interview and placed them around the farmer according to the information available (strength of the relationship, proximity between actors, other relationships between actors, etc.) codified the relations by colors according to their main characteristics which allowed us to obtain diagrams of representation of the interactions between the individuals. The realization of map of the social relations allows us to visualize the various relations mobilized by the actors, the resources they make it possible to achieve, as well as the weight and proximity of these relationships.

We therefore met 16 farmers in France, including 8 market gardeners, 3 cereal growers, 1 fruit grower, 1 wine grower, 3 breeders, all were in agroecology at least in part. In Benin, we met 11 farmer cooperatives and 12 independent producers. All practice agro-ecological subsistence agriculture, localised mainly on market gardening and rice growing.

Findings

The interviews carried out on the two study sites enabled us to show that Beninese farmers have a majority of 4 relationships concerning agriculture and endogenous knowledge. In these relationships, we most often find the family first, then neighbouring producers and quite rarely institutions or training centres. According to them, these are mainly informal relationships within the village, or within the family. Producers also told us they exchange with neighboring producers. In France, farmers mobilize an average majority of 5 relationships. They exchange quite often with other producers, without necessarily restricting themselves to geographical proximity. Very few mentioned their families to us as relationships around agroecological practices, however the family still appears in the relationships cited mainly for support.

Regarding the types of knowledge sources mobilized, there is a big difference in the relationships mobilized depending on the country. Thus, in France, access to endogenous knowledge is mainly through training or agricultural education establishments. Secondly, we see the importance of exchange between producers and of experimentation, which are often linked by exchanges around feedback between more experienced and neophyte farmers. Conversely, in Benin, educational establishments and agricultural training organizations have little weight in exchanges, while transmission is mainly through family ties or the religious community. This difference is explained in particular by the knowledge or not of the training organizations or the organizations for the promotion of agroecology present in the field by the farmers.

The interviews also allowed us to determine that access to endogenous knowledge does not occur through a single source or a single relationship, but through the complementarity of relationships and sources and into the two cases, the relationships most mobilized by farmers in access to endogenous knowledge are the family and other producers.

Practical Implications

Thus, to promote the transmission of agroecological practices mobilizing endogenous knowledge, three sets of conclusions and recommendations can be drawn from this analysis. First of all, we have seen that despite some differences in the main sources of access to knowledge, the mobilization of this endogenous knowledge to promote agroecology is quite similar between the African (Benin) and European (France) contexts. Thus, it is necessary to multiply the sources of knowledge and promote training of this type in both contexts. But this also means that it is necessary to promote exchanges of practice and training between the two contexts which, although different, can be mutually enriching.

The second result concerns the important role of sources of knowledge complementary to training, whether family relations or exchanges between producers in both contexts. This result leads us to suggest that training in agroecology, whatever the context, must integrate both the mobilization of endogenous knowledge, but even more must encourage actors to mobilize various sources of knowledge.

The third result concerns the important role of training, whatever the context, but also the weak mobilization of this source of access to knowledge, particularly in southern contexts. This result leads us to suggest the need to disseminate much more information on the existence and the possibility of access to these training courses to various audiences.

References

Altieri, M. (1995). *Agroecology: The Science of Sustainable Agriculture*. 2nd ed. Boulder, Colo. : London: Westview Press ; IT Publications, 1995.

Bambridge, T. and Le Meur p. Y. (2018). « Savoirs locaux et biodiversité aux îles Marquises ». *Revue d'anthropologie des connaissances* 121, nº 1, 29-55.

Besse, K. et Del Corso, J.P., (20211). « L'agroécologie face aux croyances. Le cas de Mankosi en Afrique du Sud ». *Mondes en développement* 196, nº 4, pp. 81-99.

Gliessman, S. (1995). « Sustainable Agriculture: An Agroecological Perspective ». In *Advances in Plant Pathology*, édité par J. H. Andrews et I. C. Tommerup, 11:45-57. Academic Press, 1995.

Hazard, L., Magrini, M.B. and Martin, G., (2017). « Transition agroécologique : Définition », *Dictionnaire de l'agroecologie* (online)

Lazega, E., (2007). . « Réseaux sociaux et structures relationnelles », 2007, 81.

Lin, N. (1995). « Les ressources sociales: une théorie du capital social ». *Revue française de sociologie* 36, nº 4 (1995): 685-704.

Roué, M., (2012). « Histoire et épistémologie des savoirs locaux et autochtones ». *Revue d'ethnoécologie*, nº 1 (20 novembre 2012).

Sambo, A., (2018). « Les savoirs endogènes comme stratégies d'adaptation au changement climatiques chez les agriculteurs, les éleveurs et les agropasteurs de l'extrême nord du cameroun. » *Revue Science et Technique, Lettres, Sciences Humaines et Sociales* 4, nº Hors-série, pp. 11-25.

Séhouéto, L. (2006). « Savoirs agricoles localisés et production vivrière en Afrique subsaharienne ». *Revue internationale des sciences sociales* 187, nº , pp. 127-34.

Wellman, B. and Berkowitz, S.D. (1988) *Social Structures: A Network Approach*. CUP Archive, 1988.

Wezel, A., Bellon, S., Doré, T., Francis C., Vallod D., and David ; C. (2009). « Agroecology as a science, a movement and a practice. A review », *Agronomy for Sustainable Development* 29, nº4, pp. 503-15.

Agricultural education and its audiences facing the challenge of climate change. A socio-economic analysis of the contribution of this training device to the implementation of Nature-Based Solutions

Asloum[1], Nina ; Gallai[2], Nicola and Del-Corso[2], Jean-Pierre
1UMR EFTS-ENSFEA, 2 route de Narbonne, 31326 Castanet-Tolosan, France
2 UMR LEREPS-ENSFEA, 2 route de Narbonne, 31326 Castanet-Tolosan, France

Short abstract

Climate change and its consequences on our society are a concern for all the population. In order to reduce or adapt to the coming changes, we need to modify our lifestyles. To accompany this change of practices, different means can be used but one of the most important is the education of young people. It is therefore important to modify diplomas, training and teaching in order to integrate the issue of climate change and its solutions. In this study, we want to present such a process for the training of French agricultural high schools. To do so, we surveyed 10 agricultural high schools and 300 students. We started our analysis by focusing on the knowledge and perceptions of the students on climate change, then we did the same with their teachers. In a final step, we brought the teachers together to present the results of the surveys and discuss how to integrate these results into their teaching.

Extended abstract

Purpose

The issues of climate change are challenging growing sections of civil society. Citizens are beginning to organize in order to raise awareness and put pressure on governments. In particular, mobilization is growing among youth. "The global climate strike movement" inaugurated in 2018 by Swedish high school student Greta Thunberg has been emulated in various other countries, including France. Based on the alarming conclusions of the report of the Intergovernmental Panel on Climate Change (IPCC), these youth movements are demanding a new way to deal with the climate issue. In particular, they militate for the maintenance of the integrity of all ecosystems and the preservation of biodiversity to be placed at the heart of the fight against global warming. In other words, they want "Nature-based Solutions" (NBS) to be privileged in this fight.

Nature-based solutions are defined by the International Union for Conservation of Nature (IUCN) as, "actions to protect, sustainably manage, and restore natural or modified ecosystems to directly address societal challenges in an efficient and adaptive manner, while ensuring human well-being and producing benefits for biodiversity" (2016, p.6). The idea carried by this concept is that preserving, restoring, or creating ecosystems provide different types of services for society (regulatory services, provisioning services, and cultural services). In the case of climate change, the ecosystem services concerned are regulating services, which aim at mitigating climate change or adapting ecosystems and populations to its effects.

However, if the NBSs meet with a growing success in the citizen mobilization of youth as well as in the scientific community, their practical implementation is not self-evident. Indeed, the latter requires not only the development of new scientific and technical knowledge, but also requires the adherence of actors to new values (those related, in a general way, to the recognition of the primacy of Nature over human activities) and to the establishment of a concerted management of natural resources on a territorial scale.

Based on these observations, the purpose of this research is to analyze and understand how youth and teachers actually position themselves with respect to NBSs and how this may impact the trainings with which they are affiliated. Few studies have so far focused on this category of the population. Yet it is today's youth who will suffer the most from the impacts of global warming and, if nothing is done, who will have to adopt emergency measures in the future.

Design/Methodology/Approach

Field of study

Within the framework of a project called DEFICLIM (Labex SMS), we have created a network with 10 agricultural high schools, 20 teachers of economics, agronomy and biology and one to two classes of BTSA per school ranging from 10 to 50 students. The aim of this project is to analyze the perception of climate change and nature-based solutions of these young people. This allowed us to create a team of teachers committed to the survey protocol from the beginning.

Methodology

In order to help teachers evolve their practices towards a better integration of climate change issues, we used a three-step method (Figure 1). The first step consists in estimating and ranking the preferences for NBSs of students. More precisely, we want to know and analyze their preferences towards these NBSs and their capacities to project themselves towards actions for the protection and maintenance of these NBS.s To do so, we use economic valuation to identify and measure their preferences and guide public policy makers (Sutter et al., 2019). Some work has already shown that these young people may be willing to pay for environmental protection whether it is to reduce the risk to their health (Guerriero et al., 2018) or for environmental protection more generally (Dardanoni and Guerriero, 2021).

To conduct this monetary assessment, we chose the Deliberative monetary valuation approach (DMV, Kenter, 2017). DMV is based on a complex process. Its implementation relies on a combination of Choice Modeling and deliberation. Choice Modeling would capture the individual preferences of young adults regarding Nature-based Solutions. Using an individual questionnaire, it is possible to identify how young people position themselves with respect to these solutions (the value they attribute to them), the way in which they envisage mobilizing them in their future professional activity, the changes in behavior that they are ready or not to make in order to do so, etc. Deliberation allows us to examine the extent to which an interactive debate between students can change the group's representations of NBSs and lead participants to evaluate their common priorities for NBSs. This examination is done through focus groups with project stakeholders.

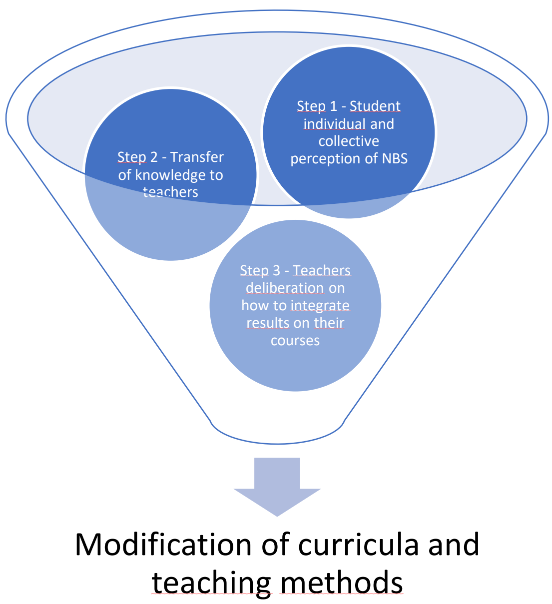


Figure 8 – A three step approach

The second step is to transfer this knowledge to teachers. Themes related to the use of NBS for climate change adaptation, and more broadly to the management of environmental commons, are becoming increasingly important in agricultural education curricula. However, teachers, especially economics and management teachers who were our main contacts during the initial stages of our research, do not always have the conceptual and methodological frameworks to deal with these topics with their students. The teachers' difficulties are all the more exacerbated because scientific advances in the fields of environmental economics and natural resources are relatively recent and the scientific knowledge produced has so far only been partially transposed into agricultural technical education. The first stage described above was the opportunity to carry out an initial transfer of this knowledge via the individual surveys carried out and the deliberative workshops set up (concepts of private, club, common, public goods; ecosystem services; territorial governance, etc.). Moreover, if the activities proposed to the students served to collect material essential to our research, they also contributed to the construction by the students, but also the teachers, of the operative value of the said knowledge thanks to their implementation in the resolution of concrete cases. Finally, these activities allowed the teachers to experiment with new methodologies that could be used in the classroom (network analysis and economic evaluation methods) and to test new tools for raising environmental issues with the students. In our opinion, these transfers need to be continued and deepened.

Finally, the third step aims to accompany the teachers in the action in organizing a workshop with the 20 teachers that participate to the project. From the preceding stage, the teachers are supposed to become aware of the new knowledge on the Climate Change and NBS, but also of the perceptions of young people regarding these environmental issues. To measure this, before the workshop, an online questionnaire will be sent to the participants in order to collect their representations of a teaching-learning point, the definition that each of them attributes to climate change, the values and anti-values that they associate with it. This seems important to us because we consider that education and the issue of climate change inevitably mix knowledge, social and political values (Roth, Barthes & Cohen, 2020). During the workshop, in order to understand the social representations of teachers with regard to climate change, the focus group will also allow us to encourage the expression of these values and anti-values[3]. To understand teachers' social representations of climate change, we will mobilize the work of the Aix School, which approaches social representations from the theory of the central core and peripheral elements (Abric, 1994). They are therefore asked to work together to create lectures and tools integrating these new knowledge and values.

Findings

For the moment, the first two stages are finished and the material collected is being analyzed. However, the workshop with the teachers will take place between May 10 and 12. Nevertheless, we can already draw some lessons from this material.

- The online student survey shows that the vast majority of students are aware of climate change issues and only 3% appear to be climate skeptics. In contrast, although a large proportion of students are aware of Nature-based Solutions, very few see them as threatened. As a result of the class discussion, 61% of students revised their judgment of NBS by considering that the use of NBS could effectively address climate change.
- The economic evaluation based on the responses to the individual questionnaires reveals that students are very sensitive to the preservation of fruit and vegetable quality, terrestrial and aquatic biodiversity. Maintaining water availability is an attribute considered less critical. Students stated that they are willing to pay in the form of a pledge from conservation organizations the equivalent of 76 euros per month to ensure the maintenance of these three attributes: 29 euros per month for terrestrial biodiversity, 24 euros per month for aquatic biodiversity, and 23 euros per month fruit and vegetable quality. After deliberation, the students make a radical change in the values attributed to NBSs. They are no longer willing to pay to protect them, while at the same time the

[3] For Canguilhem (1966°: "any value must be gained against an anti-value" as a test of a contestation" (norm/anti-norm).

students indicate that the debate has made them more aware of the importance of maintaining the benefits of NBS.

- Discourse analyses provide some insights into this paradox. While deliberation is accompanied by a greater awareness of the importance of NBSs for society, students believe that the preservation of the environmental goods that give rise to NBSs requires a shared effort. Thus, they are willing to make individual efforts only if others do as well.

For their part, the teachers learned about these results and debriefed them with their students. They also created a think tank or knowledge sharing group in which they exchanged book references and other knowledge vectors around climate change and NBS.

Practical Implications

The project is not finished, but the practical implications are already present. First, individual teachers have begun to receive training on the impacts of CC through a French professional training process called "Plan National de Formation". These PNFs are offered by the French Ministry of Agriculture. Other teachers decided to train in the animation of the "fresque du climat" (https://fresqueduclimat.org) which is a pedagogical tool use to raise awareness on CC issues. As a group of teachers has created an exchange group on new knowledge in environmental economics.

In the longer term, we hope that this project will have a deeper impact on teachers' practices.

Theoretical Implications

Even if this project is more practical than theoretical in scope, the theoretical dimension remains present. Firstly, because we would like to have our teacher support protocol validated by a scientific expert committee. We believe that this protocol, which starts from the individual and collective knowledge and perceptions of the students, is relevant. Indeed, it allows to bring a new point of view to the teacher on these practices and the object of his job. In France, teachers in agricultural high schools undergo one year of training before being confronted with their students. During this year, they consolidate their theoretical knowledge, learn the didactics of the disciplines and get to know some pedagogical tools. However, during this training time they are rarely in the presence of students and consequently, they produce their lessons with missing data. Our protocol helps to fill these gaps.

Another theoretical implication is the use of DMV. It is a recent method and very little used because it is complicated to organize. Indeed, in order to implement this method, it is necessary to ensure the presence of a sufficient number of people to be able to perform econometric analyses. We were able to carry out this experiment and will be able to compare our results with those of the literature.

References

Abric, J.C. 1994. « L'organisation interne des représentations sociales : système central et système périphérique ». *Dans* : Guimelli, C. (Ed). *Structures et transformations des représentations sociales*. Paris, Delachaux et Niestlé, pp. 73-84.

Dardanoni, V., Guerriero, C., 2021. Young people' s willingness to pay for environmental protection. Ecological Economics 179, 106853. https://doi.org/10.1016/j.ecolecon.2020.106853

Guerriero, C., Cairns, J., Bianchi, F., Cori, L., 2018. Are children rational decision makers when they are asked to value their own health? A contingent valuation study conducted with children and their parents. Health Economics 27, e55–e68. https://doi.org/10.1002/hec.3562

Kenter, J., 2017. Deliberative Monetary Valuation, in: Routledge Handbook of Ecological Economics. Taylor & Francis, p. 552.

Roth X., Barthes A., Cohen J. 2020. Plaidoyer pour les antivaleurs. Penser l'éducation, Laboratoire CIVIIC, 47. hal-03537811

Sutter, M., Zoller, C., Glätzle-Rützler, D., 2019. Economic behavior of children and adolescents – A first survey of experimental economics results. European Economic Review 111, 98–121. https://doi.org/10.1016/j.euroecorev.2018.09.004

Agricultural education students as "intermediaries" in the fight against climate change

Levy[1] Rachel, Del Corso[1] Jean-Pierre

[1] LEREPS, ENSFEA

Short abstract

The proposition aims to better understand how agricultural education students position themselves on the issue of climate change. The research is based on an online survey and semi-structured interviews with young adults enrolled in French agricultural high school. The collected material is used to determine students' beliefs about climate change. We manage to uncover the modes of access and dissemination of knowledge on climate change within the student population surveyed. Our study also makes it possible to identify, on the one hand, the interaction relationships between high school students and, on the other hand, between them and territorial and non-territorial actors. For this, the authors examine in what and how three contrasting cultural dimensions: the school, the social networks and the territories of life shape their beliefs on the subject and endow them with a power of intermediation in the said dimension. The study highlights that these three cultural dimensions contribute to forging their opinions. Moreover, it shows that if the students ensure a function of intermediary within the cultural spaces considered.

Extended abstract

Purpose

The issue of climate change challenges growing sections of civil society. Citizens are beginning to organize to raise awareness and put pressure on governments. Mobilization is particularly strong among young people. Yet, although today's youth will suffer the heaviest toll, few studies have so far focused on how this section of the population forms its opinions on climate change (Han and al., 2020). As an extension of this literature, this article pursues two main objectives. First, it aims to identify more precisely the sources of knowledge of young people on climate change and to better understand how this knowledge circulates within this population. Then, it aims to analyze how young people themselves contribute to the circulation of this knowledge and manage to mobilize it in concrete actions.

From a theoretical point of view, the research is based on contributions from the economics of institutions (Denzau and North, 1994) and cultural-historical psychology (Bruner, 1996). The interest of part of this literature is to consider that cognition is the reflection of an inscription in a particular culture. In this article, the belonging of young people to three contrasting cultural spaces, social networks, school and territories of life, will be considered as an important key to access and understand their ways of thinking about climate change and of reasoning about actions. to combat its effects. By mobilizing work on intermediaries (Howells, 2006; Nadoux and Talandier 2020), we also examine how young people are intermediaries, contributing to the transformation of knowledge on climate change, within these three spaces.

From a methodological point of view, the research is based on an online survey and semi-structured interviews with young adults enrolled in classes for the Brevet de Techniciens Supérieurs Agricoles (BTSA). The collected material is used to access students' beliefs about climate change. Through an analysis inspired by the method of studying social networks by relational chains and quantified narratives (Grosseti and Bes, 2001), we manage to uncover the modes of access and dissemination of knowledge on climate change. within the student population surveyed. Our study also makes it possible to identify, on the one hand, the interaction relationships between high school students and, on the other hand, between them and territorial and non-territorial actors. Through this, we more accurately identify the role of BTSA students as intermediaries.

Theoretical Implications

We use an institutionalist and psycho-cultural framework to analyze how individuals acquire beliefs about climate change. This literature emphasizes the socio-cultural and institutional anchoring of cognition. In the field of institutional economics, Commons (1934), argues that men living in society, it is within the framework of social interactions that habits of thought are formed. Denzau and North (1994) argue that individuals' mental models derive from their cultural heritage. These authors consider that culture determines the nature of individual and collective learning. d'Andrade (2003) also specifies that it is through institutions that the process of legitimizing cultural meanings takes place. In our study on youth, we are particularly interested in the cultural and institutional dynamics at work in three spaces: school, social networks and territories.

As Bruner (1996) points out, education is the main entry point into a culture and schools are called upon to play an essential role in this regard. Then, social networks have become places for the circulation of information and knowledge on the formation of the ways of thinking of young people is indisputable (Boulianne et al., 2020). Finally, the registration of young people in one or more territories is likely to influence their reasons and their power to act. We argue that belonging to these three cultural spaces is likely to give young people a special role in the process of circulating knowledge on climate change. The concept of "intermediary" helps us to better characterize this role.

The concept of intermediary was initially mobilized in the literature on economics of innovation and knowledge to better describe the mechanisms of knowledge transfer, particularly between science and industry. Community articulators were first referred to by Brown and Duguid (1998). These individuals help translate perspectives or knowledge held within one community into the language of another community. Several authors in territorial economy have recently introduced the concept of territorial intermediary (Nadou and Talandier, 2020). We use this literature here to examine to what extent young people trained in agricultural education can be intermediaries, particularly territorial intermediaries, and more broadly how agricultural education can be understood as an institutional device for territorial intermediation.

Design/Methodology/Approach

Agricultural education and its audiences are at the center of the study conducted here. The survey protocol concerns more particularly students in the first and second year of the Brevet de Techniciens Supérieurs Agricoles (BTSA), who are therefore potentially close to exercising a profession in the agricultural and rural environment. The survey was carried out among students from training courses with contrasting objectives: BTSAs focused on agricultural production and processing professions, BTSAs more oriented towards nature management and protection professions and occasionally various other specialties. In total, the survey concerned 16 classes of agricultural high schools located in rural and peri-urban areas of the greater south-west and south-east of France.

From a methodological point of view, an online survey was conducted in sixteen classes. Through this survey, the aim was to assess the sensitivity of this population of students to climate change, to identify the practices adopted to deal with it, the sources of information and knowledge of this public on this theme, the possible role of students in the dissemination of this information and knowledge. In total, the online survey involved nearly 300 students.

The survey was completed in May and June 2020 by twelve semi-structured interviews carried out by telephone with students who had already responded to the online survey. The purpose of these interviews was to have more precise information to better understand the role played by the students in the dissemination of information on climate change. The interviews were fully transcribed. The use of the analysis methodology in terms of quantified narration (Grosseti, 2016) then allowed us to reconstruct the relational chains of access to information sources.

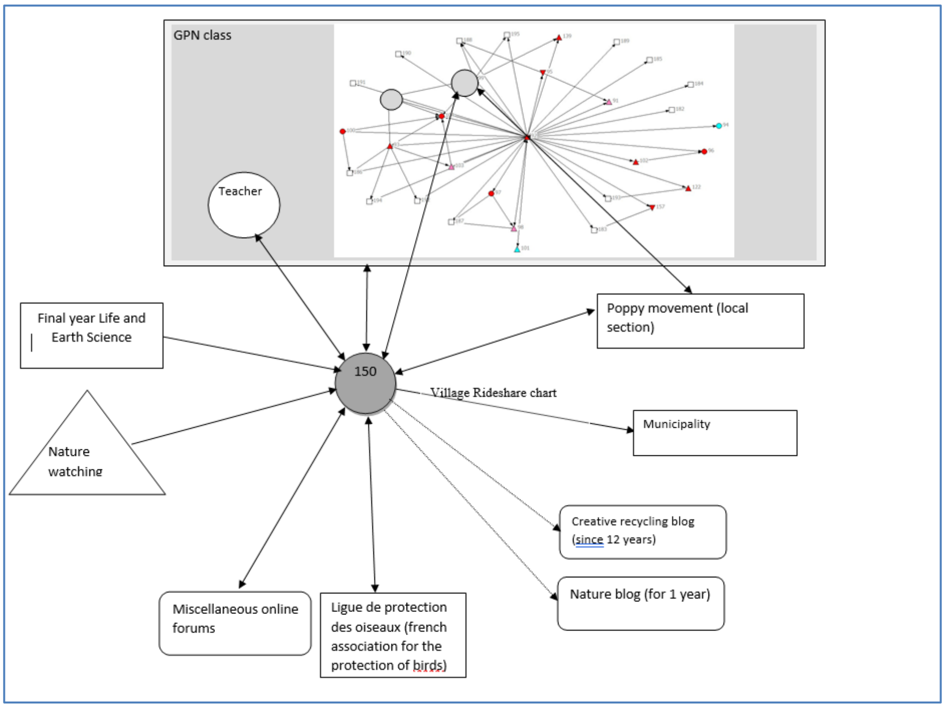
Findings

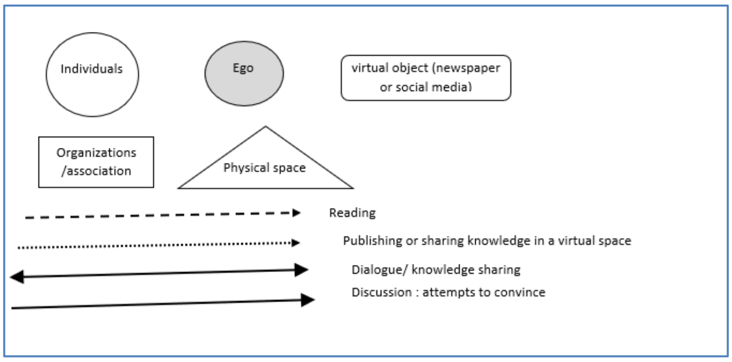
Our results show that young people are on the whole very sensitive to the issue of climate change. The level of sensitivity is independent of gender and socio-professional origin. It is less so of the training sector or the place of life. Thus, students are all the more sensitive to climate change if they follow training related to the preservation of the natural environment and if they come from an establishment located in a rural area.

The School and social networks are two major cultural spaces in which students learn about climate change. However, they do not place the same level of trust in the information circulating in these two spaces. Students indicate that they regularly use social networks for information. However, they show a strong distrust vis-à-vis the information coming from them. Along with social networks, the School is the source of information most used by students. Agricultural establishments are emerging as spaces for interactive exchanges within which opinions on climate change are formed and transformed. The teaching methods at work in these establishments stimulate the confrontation of ideas.

To go further, we have proposed representations to better characterize the intermediary function provided by students in their classes, in social networks and also in their living areas. The following example reveal that the characteristics of the territories of life are important elements to take into account to understand the beliefs of the students vis-à-vis climate change. Rural territories, through the direct observations of the evolution of natural environments that they make possible, are indeed essential sources of knowledge for students on this phenomenon. Moreover and above all, these same territories of life offer cultural and institutional frameworks conducive to the deployment of individual and collective action. Thus, several students noted that the high level of social capital in these places of life represented a real opportunity to promote new practices such as carpooling or selective sorting. In this, the territory, specifically in rural areas, appears as a space for innovation because it potentially creates new rules and standards of behavior.

Illustration 1: Schematic representation of student 150's role as an intermediary



Key: 

Practical Implications

In this work, we confirmed the conclusions of other works which showed the high level of awareness of the youth vis-à-vis the issue of climate change. In our case, we have shown that social networks, the School and the territories of life constitute three cultural spaces contributing complementary and significantly to this awareness. These three spaces undeniably contribute to shaping the beliefs and opinions of BTSA students on climate change and as such appear as spaces conducive to the formation and transformation of individual and collective preferences on this subject. But also beyond these results, we observe both within social networks, at school and in the territories, a dialectical movement between culture (the possible) and the institutions (the canonical), a movement which determines the capacity of members young people to update their ways of thinking and acting and particularly to act in and for the territories.

In a second step, we showed that that the students surveyed can ensure an intermediary function in the three cultural spaces considered here, it is indeed within the territories of life and mainly the rural territories that they assume the most actively. This function and that they appear as true operators of institutional change. Our results also illustrate the fact that the school is not only a place of dissemination of knowledge but it is an institution allowing the negotiation/renegotiation of knowledge on the climate and nourishing a process of construction/reconstruction of the social reality in the heart of the territories and acts as a territorial intermediation mechanism for the climate. Beyond the very particular role of the school as an institution playing a role of territorial intermediary, we have above all shown that it is the young people themselves who act as territorial intermediary actors in and for the territories and allowing the negotiation / renegotiation of ways of thinking and acting in these territories and particularly rural territories.

References

Boulianne, S., Lalancette M., & Ilkiw, D., 2020, “School Strike 4 Climate”: Social Media and the International Youth Protest on Climate Change, Media and Communication, vol. 8(2), pp.208–218

Bruner, J., 1996, The culture of education. Harvard University Press.

Commons, J. R., 1934, Institutional Economics. Madison. University of Wisconsin.

d’Andrade, R., 2003, « Some Causal Kinds of Powers that Culture is Made Up Of Conference: Toward a Scientific Concept of Culture », janvier, 23-26, Stanford University.

Denzau, A. T., & North, D. C., 1994, “Shared Mental Models: Ideologies and Institutions”, Kyklos, 47 (1), 3-31.

Grossetti, M., & Bes M.P., 2003, « dynamiques des réseaux et des cercles. Encastrements et découplages », Revue d’économie industrielle, pp.43-58.

Han H., and Sang Wuk A., 2020, “ Youth Mobilization to Stop Global Climate Change: Narratives and Impact, Sustainability 2020, 12, 4127

Nadou, F., & Pecqueur, B., 2020, « Pour une socioéconomie de l’intermédiation territoriale », Géographie, économie, société, 22(3), 245-263.

Nadou, F., & Talandier, M., 2020, « Intermédiation territoriale: des lieux, des liens, des réseaux, des acteurs »

Training young teachers in teaching agroecology: challenges and opportunities

Anne-Emmanuelle Fiamor, Agnès Terrieux
LISST-Dynamiques Rurales

Short abstract
We present here the results of the work of trainee teachers and students at the ENSFEA, carried out in the "Knowledge of agricultural education system" course of the Master 2 MEEF. The objective is to train them in order to be able to address the mission of "development and animation of rural territories" in the context of ministerial injunction towards agroecology. We support them in investigating their school, so that they acquire skills and knowledge in/ about agroecology from an inductive and transdisciplinary posture. This approach, which is based on a pedagogical bias, has been confirmed by the following results of the surveys: the ministerial reform, which is top-down and technically oriented, lacks meaning for both the teaching teams and their students. This lack of meaning is correlated to the ignorance of what agroecology is, beyond the disciplines related to production processes, leading to a lack of involvement of some teachers. Finally, the students coming from farming families and some teachers, who recognize themselves in the modernist frame of reference, feel that their identity is being questioned. Which leads in resisting change. These results lead us to propose a framework mobilizing the food system and the use of social sciences tools, in order to respond to the issues of inclusiveness of practices, of different types of teachers and students.

Extended abstract

Purpose

The teachers of French vocational high schools in agriculture have several assignments beyond the transmission of disciplinary knowledge, among which to participate in the "development and animation of rural territorie"s. As such, in order to orientate development in the direction of the public policies of the Ministry of Agriculture but also of social expectations, and because resistance can exist and in some cases be strong, we have chosen to propose a training course that provides tools for teaching the agroecological transition, by adapting it to the realities of the territory in which the high school is located.

The recognition of agroecology as a ministerial injunction, designed both from a technical point of view and in a top-down perspective (Plan "Enseigner à produire autrement" EPA1, 2014-2017 and EPA 2, since 2020), is likely to amplify this resistance to change. In this context, the trainee teachers and students we teach at Ensfea :

1. present a great disparity of knowledge and postures towards agroecology, ranging from ignorance to militancy.
2. do not always perceive the implications or role in agroecology of the discipline they identify with, especially when it is not directly linked to agricultural production
3. are confronted with students, colleagues, whose positions are equally disparate
4. have to deal with various territorial situations due to the position on agroecology of the high school and/or the local farmers

Noting these obstacles, we defend the idea of transdisciplinary and inductive teaching, which allows the expected agroecological transition to be rendered possible using the social and cultural meaning of agroecological practices.

Design/Methodology/Approach

This article is based on an analysis of work and exchanges with trainee teachers from the 2020-2021 academic year, corresponding to the implementation of the EPA2 plan. We propose a training course built on inquiry-based learning in the social sciences (a survey), with adults and students in vocational high schools in agriculture. We have structured the survey work by the trainees in two phases and three steps:

Phase 1:

- step 1: bibliographical analysis with the objective of defining agroecology and contextual analysis of the territories of the high school (Insee, Agreste, geoportail). Objective: to acquire knowledge on the scientific context (definition of agroecology) and the territorial context (production, services, demographics, economic and spatial dynamics…) in order to analyze the information gathered during the interviews.
- step 2: exploratory survey based on at least three interviews with two teachers and the EPA2 plan referent or the school farm manager and analysis of the interviews. Objective: to know the definition of agroecology used in the school and the position of each respondent on this subject. Preparation of the second survey phase (with the students).

Phase 2:
- step 3: survey of students, in at least two classes of different levels and training systems plus an interview with a partner (e.g. farmer, canteen worker). Objectives: to understand their position on the definition and practice of agroecology; and on agroecology in the school.

Table n°1 Numbers of trainees /schools taken into account in the communication

	2020-21	2021-22	2022-23
Intern teachers	26	40	64
Schools	24	37	51

Findings

Findings from the first phase of investigation:

Several recurring points of view that frequently mark a resistance to agroecology will be developed in the communication:

- among *high school management staff,* the arguments against the introduction of agroecological teaching and practices are based on (i) concern for the reactions of local farmers and their representatives on the Board of Directors, and (ii) the fear that agroecological practices are a risk for the economic balance of the schools' farms. In favor of teaching agroecology, one more often encounters an argument of authority ("we are implementing the Ministry's plan") than an awareness of the necessities of change, which nevertheless exists ("we have to, with climate change, we cannot go on").

-Some of *the teachers*, mostly from non-technical disciplines, think that they do not have to "talk about this" ("in my subject, I have no role to play", "I am not legitimate to talk about it, I teach history"), although some of them insist on their private practices or commitments ("I am a member of a CSA", "my garden is organic "). The group of teachers of technical and vocational subjects is more divided between disenchantment ("they have come with yet another plan"), discouragement and even concern ("here, the farmers don't want it, so with their children it is sometimes difficult", "with certain groups of students, I don't dare say the word"), enthusiasm ("we try out a lot of things, the students love it when we discover things together"), or even militancy.

This first analysis allows us to draw degrees of acceptability of agroecology according to the high schools. These are refined by the results of the second phase of the survey.

In the second phase of the survey

The trainee teachers try to understand the knowledge and representations of agroecology of their students chosen from of different grades and "tracks" (vocational, technical and general tracks of formation are present in the agricultural high schools)

The main results are that farmers' children are often more resistant, considering that they are attacked in their family identity or their future professional identity. The top-down method of imposing a plan from the Ministry contributes to the idea that farmers' knowledge is denied and therefore cannot be used in order to change practices.

We also note that high school students do not understand what "agroecology" means, they tend to parrot what they have grasped in adults discourses, but most of them are unable to relate to an understanding of "agroecology" either as a science, a movement or a practice (Wezel et al. 2019. It suffers from a lack of meaning. The students, whatever their category, criticize the fact that agroecology is talked about too much, but appreciate when practices and projects are proposed to them (without always using the term agroecology). Finally, we note a progression of knowledge in agroecology by grade, but that does not mean knowledge weakens resistance (a refractory in high grades remains refractory but their debate skills are better). As for the external partners, their comments reflect a polarization between adhesion to and rejection of agroecology, and as a result the school will be criticized or praised depending on whether it is understood to act like them or not.

The final results: three findings that cut across schools and territories are dominant. First, students from conventional farming families reject or are apprehensive about agroecology, in that they feel their identity is being targeted and attacked. Secondly, teachers of certain disciplines do not feel at all concerned by agroecology, even though they all have something to do with it. Last but not least, among high school supervisors and students alike, there is little or no understanding of what agroecology is, Extended Abstract for the 26th ESEE conference from a scientific point of view. The term is often seen as a catch-all word, as a trend, not linked to sustainable development and seems to have "come out of nowhere".

Resituating what agroecology is and giving a definition that allows them to place it in the right place seems to be the first lever to accompany this reform, by insisting not on the theoretical fact, but on the practices in order to accompany the inductive dynamics already present: "ah but in fact agroecological practices, we have them in our daily life / in our pedagogical practices".

Practical Implications

After having inventoried the levers and obstacles that appeared during the surveys in the high schools, we wanted to equip the trainees to help them teach agroecology, given the ministerial injunction and social expectations. This involves adapting and improving the design of the course around 5 points:

- Propose an introduction that shows the necessary multidisciplinary approach of agroecology, especially at the interface of natural, agricultural sciences with social sciences, each disciplinary field contributing and enriching the methods, points of view and discourse,

- Insist, through the bibliography, on a common culture of agroecology, by showing that reflection is ongoing and that scientific and professional references are moving,

- Propose a conclusive open synthesis (during the last lecture), designed each year and based on the sharing of this year results. Always in an inductive perspective, this allows trainees to show the validity of their data, the evolving character of agroecology, and to define the contours of a common culture on agroecology mixing knowledge and practices in order to give their students the opportunity to build meaning from what they are taught,

- Linking this work to subjects they have to teach from a disciplinary entry,

- Show that this experience (short and intense) allows them to become pro-active in the transition in their school, by insisting on the links to be created with the partners of the territory to learn and evolve together, to build a system of actors

Theoretical Implications

In order to support the practical implications that we have just presented above, we mobilize a framework that allows us (i) to involve all disciplines by starting from practices and (ii) to understand the link between each of these disciplines with territorial development.

To do this, we are in line with a definition of agroecology open to the food system (Francis et al., 2003; Wezel et al. 2009; Gliessman, 2016). Necessary to allow for the inclusion of different practices and disciplines. And necessary both to resituate learners' definitions (political, social, agronomic), the scales at which they are situated (local, national, global), the dimensions in which they are situated (practices, analysis, engagement), and to propose a reflection on the distinction between analysis and engagement, between theory and practices.

In this context, we propose to link this definition of agroecology to a reading grid that allows for a more detailed analysis of the food system and its articulation with the production system. The reading grid of the food social space (Poulain, 2002) allows us to situate and classify the practices and representations mobilized during the survey, by showing their interdependence, which sheds light on the systemic and necessarily integrative dimension of agroecology and its territorial impacts. It then makes it possible to consider these groups from a diachronic point of view, and thus to them in their social and political construction. This framework makes it also (and above all!) possible to identify the social and cultural significance of the examples mobilized by analysing the meaning actors give to their practices.

Finally, it is sufficiently open to allow for the necessary articulation with other concepts; in particular the different systems of governance, actor strategies, interests and motivations. Or even concepts (e.g., One Health; Michalon, 2019) used in other lectures in the ENSFEA MEEF master's degree.

References

Francis et al., 2003, “Agroecology: the ecology of Food Systems”, *Journal of Sustainable Agriculture*, Vol.22(3) 2003 http://www.haworthpress.com/store/product.asp?sku=J064

Steve Gliessman, 2016, ” Transforming food systems with agroecology*”, Agroecology and Sustainable Food Systems*, 40:3, 187-189, DOI: 10.1080/21683565.2015.1130765

Michalon, J., 2019. *One Health au prisme des sciences sociales : quelques pistes de lecture. Bulletin de l’Académie Vétérinaire de France*, 2019, 172 (early view 2020-01-13), pp.1-5. 10.4267/2042/70672. halshs-02458572

Poulain, J.-P., 2002. *Sociologies de l’alimentation, les mangeurs et l’espace social alimentaire.* Presses Universitaires de France, Paris.

Wezel et al., 2009, “Agroecology as a science, a movement and a practice. A review”. *Agronomy for Sustainable Development*, Springer Verlag/EDP Sciences/INRA, 2009, 29 (4)<10.1051/agro/2009004>. <hal-00886499>

Training of trainers in agroecology based on the teaching of endogenous knowledge

del Corso Jean-Pierre[1], Fall François[2], Gallai Nicola[1], Guillet Guillaume[3], Marie-Sainte Micheline[1].

[1] LEREPS, ENSFEA

[2] LEREPS, UTJJ

[3] INNOVATION, ENSFEA

Short abstract:

This article aims to show how, through training, it is possible to promote the use of endogenous agricultural knowledge as levers for an agroecological transition. The purpose of this proposal is to reflect on the mechanism for constructing a training reference system specific to this question by proposing appropriate pedagogical and didactic practices and tools taking into account local specificities and invariant knowledge. That condition is essential to ensure the replicability of the training reference system in various socio-territorial and ecological contexts. In this study, the authors will present a process of creation and implementation of a curricula for a training of trainers of agroecological indigenous local knowledge. This process is based on a preliminary work of identification of endogenous knowledge done in France, Senegal, Togo and Benin. From this preliminary work, the authors listed the specific and invariant knowledge. Then they gathered a group of experts from the four countries during one week to create the curricula. On a third step they implement the curricula in organizing training to trainers in the four countries. The authors aim to present this experience underlying the barriers and the leviers.

Extended abstract

Purpose

In recent years, we have witnessed the emergence of agroecological approaches initiated by groups of farmers in Africa and Occitania. These approaches based on exchanges and the pooling of experiences between farmers inaugurate new forms of collective learning. Based on endogenous knowledge, this learning makes it possible to support innovation processes while limiting technical and economic risk-taking for the actors because the learning costs are borne by the collective. The dissemination and dissemination on a larger territorial scale of agroecological approaches based on endogenous knowledge, however, comes up against significant socio-cognitive obstacles. Indeed, the adoption of agroecological practices is conditioned by important mental transformations in agriculture: such as the need to break with the well-established habit of systematic use of phytosanitary products.

Training systems, and especially those focused on the training of trainers, are obviously potentially major vectors for supporting such revisions of modes of reasoning and encouraging the dissemination of agroecological practices. To fully play this role, the devices in question need to be redesigned. On the one hand, the design of curricula in terms of skills seems to have to be imposed insofar as the priority objective is to promote mastery by learners of operational and situated knowledge, and therefore very sensitive to the specificities of the contexts of application. On the other hand and additionally, it is a question of closely associating local actors, holders of endogenous knowledge, with the design and implementation of training. Ultimately, these curricular developments must make it possible to equip learners with appropriate skills to stimulate and animate collective and participatory innovation approaches. While these concerns are beginning to find expression in public training policies, they remain very limited in reality.

Indeed, very largely anchored in the territories, the peasant knowledge represents territorial resources that can potentially be activated to support the implementation of agroecological systems as proven by the successes of experiments developed today in the territories of Occitanie and Africa. sub-Saharan. The dissemination of this knowledge on a wider territorial scale, however, requires human relays: trainers, teachers, managers of agricultural cooperatives, agricultural advisers with the necessary skills to ensure this dissemination function. We therefore propose here an approach to constructing a training reference for trainers designed for a period of four days, the training reference for trainers in agroecology based on the teaching of endogenous knowledge presented in this document is part of this aim. .

This curricula is intended for teachers, agricultural trainers, etc. responsible for designing and setting up training for trainers in agroecology based on the mobilization of endogenous knowledge. Although initially reasoned from experiments conducted in Occitania, Benin, Senegal and Togo, this reference system is intended to serve as a basis for organizing such training systems in different territories in the North and South. It was thus written for the purpose of replicability. Also, its intention is not so much to precisely define the contents to be taught as to bring out the invariant organizers of a training in agroecology (organizers guaranteeing the success of such a training).

This training reference system has been developed taking into account several requirements: to propose pedagogical and didactic practices appropriate to the teaching of knowledge of a mainly experiential and situated nature. It must also take into account local specificities but, at the same time, define invariant training organizers: an essential condition for the replicability of the training reference system in various socio-territorial and ecological contexts. The objective is thus to arrive at an experimental training system that can serve as a basis for reasoning training in agroecology according to more or less significant hourly volumes.

Theoretical Implications

This repository aims, it should be remembered, to build and develop the professional skills of trainers for the dissemination of endogenous knowledge known as "agroecological" to village communities. In this perspective, it seemed quite logical to draw inspiration from the standards of French agricultural technical education. Indeed, these repositories are built according to a particular skills-based approach (more precisely according to a capacity-based approach) allowing learners to act in a professional situation while adapting to their contingency.

In addition, the construction of this capacity reference base is based on a particular conceptual and methodological apparatus, that of Professional Didactics, and whose main ambition is "to analyze the professional activity with a view to training" (Pastré, Mayen, Vergnaud, 2006). This theoretical framework mobilizes several theoretical currents including that of "the theory of conceptualization in action" initiated by Vergnaud (Pastré, 2011). The choice of such a framework to build a frame of reference is not neutral and has important consequences in terms of training engineering, in particular on the way of teaching and learning. Indeed, considering that we can only learn (and therefore conceptualize or understand) in and through action, we are able to better understand why the curricula favor learning by doing (Success). But that does not mean that more "theoretical" learning is neglected, on the contrary. They both participate, and inseparably, in the conceptualization processes necessary for the installation of skills in learners. For Piaget (1974), succeeding does not necessarily mean understanding and vice versa. The whole challenge for the trainer is then to create a teaching-learning situation conducive to "succeeding in making people understand".

Most often, this consists in initially proposing to the learner a situational problem to be solved and which is based on a real Significant Professional Situation (SPS). The contributions of knowledge proposed as the problem is solved (knowledge-tool) are then deemed to make the learning process more effective and to be transposable subsequently to more complex situations. It is precisely the contextualization of these knowledge-tools to a specific situation (pragmatization) that allows once decontextualized (explicitation) to be recontextualized again to a different situation. This then allows the learner to gain in abstraction and generalization and thus to "increase in competence" (with a greater level of acquisition or mastery of the competence). The training modules offered are based on this so-called inductive didactic approach (contextualization-decontextualization-recontextualization).

Design/Methodology/Approach

The drafting of this reference document which was carried out in Benin in the form of a writing workshop by bringing together the various stakeholders in this project.In terms of work stage, a preliminary stage of identification of endogenous knowledge based on issues common to the 4 countries was carried out based on the results of surveys conducted in the different territories and which made it possible to draw up a cartography of endogenous "agroecological" knowledge. Starting from there, the main stages in the development of this reference common to the 4 countries were then the following: 1- a first stage of identification of the fields of competence and significant professional situations. 2- A second stage of identification of the training modules and their articulation. 3 -Then we worked out the detail of the descriptive sheets of the training modules. 4- To build a module architecture and the training schedule.

Finding

The first step therefore aimed to identify fields of competence and significant professional situations. Based on the knowledge identified beforehand, 4 fields of competence have been identified: water resource management; soil and fertilizer management; managing biodiversity and optimizing synergies. Each of these fields of competence was then associated with significant professional situations allowing the contextualization of the training.

For example, in the field of biodiversity management, we have identified a large number of SPS aimed at the management of pests and diseases (such as the manufacture of biopesticides or the establishment of an association of crops. Still in the fields of biodiversity management of the SPS have also been identified in the field of the conservation of peasant seeds and local breeds, for example the implementation of varietal selection techniques. Finally, for the maintenance of biodiversity, these are the following SPS that have been identified: crop diversification practices and creation of biodiversity sinks.

Once these fields of competence and the SPS have been identified, it was a question of identifying the training modules and their articulation. Starting from the premise that the objective of this training of trainers would aim to validate the following capacities: CC1: Understanding the challenges of agroecology, CC2: Mastering a didactic and methodological approach to conduct learning in agroecology and CC3: Transmitting and transpose the lessons learned to design and run training courses for trainers in agroecology in various contexts and diverse audiences of learners. The training was built within the framework of three modules: a General Module (MG) centered on generic contributions, a Professional Module (MP) centered on the learning of professional gestures and an Andragogy Module (MA) intended to develop the reflexive capacities of the learners with a view to replicating the achievements in the training of trainers in agroecology. These three modules have been designed to operate in close interaction. Their content should therefore not be treated in a compartmentalized way, but on the contrary in synergy.

In summary, the modular architecture of these training courses, whatever the context, is therefore organized as follows:

- General Module 01 : Explain the limits of the intensive agricultural model and its economic, social and ecological dead ends

- General Module 02 : Highlight the new powers of action available to farmers by reactivating the use of endogenous knowledge in their practices

- General Module 03 : Show that the implementation of alternative agroecological practices calls for the mobilization of systemic reasoning to manage the dynamic interactions between agriculture and natural resources (water, soil, biodiversity)

-Professional module 01 : Acquiring a method for choosing an appropriate problem serving as a support for learning

- Professional module 02 Organize with a professional the activity of learners on a field of experimentation and control it

- Professional module 03 : Organize a debriefing of the activity carried out by the learners, under the supervision of the professional(s)

- Professional module 04 : Evaluate and facilitate the transposition of these learning methods to other contexts and/or problems and/or resources and/or knowledge, etc.

- Applied module 01: Carry out a debriefing on the training experienced to bring out the main invariant organizers of successful training in agroecology

- Applied module 02: Based on the lessons learned from this debriefing, put learners in a position to design training adapted to their territory, their future audience, the means available

- Applied module 03: Based on the lessons learned from this debriefing, put learners in a position to design training adapted to their territory, their future audience, the means available

Practical Implications

Globally, we could note that the implementation of such training must be done in coordination with the actors who hold knowledge in the territories. It is also necessary to design training by making people act and not only in the transmission of knowledge. Finally, we can identify two impacts of the experiment:

1) Engineering resources deposited on a digital platform allowing the construction of training courses for trainers in agroecology on an extended territorial scale.

2) Experimental system that could lead to an international diploma in North/South collaboration in higher education for the training of trainers in agroecology.

References

Les 10 éléments de l'agroécologie de la FAO (point de vue institutionnel):https://www.fao.org/3/i9037fr/I9037FR.pdf
Memento pour l'évaluation de l'agroécologie du GTAE (point de vue ONG techniciennes et recherche): https://www.avsf.org/public/posts/2349/memento_evaluation_agroecologie_gtae-2019.pdf
Déclaration de Nyeleni sur l'agroécologie paysanne (point de vue organisations paysannes): http://www.hlrn.org/img/documents/Declaration-du-Forum-International-sur-l%E2%80%99Agroecologie-Nyeleni-2015.pdf
MAYEN, P. (2013). Apprendre à produire autrement : quelques conséquences pour former à produire autrement. Pour, 219, 247-270. https://doi.org/10.3917/pour.219.0247
https://www.reseau-far.com/wp-content/uploads/2021/11/infographie_VF-1.pdf
https://www.reseau-far.com/wp-content/uploads/2021/07/09072021_IRAM_Formation-Agriculteurs_T1_BD.pdf
https://www.inter-reseaux.org/wp-content/uploads/communication_dietsch-ruault-bakker_vf.pdf
http://www.iedafrique.org/IMG/pdf/Agridape_no29-3-.pdf
PASTRE, P. (2011). La didactique Professionnelle. Approche anthropologique du développement chez les adultes, Formation et pratiques professionnelles. Paris : PUF.
PASTRE, P., MAYEN, P. & VERGNAUD, G. (2006). La didactique professionnelle. Revue Française de Pédagogie, 154, 145-198
PIAGET, J. (1974). Réussir et comprendre. Paris : Presses universitaires de France
VERGNAUD, G. (1996). Au fond de l'action, la conceptualisation. In Barbier J.M. (dir.) Savoirs théoriques, savoirs d'action (pp. 275-292). Paris : PUF
Guide pour l'élaboration d'un diagnostique des pratiques agroécologiques en milieu paysan (développé par l'ONG SOS Faim) : https://www.sosfaim.be/wp-content/uploads/2020/01/SOS-19-guide-agro-web.pdf
Manuel de l'animateur en agroécologie (développé par l'ONG Terre et Humanisme): https://drive.google.com/file/d/1Lg5XW0As0bU2FosjMQSw7JzVG3IDZB0y/view
Manuel de formation en agriculture biologique pour l'Afrique (créé par l'IFOAM): https://www.organic-africa.net/fr/manuel-de-formation.html

TOPIC 2 - Digitalisation of advisory services and education

Session 2A- Critical perspective on digitalisation and advisory networks

Making use of system concepts for the analysis of digitalisation in agriculture: Synergies, Clashes or Voids?

Knierim[1a], A., Herrera[1], B., Paulus[1], M., Brunori[2], G., Hortigüela[3], R., Vergamini[2], D., Giagnocavo[3], C.

[1] University of Hohenheim, Germany
[2] University of Pisa, Italy
[3] University of Almeria, Spain
[a] Corresponding Author: a.knierim@uni-hohenheim.de

Short abstract:
System concepts in agriculture are numerous, frequently used to illustrate a complex situation or the interdependencies and nestedness of influencing factors. Generically, a system can be described as a set of elements or entities that are interconnected through relations, separated from the environment through a boundary, and operating as a whole, thus going beyond the single entities' operations. An advanced analytical framework in this regard is the social-ecological system (SES) framework that depicts the complexity of sustainable use of natural resources. For the purpose of assessing digital technologies' potentials to contribute and enable transitions towards (more) sustainable agriculture, we describe and evaluate a selection of digitalisation-related system concepts whether they fit to enhance and/or specify the SES framework in this aspect. Furthermore, we assess the added value that can be generated by highlighting particular aspects of the social-ecological system through the integration of the AKIS and the Resources and Capabilities concepts. We conclude with recommendations for the enhanced system concept's application when doing empirical fieldwork in digital agriculture dedicated Living Labs.

Extended abstract

Introduction and Purpose

Digitalisation is considered to have the potential to substantially increase sustainability of agricultural production and as one means by which to tackle complex economic, social and ecological challenges in the agri-food sector. However, digital technologies may equally be a reason for increasing inequalities in access to information and resources, a source of negative external effects, power imbalances, and the cause of structural asymmetries among both citizens and entrepreneurial actors. In the EU, the CAP emphasises the objective of supporting farmers' competitiveness and sustainability by means of digital technologies. In this respect the Horizon Europe project CODECS ("Maximising the co-benefits of agricultural digitalisation through conducive digital ecosystems") was set up to explore and assess how digitalisation can be used sustainably, equipping farmers and other actors in the agri-food sector with capabilities and resources to shape sustainable futures.

To appropriately capture the complexity of digital technology related interaction processes in the agri-food sector, we make use of the 'system' concept. In its core components, a system is composed of (i) elements that are connected through (ii) relations and separated by (iii) boundaries from its (iv) environment; systems are not bound to a scale but they can be nested, so that systems (v) may contain subsystems or be part of an overarching system of systems (Meffert 1971; Schiere et al. 2004). Furthermore, a system is a mental model that can provide analytical guidance, if tailored and configurated to a situation at hand. In the context of CODECS, such tailoring or fitting of the respective system concept for the multi-actor approach, implemented through inter- and transdisciplinary research, requires a robust nevertheless explicit specification of the system's composition (= elements) and inner function (= kind and direction of linkages) that can be translated into cause-effect relationships (Knierim et al. 2018).

The social-ecological system framework (SESF) represents a generic classificatory framework that facilitates multidisciplinary efforts toward a better understanding of complex real-life problems, because it is theory-neutral, allowing the development of different types of causal models (Foran et al. 2014; Schlüter et al. 2014). While often used to study natural resource systems and related interactions, outcomes and governance, its application to other fields has been frequent, including specifically knowledge and digitalisation (Hess and Ostrom, 2007; Foran et al. 2014). However, specific rules were found to be extremely diverse and rich across cases, and further development of the framework is necessary in order to define variables adapted to local contexts (McGinnis and Ostrom, 2014).

For further specifying elements, relations and dynamics of the SESF appropriate for the study of digital ecosystems in agriculture and their impacts on farmers and other actors' agency to responsibly and gainfully use digital technologies, we explore i) system concepts recently used to study digitalisation in agriculture and, ii) the resources and capabilities theory, which allows to understand how actors respond to dynamic environments. It is with the practical objective to explore the question whether and how those concepts can be (best) combined to inter- and trans-disciplinarily study digital agricultural technologies' sustainability in the CODECS project's living labs, that we discuss the analytical frameworks' potential to systematically guide empirical research by operationalising interdependent relations at various intervention levels.

Design/Methodology/Approach

Based on the concepts described in the first section, we conducted a literature search along key terms and purposefully select articles (limited choice). The criteria for deciding which analytical framework to include was that they should provide concepts for addressing technological change with a wide, preferably multi-disciplinary perspective and, highlight those elements influencing digitalisation processes and the sustainability of agricultural practices. As such, those frameworks can provide theoretical background to compare systems components: (i) elements that are connected through (ii) relations and separated by (iii) boundaries from their (iv) environment. We assess the framework with respect to their comprehensiveness and the degree of precision and detailedness of the elements and relations. The descriptions and definitions were summarized, and commonalities and differences were extracted. Finally, those aspects of current system frameworks were contrasted deriving implications and conclusions for their integration (based on the most comprehensive SES framework), and the added value that comes with the resources and capabilities (R&C) approach and the consideration of the AKIS concept.

Findings

Additional to the SES framework, we identified three other ones utilized for the analysis of digital systems in agriculture: the socio-cyber-physical system (SCPS); the digital innovation ecosystem (DIES) and the digital agricultural innovation ecosystem (DAIS). A bit different in its content orientation, the agricultural knowledge and innovation system (AKIS) concept is equally used at the indicated interface. Finally, we include in this section a brief description of the resources and capabilities approach (R&C).

The Social-ecological system concept, SES

The Social-Ecological System Framework (SESF) is an analytical tool which allows the differentiation of multi-tier, highly complex, rapidly evolving phenomena at the interface of natural (ecological) and political-societal spheres. It is a composed of multiple subsystems and internal variable of these subsystems at multiple levels, with the potential to disentangle various influencing factors such as legal, economic, technological, political, social and psychological components that influence outcomes in real-life cases. The SESF has been applied for several decades to complex natural resource management challenges that require both responsible individual as well as collective action. It is open to study the design and the dynamics of decision making and institutionalisation as it focusses on how "humans repeatedly interact with rules and norms that guide their choice of strategies and behaviours", and where new norms, rules and technologies may be developed by the actors (Ostrom 1990; Hess and Ostrom 2007).

The SESF helps to identify relevant variables for studying a single focal SES situation, based on a common, nested set of variables. It is structured into four first level core subsystems: Resource units, Resource Systems, Governance systems, and Actors/Users where the proposed point of entry is a focal action situation or one of the subsystems within the SES. Each core subsystem is made up of second level variables which are further composed of deeper level variables. These four systems interact in the focal action situation. Thus, the SESF provides a common language between disciplines for organizing agreement about many variables relevant in the analysis of cases (Binder et al, 2013) and also principles which are expected for sustainable systems, e.g.

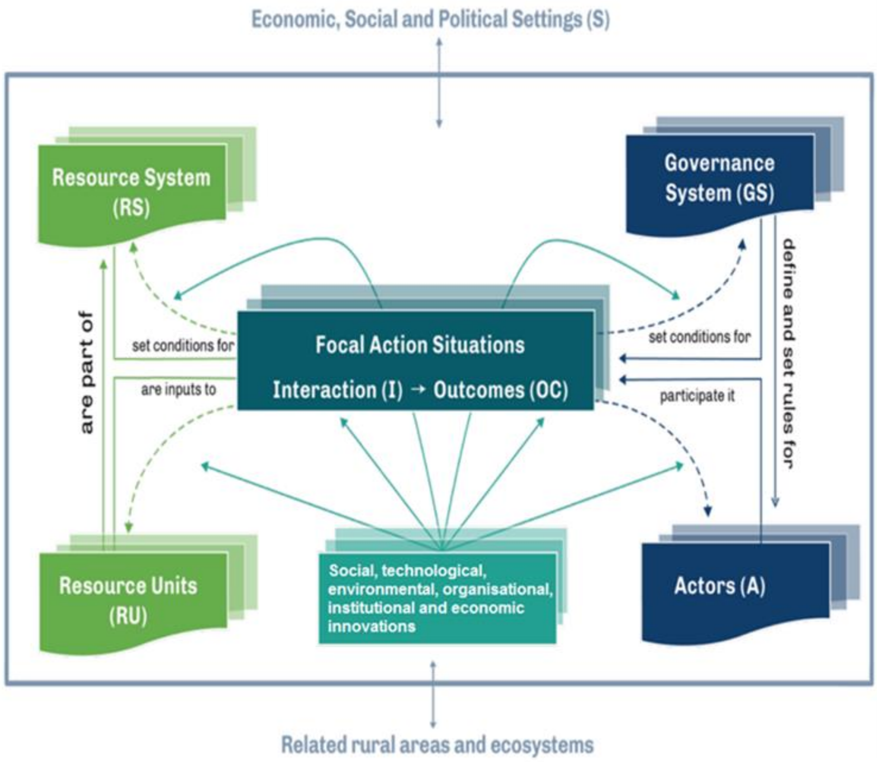


Figure 1. Social Ecological System Framework diagram

In the here presented form, the SESF comprises additionally 'social and technological innovation' as an explicit component, which impacts on resources and actors as well as on the input-output process addressed in the Focal Action Situation (cf. Fig 1).

3.2 The social-cyber-physical system, SCPS

The SCPS studies the impacts emerging from the mutual interactions between social components (e.g. people, business, institutions), cyber-related components (e.g. data infrastructure, digital technologies and skills, other digital requirements) and physical, material elements physical-entities (e.g. machinery, natural resources) at different possible levels of analysis (e.g. farms, sectors, supply chains) (Mette et al., 2022).
The elements classified in SCPS as (i) entities are distinguished as those of the social domain (people and their social rules, values, practices, private actors like start up, public organisations, animals, laws, markets), physical (natural or artificial things) and cyber domain (e.g. data infrastructure, software, digital devices and artefacts) (Rijswijk et al., 2021); (ii) relationships are the mediators between entities' agency and social structure (D´Epelteau, 2018 in Metta et al. 2022). Relationships are how two or more entities are connected within the same domain or among different socio-cyber-physical domains (Metta et al., 2022), while (iii) activities are those tasks, projects, or entire processes conducted by individuals or multiple entities (Metta et al. 2022, S. 4). The SCPS offers a frame to define problems and reflect on potential consequences of digitalisation, relevant for the analysis of responsible research and innovation in rural areas (Rijswijk et al., 2021).

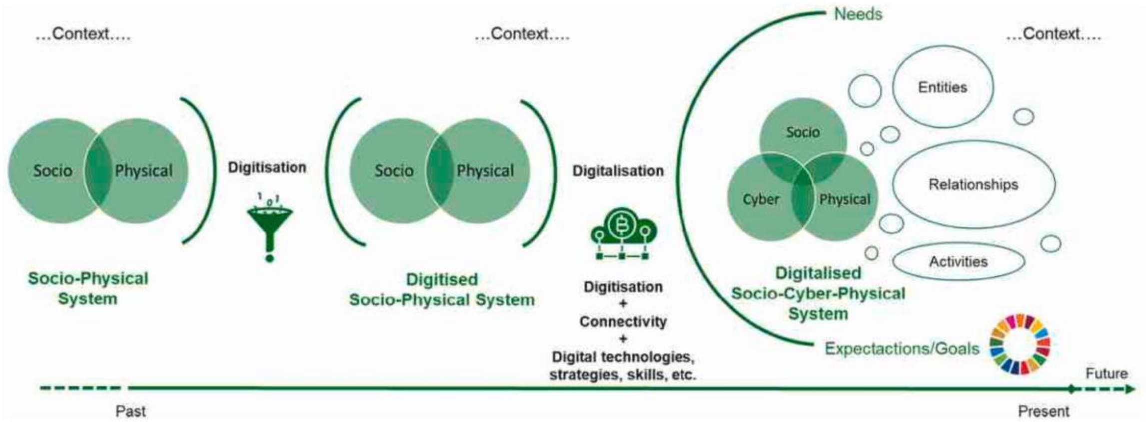


Figure 2: An integrated socio-cyber-physical system framework (Metta et al. 2022, p. 2; p. 4)

From this highly condensed description, illustrated by figure 2, we derive that elements and relations encompass a very diverse multitude of items so that the concept has a huge potential to cover a complex part of reality. Two shortcomings are related to this system concept: (i) there is a lack of distinctiveness between the categories 'relationship' and 'activity' so that no clear line can be drawn, and (ii) there is no indication how system boundaries can be determined, how the 'context' is distinguished from the system in consideration. Some authors limit the model's relevance to an assistance "in highlighting consequences of altered relations between the three domains" (Rijswijk et al 2021:86).

The digital agricultural innovation ecosystem, DAIS

As the name DAIS implies, digitalisation as component of the Agricultural Innovation System is grounded on how the Agricultural Innovation System (AIS) approach is implemented (Fielke et al. 2019). Prior works addressed the interactions between innovation systems and digitalisation (Schnebelin et al. 2021). Rijswijk et al. (2019) take this to a conceptual level, with a focus on ex-ante analysis of socio-technical transitions. The need for this conceptualisation roots in the assumption that technology-induced transitions should not be simply assessed as a technological fix regardless of the "interactions between technological trends and the context within which they sit" (:2). In other words, it is assumed that intensified digitalisation of agriculture affects interactions within agricultural networks and holds implications for innovation processes on a larger scale.

Thus, AIS is considered "the legacy of technological, societal, economic and institutional interactions that provide the platform through, and extent to which, novel arrangements are possible" (Fielke et al. 2019:2). Besides, the authors argue that the approach to DAIS integrates three additional concepts: (i) multi-level perspective, (ii) responsible research and innovation and (iii) innovation ecosystems. The latter are described as "networks of innovation communities interacting at various levels" (ibid:2) and within a socio-technical landscape where "[T]echnology and society interact to create values and means of production that change over time" (ibid:4), so that the AIS is transformed from a disconnected to digitalized form. Transitional changes are expected to happen on a niche (e.g. niche innovation communities), niche-regime (e.g. niche innovation ecosystems) and regime level (e.g. impacts of digitalisation on policy and technology) (ibid:4), involving possible interactions between human and non-human actors at niche and niche-regime levels.

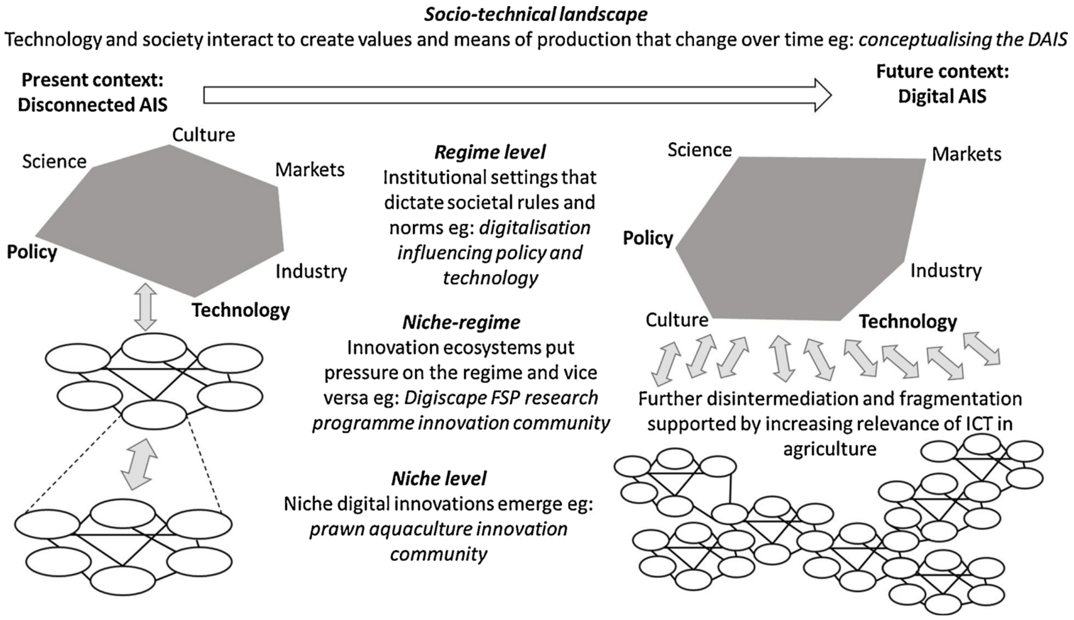


Figure 3 :Digital agricultural innovation ecosystem diagram (Fielke et al. 2019)

We conclude that the DAIS approach intends to cover several socio-economic dimensions affecting and being affected by the digital transformation of agriculture. However, the concept remains a qualitative one, e.g. the intervention levels niche, regime and landscape are not clearly delimited, or the term 'innovation ecosystems' is used to indicate a state in-between these levels. The concept offers interfaces with social sciences theories as e.g. ANT by introducing human and non-human actors. However, there is little emphasis on how relations between these actors may change due to the digitally induced transition, and by its alignment with the science-technology studies' model, the DAIS is more oriented towards digitalisation governance and ex ante assessment of transformation through digital innovations, than to the level of interactions and their impacts.

The digital innovation ecosystem, DIES

'Digital innovation ecosystem' is a hybrid term, referring to technologies and change processes. The concept of technology ecosystems (which differs strongly from the term ecosystem in ecology) has been very common in business enterprise and technology studies for some time (Adomavicius et al. 2008). For example, Wolfert et al. (2023:4), consider innovation ecosystems as embedded in business ecosystems, and specify "a digital innovation ecosystem typically (....) concerns flows of technology and information across people, organizations and institutions", it is "an integrated system of systems in which no actor, actant or system is greater than another" (ibid:4). Further normative stances are associated with the DIES term such as "an ecosystem that is conducive to the innovation objectives" (ibid:2); or "business ecosystems emphasize that a loose network of actors with various backgrounds is involved in the creation and delivery of end products" (:4).

Another guiding idea is that DIES can be built, that they are created jointly by human and non-human actants (Wolfert et al. 2023:3), which indicates the transfigurative character of the DIES concept in contrast to representing a kind of e.g. cyber-physical environment. Expanding on the analysis of six EU projects with the DIES concepts, the authors insinuate the emergence of a 'minimal viable ecosystem', which occurs only over time and may require 'resources and ingenuity' (ibid:13).

From this brief description we derive that the here proposed digital innovation ecosystem concept clearly recognises the entanglement of the technological with the entrepreneurial dimensions, underlines its potential designability, and emphasises the network character of relations, but falls short with respect of (i) what the ecological and physical aspects of the digitalisation concerns, (ii) with the delimitation of the system's boundaries, iii) its impact on (human) actors, and iv) the governance of such change.

Comparison of system related frameworks
The four presented system concepts have different disciplinary origins and vary in the specification of elements and relations. However, they also reveal overlaps in terms, objectives and study objects. In order to prepare an improved analytical framework, we compare the systems' components.

Table 1. Comparison between frameworks for analysis of digital ecosystems

Framework	***Socio- Ecological System Framework*** ***SESF***	***The social-cyber-physical system*** ***SCPS***	***The digital agricultural innovation ecosystem DAIS***	***The digital innovation ecosystem*** ***DIES***
(i) elements	Four core subsystems which interact within a focal situation	Entities of social, physical and cyber domains	Human and non-human actors, individual and corporate ones	Human and non-human actants; business and technology subsystems
(ii) relations	Interactions of both collective and individual actors, inputs lead to outcomes	tasks, projects, or processes conducted by individuals or entities	*Not specified*	*Not specified*
(iii) boundaries	Nested subsystems, geographic, institutional etc. boundaries	Farm, sector, supply chain	Regime level, niche regime level, niche level	*No boundaries*
(iv) environment	Economic, social, political settings; physical environment, ecological conditions	Ecological system is considered as part of physical system	Does not consider ecological aspects;	Does not consider physical or ecological aspects
Purpose according to the authors	common specific variables, common language for multi-level analysis of focal situations	Analyse impacts emerging from interactions between social, cyber-related & physical elements	Study the outcomes caused by the digital socio-technical transformation of agriculture	Analyze the technological and entrepreneurial dimensions of an innovation

From the juxtaposition of the different system concepts, we see that the degree of structural organisation and differentiation of the SES concept is not achieved or mirrored completely by any of the other concepts. Secondly, all other system concepts compared to SES neglect the ecological dimension, essential to address sustainability issues; only the SCPS includes the physical world although with rather low aspirations. More importantly, the understanding of 'ecosystems' in DIES and DAIS remains transfigurative; the entry of e.g. resources like land, air, water etc. as real-life production factors relevant for agriculture are not explicitly considered.

In contrast, the role that technologies play (or receive, get octroyed) and the not yet well explored interdependences they cause among social actors and in socio-economic subsystems is more explicit and central in the SCPS, the DIES and the DAIS, although with different foci and degrees of details. While the SCPS is relatively broad in the range of subsystems, the DIES is more specific with respect to the interface between the business and the technology spheres. Finally, the DAIS specifies the multi-level governance aspect through its conceptual link to the social-technological transformation concept of Geels (2002) that relies on a dynamic understanding of the spread of innovations within societies.

Apparently, the SESF can gain from specifications when applied to the study of digitalisation in agriculture. Both, DIES and DAIS may help to focus relevant aspects, such as the interdependencies among technologies, technological infrastructures and learning and institutional changes needed for the innovation processes to be successful. Some aspects remain less well addressed, such as actors' agencies or the particular role that information and knowledge building plays when implementing digital solutions for sustainable agriculture.

Secondly, when referring to the term 'digital ecosystem', based on the above presented comparison, no definite conclusion can be deduced. Hence, we consider it (i) a space within the SESF that is shaped by the economic and technology spheres therein, and that (ii) requires explicit additional descriptions of its natural-physical and its social features.

Addressing the digital ecosystem with the resources and capabilities approach
In order to further detail the context and dynamics of the SESF, we introduce the resources and capabilities approach (R&C), which allows us to understand how actors respond to dynamic environments. The R&C approach is a branch of organisational theory, which enhances the understanding of how individual and collective capabilities and resources, e.g. the capability to innovate, and having the resources to do so (assets, access to knowledge, enabling institutions, etc.), influence the transition to a more sustainable agriculture (e.g., even if an actor possess valuable resources, ineffective use or non-existence of capabilities will prevent full exploitation of such resources and vice versa) and how dynamic capabilities are utilised to respond to external factors. Resources (tangible and intangible) may be utilised in order to create value, achieve an objective, or solve a problem. Capabilities are the individual/collective know-how/abilities to undertake specific activities, which imply a combination of resources and individual action or, organizational routines. Within capabilities, we identify dynamic capabilities as e.g. the "(…) ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (Teece et al. (1997: 516), the "capacity of an organization to purposefully create, extend or modify its resource base" (Helfat et al., 2007, p. 4; Easterby-Smith et al., 2009). Thus, dynamic capabilities are designed to integrate, reconfigure, renew, and re-create its resources and capabilities and, more importantly, update and rebuild its core capabilities in response to a changing environment in order to achieve and maintain its competitive advantage (Wang and Ahmed, 2007). It should be noted that under this approach, collaborations and innovations are seen to be both resources and capabilities (for example, digital innovations and collaborative networks v. the ability to innovate, the ability to collaborate, respectively).

Complementing the digital ecosystem with the AKIS concept
The particular attention that knowledge and innovation processes merit, when studying technology-related change in the field of agriculture, has been reflected in the evolvement of the agricultural knowledge and innovation system (AKIS) concept, occurring in parallel with the above-mentioned agricultural innovation system concept (AIS) (EU SCAR 2012). While the latter can be related to economic and management study fields (cf. section 3.4), the former is closely linked to agricultural advisory services studies, and gives foci to the processes of knowledge generation and exchange, learning and innovation support services. For the purpose of the present paper, we propose to use the AKIS concept to particularly highlight the conditions and processes of knowledge acquisition, information exchange and learning that occur within digital ecosystems and support farmers and other actors when implementing digital technologies. Depending on the adopted perspective, the AKIS concepts can thus be specific on actor categories, the type of relational interactions and services, functions attributed to subsystems etc.

Several authors consider digitalisation a driver for the transformation of AKIS, e.g. through the emergence of new actors (Klerkx et al. 2019) or through a shift in knowledge providing and processing interactions (Ingram and Maye 2020). More specifically, digital innovations may enable or disrupt knowledge networks, they may come together with the emergence of new actors and among the already involved ones, they may lead to change of roles (Ingram and Maye 2020).

Although, the AKIS concept is used to evoke the multi-level, multi-sector influencing factors on targeted information and innovation processes in agriculture, and thus refers to macro- or meso-scale perspectives, the aimed at results usually arise at the local level, e.g. among farmers, in innovation networks, living labs etc. E.g. the EIP-AGRI operating unit (2018) describes the AKIS as "the whole knowledge exchange system: the ways people and organizations interact within a country or a region. AKIS can include farming practice, businesses, authorities, research, etc. and can vary a lot, depending on the country or sector".

Summarising, the AKIS concept has the potential to further specify the actor and governance subsystems in the SESF, and to highlight knowledge exchange and learning components relevant for the interactions around the development and application of digital technologies as studied with the FAS focus.

Integrating R&C and AKIS within the SESF – synergies and voids

Although, the strong integrative potential of the SESF can be acknowledged, for the sake of addressing the sustainability of digital agricultural technologies, further conceptual concretisation is a prerequisite. Therefore, we propose to use the R&C concept to focus on (individual and collective) actors' agencies and roles when pursuing and implementing change. In addition, the AKIS will be used to specify influencing factors related to certain resources (e.g. intangible services, rules and institutions connected to the implementation of digital technologies in the agricultural sector) and capabilities (e.g. knowledge generation, sharing and use).
The 'digital ecosystem' concept, representing so far, an organized set of digital, economic and organisational components, requires further specifications of its social, institutional and natural-physical features as well as an improved understanding how it evolves, is shaped and transformed in the course of time by various external influences. Here, the R&C concept, in particular dynamic capabilities can give conceptual support. Also, the AKIS components within a R&C analysis, helps to disentangle the roles that access to information and innovation support play for the diffusion of new digital technologies within socio-economic systems.

Practical and Theoretical Implications

The conceptual analysis presented here will inform part of the analytical approach to CODECS HEU with the aim to improve the collective capacity to understand, assess and foresee the full range of benefits and costs of farm digitalisation, and to build digital ecosystems that maximise the net benefits of digitalisation.

With the empirical testing of the concepts, interactions between farms and other agri-actors and the components of the social, ecological, institutional and technical (eco-)systems will be understood. Future work in this regard will be relevant to analyse the governance of digitalisation and consequences and implications for the future.

References

Binder, C. R., J. Hinkel, P. W. G. Bots, and C. Pahl-Wostl. 2013. Comparison of frameworks for analyzing social-ecological systems. Ecology and Society 18(4): 26. http://dx.doi.org/10.5751/ES-05551-180426

Easterby-Smith, M., Lyles, M. A., & Peteraf, M. A. (2009). Dynamic capabilities: Current debates and future directions. British Journal of Management, 20, S1-S8.

EIP-AGRI Service Point. Brochure Agricultural Knowledge and Innovation Systems (2018)
https://ec.europa.eu/eip/agriculture/en/publications/eip-agri-brochure-agricultural-knowledge-and.html

Fielke, Simon J.; Garrard, Robert; Jakku, Emma; Fleming, Aysha; Wiseman, Leanne; Taylor, Bruce M. (2019): Conceptualising the DAIS: Implications of the 'Digitalisation of Agricultural Innovation Systems' on technology and policy at multiple levels. In: NJAS: Wageningen Journal of Life Sciences 90-91 (1), S. 1–11. DOI: 10.1016/j.njas.2019.04.002.

Foran, T. et al. (2014) Taking Complexity in Food Systems Seriously: An Interdisciplinary Analysis. World Development 61:86-101

Hess C., Ostrom E. (2007). Understanding Knowledge as a Commons: From Theory to Practice, MIT Press.

Ingram, J. and D. Maye (2020). What are the Implications of Digitalisation for Agricultural Knowledge? Frontiers in Sust. Food Syst. 4:66. DOI 10.3389/fsufs.2020.00066

Klerkx, L., Jakku, E., Labarthe, P. (2019) A review of social science on digital agriculture, smart farming and agriculture 4.0: New contributions and a future research agenda. NJAS 90/91 100315. DOI.org/10.1016/j.njas.2019.100315

Knierim, A.; Laschewski, L.; Boyarintseva, O. (2018): Inter- and Transdisciplinarity in the Bioeconomy. pp. 39-72. In: Lewandowski, I. Bioeconomy. Shaping the Transition to a sustainable, biobased Economy. Springer: Switzerland.

McGinnis, M.D.; Ostrom, E. (2014): Social-ecological system framework: initial changes and continuing challenges. In: *E&S* 19 (2). DOI: 10.5751/ES-06387-190230.

Metta, M.; Ciliberti, S.; Obi, C.; Bartolini, F.; Klerkx,L.; Brunori, G. (2022): An integrated socio-cyber-physical system framework to assess responsible digitalisation in agriculture: A first application with Living Labs in Europe. In: Agricultural Systems 203, S. 103533. DOI: 10.1016/j.agsy.2022.103533.

Meffert, H.: Systemtheorie aus betriebswirtschaftlicher Sicht, in: System analyse in den Wirtschafts- und Sozialwissenschaften, hrsg. von Karl-Ernst Schenk, Berlin o. J. [1971], S. 174-206, hier S. 176.

Ostrom, E., 1990. Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press, Cambridge.

Rijswijk, K.; Klerkx, L.; Turner, J. A. (2019): Digitalisation in the New Zealand Agricultural Knowledge and Innovation System: Initial understandings and emerging organisational responses to digital agriculture. In: NJAS: Wageningen Journal of Life Sciences 90-91 (1), S. 1–14. DOI: 10.1016/j.njas.2019.100313.

Rijswijk, K., Klerkx, L., Bacco, M., Bartolini, F., Bulten, E., Debruyne, L., Dessein, J., Scotti, I., Brunori, G., (2021). Digital transformation of agriculture and rural areas: a socio-cyber-physical system framework to support responsibilisation. J. Rural. Stud. 85, 79–90. https://doi.org/10.1016/J.JRURSTUD.2021.05.003.

Schiere J.B. , Groenland R., Vlug A. and . Van Keulen H. System Thinking in Agriculture an overview. Chapter 4 in Emerging Challenges for farming systems - lessons from Australian and Dutch agriculture; edited by Ken Rickert. Rural Industries Research and Development Corporation

Schnebelin, É.; Labarthe, P.; Touzard, J.-M. (2021): How digitalisation interacts with ecologisation? Perspectives from actors of the French Agricultural Innovation System. In: Journal of Rural Studies 86, S. 599–610. DOI: 10.1016/j.jrurstud.2021.07.023.

Schlüter, M.; Hinkel, J.; Bots, P. W. G.; Arlinghaus, R. (2014): Application of the SES Framework for Model-based Analysis of the Dynamics of Social-Ecological Systems. In: *E&S* 19 (1). DOI: 10.5751/ES-05782-190136.

TAP (Tropical Agriculture Platform) (2016) Common Framework on Capacity Development for Agricultural Innovation Systems: Synthesis Document. CAB International, Wallingford, UK.

Teece, D.J., Pisano, G. and Shuen, A. (1997), Dynamic capabilities and strategic management. Strat. Mgmt. J., 18: 509-533. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

Wang C. L., Ahmed P. K. (2007). Dynamic capabilities: A review and research agenda. https://doi.org/10.1111/j.1468-2370.2007.00201.x

Winter, S. G. (2003). 'Understanding dynamic capabilities', Strategic Management Journal, 24, pp. 991–995. https://doi.org/10.1002/smj.318

Wolfert, S., Verdouw, C., van Wassenaer, L., Dolfsma, W., & Klerkx, L. (2023). Digital innovation ecosystems in agri-food: design principles and organizational framework. *Agricultural Systems*, *204*, 103558.

How does misinformation influence the virtual agri-food advisory service? Multiactor's Perspectives from Sri Lanka

Ataharul Chowdhury, Khondokar H. Kabir, Kasuni Sachithra Illesinghe Kankanamge

School of Environmental Design and Rural Development, University of Guelph, Ontario, Canada

Short abstract:

Misinformation can be a major problem in the agri-food sector, just as in health and politics. The rise of social media has changed how agri-food actors communicate, making it easier for them to connect and overcome the challenges of limited resources and slow service. While ease of access and rapid dissemination of information makes social media beneficial, it also creates a fertile ground for spreading misinformation. Understanding misinformation and its related issues can help inform strategies to address it. This study analyzed the perspective of farmers, researchers, advisors, and input dealers from Sri Lanka, about misinformation and its influence on agri-food advisory services in the virtual realms of social and online media. Using Q-methodology, we found three distinct perspectives on the issue. The first perspective sees social media as a great tool for connecting people but also a major source of misinformation. The second perspective believes that the main motivation for spreading misinformation in the agri-food sector is the profit, generated by those unfamiliar with the challenges farmers face. The third perspective sees misinformation as spreading quickly and difficult to counteract but acknowledges that it can be posted and shared by mistake. The three perspectives emphasize improving digital literacy skills to combat agri-food misinformation. The findings can improve our understanding of the issue and provide valuable insights for future research.

Extended abstract

Purpose

Misinformation is a significant challenge in today's society, particularly in the context of the agri-food sector (Chowdhury and Odame 2013; Kaushik et al. 2018; Bastos et al. 2018; Klerkx 2021). The spread of false or misleading information through various social and online media channels can greatly impact farming communities' adoption and decision-making (Somerville 2019). This is particularly evident in the recent crisis in Sri Lanka, where introducing a new organic farming policy led to a significant amount of misinformation being spread among the agricultural community (Bhowmick 2022). The agri-food sector is essential to Sri Lanka's economic and social development, and the spread of misinformation has the potential to harm the sector in a variety of ways. Misinformation can undermine the public's trust in the sector, leading to decreased investment and reduced productivity (Al-Rawi 2019; Zhang et al. 2019). Furthermore, it can lead to the adoption of ineffective or even harmful farming practices, negatively impacting the environment and food security.

It is necessary to build awareness about misinformation among agri-food actors, such as farmers, advisors, and other agriculture and food industry members, because it can significantly impact their livelihoods. Misinformation can spread quickly and easily through social media and other channels, causing confusion and undermining the public's confidence in the agriculture and food industry (Wardle and Derakhshan 2017; Ferreira et al. 2022). This, in turn, can lead to reduced demand for products, lower prices, and decreased profits for farmers and other agri-food actors. In addition, misinformation about agriculture and food production practices can influence public policy decisions, leading to regulations that may be misguided or harmful to the industry. This can make it more difficult for agri-food actors to operate and make a living.

There is a growing concern among scholarly communities that agri-food actors remain aware of the sources of misinformation, understand how it spreads, and take steps to counteract it (Chowdhury et al. 2023; Gibson et al. 2022; Leal et al. 2020; Klerkx 2021). This can include engaging with consumers and stakeholders to educate them about agriculture and food production practices and working with organizations and government agencies to promote accurate information about the industry. In response to this challenge, the present study explores the perception of key actors (farmers, researchers, advisors, and input dealers) in the Sri Lankan agri-food sector about the misinformation and its influences on contemporary agri-food advisory services in the virtual realms of social and online media. The findings of this study will be of great interest to a wide range of intermediaries, including policymakers, researchers, and practitioners in the agri-food sector, as well as those interested in the broader issue of misinformation in society. The findings will inform the development of strategies and interventions to reduce misinformation's impact on the agri-food sector in Sri Lanka and beyond.

Design/Methodology/Approach

The present study employed the Q methodology to gather data from a sample of purposively selected farmers, extension personnel, input dealers, and researchers in Sri Lanka. This study stands out as one of the first to investigate the perspectives of key players in the agri-food sector in Sri Lanka regarding misinformation. To guide the exploration of stakeholders' perspectives on misinformation in the agri-food sector, we utilized the framework proposed by Chowdhury et al. (2023), which provides a comprehensive guide for conceptualizing the various dimensions and elements of misinformation. Participants were asked to rank 19 statements covering various aspects of misinformation, including their perceptions of it, the sources and dynamics of its dissemination, and its effect on their sector. Following the framework proposed by Chowdhury et al. (2023), and reviewing the literature on misinformation research in health and other sectors, we developed statements for this study. Initially, we had 36 statements, which were consolidated and reduced to 19 based on feedback from Sri Lankan extension personnel and researchers. From September to November 2022, we conducted an online Q-sort survey among a purposively selected group of respondents from the Agri-food sector in Sri Lanka using Qualtrics. Participants were asked to sort 19 statements on a grid chart, ranging from -3 (strongly disagree) to +3 (strongly agree). After completing the Q-sort, participants could provide written explanations for their agreements or disagreements with the statements. After collecting the data, we analyzed it using PQ software. We first conducted a correlation matrix to see the relationship between the Q-sorts, then performed a principle component analysis of similar group Q-sorts. The analysis revealed distinct statements and helped us group participants with similar perspectives.

Findings

The Q-sort analysis revealed three distinct perspectives. These perspectives accounted for over 65% of the differences between the 15 Q-sorts (see table 1 below). The stakeholders were grouped into three categories based on their perceptions of misinformation issues. An "idealized sort" was created for each perspective, showing where each Q-statement would be placed if the stakeholder perfectly fit that perspective. The distinguished statements were used to compare each perspective to others.

Table 1 Summary of Q-sort factor loadings.

Agri-food intermediaries	P1	P2	P3
Perspective 1 (P1)			
Researcher	**0.6068X**		
Producer	**0.5784X**		
Producer	**0.6009X**		
Educator	**0.5719X**		
Advisor	**0.8423X**		
Producer	**0.7762X**		
Advisor	**0.8313X**		
Advisor	**0.6919X**		
Advisor	**0.6553X**		
Perspective 2 (P2)			
Researcher		**0.5847X**	
Advisor		**0.4795X**	
Producer		**0.7568X**	

Producer		**0.6205X**	
Advisor		**0.6362X**	
Advisor		**0.8103X**	
Advisor		**0.6324X**	
Perspective 3 (P3)			
Input dealers			**0.7540X**
Producer			**0.7892X**
Producer			**0.6621X**
Advisor			**0.6075X**
Advisor			**0.7420X**
Explained Variance (%)	**26**	**20**	**19**
Eigenvalues	**12.21**	**2.84**	**2.56**
Total defining Q-sorts	**4**	**4**	**7**

The results for **Perspective 1** showed that the participants have a mixed view on the role of social media and traditional media in spreading misinformation in the agri-food sector (see table 2 below). They believe that social media is a great tool for connecting previously unconnected people but also a significant source of misinformation. Participants in this group think that agri-food actors may spread misinformation without any clear motivations but also believe that traditional media doesn't play a role in spreading misinformation. They feel that improving digital literacy skills can help combat agri-food misinformation.

Table 2. Statement significantly differentiating (p< 0.01 & 0.05) the three identified perspectives and consensus statements according to Q-methodology.

Perspectives	**Significantly different statements**	
	Agreement and neutral statements	**Disagreement statements**
Perspective 1	5. Social media connects unconnected people yet is a major source of misinformation. (+1; 0.75*) 11. Agri-food actors spread misinformation without any hidden motivations to achieve profit or power. (1; 0.21*)	19. Enhancing the ability to critically evaluate digital content does not contribute to combat agri-food misinformation. (-1; -0.39) 9. Nowadays, traditional media also spread misinformation about the agri-food issue by misinterpreting facts. (-3;1.63*)
Perspective 2	7. The motivation for creating and spreading misinformation within the agri-food online and social media is profit rather than power (+2; 1.29*) 6. Misinformation in the agri-food sector is primarily generated by those actors who are unfamiliar with existential issues of farmers and agriculture. (+2; 1.17*)	15. Farmers and other agri-food operators incur no financial losses due to misinformation spreading within social media groups. (-2; 1.25*) 19. Enhancing the ability to critically evaluate digital content does not contribute to combat agri-food misinformation. (-2; 1.55)
Perspective 3	8. Misinformation spreads faster than the truth. (+3; 1.78) 2. Misinformation could be posted and shared by mistake. (+2; 1.50*) 12. Lack of moderation contributes to spreading misinformation across social media. (+1; 0.82) 18. Reporting and blocking misinformation spreaders to moderators and FB doesn't help to combat misinformation. (0; 0.02*)	13. People spread misinformation without double-checking it because they want to be popular in their networks. (-1; 0.49*) 16. Correcting misinformation is a waste of time since it is a continuous and never-ending process. (-1; 0.51*) 19. Enhancing the ability to critically evaluate digital content does not contribute to combat agri-food misinformation. (-1; 1.55)

[positive value in parentheses indicate agreement, and negative values indicate disagreement; z-score at p< 0.01* & 0.05**]

Perspective 2 suggests that these participants believe that the primary motivation for spreading misinformation in the agri-food sector is profit. It is primarily generated by actors unfamiliar with the issues faced by farmers and the agriculture sector. They disagree with the view that misinformation does not result in financial losses for farmers and agri-food operators and that enhancing digital content evaluation skills does not effectively combat agri-food misinformation.

Perspective 3 holds a negative view on the issue of misinformation in the agri-food sector. They believe misinformation spreads quickly and is difficult to counteract, although they acknowledge that it can be posted and shared by mistake. They also believe that a lack of moderation contributes to spreading misinformation on social and online media and that reporting and blocking misinformation spreaders is ineffective in combating it. They also believe that correcting misinformation is not a never-ending process and that improving digital literacy skills will help combat agri-food misinformation.

Practical Implications
The results of this study have several practical implications for the agri-food sector in Sri Lanka. Firstly, the study highlights the importance of addressing misinformation as a critical issue in the agri-food sector and the need to develop effective strategies to combat it (see **statement 19**). This includes identifying the motivations behind spreading misinformation, addressing them, and promoting digital literacy skills among agri-food actors to help them critically evaluate digital content. Additionally, the study highlights the need for greater collaboration between various actors in the sector, including farmers, extension personnel, researchers, and media, to effectively counter misinformation and promote accurate information.

Theoretical Implications
This study highlights several important theoretical implications for the fields of misinformation, communication, and agriculture. It underscores the need for a nuanced understanding of misinformation and its impact by considering multiple perspectives, which reveals the variety of motivations behind the spread of misinformation, such as profit, power, and a lack of critical evaluation skills. It is one of the first attempts to apply the analytical framework Chowdhury et al. (2023) proposed to research and understand misinformation in the agri-food sector. The study also highlights the role of social media in spreading misinformation and the need for interdisciplinary approaches that involve various actors in the agri-food sector to combat it effectively. These findings contribute to our understanding of the issue and can provide valuable insights for future research.

References
Al-Rawi, A. 2019. Gatekeeping Fake News Discourses on Mainstream Media Versus Social Media. Social Science Computer Review 37(6): 687–704. https://doi.org/10.1177%2F0894439318795849.

Bastos, M., C. Piccardi, M. Levy, N. McRoberts, and M. Lubell. 2018. Core-periphery or Decentralized? Topological Shifts of Specialized Information on Twitter. Social Networks 52: 282–293. https://doi.org/10.1016/j.socnet.2017.09.006.

Bhowmick, S. (2022). Understanding the Economic Issues in Sri Lanka's Current Debacle. New Delhi, India: ORF, Observer Research Foundation.

Chowdhury, A., and H. H. Odame. 2013. Social Media for Enhancing Innovation in Agri-food and Rural Development: Current Dynamics in Ontario, Canada. In W. Ashton & A. S. Carson [Eds.]. The Journal of Rural and Community Development 8(2): 97-119.

Chowdhury, A., Kabir, K. H., Abdulai, A.R., and Alam, M.F. 2023. Systematic Review of Misinformation in Social and Online Media for Developing an Analytical Framework for Agri-food Sector. Sustainability 15(6): 4753. https://doi.org/10.3390/su15064753.

Ferreira C. M. M., J. P. Sosa, J. A. Lawrence, C. Sestacovschi, A. Tidd-Johnson, M. H. U. Rasool, V. K. Gadamidi, S. Ozair, K. Pandav, C. Cuevas-Lou, M. Parrish, I. Rodri-guez, and J. P. Fernandez. 2022. The Impact of Misinformation on the COVID-19 Pandemic. AIMS public health 9(2): 262–277. https://doi.org/10.3934/publichealth.2022018.

Gibson, J., J. Greig, S. Rampold, H. Nelson, and C. Stripling. 2022. Can You Cite that? De-scribing Ten-nessee Consumers' Use of GMO Information Channels and Sources. Advancements in Agricultural De-velopment 3(2): 1-16. https://doi.org/10.37433/aad.v3i2.181.

Kaushik, P., A. Chowdhury, H. H. Odame, and A.V. Paassen. 2018. Social Media For Enhancing Stakeholders' Innovation Networks In Ontario, Canada, Journal Of Agricul-Tural & Food Information 19(4): 331-353. https://doi.org/10.1080/10496505.2018.1430579.

Klerkx, L. 2021. Digital and Virtual Spaces as Sites of Extension and Advisory Services Research: Social Media, Gaming, and Digitally Integrated and Augmented Advice. The Journal of Agricultural Education and Extension 27(3): 277-286. https://doi.org/10.1080/1389224X.2021.1934998.

Leal, A., J. N. Rumble, A. J. Lamm, and K. D. Gay. 2020. Discussing Extension Agents' Role in Moderating Contentious Issue Conversations. Journal of Human Sciences and Extension 8(2). https://www.jhseonline.com/issue/view/111.

Somerville, P. 2019. Misinformation in Agriculture Contributing to Tech Block. The Weekly Times. https://www.weeklytimesnow.com.au/agribusiness/misinformation-in-agriculturecontributing-to-tech-block/news-story/d9d3066537c06d6c2a31eafc6a2936c4.

Wardle, C., and H. Derakhshan. 2017. Information Disorder: Toward an Interdisciplinary Framework for Research and Policy Making. Council of Europe Report, 27.

Zhang, C., A. Gupta, C. Kauten, A. V. Deokar, and X. Qin. 2019. Detecting Fake News for Reducing Misinformation Risks Using Analytics Approaches. European Journal of Operational Research 279(3): 1036–1052. https://doi.org/10.1016/j.ejor.2019.06.022.

Action-oriented approach to assess digitalization-related risks and trade-offs by advisors

Nevena Alexandrova Stefanova, Zofia Krystyna Mroczek-
Food and Agriculture Organisation (FAO, Rome)

Short abstract

The massive introduction of any new technology poses certain societal concerns that need to be addressed to allow the technology to maximize its benefits and minimize any potential risk and ultimately, unleash its innovation potential. This is particularly valid for the digitalization, understood as a socio-technical process which accompanies the large use of various digital technologies that have impact on social and institutional contexts (Tilson et al., 2010). Both incremental and disruptive innovation provoke changes at local level, i.e. in rural communities that are often more vulnerable to changes. Extension and advisory services, being at the frontline of the local innovation process, have a key role to play in addressing uncertainties brought by new digital technologies. This paper proposes a practical and action-oriented approach that can guide advisors to assess digitalization-related risks, identify trade-offs and risk management strategies.

Extended abstract

Purpose

In times of unprecedented challenges that affect agrifood systems, the digitalization, often defined as a socio-technical process which accompanies the large use of various digital technologies with impact on social and institutional contexts (Tilson et al., 2010), offers unique opportunities for accelerating agricultural development towards more sustainable and integrated agrifood systems and achieving United Nations (UN) Sustainable Development Goals (SDGs). However, digital technology dividends are not automatic. The introduction of any new technology is bringing uncertainty and raising questions as “Is the technology fit-for-purpose and effective?”, “is it cost-efficient and affordable?”, “Is it safe for environment, humans and the society?”. If concerns remain unaddressed, technologies could not unleash their innovation potential and can turn the potential dividends to a divide. Digitalisation in extension and advisory services (EAS) can enhance access, delivery, scope and impact of EAS for agricultural producers and processors, including youth and rural women. Reciprocally, EAS can advance the digitalization in rural areas. But to that end, EAS need to combine the introduction of digital technologies and enhancing digital literacy with the capacity to assess, analyse and mitigate potential hazards and risks in the local context they operate. Furthermore, this assessment needs to be done at planning stage of EAS programmes and initiatives, and not when the damage is done. This paper proposes a structured approach for EAS actors to deal with uncertainties of digital technologies to maximize their benefits by minimizing negative impacts, particularly for vulnerable groups.

Design/Methodology/Approach

The proposed approach is inspired by various risk assessment methodologies related to other new technologies (EFSA, 2010; Codex Alimentarius, 2008), and specifically the framework proposed by Rijswijk et al., 2021. The latter aims to analyse the problematization of digital technologies in their various dimensions and better understand ethics, in line with responsible research and innovation (RRI) approach. This framework proposes three conditions for successful digitalization: design, access and navigating complexity of the given technologies as areas of intersection of the cyber (digital), physical (natural and artificial assets) and social dimensions (communities, institutions). While it provides insights for analyzing (unknown) impacts of digitalization, this framework remains academic and hence requires further operationalization to suit EAS practice. We made an effort to adapt it to the EAS system and better align the concept with the sustainability approach by partially renaming and redistributing the content of the three dimensions, hereby called socio-economic, cyber and environmental.

The following principles have guided the development and the implementation of the framework:

- The risk assessment shall be kept simple and practical
- The risk assessment shall be based on evidence
- The risk assessment is technology-, location- , community- and scale-specific for the first time when the technology/set of technologies is introduced
- The approach distinguishes between hazards (situations with potential for harm) and risks (the likelihood the situations to happen and bring significant negative impact in the local area)
- The mitigation measures should be proportionate to the evaluated risk
- The risk shall be placed in a perspective (compared with the most common current practice at the specific location; discussed against the potential benefits)
- The measures should be effective and cost-efficient
- The overall risk evaluation should be regularly updated and revised when new knowledge and evidence are made available
- Risk management and mitigation actions and their results should be documented to allow monitoring and evaluation.

Findings

The main objective of the revised framework is to provide a structured step-wise approach (fig.1) that will guide the advisors to do an ex-ante assessment of hazards and risks of digitalization in EAS; environmental, socio-economic and cyber (technology-based), and provide insights how advisors can take actions to avoid or manage them through an appropriate design, access and navigating the complexity.

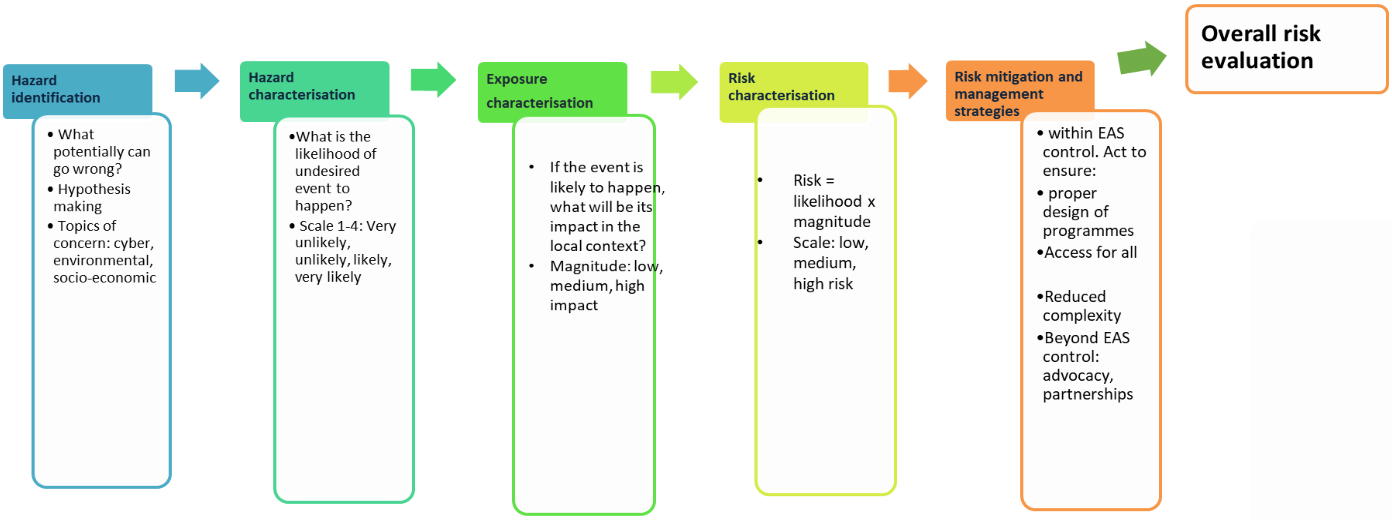


Figure 1. *Dealing with digital hazards and risks in extension and advisory services: 6-step approach*

The approach segregates between hazards (situations with potential harm), and risks (the likelihood the situations to happen and bring significant negative impact in the local area). The approach is specific for the technology, or sets of technologies and the context of the local area, where its application is planned.

As a first step, hypotheses are made on potential hazards associated with the introduction of the technology/ies in the specific context around the main topics of concern- cyber, environmental and socio-economic (fig.2). Typical questions to be asked at this stage can be as follows:

- Does the nature of the technology present potential harm for humans, animals, plants? How?
- Is the technology complex (set of technologies, big data)? Can it be easily comprehended by farmers?

- Does the technology require maintenance and is the maintenance accessible and affordable in the local area?
- Is the needed digital infrastructure in place in the local area? Is it accessible for all?
- Does it use more natural resources and energy than its alternative, the conventional practice (if available)?
- Can the technology potentially damage the environment? How?
- Is the technology fit-for-purpose and relevant to the farmers' needs?
- Has the design process of the EAS digital modality been participatory and farmer-centered?
- Is the new technology cost-efficient?
- What are the vulnerable and more exposed to risks groups?
- What are the power dynamics among the stakeholders?
- Are there capacities in place to successfully implement the digital solution proposed?
- Can the technology impact negatively the employment opportunities of the local community?
- How is the farmer's data valorized and governed?

As a next step, the hypotheses are assessed against the likelihood of occurrence of that undesired impact in the specific context. A scale from 1 to 4 is used, where the 1 is very unlikely and 4 is a very likely event. If the chance is assessed as unlikely or very unlikely, the process stops here. Should the hazard is characterized as likely or very likely, a third step is used to access the exposure or the magnitude of the future undesired impact. If the application of the technology is done on a small project pilot, its exposure will be limited to a few farmers and the magnitude will be very low; then the assessment process stops here and no mitigation strategies are needed. For medium and high magnitude, combined with likely and very likely chances of occurrence, the risk is characterized as, medium and high in the 4th step. Further, specific mitigation and risk management strategies are to be identified (step 5) or in obsolete cases of unacceptable risk, the technology is to be dropped out at the step 6 of the overall risk evaluation.

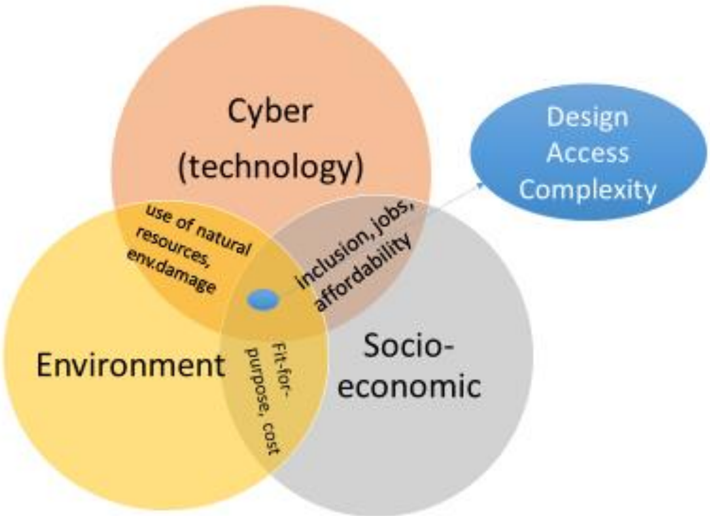


Figure 2. Digitalisation impact conditions: cyber (technology-generated), environmental and socio-economic dimensions with their triple intersection (design, access, complexity). The hazards are assessed according to the three conditions of impact of the digitalization, cyber, environmental and socio-economic, and the mitigation strategies are focused on improving the design, ensuring equitable access and navigating complexity. *Rijswijk et al., 2021 with modifications by the authors.*

Practical Implications

How the framework can be applied in practice can be best demonstrated through an example of ex-ante risk assessment of the introduction of smart irrigation system for remote and automated switch on/off of the irrigation based on sensors, IoT and mobile phone applications in a rural area with poor infrastructure and frequent electricity black-outs. The assessment of the hazards in cyber, environmental and socio-economic dimensions allows the advisor to formulate the hypothesis of potential not-fit for-purpose solution due to the potential ineffectiveness in case of black-outs and high maintenance costs, despite the findings that higher efficiency in farming management can be achieved with 40% reduction of manpower needed to control the irrigation (benefits). As a next step, the hazard is characterized as very likely, however, in view of the limited scale of introduction, the exposure is characterized as low. The risk (likelihood x exposure) is therefore characterized as medium and mitigations strategies are identified in step 5 that can include an improved design, such as alert notifications in case of malfunction, ensuring a personnel for checks and maintenance and, ensured technology access and navigating complexity through identifying or advocating for financial support mechanisms (subsidies, credits) and proper capacity development for the farmer and his/her employees (household). The overall risk evaluation is low risk, as effective strategies can be applied to mitigate it.

As the example demonstrates, the proposed risk framework can be used an EAS actors' guide for decision-making to apply digital technologies in a specific location and scale. It stimulates the advisors' reflection on both positive and negative possible impacts of the digital technologies, especially when they are introduced for the first time in a particular context and no previous experience is available. It guides the advisors to request further specific information (need to know vs. good to know) to the IT solution providers and AKIS (AIS) actors in general that can lay a solid ground for local partnerships.

Theoretical Implications

Various approaches exist to facilitate digital EAS, such as responsible research and innovation (RRI) or human-centred design (HCD). However, they are not without limitations since different stakeholders are impacted differently by digital technologies, having divergent interests and unequal bargaining power and vulnerabilities.

Some of the key theoretical implications of the proposed framework are:

- Translating complex concepts of hazard, risk and benefit analyses into a practical and action-oriented framework
- Defining the areas of concern, their interrelation and direct linkage with the sustainable development approach of the Rio+20 Conference, seen as nexus of environmental, social and economic areas
- Articulating the major topics of concern in a particular area, e.g.
- Social: vulnerable groups, societal power dynamics, capacities in place
- Economic: economic viability compared to the traditional practice, profitability, economic unbalance between technology users and non-users; affordability, jobs loss
- Environmental: overuse of resources (water, minerals, electricity, energy etc.), GHG emissions increase
- Cyber and nature of the technology: violation of privacy, misuse of data….
- Providing a focus on the areas intersection, where the expected impact could be bigger and more complex and where mitigation measures should focus on.
- Access:

Access can be considered at different levels. One of the most evident levels is a physical access: outside the cities, digital devices are often hard to find, while infrastructure (stable electricity, broad bandwidth internet etc.) are likely to be poor or unavailable in rural areas. However, access depends also on the affordability of devices, mobile services and fees etc. Internet and mobile services prices are still too often prohibitive for rural people. The price of 5 GB of fixed broadband can go up to more than 20 per cent of monthly gross national income per capita in 19 of the least developed countries, according to the UN report (UN, 2020).

Rural poor and those who, like often women, do not have a say in income spending, may be thus excluded even where digital services are present. These issues are often referred to as 'first level access' (FAO-AGRILINK webinar, 2021; McCampbell, M. et al., 2021).

- Design:

To effectively design and use digital technologies in EAS, a set of new skills is required both on supply and demand side. It starts with awareness of such technologies but is not only about technological skills. Equally important are skills to package effectively knowledge and information into digital format, accompany rural producers, including the illiterate, in analysing and interpreting data to make informed decisions, and many others. Those capacities are often missing and there is still too little recognition of their importance at a practical level. Hence, the content of digital advice may be difficult to comprehend and to act upon or irrelevant.

In order to be relevant, digital EAS need to be context specific and tailored, rather than blanket-like (e.g. TV). They should allow for multilateral interactions rather than unilateral dissemination. Hence, it is key that digital technologies in EAS take into account intersectionality of rural population and their heterogenous needs. They should be designed with farmers being involved from the beginning in planning, design, implementation, and their evaluation.

All this, coupled with an inappropriate design not thought for smallholders' needs, may lead to them simply not using, or using inadequately, digital technologies, thus missing on important advice and information. Hence, inconsiderate investing in digitalization in EAS may miss the goal of reaching them, while causing further negligence in traditional services or public goods related themes. For instance, many digital tools are related to the use of inputs rather than to sustainable practices such as agroecology or soil regenerative techniques (FAO-AGRILINK webinar, 2021).

- Complexity

Another aspect of access relates to the so-called digital literacy and the content, i.e. capacity to use digital devices and information conveyed through them. It is related to the complexity of proposed solutions. Literacy levels and familiarity with modern tools can be lower amongst rural people, especially the poor and women. If the digital EAS are not designed with this in mind, and instead follow the latest sophisticated technological trends, many people may be simply unable to use them. This is often referred to as the second level access.

McCampbell, M. et al. analyse persisting challenges of digital attempts, mentioning among others power inequalities, unintended consequences at scale (e.g. misuse of data), unawareness of implications and capacity of actors to reflect critically, participate actively and protect their rights in the digital processes. These factors are thus indirectly hampering a truly inclusive and full access to digital technologies and are called third level access (McCampbell, M et al, 2021). Following this reasoning, digital literacy is also about attitudes, agency, and ownership (FAO-AGRILINK webinar, 2021).

Last but not least, human component is also key to preserve people's agricultural know-how and foster their innovation potential. Ecosystems and agriculture are not a Swiss watch that can be regulated by machines, and traditional and indigenous knowledge are vital elements of agricultural innovation system. Overreliance on the digital leads people to underestimating human knowledge and to forgetting how to do things without digital sensors and Internet. Two streams of knowledge and skills: scientific/digital and human/traditional should work hand in hand with the former helping also to document and preserve the latter.

Communication of hazards and risks is an integral part of the risk management strategies to deal with complexity and skilled advisors play an increasing role in it. Risk communication processes contribute to determining the perception of risk of the exposed community, and participate in the construction of a society's understanding of its own security. Yet, because of rapid developments in communication technology and a general digitalisation of information, the function of risk communication has recently undergone comprehensive changes. The way information is constituted, verified, legitimated and transmitted has become more instantaneous and diffuse and new actors and new communication technologies have changed this picture in ways we as yet do not fully understand (Bencsik, Hargitai and Kulachinskaya, 2022). A trusted advisor should provide evidence-based information by addressing the community perception of risks and involve farmers and rural actors throughout the whole risk assessment process.

Digitalisation is heterogenous and can take many pathways. That is why social innovation should anticipate and be supported by the technological one (McCampbell, M et al, 2021). In the agriculture and in the EAS, it should have a primary goal of sustainably improving rural livelihoods, and not just pursuing latest technologies. Sustainable and inclusive digital transformation should be accompanied by a broader transformation of the socio-economic development schemes and coherent strategies (CTA, 2019; Rijswijk et al., 2021). While empowering smallholder farmers to access digital EAS is important, it is also absolutely key to put them in a driver's seat so that they can not only use them, but truly own them to harness their human innovation potential. Finally, the proposed risk assessment approach should be seen as a voluntary decision-making, capacity- development and information gaps identifying tool and not as a basis for formal technology regulation that might present obstacles in maximizing the benefits of the digitalization.

References

Bencsik, A., Hargitai, D.M. and Kulachinskaya A. 2022. Trust in and Risk of Technology in Organizational Digitalization, Risks 2022, 10(5), 90; available at https://doi.org/10.3390/risks10050090)

Codex Alimentarius. 2008. Guideline for the Conduct of Food Safety Assessment of Foods Derived from Recombinant-DNA Plants. CAC/GL-45-2003; available at https://www.fao.org/fao-who-codexalimentarius/thematic-areas/biotechnology/en/

CTA. 2019. The digitalization of African agriculture report. 2018-2019.

EFSA. 2010. Guidance on the environmental risk assessment of genetically modified plants. EFSA Journal 2010;8(11):1879 (available at: https://doi.org/10.2903/j.efsa.2010.1879)

FAO-H2020 AGRILINK. 2021. Addressing the digital challenge: extension and advisory services (EAS) for the empowerment of small and family farmers. E-discussion. (available at: https://smartagro.lv/wp-content/uploads/2021/11/AgriLink-_-FAO-Discussion-Document-QUESTIONS.pdf)

FAO-H2020 AGRILINK. 2021. Extension and advisory services (EAS) for the empowerment of small and family farmers: Addressing the digital divide. Webinar. (available at https://www.youtube.com/watch?v=k3Y_pYa8AIg and https://www.youtube.com/watch?v=Nw9uOMWXM-8)

McCampbell, M., Schumann, Ch., Klerkx, L.. 2021. Good intentions in complex realities: Challenges for designing responsibly in digital agriculture in low-income countries. Journal of the European Society for Rural Sociology. (available at: https://onlinelibrary.wiley.com/doi/10.1111/soru.12359)

Rijswijk, K., Klerkx, L., Bacco, M., Bartolini, F., Bulten, E., Debruyne, L., Dessein, J., Scotti, I., Brunori, G. 2021. Digital transformation of agriculture and rural areas: A socio-cyber-physical system framework to support responsibilisation. Elsevier. Volume 85, p. 79-90. (available at https://www.sciencedirect.com/science/article/pii/S074301672100125X#!)

Tilson, D., Lyytinen, K., Sørensen, C.. 2010. Research commentary—digital infrastructures: the missing IS research agenda. Inf. Syst. Res. 21 (4), 748–759.

UN. 2020. Report of the Secretary-General Roadmap for Digital Cooperation

Can agricultural knowledge and innovation systems guide the digital transition of short food supply chains? A study in Greece and Italy

Chrysanthi Charatsari[1], Anastasios Michailidis[1], Marcello De Rosa[2], Evagelos D. Lioutas[3], Dimitrios Aidonis[3], Luca Bartoli[2], Martina Francescone[2], Giuseppe La Rocca[2], Luca Camanzi[4]

[1]Aristotle University of Thessaloniki, School of Agriculture, Department of Agricultural Economics
[2]University of Cassino and Southern Lazio, Department of Economics and Law
[3]International Hellenic University, Department of Supply Chain Management
[4]Università di Bologna, Department of Agricultural and Food Sciences

Short abstract

Agricultural digitalization creates a disruptive environment for agricultural knowledge and innovation systems (AKIS). To cope with the digital transition, the actors participating in such systems, and the AKIS as a whole, should integrate and reconfigure competencies known as dynamic capabilities. Dynamic capabilities are the abilities of an organization or system of organizations to sense changes in the external environment, seize opportunities and avoid threats that emerge during transformative periods, and reconfigure routines and practices to adapt to high-velocity environments. In the present study, focusing on the digitalization of short food supply chains, we aim to explore if AKIS and the actors participating in these systems have such capabilities. To meet this purpose, we lean upon data collected during two workshops held in Greece and Italy. Our results revealed that, despite their sensing ability, AKIS actors in both countries have a low seizing capacity and questionable competence in initiating transformational activities. New entrants in AKIS are capable of seizing opportunities associated with digitalization but, being loosely connected with other actors, cannot facilitate the flow of knowledge in the system.

Extended abstract

Purpose

Agricultural digitalization shapes a new ecosystem for agricultural knowledge and innovation systems (AKIS). The introduction of digital technologies in farm practice creates a new scene that encompasses the key features of a high-velocity environment, as described by Bourgeois and Eisenhardt (1998). Changes in technology, regulatory frameworks, and the demand for advice are rapid and discontinuous, while old knowledge and operational routines become quickly obsolete, and new actors enter the stage. Indeed, the race of technological development is followed by the emergence of new legislative regulations (Cook et al., 2022), while advisors have to build new skills and competencies (Charatsari et al., 2022; Eastwood et al., 2019). New actors, such as Ag-Tech companies, without previous connection with AKIS enter the system (Klerkx et al., 2019), and organizations already offering advisory services are urged to undertake new roles (Knierim et al., 2019; Eastwood et al., 2017) and adapt their operational paradigms to guide or, at least, follow the stream of the digital revolution (Charatsari et al., 2020). Old and new players bring to AKIS their expertise and operational capacity (Ingram and Maye, 2020), thus changing the resource base of the system and increasing its complexity.

Although organizations can cope with incremental change by exploiting their resources (knowledge, expertise, networks, etc.) and by following standard routines and practices, high-velocity conditions require the development and use of their dynamic capabilities, i.e., their ability to leverage strategic and organizational processes by, for instance, developing new services, building alliances, creating novel resources, and evolving or recombining already used resources to create value for their customers (Eisenhardt and Martin, 2000). In this sense, dynamic capabilities help an organization to keep up with discontinuous change and achieve its purposes under uncertainty (Barreto, 2010). These capabilities can be divided into three categories. First, the capacity to sense and shape opportunities and threats. Second, the ability to seize opportunities by maintaining and improving essential competencies. Third, the capability to initiate and undergo transformations when external threats appear on the horizon (Teece, 2007).

A pivotal question is whether AKIS actors (and the AKIS system as a whole) have the dynamic capabilities to navigate digitalization. Our study aims to offer a preliminary answer for the Greek and Italian AKIS. Instead of focusing on the digitalization of mainstream agricultural production models, we shifted our attention to short food supply chains (SFSCs). As research has shown, the alternativeness of such chains, referring to sociotechnical specificities (Burgess et al., 2022) and normative beliefs of farmers and consumers about the appropriateness of following farm modernization paths (Lioutas and Charatsari, 2020), makes their digitalization difficult. Hence, supporting and practicing the digitalization of SFSCs represents a challenge for AKIS.

Design/Methodology/Approach

To answer our research question, we lean upon data collected during two workshops organized in Greece and Italy. The Greek workshop involved 10 farmers who distributed their products through SFSCs and five farm advisors. The Italian workshop comprised 10 SFSCs farmers and three farm advisors. The discussion guide included questions referring to the performance of AKIS and the actors participating in them, their ability and readiness to guide the digitalization of SFSCs, and the dynamic capabilities of individual actors and of AKIS as a whole. To analyze data, we performed two thematic analyses (one for each country) following the steps outlined by Braun and Clarke (2006).

Findings

The analysis uncovered that Greek AKIS has a considerable capability to sense opportunities associated with digitalization. Freelancer advisors participating in the workshop noted that they continuously monitor for relevant opportunities. Nevertheless, finding cheap digital solutions that can be translated into sizeable benefits for small-scale farmers (i.e., the majority of producers who choose SFSCs to distribute their products) is far from easy. On the other hand, farmers argued that medium-sized private advisory companies are able to discern opportunities more effectively. However, being oriented toward "big farming," private firms cannot tailor their suggestions to farmers participating in SFSCs. Finally, public advisory services seem to be absent from the praxis of digitalization, despite the fact that they can filter and calibrate opportunities, therefore offering suggestions on what deserves investment and what does not.

It is worth mentioning that all the advisors participating in the workshop claimed that they have taken significant steps to develop knowledge related to digitalization, but, as they stated, the process of turning digital technologies into tangible benefits for farmers participating in SFSCs presents difficulties due to the lack of fit between the operational characteristics of their farms and the advanced nature of digital technologies. Nevertheless, farmers stand critically against the capability of (old) AKIS actors to seize opportunities by creating alliances, building new networks with AgTech companies, and designing action plans for promoting and exploiting digital technologies.

In such a framework, it is not surprising that private advisory companies and new entrants in AKIS, like digital technology providers, are those who can effectively seize the opportunities of digitalization. For public actors, the transformational capacity is low since they seem to carry – and operate under the influence of – the stamp of the "analog" socioeconomic environment. On the contrary, private sector advisors and freelancers noted that they spend resources to support digitalization and develop plans to translate digital tools into value for farmers. However, the capacity of SFSCs farmers to transform their enterprises so as to exploit the opportunities of digitalization is limited for various reasons: cost constraints, limited support from AKIS actors, institutionalization, fear of transformation, and a consequent tendency to inertia. In sum, the Greek AKIS – lacking an operational backbone that supports innovation and adaptation to external changes – does not possess the transformational capacity needed to effectively navigate digitalization.

In Italy, the results confirmed that AKIS actors are highly competent in detecting opportunities related to digitalization. However, even though private advisory companies are eager to reformulate their value propositions and develop new services, they tend to ignore the specificities of SFSCs, thus directing their efforts to sense and seizing opportunities for supporting the digitalization of mainstream farm production systems (especially those producers who distribute their products through export-oriented supply chains).

Notably, public advisory services, albeit conceiving of digitalization as an inflection point for the future of farming, having limited human resources and technical capabilities, seem unable to serve all the heterogeneous farmers' segments. Opportunity-seeking and seizing are, therefore, mainly directed toward addressing the needs of commercially-oriented farms, which heavily contribute to the country's economy. Hence, the innovations promoted by public advisory services are considered incompatible with SFSCs.

The lack of skills on the part of both farmers and advisory organizations seems to be the main obstacle in their ability to transform themselves and, consequently, facilitate and boost the digital transition of SFSCs. Interestingly, workshop participants noted that Universities and research centers actively participate in the Italian AKIS; however, their role is limited in the production or improvement of digital technologies without directly contributing to the upskilling of farmers and advisors. Technology providers, on the other hand, do have the necessary knowledge assets but are not strongly linked with AKIS since their role is reduced to that of the supplier of digital tools. Hence, the transmission of knowledge from AgTech companies to advisory organizations and farmers is limited. Such conditions raise doubts about the transformative capacity of independent actors and the whole AKIS.

Practical Implications

The findings indicate that AKIS in both countries are not sufficiently equipped with the dynamic capabilities needed to direct the course of agricultural digitalization and make the most of the digital technologies available. A critical point of concern is the limited ability of both Italian and Greek AKIS to seize the opportunities that digitalization opens up and transform themselves by reconfiguring their business models and the modus operandi of the wider AKIS.

Theoretical Implications

Through a theoretical lens, the present study suggests that dynamic capabilities are essential properties of AKIS that can explain how well and why actors and the knowledge and innovation systems fit and perform in the changing plot that digitalization creates for agriculture.

References

Barreto, I. (2010). Dynamic capabilities: A review of past research and an agenda for the future. *Journal of Management*, *36*(1), 256-280.

Bourgeois III, L. J., & Eisenhardt, K. M. (1988). Strategic decision processes in high velocity environments: Four cases in the microcomputer industry. *Management Science*, *34*(7), 816-835.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.

Burgess, P., Sunmola, F., & Wertheim-Heck, S. (2022). Blockchain enabled quality management in short food supply chains. *Procedia Computer Science*, *200*, 904-913.

Charatsari, C., D. Lioutas, E., De Rosa, M., & Papadaki-Klavdianou, A. (2020). Extension and advisory organizations on the road to the digitalization of animal farming: An organizational learning perspective. *Animals*, *10*(11), 2056.

Charatsari, C., Lioutas, E. D., Papadaki-Klavdianou, A., Michailidis, A., & Partalidou, M. (2022). Farm advisors amid the transition to Agriculture 4.0: Professional identity, conceptions of the future and future-specific competencies. *Sociologia Ruralis*, *62*(2), 335-362.

Cook, S., Jackson, E. L., Fisher, M. J., Baker, D., & Diepeveen, D. (2022). Embedding digital agriculture into sustainable Australian food systems: Pathways and pitfalls to value creation. *International Journal of Agricultural Sustainability*, *20*(3), 346-367.

Eastwood, C., Ayre, M., Nettle, R., & Rue, B. D. (2019). Making sense in the cloud: Farm advisory services in a smart farming future. *NJAS-Wageningen Journal of Life Sciences*, *90*, 100298.

Eastwood, C., Klerkx, L., & Nettle, R. (2017). Dynamics and distribution of public and private research and extension roles for technological innovation and diffusion: Case studies of the implementation and adaptation of precision farming technologies. *Journal of Rural Studies*, *49*, 1-12.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: what are they? *Strategic Management Journal*, *21*(10-11), 1105-1121.

Ingram, J., & Maye, D. (2020). What are the implications of digitalisation for agricultural knowledge? *Frontiers in Sustainable Food Systems*, *4*, 66.

Klerkx, L., Jakku, E., & Labarthe, P. (2019). A review of social science on digital agriculture, smart farming and agriculture 4.0: New contributions and a future research agenda. *NJAS-Wageningen Journal of Life Sciences*, *90*, 100315.

Knierim, A., Kernecker, M., Erdle, K., Kraus, T., Borges, F., & Wurbs, A. (2019). Smart farming technology innovations–Insights and reflections from the German Smart-AKIS hub. *NJAS-Wageningen Journal of Life Sciences*, *90*, 100314.

Lioutas, E. D., & Charatsari, C. (2020). Smart farming and short food supply chains: Are they compatible? *Land Use Policy*, *94*, 104541.

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, *28*(13), 1319-1350.

Acknowledgment

This study has been realized in the framework of the project "Data-enabled Business Models and Market Linkages Enhancing Value Creation and Distribution in Mediterranean Fruit and Vegetable Supply Chains – MED-LINKS" (ID 1591). Financial support to the project has been provided by PRIMA, a program supported by the European Union, and co-funding has been provided by the Italian Ministry for University and Research (Decreto Dirigenziale n.1366.14-06-2021), the Egyptian Academy of Scientific Research and Technology (ASRT), the French National Research Agency (ANR-21-PRIM-0009-07), the Greek General Secretariat for Research and Technology (ΓΓPRM-0362988, ΓΓPRM-0352264) and the Moroccan Ministry of Higher Education, Scientific Research and Professional Training (Convention n. 5 and n.6).

Session 2B – Designing & Selecting the right digital tool for advisors

Working with farmer organizations to co-design more user-relevant and responsible digital advisory services? An analysis of motivations and blocking factors.

Chloé Alexandre[1], Teatske Bakker[1]
[1]CIRAD

Short abstract:

Because of their in-depth knowledge of farmers' profiles and local contexts, but also because of their ability to interact with international actors and projects, farmer organizations (FOs) are increasingly considered as key players in the development of digital advisory services. This co-design with FOs is indeed put forward as a way to produce a more user-relevant and responsible digital advisory services. However, several recent initiatives in Africa show that this is not always the case. Based on a synthesis of literature in two domains (socio-anthropology of development; work on the digitization of advisory services) and a case study in Burkina Faso, this paper analyzes the diversity of reasons motivating the inclusion of FOs in the process of developing digital advisory services; and explores the conditions necessary for the inclusion of these FOs to effectively lead to the creation of a more user-relevant and responsible services. Practical recommendations are also formulated to this end.

Extended abstract

Purpose

Participatory approaches and co-design with users are increasingly emphasized in order to develop digital advisory services that meet the expectations of users (farmers and/or advisors) (Klerkx et al., 2019; Steinke et al., 2022) and respect their data rights (McCampbell et al., 2021). In Africa, the vast majority of digital advisory services are developed in the framework of international development projects, involving international actors (NGOs, research, etc.) and local actors (Alexandre, 2022; McCampbell, 2021). Because of their in-depth knowledge of farmers' profiles and their working environment, but also because of their knowledge of the functioning and "vocabulary" of development projects, farmer organizations (FOs) are increasingly considered as key actors in the development of digital advisory services. The expected benefits of collaboration with FOs include access to specific knowledge (knowledge of the agro-climatic context and farmers' activities), logistical support for the service development process (identification of potential users, conducting interviews, etc.), but also the legitimization of development projects that are often designed by actors from Northern countries.

Recent studies analyzing the development process of digital advisory services in Africa show, however, that the willingness to include FOs in this process does not necessarily result in the creation of a service that is more relevant for farmers and more responsible (Alexandre et al., 2022; McCampbell et al., 2021). This can be explained, among others, by the fact that the collaborative context is not conducive to the inclusion of the FO in major design choices, that the interlocutors chosen within the FO are not able to convey the diversity of user expectations, or that FOs do not have the capabilities to voice their ideas in such a multi-actor innovation process (ibid.).

Given this observation, this paper proposes to explore in greater detail the reasons motivating advisory service providers to include FOs in the development process of digital advisory services; and to analyze the conditions necessary for the inclusion of these FOs to effectively lead to the creation of more user-relevant and responsible services.

To this end, we propose a cross-analysis of studies in socio-anthropology of development on FOs in Africa and studies in social sciences (management sciences, innovation studies, etc.) on the development of digital agricultural advisory services. The work in socio-anthropology of development is mobilized to reposition the contemporary discourses on the need to include FOs in development projects in a longer historical trajectory and to provide a " demythified " reading (Olivier de Sardan, 1995). This work indeed emphasizes the need to go beyond idealized representations (or myths) of FOs in Africa, in order to analyze, among others, the games of interests and power struggles between FO members (ibid.). Studies on digital advisory services (in management sciences, innovation studies, etc.) provide insight into the expected benefits of co-designing digital services with producer organizations, but also into the factors that help explain the difficulty of effectively involving farmer organizations and thereby developing more relevant and responsible digital services. Finally, we formulate recommendations for the inclusion of FOs to participate in the creation of a more user-relevant and responsible digital agro-advisory services.

Design/Methodology/Approach

The results presented in this paper are based on a synthesis of peer-reviewed scientific articles from two communities: studies in socio-anthropology of development on FOs in Africa and their inclusion in development projects; and studies in social sciences on digital agricultural advisory services, which mention either the expected benefits of including FOs in the service design process or the factors that hinder this inclusion. The analysis of the articles provides the framework below (Table 1).

Table 1: Analytical framework

Categories of the analytical framework
- Development of FOs in Africa and state of play
- Contemporary representations of FOs
- Discourses on the inclusion of FOs in development projects
- Motivations expressed for co-designing digital services with POs; expected benefits
- Blocking factors

This literature synthesis will be highlighted by exploring a case study in Burkina Faso, tracing the development of digital agricultural advisory services within multi-actor partnerships involving businesses, international NGOs and producer organizations. This case study is the result of a field survey conducted over 1.5 years (2018 and 2019) based on semi-structured interviews, observations and secondary data analysis (Alexandre, 2022).

Findings

a. *The motivation to include FOs is embedded in a long historical trajectory and may be based on distorted representations of farmer organizations*

After tracing the development history of producer organizations in West Africa (Blein & Coronel, 2013; Bosc et al., 2002; Dugué et al., 2012), we put contemporary discourses on the need to co-construct digital advisory services with FOs into the longer trajectory of the evolution of international development paradigms (Jacob & Lavigne Delville, 1994; Olivier de Sardan, 1995). We then present two myths associated with FOs that still tend to permeate developmentalist discourses and thought patterns: the myth of "needs" and the tendency to stereotyping; and the myth of farmers' organizations as a consensual community, invisibilizing internal power issues (Olivier de Sardan, 1995). We illustrate these two myths in the cases studied in Burkina Faso and discuss their implications for the development of digital agricultural advisory services.

b. Expected benefits of including FOs in the development of digital advisory services and identified blocking factors

We present the expected benefits of including FOs in the development of digital advisory services (more relevant services, responsible innovation, legitimization e.g.). We then draw on case studies conducted in Africa on the development of digital advisory services to identify the factors blocking the engagement of FOs in this process and the consideration of their interests (Alexandre et al., 2022; McCampbell et al., 2021; Ortiz-Crespo et al., 2020; Steinke et al., 2022). Table 2 shows these different blocking factors, grouped by category. We analyze these blocking factors in Burkina Faso and illustrate how they impacted the development process and the digital advisory services created.

Table 2: Factors contributing to explain that co-design with FOs does not automatically result in more user-relevant and responsible digital advisory services. Source: Authors, based on literature synthesis and the case study

Categories of factors	Blocking Factors
Willingness of the PO to represent the interests of the users	- Technicians and elected representatives of the FO do not represent the interests of producers (or service users) - Operating FOs vs. "empty shells"
Capacity of the FO to represent the interests of the users	- A diversity of users that cannot all be satisfied (various farmers; various advisors; various elected representatives – with potentially contrasting goals and/or demands) - Interaction with non-representative users when designing services - Weak open innovation capabilities - Low digital capabilities
FO organizational culture	- *Top-down* culture and lengthy decision-making process - Lack of organizational memory on participatory processes
Collaboration environments	- Development projects that are too restrictive (too short in duration; no room for experimentation because activities are planned in advance and cannot be adapted; focus on results rather than learning; limited opportunity to take risks). - Methods of collective decision-making that are not conducive to the inclusion of the least endowed actors.

Practical Implications

Organizations interested in working with FOs to develop more relevant and responsible digital advisory services are advised to pay attention to several points:

- Choice of FO: not all FOs have the willingness, capabilities and organizational culture to participate effectively in a service co-design process
- Choice of user representatives: the profiles of potential users of a digital advisory service are diverse. It is important to take this diversity into account and to identify actors who are able to represent the expectations and constraints of all these potential users.
- Collaborative environment: short-term development projects, with predetermined and inflexible activities, do not constitute a collaborative environment that is conducive to the involvement of FOs in the design and development of digital services. Attention should also be paid to developing animation and decision-making methodologies that allow the least endowed actors to enforce their interests.

Theoretical Implications

Crossing social science studies on digital advisory services with studies in socio-anthropology of development makes it possible to question the reasons for including FOs in the development of services and to identify a list of factors contributing to explain the failure of projects aiming to include FOs in the development of digital services that are more relevant to users and responsible.

References

Alexandre, C. (2022). Opérationnalisation et évaluation de la capacité d'innovation ouverte dans les services dans un contexte contraint : Le cas des services numériques de conseil agricole au Burkina Faso. Thèse en sciences de gestion, CIRAD/EDEG/Institut Agro, France.

Alexandre, C., Toillier, A., & Mignon, S. (2022). Exploring the Nature of Dynamic Capabilities and Enabling Environments for Service Innovation in the Global South: The Case of Digital Agro-advisory Services in Burkina Faso. *Journal of Innovation Economics & Management*, 39(3), 241–273. https://doi.org/10.3917/jie.pr1.0127

Blein, R., & Coronel, C. (2013). Les organisations de producteurs en Afrique de l'Ouest et du Centre : Attentes fortes, dures réalités. Etudes FARM, 82p.

Bosc, P.-M., Berthomé, J., Losch, B., & Mercoiret, M.-R. (2002). Le grand saut des organisations de producteurs agricoles africaines : De la protection sous tutelle à la mondialisation. *Revue internationale de l'économie sociale : Recma*, 285, 47. https://doi.org/10.7202/1022251ar

Dugué, M.-J., Pesche, D., & Coq, J.-F. L. (2012). Appuyer les organisations de producteurs. Éditions Quæ. https://doi.org/10.3917/quae.dugue.2012.01

Jacob, J.-P., & Lavigne Delville, P. (Eds.). (1994). Les associations paysannes en Afrique: Organisation et dynamiques. APAD ; Karthala ; IUED.

Klerkx, L., Jakku, E., & Labarthe, P. (2019). A review of social science on digital agriculture, smart farming and agriculture 4.0: New contributions and a future research agenda. *NJAS - Wageningen Journal of Life Sciences,* 90–91, 100315. https://doi.org/10.1016/j.njas.2019.100315

McCampbell, M. (2021). More than what meets the eye: Factors and processes that shape the design and use of digital agricultural advisory and decision support in Africa. PhD thesis, Wageningen University, Wageningen, the Netherlands

McCampbell, M., Schumann, C., & Klerkx, L. (2021). Good intentions in complex realities: Challenges for designing responsibly in digital agriculture in low-income countries. *Sociologia Ruralis,* 62(2), 279–304. https://doi.org/10.1111/soru.12359

Olivier de Sardan, J.-P. (1995). Anthropologie et développement : Essai en socio-anthropologie du changement social. In *Africa: Journal of the International African Institute* (Vol. 68). https://doi.org/10.2307/1161283

Ortiz-Crespo, B., Steinke, J., Quirós, C. F., van de Gevel, J., Daudi, H., Gaspar Mgimiloko, M., & van Etten, J. (2020). User-centred design of a digital advisory service: Enhancing public agricultural extension for sustainable intensification in Tanzania. *International Journal of Agricultural Sustainability*, 1–17. https://doi.org/10.1080/14735903.2020.1720474

Steinke, J., Ortiz-Crespo, B., van Etten, J., & Müller, A. (2022). Participatory design of digital innovation in agricultural research-for-development: Insights from practice. *Agricultural Systems*, 195, 103313. https://doi.org/10.1016/j.agsy.2021.103313

Digitalisation of advisory services and education: The case of remote consulting to overcome the challenge of on farm meeting restrictions for farm advisors, by choosing appropriate digital tools.

Evi Arachoviti, Laura Palczynski

Innovation for Agriculture, UK

Short abstract

Covid 19 restrictions necessitated the expanse of online communication offerings, which was particularly challenging in the agricultural sector and for IfA specifically, as a knowledge exchange organisation. The Online Agricultural Show was well received and provided an opportunity for connectivity to move online, with virtual stands to learn about research and products, and a beer tent for informal chats with music. The decision to adapt the Online Agricultural Show platform to IfA Live, allowed IfA to expand its knowledge exchange offerings – catering not only to those who enjoy and take time to attend physical events and activities, but also to those who are interested to engage but unwilling or unable to travel, or have limited time.

Extended abstract

Purpose

The purpose of this work is to showcase an example of knowledge exchange digital tool and how the adoption of this innovative tool impacted practises and skills in Innovation of Agriculture Organisation.

The Online Agricultural Show

There is an emerging need for remote consulting in the agricultural industry. Many farm advisors and vets are not able to meet with their farmer clients, a challenge experienced during COVID– 19 crisis that imposed lockdown restrictions, but also during bird flu outbreaks or due to other reasons which pose similar meeting restrictions such as bad weather or economic difficulties.

These restrictions necessitated the expanse of online consultation and communication offerings that facilitate the exchange of valuable knowledge and best farming practices and improve interaction among peers (advisors and farmers) in a period where face to face meetings and on farm consultation becomes a challenge.

Another aspect of vital importance to the farming community is the agricultural show calendar that provides networking and business opportunities, as well as social engagement. At the time of the necessary lockdown restrictions, imposed as a result of the COVID 19 outbreak, most agricultural shows across the UK had to be cancelled. The shows are important events for the community, not only for business purposes but they also play an important role in the social calendar for often isolated farmers.

The Online Agricultural Show digital platform (figure 1), was originally created to meet these needs of the farming and advisory community: 1. businesses that would normally meet potential customers at shows were able to have a customizable trade stand, and 2. farm advisors could showcase informative videos to farmers with a timetabled live play and a playback feature. 3. there were also online classes for livestock competitors using photographs and a virtual beer tent for informal chats and party.

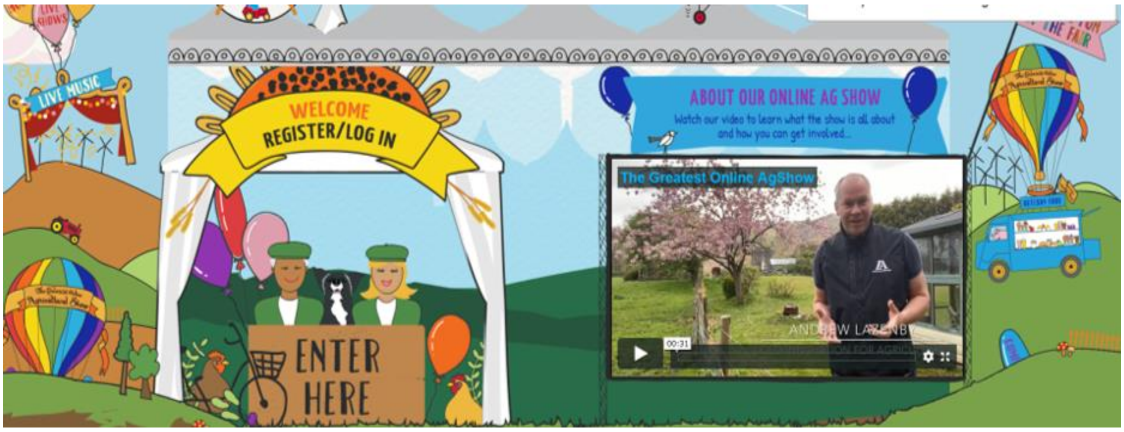


Figure 1: The Greatest Online Agricultural Show main web page

The Online Agricultural Show was well received and provided opportunity for connectivity to move online with opportunities to learn about research and products, and a beer tent with live chat and entertainment. IfA ran the 'Innovation Hub' on the day of the show, hosting 50 films on farming innovations, including biosecurity in beef, cover cropping and reducing antibiotic use.

Farm advisors have seen that the Online Agricultural Show tool with the use of the video platform plus other features to develop, such as live chat room, etc., may well fit to their needs for remote consulting. The platform can be used to share and discuss farm advice remotely, that can be set up either as timed sessions, or replay able sessions for farmers to follow at a time and pace that best suits them. The main focus has been on ensuring that the tool was user friendly and easy to use, therefore generating high levels of site hits, which in turn delivered successful levels of knowledge exchange. The online agricultural show received over 50,000 website hits within its official 'show' day. Advisors reported successful levels of interaction via the live chat facility and the educational videos generated high numbers of views.

IfA Live platform

Under the H2020 FAIRshare project, which supports the wider use of digital advisory tools and services by making them Findable, Available, Interoperable, Reusable and Shareable (FAIRshare), we decided to adapt the Online Ag Show to IfA Live platform. This tool offered the opportunity to expand further our knowledge exchange offerings, looking for opportunities to share solutions to advisor challenges in using online communication and training with clients/farmers post COVID-19.

IfA Live platform is a digital space (figure 2), hosted by IfA's website, which offers a limited access period for a range of information/training resources such as pre-recorded presentations, infographics, videos on farm walks, as well as links to tools/downloadable resources and is followed by an interactive Q&A session to discuss the topics. This allows a two-way communication between farmers and advisors based on the materials shared and cater not only to those who took time to attend physical events and activities, but also to those who are interested to engage but unwilling or unable to travel, or have limited time.

Figure 2. IfA Live Platform Leaflet

The Q&A can take place via a Zoom call embedded into the platform, or at an in-person meeting, thus the platform can support fully online, or hybrid events. The platform offers convenient access to resources/ training, limits travel requirements, mitigates biosecurity concerns associated with hosting farm visits, whilst still maintaining the interactive element that many online training tools such as webinars lack. The users (advisors/farmers) can choose how long they want the materials to be available for, and whether access is open to anyone registered on the IfA Live platform, or restricted to only certain users. Also, they retain ownership of any materials uploaded.
In November 2022, the IfA Live Platform was used to host an online event: Decarbonising UK Meat Production: A focus on ruminants. The event spanned 14th November – 5th December and during this time users could watch virtual farm walks, presentations from industry experts, and access other tools and resources relevant to the topic. The event was supported by a Q&A session on 21st of November, an online video call which provided an interactive opportunity

Figure 3: IfA Live Event in Decarbonising UK Meat Production

for participants (advisors, farmers, researchers and industry experts) to engage and exchange with the host farmers, presenters, and others interested in the subject matter.

The event had 120 users registered on the portal, and 49 attended the Q&A, and was well received with feedback from farmers and advisors, broadly positive in regards with its informative content that builds confidence around these new topics, with its accessibility at home or in the field and the flexibility offered to access it in their own time, or to have it in the background when completing other tasks.

Overall, IfA Live platform is an effective communication and dissemination tool which allows informative and well-received events to take place online, thereby avoiding geographical and travel limitations. Furthermore, users could access resources at any time within the date range specified, which is considered very convenient. The fact that the tool integrates visual/written materials, videos and live Zoom calls all into one place, and allows contributions from multiple stakeholders is a value added.

IfA Live is fully functional now, though some extra adaptations may be needed to make it more suitable for the provision of training. A key obstacle for this tool might be the need for income to cover the administrative and maintenance costs for the platform. Because it is attached to the back-end of our website, we cannot give external access to upload materials directly, but the IfA in-house team will be on hand to get things up and running and continue running it smoothly. This means ordinarily there would be a fee to cover this administration. An option could be to further adapt IfA Live for providing E-training and pair it with certification schemes to provide income to support maintenance and sustainability of the platform. Another hurdle to its maintenance and expansion in the future, might be the lower interest in online events that we experience following the easing of on farm meeting restrictions. Yet, the alternative of using the tool in hybrid events, where the Q&A session takes place in person and the information/training material can be assessed online any time that is convenient for the user, can be an extra asset for the tool.

Concluding Remarks

COVID- 19 and other on farm meeting restrictions challenges necessitated the expanse of online communication activities and remote consulting offerings for our organisation. This was particularly challenging in the agricultural sector due to various factors such as aging population, reluctant tech-adoption, behaviour change, loneliness is an issue, etc., and for IfA specifically as a knowledge exchange organisation which championed peer-to-peer learning opportunities through the use of farm visits, group workshops and face-to-face farm/industry events and conferences. Yet in practice, the use of these online communication and remote consulting tools, proved to be effective allowing informative events to take place without geographical and travel limitations and offering the flexibility to the users to access the information/training material at their convenience within the date range specified. Of course, as with all online communication and dissemination tools, success is very much depending on the topic chosen, quality of content, and effective promotion to drive attendance.

In terms of IfA's practices, skills and organisation of our knowledge exchange activities, we were very aware of the need to respect people's time. A face-to-face event will often last longer, to account for provision of food, informal networking, moving between locations, and making attendees feel it was worth the time and effort of getting there.

In online opportunities on the other hand, there are a lot more distractions to contend with, so we had to strike a balance between allowing enough time to provide valuable content, whilst being short enough that we held the attention of the people watching a video/presentation or attending an online meeting.

We found around 10-20 minutes for a virtual farm tour, and maximum of 1.5 hours for an online meeting – which must involve plenty of interactivity – opportunities for questions, workshop activities, etc. worked well.

Now that COVID-19 restrictions have been lifted, it's great to have the option to meet face-to-face, often this helps to build rapport and work collaboratively with our network. Yet, having the experience and now the skillset to run these online events in a more time and travel - saving way than running physical events, allows us to:

a) reach more people from a wide geographical area and
b) ensure those who engage with us, see us respecting their time by allowing access to resources at their convenience before and after a scheduled Q&A meeting call.

In the end, IfA Live gives us more options for efficiency in our knowledge exchange activities, helping our funding to achieve greater impact (important for us as a charity!), and let's not forget the Net Zero targets which reduced travel might contribute to!

Transitioning to Agriculture 4.0: the role of the agricultural advisor

Karen McGrath[a], Áine Regan[b], Tomás Russell[a]

[a] School of Agriculture and Food Science, University College Dublin, Belfield, Dublin 4, Ireland
[b] Department of Agri-food Business & Spatial Analysis, REDP, Teagasc Mellows Campus, Athenry, Co. Galway, H65 R718

Short abstract (200 words):

The agricultural landscape is shifting towards automated technologies and digitalised farm management systems. Whilst this digitalised approach brings with it many benefits, digital technologies can exhibit potentially disruptive features, and present new challenges for farmers and advisors in terms of new skill requirements, changes in labour capabilities and changes in relationship dynamics. One of the main barriers of agricultural digitalisation is the low and uneven adoption and diffusion of digital technologies and the uncertain futures which digital technologies create. In order to mitigate these concerns, it is important for advisors to be aware of the various facets of farmer engagement with digital technologies. This scoping study analyses digital agriculture through a social and behavioural science lens, summarising what the social sciences have learned about digital agriculture and how farmers engage with digital technologies. The study uncovers the double-edged nature of digital technology and the many factors that affect farmer adoption of digital technologies. Being aware of these factors will be important for advisors to develop their relevant skills and expertise to help farmers, and themselves, navigate through the transition to Agriculture 4.0.

Extended abstract

Purpose

It is argued that we are entering a fourth agricultural revolution, a transition relating to changes from the introduction of digital technologies (Rose and Chilvers, 2018). External pressures such as achieving food security and increasing environmental and labour availability concerns are resulting in a push towards automation and a rapid increase in digital technologies in the agri-food sector. Digital technologies are being primed as an effective solution to these concerns with promises that digital technologies can make farming systems more efficient, productive, and environmentally friendly (Birner et al., 2021), hence making the increasing use of digital technology key to achieving some of the key objectives set out in the new CAP reform 2023-2027.

However, technologies actively shape their context, shaping human actions and perceptions (Verbeek, 2008); and whilst a digitalised approach can bring with it many benefits, digital technologies can exhibit potentially disruptive features which present new challenges for agricultural actors, including farmers and farm advisors. Some of these challenges include the low and uneven adoption and diffusion of digital technologies in the sector contributing to the digital divide, and also the high levels of uncertainty that are generated as a result of increased digital use in the sector (Charatsari et al., 2022). These challenges present new implications and expectations for advisory services. Farmers now require a greater input from their advisory network to deal with the opportunities and challenges new technologies present (Eastwood et al., 2019). Advisors and advisory services play an important role in alleviating adoption issues and other issues associated with digitalisation; however, high levels of digitalisation can have a transformational nature which affects organisations, potentially restructuring the context within which extension and advisory services operate (Charatsari et al., 2020). These services therefore need to change to respond to this shifting environment, and advisors' capabilities need to evolve as technologies evolve. To support advisors in developing these capabilities, a deeper understanding of farmer engagement with digital technologies is needed. This includes addressing not only the implicit and explicit barriers and facilitators of adoption, but also by exploring the wider social implications that digital tools elicit, which as Charatsari et al. (2022) mentions, has not been widely considered in advisors' digi-grasping.

Design/Methodology/Approach

In order to get a holistic view of agricultural digitalisation, a scoping study was conducted to establish what the social and behavioural sciences has learned about farmer engagement with digital technologies, paying particular attention to findings of empirical research. This approach allows us to investigate how agricultural digitalisation is being realised by its key actors, informing, and framing what we know and how we think about agricultural digitalisation, therefore shaping our response to and future approach to digital agriculture.

The study followed the 5-stage methodological framework for scoping studies outlined by Arksey and O'Malley (2005). A search string (Table 1) was formulated and deployed in six databases in July 2020. Limitations on database searches included studies published in English and those conducted between 2014 and the time of the study (2020). This timeline was identified by Klerkx et al., (2019) as a period of accelerated growth in social science publications in digital agriculture.

Table 1. Key search terms

Search String	(adopt* OR attitud* OR behavio* OR "decision making" OR diffusion OR "digital divide" OR engag* OR opinion OR perception) AND (automation OR digit* OR smart* OR "big data" OR robotics OR IoT OR ICT) AND (farm* OR agri*)

The search yielded 10,581 results which were imported into the knowledge management software Endnote X9 and were screened and refined in four main stages. After removing duplicates (n=2,278), the remaining 8,303 paper titles and abstracts were queried against a set of inclusion and exclusion criteria for their eligibility in the study, and unrelated papers (n=7,687) were excluded. The remaining 616 articles were reviewed in full, leaving 164 records for inclusion in the study. To ensure no other relevant literature had been omitted in error, additional records were obtained through hand searching bibliographies and contacting authors most involved in the discipline of social and behavioural science and digital agriculture to identify up to 10 key references in this area, adding 49 additional studies. A list of mapping questions was developed by all authors and all references were read and coded. During the coding process, 13 references were removed and data from the remaining 200 records was imported to Excel and descriptively and thematically analysed.

Findings

Seven key themes were identified from the empirical research; 1) farmer motivations to adopt technology; 2) work-life balance on the farm; 3) changes in skills, role, and identity; 4) data ownership, power, and security; 5) isolation and inclusion; 6) farm system impacts; and 7) public perception of digital agriculture. These themes were referred to both positively and negatively throughout the literature, highlighting the double-edged nature of digital technologies, and implications not only for the farmer, but also for the advisor.

One of the most common themes of the empirical research focused on analysing factors that affect farmer adoption of digital technologies. It has been argued that technological change is skill-biased and new skill requirements can displace or replace some forms of workers. Large amounts of data digital technologies provide can lead to more complex decision-making processes for farmers and this in turn puts pressure on advisors to widen their area of competence and embrace digital technologies, putting them at risk of being without a job if they were unable to adapt to the digital age (Rijswijk et al., 2018). Integration of digital technologies changes advisors professional identity as they now have new tasks; understand technology and translate the meaning of data (Charatsari et al., 2022).

One of the key factors of adoption is communication, support, and influence of others. Poor knowledge exchange, lack of awareness and information access hamper adoption and one of the primary reasons why forced-adoption technology is slow to take off is that without prior knowledge or experience, users do not know what it is good for. A lack of decision support, technical assistance, training, support on aspects of implementation, and advisory services (György et al., 2018) all affect the decision to adopt, and it has been highlighted that there is a gap between industry support and user ability to operate machines (Barnes et al., 2019). Farmers require supports in order to foster adoption and it's been found that farmers can be highly influenced by others in their decisions to adopt technologies. Having strong organizational support and support from family and fellow farmers makes individuals more willing to adopt (Chuang et al., 2020). Advisors play an important role as influencers of adoption as their support and confidence in handling technology encourages farmers to use them themselves (Lundström and Lindblom, 2018), with advisors taking up the 'role model' role (Lundström et al., 2016). The wide range of factors of adoption highlighted in the study shows the complexity of the adoption process and the many roadblocks of agricultural digitalisation, highlighting the challenging endeavour it is for advisors to facilitate the transition to Agriculture 4.0 (Charatsari et al., 2022).

Practical Implications

Digitalisation is often understood as farm-centric (Rijswijk et al., 2019) but results from this study show that human factors are intertwined with digitalisation. Understanding these social contexts will make it possible for advisors to consider the wider implications digitalisation has for famers beyond productivity levels. Understanding digitalisation from the farmers' perspective will enable extension personnel to assess farmer's needs and build advisory capacity to tailor programs to better support farmers in adoption. Advisors have the capability to address the lack of training supports available to farmers. This may require advisors to upskill themselves and it has been suggested that technology companies should engage with stakeholders to build understanding, for example, training the trainers (Eastwood et al., 2017), benefitting advisors. Rijswijk et al., (2019), stated that the first response to digitalisation required by organisations such as extension and advisory systems is the upskilling or hiring of new capabilities.

Theoretical Implications

These findings contribute to the literature on adoption of agricultural technology and to the theory on farmer engagement and the role for extension. It highlights the role extension personnel have as influencers of adoption and the value of interpersonal communication, as farmers seek impartial advice and support from experts to validate decisions (Barnes et al., 2019). Developing an information system that is neutral and can support farmers in obtaining information on solutions that correspond to local and regional contexts would complement informal farmer-to-farmer communication which plays a large role in supporting innovation adoption and dissemination (Knierim et al., 2018). Understanding that there is more to technology adoption than visible, tangible factors, reinforces the importance of advisors developing their 'soft skills' to address the social concerns that farmers have. Understanding that social issues can be barriers to adoption can help advisors realise that they must engage with farmers in a different way and may need to take an alternative approach to supporting the farmer. Considering these factors will help to create an enabling environment for agricultural systems.

References

Arksey, H. & O'Malley, L. 2005. Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology,* 8**,** 19-32.

Barnes, A. P., Soto, I., Eory, V., Beck, B., Balafoutis, A., Sánchez, B., Vangeyte, J., Fountas, S., Van Der Wal, T. & Gómez-Barbero, M. 2019. Exploring the adoption of precision agricultural technologies: A cross regional study of EU farmers. *Land Use Policy,* 80**,** 163-174.

Birner, R., Daum, T. & Pray, C. 2021. Who drives the digital revolution in agriculture? A review of supply-side trends, players and challenges. *Applied Economic Perspectives and Policy,* 43**,** 1260-1285.

Charatsari, C., D. Lioutas, E., De Rosa, M. & Papadaki-Klavdianou, A. 2020. Extension and Advisory Organizations on the Road to the Digitalization of Animal Farming: An Organizational Learning Perspective. *Animals,* 10**,** 2056.

Charatsari, C., Lioutas, E. D., Papadaki-Klavdianou, A., Michailidis, A. & Partalidou, M. 2022. Farm advisors amid the transition to Agriculture 4.0: Professional identity, conceptions of the future and future-specific competencies. *Sociologia Ruralis,* 62**,** 335-362.

Chuang, J. H., Wang, J. H. & Liang, C. Y. 2020. Implementation of Internet of Things depends on intention: young farmers' willingness to accept innovative technology. *International Food and Agribusiness Management Review,* 23**,** 253-265.

Eastwood, C., Ayre, M., Nettle, R. & Dela Rue, B. 2019. Making sense in the cloud: Farm advisory services in a smart farming future. *NJAS - Wageningen Journal of Life Sciences,* 90-91.

Eastwood, C., Klerkx, L. & Nettle, R. 2017. Dynamics and distribution of public and private research and extension roles for technological innovation and diffusion: Case studies of the implementation and adaptation of precision farming technologies. *Journal of Rural Studies,* 49**,** 1-12.

György, K. T., Lámfalusi, I., Molnár, A., Sulyok, D., Gaál, M., Horváth, Z. K., Domán, C., Illés, I., Kiss, A., Péter, K. & Kemény, G. 2018. Precision agriculture in Hungary: assessment of perceptions and accounting records of FADN arable farms. *Studies in Agricultural Economics (Budapest),* 120**,** 47-54.

Knierim, A., Borges, F., Kernecker, M. L., Kraus, T. & Wurbs, A. 2018. What drives adoption of smart farming technologies? Evidence from a cross-country study. Chania: International Farming Systems Association (IFSA) Europe.

Lundström, C. & Lindblom, J. 2018. Considering farmers' situated knowledge of using agricultural decision support systems (AgriDSS) to Foster farming practices: The case of CropSAT. *Agricultural Systems,* 159**,** 9-20.

Lundström, C., Lindblom, J., Ljung, M. & Jonsson, A. 2016. Sustainability as a governing principle in the use of agricultural decision support systems: the case of CropSAT. Newport: International Farming Systems Association (IFSA) Europe.

Rijswijk, K., Klerkx, L. & Turner, J. A. 2018. Digitalisation of agricultural knowledge providers: the case of New Zealand. Chania: International Farming Systems Association (IFSA) Europe.

Rijswijk, K., Klerkx, L. & Turner, J. A. 2019. Digitalisation in the New Zealand Agricultural Knowledge and Innovation System: Initial understandings and emerging organisational responses to digital agriculture. *NJAS - Wageningen Journal of Life Sciences,* 90-91.

Rose, D. C. & Chilvers, J. 2018. Agriculture 4.0: Broadening Responsible Innovation in an Era of Smart Farming. *Frontiers in Sustainable Food Systems,* 2.

Verbeek, P.-P. 2008. Morality in Design: Design Ethics and the Morality of Technological Artifacts. *In:* Kroes, P., Vermaas, P. E., Light, A. & Moore, S. A. (eds.) *Philosophy and Design: From Engineering to Architecture.* Dordrecht: Springer Netherlands.

Designing with Farmers: A multi-actor framework to include Human-Centred Design in the digitization of farming services and collaboration practices.

David Hearne[1], Daniel Wolferts[2], Gráinne Dilleen[3]

[1]South East Technology University (SETU);[2] Fraunhofer Institute for Applied Information Technology (FIT); [3]South East Technology University (SETU)

Short abstract:

Agricultural innovation, such as new software and hardware, have often been created through a development lifecycle that often ignores users' values, needs and concerns. Advisory services (or extension services) play a key role in promoting agricultural development and innovation and facilitate between involved actors. Traditional "linear models" of innovation have increasingly been replaced by more systemic approaches, including researchers, extension services, educators, and end-users—as promoted in the Mutli-Actor Approach (MAA) by the EIP-Agri. Our work follows a Human-Centred Design (HCD) approach. HCD can be described as a methodology where designers follow a holistic approach to focus on users' human needs in order to humanize the innovation process. We use the DEMETER Stakeholder Open Collaboration Space (SOCS) as an illustrative case study to demonstrate how using a Human-Centred Design (HCD) approach results in a more intuitive and user-friendly solution and demonstrates how HCD, as a MAA framework, can be used by advisory services to improve collaboration and aid in the digitization of agricultural practices. We illustrate methods on how agricultural advisors can include farmers in innovation processes from the very beginning, thus strengthening their position in agricultural innovation.

Extended abstract

Purpose

Advisory services (or extension services) play a key role in promoting agricultural development and innovation (Anderson, 2008). They "support and facilitate people engaged in agricultural production to solve problems and [helps them] to obtain information, skills and technologies to improve their livelihoods" (ibid. p. 6). Christopolos (2010) defines them as "systems [that] should facilitate the access of farmers, their organisations and other market actors to knowledge, information and technologies" (Christopolos, 2010). In the agricultural innovation process, advisory services increasingly inherit the role of being the mediators between involved parties, such as farmers and suppliers (Faure, 2012).

Agricultural innovation such as software and hardware have often been created through a development lifecycle that often ignores users' values, needs and concerns (Ingram and Gaskell, 2019). It is argued that this is because development lifecycles focus on high quality code and not on the value of the product to the end-user (Bygstad, Ghinea and Brevik, 2008). Kenny and Regan (2021) found that this lack of end-user engagement can lead to lower levels of technology adoption in the farming community. These traditional "linear models" of innovation have increasingly been replaced by more systemic approaches, including researchers, extension services, educators and end-users (Anderson, 2008). Addressing the needs and concerns of stakeholder, such as farmers, allows design and development teams to focus on problems, rather than design or development goals, which can also lead to a better adoption rate (Steinke et al., 2020; Oliver et al., 2017). Especially farmers need to be involved as key actors in the development of agricultural innovations rather than end-users (Meynard et al., 2012). Such a co-innovation approach can lessen the uncertainty traditionally associated with technology adoption (Kernecker et al., 2021) and enable development teams to understand the user, increase creativity and think about problems differently (Parizi et al., 2022). However, involving end-users in the design technologies is difficult due to the relationships and different perspectives between stakeholders in co-design, which impacts the outcomes and performance of the design process (Berthet et al., 2018). The Multi-Actor Approach as identified by the European Innovation Partnership (EIP-AGRI) is an approach to European projects that addresses real problems that farmers and other end-users face and includes such actors in the development process of technology from the very beginning, thus ensuring the real-life applicability of the developed solutions (EIP-AGRI, 2017). It emphasizes the importance of a systems approach to innovation, by connecting practitioners, scientists, and, consequently, agricultural service providers. This framework underlines the importance of agricultural extension services as mediators between farmers and technology suppliers.

Design/Methodology/Approach

Our work follows a Human-Centred Design (HCD) approach. HCD can be described as a methodology where designers follow a holistic approach to focus on users' human needs (Norman, 2013). At its core, HCD promotes the needs and concerns of the affected stakeholders to be the focus of the development efforts of the technology. Van der Bijl-Brouwer and Dorst (2017) believe that HCD methods humanize the innovation process and that such approaches are key to dealing with innovation challenges. HCD activities follow a standardized process, for instance as defined in the ISO 9241:2010, consisting of four types of activities: understanding and specifying the context of use, specifying the user requirements, producing design solutions, and evaluating the design (Lundström and Lindbolm, 2016). The results of the last activity then feed back into the understanding and specification of the context of use. By following an iterative approach, technology is not just developed in a one-time operation and then released to the market. It is rather developed in small, incremental steps, with each iteration improving on the former, thus allowing for quick changes based on newly gathered information. Co-creative activities have proven to yield valuable outcomes in a diverse range of application fields like medicine (Beres et al., 2019), economic development (Mattson and Wood, 2013), and social innovation (Brown and Wyatt, 2010).

This paper uses the development of the DEMETER Stakeholders Open Collaboration Space (SOCS) as an illustrative case study to demonstrate how using a Human-Centred Design (HCD) approach results in a more intuitive and user-friendly solution and demonstrates how HCD as a MAA framework can be used by advisory services to improve collaboration and aid in the digitization of agricultural practices. Such a HCD approach can fulfil the requirements of the EIP-AGRI, thus bringing to life the MAA. This approach was followed to ensure that farmers and other stakeholders are more than mere recipients of technology and are instead involved throughout the design and development stage, thus becoming prosumers rather than mere consumers of agricultural innovation.

The paper draws from interdisciplinary literature including information systems, social sciences, behavioural science, systems engineering and user experience. As the project is on-going, the work described in this paper relates to past, ongoing, and future activities. First, we explain the HCD and MAA approach and how we conceptualized and tailored the HCD process to fit with the SOCS development and project environment. Further, we define how we drew methodologies from the realm of Design Thinking to better understand farmers' needs, interests, and concerns regarding digital technologies, and how we applied those in a project that went fully remote with the start of the COVID19 pandemic. Finally, we describe the process of incorporating external stakeholders' feedback into the SOCS development, explaining the steps undertaken to ensure a consistent HCD approach as a method for MAA. Furthermore, this study identifies good practices and recommended activities to ensure a MAA is followed.

Practical Implications

Advisory services play a key role in the agricultural innovation process, as they can facilitate connections between farmers and other key actors, such as technology providers. Our work illustrates methods on how agricultural advisors can include farmers in innovation processes from the very beginning of the innovation process. It demonstrates how human-centred design methods can produce tools that strengthen farmers' position within the development of agricultural innovation. Our work illustrates how a human-centred design approach can be utilized to elicit farmers' needs and concerns, develop specific requirements and create concrete designs for an agricultural collaboration platform. We help agricultural advisors and educators to better understand drivers and barriers of collaboration within the agricultural domain.

Theoretical Implications

Our contribution informs agricultural advisory and education services by adding to the existing body of literature pertaining to agricultural advisors and educators to better understand drivers and barriers of collaboration within the agricultural domain. As our paper focuses on guidelines for practitioners.

References

Anderson, Jock R. "Agricultural advisory services." (2008).

Beres, Laura K., et al. "Human-centered design lessons for implementation science: improving the implementation of a patient-centered care intervention." Journal of acquired immune deficiency syndromes (1999) 82.3 (2019): S230.

Berthet, Elsa T., Gordon M. Hickey, and Laurens Klerkx. "Opening design and innovation processes in agriculture: Insights from design and management sciences and future directions." Agricultural Systems 165 (2018): 111-115.

Brown, Tim, and Jocelyn Wyatt. "Design thinking for social innovation." Development Outreach 12.1 (2010): 29-43.

Bygstad, Bendik, Gheorghita Ghinea, and Eivind Brevik. "Software development methods and usability: Perspectives from a survey in the software industry in Norway." Interacting with computers 20.3 (2008): 375-385.

Christoplos, Ian. "Mobilizing the potential of rural and agricultural extension." (2010).

EIP-AGRI SP. “Horizon 2020 Multi-actor Projects”. Brussels: EIP-AGRI Service Point (2017). Accessed Sept 29, 2020. https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_ brochure_multi-actor_projects_2017_en_web.pdf

Faure, Guy, Yann Desjeux, and Pierre Gasselin. "New challenges in agricultural advisory services from a research perspective: A literature review, synthesis and research agenda." The Journal of Agricultural Education and Extension 18.5 (2012): 461-492.

Ingram, Julie, and Pete Gaskell. "Searching for meaning: Co-constructing ontologies with stakeholders for smarter search engines in agriculture." NJAS-Wageningen Journal of Life Sciences 90 (2019): 100300.

Kenny, Ursula, and Aine Regan. "Co-designing a smartphone app for and with farmers: Empathising with end-users’ values and needs." Journal of Rural Studies 82 (2021): 148-160.

Kernecker, Maria, Busse Maria, and Knierim Andrea. "Exploring actors, their constellations, and roles in digital agricultural innovations." Agricultural Systems 186 (2021): 102952.

Lundström, Christina, and Jessica Lindblom. "Considering farmers' situated knowledge of using agricultural decision support systems (AgriDSS) to Foster farming practices: The case of CropSAT." Agricultural Systems 159 (2018): 9-20.

Mattson, Christopher A., and Amy E. Wood. "Eight principles derived from the engineering literature for effective design for the developing world." International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. Vol. 55881. American Society of Mechanical Engineers, 2013.

Meynard, Jean-Marc, Benoit Dedieu, and A. P. Bos. "Re-design and co-design of farming systems. An overview of methods and practices." Farming Systems Research into the 21st century: The new dynamic (2012): 405-429.

Norman, Don. “The design of everyday things: Revised and expanded edition.” Basic Books (2013)

Oliver, David M., et al. "Design of a decision support tool for visualising E. coli risk on agricultural land using a stakeholder-driven approach." Land Use Policy 66 (2017): 227-234.

Parizi, Rafael, et al. "How has design thinking being used and integrated into software development activities? A systematic mapping." Journal of Systems and Software (2022): 111217.

Steinke, Jonathan, et al. "Tapping the full potential of the digital revolution for agricultural extension: an emerging innovation agenda." International Journal of Agricultural Sustainability 19.5-6 (2021): 549-565.

Van der Bijl-Brouwer, Mieke, and Kees Dorst. "Advancing the strategic impact of human-centred design." Design Studies 53 (2017): 1-23.

Managing digital cognitive load for farmers and advisory networks in a digital agriculture future

Callum Eastwood, Paul Edwards, Brian Dela Rue

New Systems and Competitiveness, DairyNZ Ltd, Lincoln 7608, New Zealand

Short abstract

As digital technology becomes a cornerstone of the agri-food system, changes in practices are occurring at the farm and advisory level. While increased access to data, digital apps and platforms, and decision-making tools are aimed at making the practice of farming easier and more productive, there is also a potential for adding to decision making complexity, uncertainty, and cognitive load for both farmers and advisors. The concept of cognitive load has yet to be explicitly examined by digital agriculture scholars. In this paper we consider: a) how can digital agriculture technologies act to reduce or increase cognitive load?, and b) what are cognitive load factors in the interaction between farmers, technology and advisors? We apply cognitive load theory to the emergent data and interactions around digital technologies in pasture-based dairy farming. We find that while advisors are highly connected with farmer data in some domains such as environmental management and animal health, in other aspects farmers are navigating the cognitive load challenges in isolation. Our study highlights opportunities for farm advisory networks to address and manage farmer digital cognitive load.

Extended abstract

Purpose

As digital technology becomes a cornerstone of the agri-food system, changes in practices are occurring at the farm and advisory level. While increased access to data, digital apps and platforms, and decision-making tools are aimed at making the practice of farming easier and more productive, there is also a potential for adding to decision making complexity, uncertainty, and cognitive load for both farmers and advisors.

Many authors in this domain have touched on the impact that greater amounts of data for decision making might have on the farm management process (Jago et al., 2013, Klerkx et al., 2019, Ingram et al., 2022), including the initial learning load required by users of digital technology (Eastwood et al., 2019, Ingram and Maye, 2020). The concept of cognitive load has yet to be explicitly examined by digital agriculture scholars (Eastwood et al., 2021).

Cognitive load can be defined as the amount of working memory resources that are used while conducting a task, or the relative demand imposed during a particular task (Klepsch et al., 2017, Skulmowski and Rey, 2017, Han et al., 2021). There are three kinds of cognitive load, involving germane load (embedded knowledge in long-term memory), intrinsic load (inherent difficulty associated with learning new tasks or practices), and extraneous load (processes not related to how information is presented to learners) (Sweller, 2010, Skulmowski and Rey, 2017).

In this paper we consider: a) how can digital agriculture technologies act to reduce or increase cognitive load?, and b) what are cognitive load factors in the interaction between farmers, technology and advisors?

Design/Methodology/Approach

Our study is based on an analysis of the implementation of digital agriculture in three pasture-based dairy farming contexts: 1) digital tools used for grazing management, 2) application of virtual fencing technology, and 3) digital tools for environmental management. Data includes interviews of 40 farmers and advisors, and technology use surveys of 500 farmers since 2008. Interviews were recorded and transcribed, and subsequently analysed for themes around the integration of data and technology in decision making, support required, and impact of farm management processes.

Findings

Findings from this study highlight that cognitive load of digital agriculture implementation can be impacted in a variety of areas. At a basic level, the implementation of new technologies and processes increased learning and adaptation requirements for farm teams. Continuing to manage day to day operations on farm, as well as embedding a new technology, can cause a peak in cognitive load, particularly for decision-support technologies (Dela Rue et al., 2020). The length of this peak is determined by factors such as the complexity of the technology, intuitiveness of the data interface or software, skills and motivation of the farm team, and support networks.

Increases in intrinsic load can arise from access to greater data for decision-making, for example daily or hourly updates and large amounts of data at the individual animal level. This access to information can be overwhelming if the data are not analysed by smart algorithms the present relevant decision options to farmers. The constant access to data through smartphone platforms also presents the risk of farmers being 'always on the job', as has previously been found with robotic milking systems (Hansen and Stræte, 2020). However, farmers in our study also noted that easy access to farm information during the night or while away from the farm also could help them feel in control and lowered stress.

Digitalisation has potential implication for the farm team and future farm skills. Farmers noted that the introduction of technology could have negative impacts on the learning of inexperienced staff around aspects such as pasture management and animal husbandry. They also noted a potential reliance on technology and data-driven systems. This may have longer term impacts around germane load when staff moved to other farms where there were different practices or less reliance on technology. Changes to cognitive ability and load have been noted in other technology studies (Han et al., 2021).

Increased cognitive load through technology use has the potential to increase workplace stress and decrease job satisfaction (Nazareno and Schiff, 2021). This is particularly the case on farms where technology adds to task complexity, where technology performance is poor or does not meet expectations, or where aspects such as poor technology interoperability creates additional work. Digital technology also provides a means for staff on the farm to increase participation in farm management tasks, such as grazing management or identification of animals with health issues. Discussions about use of the data and technology can help to reduce the extraneous load across the whole farm team. However, the farm team can also have a heightened awareness that their work and decision making is visible to everyone and recorded digitally. The feeling of surveillance and control in the workplace has been identified as a potential issue where technology have been applied in non-agricultural workplaces (Nazareno and Schiff, 2021).

The use of technology and automation in some parts of the farms system may lead to a greater proportion of time spent on other tasks. If these tasks are manual, such as milking, it may lead to greater job satisfaction or injury. Intense or monotonous activities can both impact cognitive load and fatigue, leading to implications for sleep and wellbeing (Caldwell et al., 2019). However, some farmers enjoy these manual or repetitive tasks as it provides a time to connect with animals and other staff, and to think about strategic decisions. Other studies have shown that manual work can actually reduce cognitive load and provide a change to de stress (Nazareno and Schiff, 2021).

Advisory networks can be both impacted by cognitive load challenges, and actors in mitigating cognitive load among farmers. The integration of digital tools in farm advisory services is possibly more advanced than on farm, with use of back office digital tools and the need for advisors to learn the range of tools used by their farmer clients (Eastwood et al., 2019). This breadth of tools can place a high germane load on advisors as they 'dip in and out' of different tools, data, and platforms. There is an increasing role for advisors in mitigating farmer cognitive load (e.g. intrinsic load associated with learning new tools). The difficulty for advisory networks is in navigating the time associated with transitioning from traditional advisory models, negotiating roles in the advisory-technology supplier interface, and investing sufficient time to maintain currency in the evolving Agritech domain.

Practical Implications

Consideration of cognitive load implications should be a key part of responsible innovation in respect to digitalisation of agriculture (Rose et al., 2021). Cognitive load will be important consideration for future technologies, for example the use of robotics, automation and augmented reality (Han et al., 2021, Eastwood et al., 2022). In the design of digital technologies, the management of intrinsic cognitive load is highly important. However, when considering learning resources and advisory support for technologies the management of extraneous load needs to be a major factor.

Theoretical Implications

This study is the first to specifically apply cognitive load theory (CLT) to digital agriculture innovation. It identifies major areas where CLT should connect with design, training and advisory support of digital agriculture.

References

Caldwell, J. A., J. L. Caldwell, L. A. Thompson, and H. R. Lieberman. 2019. Fatigue and its management in the workplace. Neuroscience & Biobehavioral Reviews 96:272-289.
Dela Rue, B. T., C. R. Eastwood, J. P. Edwards, and S. Cuthbert. 2020. New Zealand dairy farmers preference investments in automation technology over decision-support technology. Animal Production Science 60(1):133-137.
Eastwood, C. R., M. Ayre, R. Nettle, and B. Dela Rue. 2019. Making sense in the cloud: Farm advisory services in a smart farming future. NJAS - Wageningen Journal of Life Sciences 90-91:100298.
Eastwood, C. R., B. Dela Rue, J. P. Edwards, and J. Jago. 2022. Responsible robotics design–A systems approach to developing design guides for robotics in pasture-grazed dairy farming. Frontiers in Robotics and AI 9.
Eastwood, C. R., J. P. Edwards, and J. A. Turner. 2021. Review: Anticipating alternative trajectories for responsible Agriculture 4.0 innovation in livestock systems. Animal:100296.
Han, Y., Y. Diao, Z. Yin, R. Jin, J. Kangwa, and O. J. Ebohon. 2021. Immersive technology-driven investigations on influence factors of cognitive load incurred in construction site hazard recognition, analysis and decision making. Advanced Engineering Informatics 48:101298.
Hansen, B. G. and E. P. Stræte. 2020. Dairy farmers' job satisfaction and the influence of automatic milking systems. NJAS - Wageningen Journal of Life Sciences 92:100328.
Ingram, J. and D. Maye. 2020. What Are the Implications of Digitalisation for Agricultural Knowledge? Frontiers in Sustainable Food Systems 4(66):1-6.
Ingram, J., D. Maye, C. Bailye, A. Barnes, C. Bear, M. Bell, D. Cutress, L. Davies, A. de Boon, L. Dinnie, J. Gairdner, C. Hafferty, L. Holloway, D. Kindred, D. Kirby, B. Leake, L. Manning, B. Marchant, A. Morse, S. Oxley, M. Phillips, Á. Regan, K. Rial-Lovera, D. C. Rose, J. Schillings, F. Williams, H. Williams, and L. Wilson. 2022. What are the priority research questions for digital agriculture? Land Use Policy 114:105962.
Jago, J., C. R. Eastwood, K. Kerrisk, and I. Yule. 2013. Precision dairy farming in Australasia: adoption, risks and opportunities. Animal Production Science 53(9):907-916.
Klepsch, M., F. Schmitz, and T. Seufert. 2017. Development and Validation of Two Instruments Measuring Intrinsic, Extraneous, and Germane Cognitive Load. Frontiers in Psychology 8.
Klerkx, L., E. Jakku, and P. Labarthe. 2019. A review of social science on digital agriculture, smart farming and agriculture 4.0: New contributions and a future research agenda. NJAS - Wageningen Journal of Life Sciences 90-91:100315.
Nazareno, L. and D. S. Schiff. 2021. The impact of automation and artificial intelligence on worker well-being. Technology in Society 67:101679.
Rose, D. C., J. Lyon, A. de Boon, M. Hanheide, and S. Pearson. 2021. Responsible development of autonomous robotics in agriculture. Nature Food 2(5):306-309.
Skulmowski, A. and G. D. Rey. 2017. Measuring Cognitive Load in Embodied Learning Settings. Frontiers in Psychology 8.
Sweller, J. 2010. Element Interactivity and Intrinsic, Extraneous, and Germane Cognitive Load. Educational Psychology Review 22(2):123-138.

How can Blockchain impact the Food Traceability Supply Chain? Costs and benefits for the digitalization of the agri-food system.

Maria Bonaria Lai[1], Annapia Ferrara[1], Daniele Vergamini[1], Gianluca Brunori[1]

[1] Dipartimento di Scienze Agrarie, Alimentari e Agroambientali – Università di Pisa

Short abstract:

Blockchain technology (BCT) ensures trust and transparency along the food supply chain (FSC). It helps to develop the digitisation of rural businesses and accelerate the transition toward a circular economy in the agricultural sector (Pakseresht et al., 2022). However, to foster the adoption of BCT, it is necessary to understand in which cases the adoption of the BCT creates value along the FSC. Therefore, the present study aims to inform on the problems BCT responds to along the FSC, the conditions that allow BCT to create value along the FSC, and the disadvantages of applying BCT along the FSC. To do so, a Systematic Literature Review (SLR) methodology is employed (Tranfield et al., 2003), as a means to gain knowledge from the available evidence to provide insights and guidance for intervention into the operational needs of practitioners. Articles from both peer-reviewed academic journals and industry reports are considered. The information collected is subsequently clustered according to the thematic analysis (Liñán & Fayolle, 2015). What are the performances of traceability systems and how the blockchain might help the agri-food system in its process of digitalization? What are the benefits and costs?

Extended abstract

Purpose

In the era of the Fourth Industrial revolution (industry 4.0.), the digitalisation of the agri-food sector became essential to achieve a balanced economic growth based on the quality of food production and lifestyle in rural territories (European Commission, 2021). Here, blockchain technology (BCT) is among the most predominant digital applications to support the agri-food sector's sustainability (Rolandi et al., 2021). According to FAO & WUR (2021), BCT helps mitigate our days' climate and social challenges by ensuring the efficiency and transparency of transactions, as well as the traceability of food products along the food supply chain (FSC) (FAO & WUR, 2021): BCT does not only helps producers to reduce the information asymmetry with final consumers (Lehtinen, 2017; Deloitte, 2018), but also supports a collaborative peer-to-peer environment (Hua et al., 2018) able to generate information to track the environmental impacts generated, the resources employed and recycled along the SC, thus providing useful elements to boost a circular economy (Pakseresht et al., 2022).

However, the blockchain is a complex technology (FAOrganization & WUR, 2021; van Wassenaer et al., 2021) both from a digital and an administrative point of view: it can be described as a platform for generating and recording transaction data, which combines the intelligent communication interfaces of the Internet of Things, helping the connection among the socio-economic actors, involved along the FSC, and the Artificial Intelligence (AI) tools, assisting the SC stages, from the farm to consumers (Vern et al., 2022). To do so, this technology develops on a *distributed ledger* consensually shared, replicated, and synchronised between the actors (nodes of the chain) who, with their interests and power positions, form the BCT *ecosystem* of the FSC and act according to an agreed set of rules for its *governance* (FAO & WUR, 2021; van Wassenaer et al., 2021).

Due to its complexity and a lack of comprehensive guidelines for its adoption, the pioneering application of BCT to the FSC has created several use cases that generate blurred information about the socio-technical aspects to assess its applicability in a way to create value along the FSC (van Wassenaer et al., 2021). Who decides which data to track? Who produces the data? Who manages and maintains the data? Who accesses the data? How is data produced? How are they managed and maintained? How are permits generated? What is attested, and what are information quality and integrity implications? What are the advantages of the presence of information and its distribution? What are the disadvantages of adopting the BCT along the FSC? All these questions remain unanswered. Therefore, this study aims at filling this gap by asking the following research questions: in which cases and under which conditions does the adoption of BCT in FSC generate value?

Design/Methodology/Approach

This study employs the Systematic Literature Review (SLR) methodology to examine valuable literature for the objectives of this research. According to Tranfield et al. (2003), the SLR is a helpful approach to gaining knowledge from the available evidence to provide insights and guidance for intervention into the operational needs of practitioners. Composed of nine different steps defining the planning and conducting of the review, as well as reporting and disseminating its results, the SLR utilises a rigorous, transparent, and replicable methodology for the selection of contributions, synthesis, and clustering of data. Therefore, to inform the cases allowing the BCT to create value along the FSC, this research uses the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) approach to favour clear evidence-based reporting (Moher et al., 2009). A literature review is carried out for this study until 2023. The design of the search protocol indicated precise inclusion and exclusion criteria concerning the language and the study type, allowing contributions from both peer-reviewed academic journals and industry report to be identified. After an initial classification of theoretical and empirical contributions, a qualitative approach has been adopted to allow a thematic analysis (Liñán & Fayolle, 2015) to identify the specific themes influencing the areas this research investigated: the problems that the BCT responds along the FSC; the conditions that allow the BCT to create value along the FSC; and the disadvantages of applying the BCT along the FSC.

Findings

Due to the novelty and elusiveness of the BCT, there is no ready-to-use analytical framework or guideline yet for assessing its applicability and choosing the proper technical and organisational setup (van Wassenaer et. alt. 2021). The adoption of blockchain can be a game changer for the FSC, removing the traditional system flows and inefficiencies. Based on the literature review done in this research, it has been possible to identify the existing distributed ledger technologies and their application to the agri-food sector. As traceability represents a crucial element to guarantee FSC transparency, making all actors responsible and developing a sustainability culture, adopting blockchain and distributed ledger technologies could improve the traceability of FSC moving this last towards a digital ecosystem. A study comparing eight blockchain projects affirmed that blockchain application in the FSC is still rare, and information about technical implementation is not detailed (Galvez et al, 2018). At the same time, another study by Zhao et al. (2019) shows that several researchers proposed different traceability systems in the context based on blockchain, combined with other technologies (such as RFID, IoT, NFC, Cloud computing, and Big Data) across different agri-food value chains (Mireille van Hilten et al. 2020). The period 2017-2018 has been an essential phase of exploration for blockchain applications in agri-food (Lan van Wassenear, 2021). From this perspective, the BTC could be a valid driver for the sustainable digitisation of the agri-food system. Designing sustainable digitisation paths strongly depends on the correctness of the information provided, their accessibility and immutability, on the institutional assets and related governance systems, and finally on the communication and learning processes. These aspects represent the new challenges of food traceability systems. We can group these challenges into three main categories: actors, technologies, and impacts.

Practical Implications

The digitalisation of the FSC involves an ecosystem of human actors that translate their interests and power positions into arrangements and agreements (van Wassenaer et. alt. 2021). This study aims to conduct a review of the existing literature to inform practitioners on the application of BCT in a way to create value along the FSC. The results of this research will be considered in the framework of AGRITECH (National Research Centre for Agricultural Technologies), which aims at applying enabling technologies in the Agri-food sector to counteract the effects of climatic change, reduce the environmental impact of agriculture and improve productivity and sustainability[4]. Several use cases applying BCT along the FSC will be considered.

[4] AGRITECH : https://www.cmcc.it/projects/agritech-national-research-centre-for-agricultural-technologies

Theoretical Implications

This literature review contributes to state of the art on BCT. In particular, it emphasises how the blockchain concepts of trust, traceability, and transparency might guarantee the traceability of the food supply chain, facilitating the FSC in the digital transition process. Moreover, blockchain technology is still in the testing phase in agri-food systems, and its implementation in FSC has some issues that need to be tackled.

References

Food and Agriculture Organization of the United Nations, & Wageningen University and Research. (2021). *Applying blockchain for climate action in agriculture: State of play and outlook*. FAO and WUR. https://doi.org/10.4060/cb3495en

Hua, J., Wang, X., Kang, M., Wang, H., & Wang, F. Y. (2018). Blockchain based provenance for agricultural products: A distributed platform with duplicated and shared bookkeeping. *In Proceedings of the 2018 IEEE Intelligent Vehicles Symposium (IV)*, 97-101.

Lehtinen, U. (2017). Sustainable Supply Chain Management in Agri-food Chains: A Competitive Factor for Food Exporters. In R. Bhat (Ed.), *Sustainability Challenges in the Agrofood Sector* (pp. 150–174). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781119072737.ch7

Liñán, F., & Fayolle, A. (2015). A systematic literature review on entrepreneurial intentions: Citation, thematic analyses, and research agenda. *International Entrepreneurship and Management Journal*, *11*(4), 907–933. https://doi.org/10.1007/s11365-015-0356-5

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *Journal of Clinical Epidemiology*, *62*(10), 1006–1012. https://doi.org/10.1016/j.jclinepi.2009.06.005

Pakseresht, A., Ahmadi Kaliji, S., & Xhakollari, V. (2022). How Blockchain Facilitates the Transition toward Circular Economy in the Food Chain? *Sustainability*, *14*(18), 11754. https://doi.org/10.3390/su141811754

Randall, L., Wøien Meijer, M., & Ormstrup Vestergård, L. (2020). *Rural perspectives on digital innovation: Experiences from small enterprises in the Nordic countries and Latvia*. Nordregio. https://doi.org/10.6027/R2020:4.1403-2503

Rolandi, S., Brunori, G., Bacco, M., & Scotti, I. (2021). The Digitalization of Agriculture and Rural Areas: Towards a Taxonomy of the Impacts. *Sustainability*, *13*(9), 5172. https://doi.org/10.3390/su13095172

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *British Journal of Management*, *14*(3), 207–222. https://doi.org/10.1111/1467-8551.00375

van Wassenaer, L., van Hilten, M., van Asseldonk, M., & van Ingen, E. (2021). *Applying blockchain to climate action in agriculture: State of play and outlook : background paper*. Wageningen Economic Research. https://doi.org/10.18174/532926

Vern, P., Miftah, N., & Panghal, A. (2022). Digital Technology: Implementation Challenges and Strategies in Agri-Food Supply Chain. In R. S. Mor, D. Kumar, & A. Singh (Eds.), *Advanced Series in Management* (pp. 17–30). Emerald Publishing Limited. https://doi.org/10.1108/S1877-636120220000027002

Zhao G, Liu Shaofeng, Lopez C., Lu H, Elguta S., Chen H, Boshkoska B.M (2019) *Blockchain technology in agri-food value chain management : A synthesis of application, challenges and future research direction.* Computer in Industry Volume 109, 83-99 https://

Session 2C – Adoption and use of tools

Factors influencing the use of digital advisory tools and services: insights from user cases across Europe

Lies Debruyne[1], Charlotte Lybaert[1], Rani Van Gompel[1], Tom Kelly[2]

[1]ILVO, [2]Teagasc

Short abstract

In the FAIRshare project, we explore how advisors can use digital advisory tools and services (DATS) to support farmers in getting the most value for themselves, their families and customers. Through an exploratory analyses of early experiences with use of selected DATS in 17 diverse User Cases, we identify a number of barriers and supportive factors, in addition to a broad range of so-called influencing factors, requirements and preconditions for success. Despite the diversity in contexts across the UCs, we could identify a number of common factors across UCs. COVID-19 has been an important game changer in this respect, but also other ongoing global/societal developments and the challenge to maintain high quality, professional advisory services, in support of efficient and future-oriented farming systems, within this changing environment, exist across all UCs. However, these more universal drivers lead to different challenges, depending on specific contexts and situations. Central in the search for suitable DATS to address these challenges, is in the first place having a good understanding of the challenge and the different end-users needs.

Extended abstract

Purpose

With digital technologies becoming more and more commonplace in day-to-day life, and with new technologies pushing the digital revolution forward, it is important to reflect on what this (r)evolution means for agriculture. While there is a multitude of angles and aspects to explore, the H2020 project FAIRshare focuses specifically on the advisor-farmer interface, and how digital advisory tools and services (DATS) used at this interface, can support farmers in getting the most value for themselves, their families and customers. An important part of the project is to enable the sharing of tools, knowledge and experience that exist currently within the farm advisory community. To this end, 30 User Cases (UCs) follow a living lab approach to develop or adapt DATS to suit their advisory needs, in combination with a business plan for development and further use of those DATS. As part of the living lab approach, we conducted an exploratory analyses to identify the various influencing factors impacting the use and adoption of DATS, based on experiences of working with 1-2 "pilot" DATS (DATS with which they have had some initial experience) for a subset of 17 UCs. The 17 selected UCs represented highly diverse farming and advisory systems and contexts, and engaged with a range of tools, covering different aims and functions, e.g. tools for monitoring purposes (with the use or need of specific sensors), decision support and management tools, and tools focused on communication, knowledge exchange, e-learning and training.

We could build on a large body of literature around the acceptance of (IT/digital) technologies, with several authors developing frameworks and models to understand the influencing factors around technology acceptance and use. Two models in particular shaped our research: first, the Unified Theory of Acceptance and Use of Technology model (Venkatesh et al., 2003), which combines the components of eight technology acceptance models and theories: the Theory of Reasoned Action (Fishbein & Ajzen, 1975); the Technology Acceptance Model (Davis et al., 1989); the Motivation Model (Davis et al., 1992); the Theory of Planned Behaviour (Ajzen, 1991); the model of PC utilization (Thompson et al., 1991); innovation diffusion theory (Rogers, 1995); and social cognitive theory (Bandura, 1986; Compeau and Higgins, 1995). It proposes three direct determinants of intention to use (performance expectancy, effort expectancy, and social influence) and two direct determinants of usage behavior (intention and facilitating conditions). Second, we used the theory on the uptake and use of Decision Support Tools (DSTs), developed by Rose et al. (2016) (Fig.1), in which the identified performance, ease of use, peer recommendation, trust, cost, habit, relevance to user and farmer/advisor compatibility as important factors influencing use of DSTs. Linked to this, they also identify a number of modifying factors (i.e. age, scale of business, farming type, IT education), one enabling factor (i.e. facilitating conditions) and two driving factors (i.e. compliance (legislation), level of marketing).

1. Design/Methodology/Approach

We followed a qualitative research approach, based on semi-structured interviews, which fit well with the exploratory nature of this analyses. We developed an interview guideline, which contained four main sections: i) introduction and exploring the challenge identified by the UCs; ii) zooming in on experiences with pilot DATS, linked to the challenge they identified for their UC; iii) short scoring exercise in Mentimeter (https://www.mentimeter.com/)), in which participants were asked to indicate, on a scale from 1-5, their agreement with a number of statements, modified from the statements suggested by Rose et al. (2016), and iv) their views on the future use of the pilot and other DATS. In preparation of the interview, the interviewer read a UC description, prepared by the UC partners, as part of the project tasks, to support a good understanding of the DATS and overall UC before starting the interview. Semi-structured interviews were conducted online, using Microsoft Teams, between February 26th and March 11th, 2021. We performed 15 interviews, from which 2 interviews covered 2 UCs. Between 1-4 people participated per interview, leading to a total of 28 UC participants being interviewed, with different profiles (researchers, advisors, tool/IT developers, …). The duration of the interviews ranged between 1 to 2 hours, depending on the number of participants, UCs and pilot DATS discussed during the interview. Interviews were transcribed, and together with the UC descriptions, were coded using NVIVO12. We followed an open coding approach, focusing our analysis on both external and internal factors influencing DATS development and adoption.

2. Findings

The results are structured along three main parts: i) drivers for DATS development and adoption; ii) experiences with DATS' use, and iii) main influencing factors, preconditions and requirements for successful DATS development and/or adaptation and adoption.

a. Drivers for DATS development and adoption

Challenges are identified by the UCs, and are to be considered as driving forces for both tool development and adoption. We can distinguish between 2 main groups of drivers: i) global/societal challenges and ii) challenges related to maintaining future-oriented and efficient advisory organisations. At the global/societal level, the COVID-19 pandemic and a global trend towards digitalization were considered by several UCs as important drivers for DATS adoption. The COVID 19 pandemic forced a switch to online contacts, meetings and network events, and forced advisory services to look for diverse tools that could help them overcome existing travel and meeting restrictions. Regarding digitalization, there was a clear need for tools that allow for translating 'big data' into data-driven DSTs, and it was believed that advisory organisations should take up a proactive role in designing and developing specific tools and systems that fit their own needs, and the needs of the farming community, and as a result digital tools are often included in the strategic directions for the organisation set by management. At the level of the advisory organisations, digital tools were seen as a way to overcome the challenge of structured and fluent internal and external communication, in the form of, e.g., digital knowledge repositories and various communication tools to reach the farmer 'where he or she is'. Digital tools were also perceived as a means to help offer more structured, high quality advice, in a transparent manner, supporting a good farmer-advisor relationship. However, some expressed concerns that the increased use of digital tools will make advisors more office bound, which could have a negative impact on the image that farmers have of advisors. It was stressed that fieldwork, on-farm visits and farmer discussion groups should remain an integral part of the advisor's job, with DATS supporting and strengthening the advice offered during such visits and meetings. Finally, it was mentioned that while there may be already a wide array of DATS available to address some of the aforementioned needs, it is a challenge for advisors to find the right tool to suit their specific needs, so they also expressed the need for support in choosing and using the right tool in a correct way.

b. Main barriers and opportunities for DATS development and adoption

	Barriers	**Supporting factors & opportunities**
Institutional/ Organisational level	1. Government (e.g. bureaucracy) 2. Poor connectivity 3. Poor cooperation between different departments 4. Lack of organizational resources	1. Clear support from organization 2. Good IT-support 3. Good contact with tool development team 4. Possibility to update and/or adapt tool
Individual level	1. Ageing farmer/advisor population 2. End users are reluctant or sceptic 3. Inherent lack of motivation 4. Users lack right competencies or capabilities to use tool 5. Tool difficult to use 6. Not enough time to learn and work with new DATS 7. Advisors feel threatened by DATS 8. Affect advisor-farmer relationship negatively 9. Farmers and/or advisors feel in competition with tool	1. Younger farmers and advisors are more eager to use new technologies 2. Intrinsically interested or motivated end-users 3. Use of DATS strengthens or support advisors 4. Availability of clear (online) guidelines or trainings for end-users 5. Have the option to easily reach out for support 6. DATS strengthen relationship between farmer/advisor or between a team of advisors 7. Learning about positive experiences through colleagues 8. Availability of end-user feedback
Technological/DATS level	1. Finding a suitable tool adapted to a specific need or context 2. Not straightforward to exchange tools across borders 3. Development and use of DATS requires too much time 4. Cost for development and/or maintenance 5. Lack of clear added value for users 6. Poor or inadequate tool functionalities 7. Online tools still depend on following up with an advisor 8. Data ownership	1. Ease-of-use 2. Up-to-date 3. Attractive look and feel 4. Interoperability 5. Address a real need of users 6. Perceived as useful or interesting 7. Saves time and/or money 8. Improves farm results 9. Supports decision making 10. Supports knowledge exchange 11. Improving quality of advice 12. Good balance between cost and benefit 13. Support farmer to determine who gets access to the data

c. Main influencing factors, preconditions and requirements

This section aims to present an overview of the main influencing factors (i.e., factors that can act both as an opportunity or barrier, depending on the context), and also presents a number of preconditions and requirements to support tool development/adaptation and adoption, structured along the levels of institutions/organisations, individuals and technologies.

At the level of institutions/organisations the availability of government support was a first important influencing factor, either exerting a positive effect, for instance by providing funding or prioritising it in specific development programmes, or negative effect, e.g. , through the lack of funding or information. Governments, and the linked public advisory organisations, may have an important role to play in the development and adoption of DATS that support public goods delivery, which may be less addressed by privatised advisory organisations, working on a client-needs basis. Based on UC experiences, having a supportive government is not an absolute precondition or requirement, but nevertheless an important aspect to consider in the overall process. Second, there was the availability of infrastructure, looking both at internet connectivity and accessibility to specific hardware (e.g. computers, tablets, smartphones). For some UCs and DATS this was seen as an absolute precondition, i.e. some DATS only function online, but in most cases it was considered as an important influencing factor to consider when developing tools, e.g., finding ways to overcome issues with poor connectivity, or consider carefully what hardware is most commonly used or accessible for the different end users. A third crucial influencing factor on this level was the organisational capacity, where interviewees reflected on the different roles needed to support DATS development and adoption. There are IT developers, who tend to focus on functionalities and practicalities, ease-of-use, making the tool attractive, but there is also the need for technical know-how and expertise of advisors and/or farmers to ensure that tools are developed which offer a real added value for the end user, so the distribution of each of these roles, and the available resources (time, money) for each aspect needs to be carefully considered.

At the individual level, an influencing factor was the advisors' and/or farmers' willingness or inherent need for a specific DATS. Simply stated, if the DATS addresses a real need of advisors and/or farmers, their willingness to adopt such a tool will always be higher. However, there are other moderating factors at play: some people are simply more open towards accepting change, feel more comfortable or competent with the use of IT, are more eager or confident to develop new competencies. Also, the effect of age on DATS uptake was frequently discussed, and linked to willingness and openness towards DATS. While it mentioned that older people are less flexible in taking up these new technologies, and it is more common practice for younger people, it was also mentioned that care should be taken to avoid such generalisations. These factors were usually more considered as influencing factors, and not as preconditions and requirements, and it was believed that they could be influenced by for instance closely involving end users in the process of tool development and optimisation, supporting people in the development of new skills and competencies, or by having DATS with a clear added value for the end users.

At the technological/DATS level, we found a number of important preconditions and a wide range of requirements and functionalities interviewees envisioned for their DATS, based on early experiences with the pilot DATS. A first precondition was a good balance between ease-of-use and functionalities. While user friendliness and ease-of-use in itself could be considered as a precondition, the complexity of some of the aspects covered by DATS do not always allow for very basic or easy-to-use interfaces. Some complexity is in some cases unavoidable, and in fact needed to ensure a good functionality. Developers should strive for maximal user friendliness and ease of use, including a professional look and feel of the tool, while ensuring excellent functionalities. A second precondition was ensuring a good balance between costs and benefits, where costs and benefits are of course not only understood as monetary costs and benefits. If a tool provides a clear added value or benefit (better farm management, enhanced knowledge, time and money saved, …), to the end user, users are willing to handle a higher cost. So, the key is in finding the balance, and this is also a balance that is often made on an individual basis. Third, data management needs to be in line with GDPR requirements. Apart from the fact that these are legal requirements, which should be followed under all circumstances, they are also essential in alleviating concerns around data privacy and ownership. Specifically for DSTs the availability of high quality data was another precondition. Without reliable, high quality data, it is impossible to develop reliable, high quality DATS.

Finally, based on experiences with pilot DATS, UCs each tended to have a 'wish list' of requirements for the tool that they aim to introduce for their UC. First of all, for nearly all tools it was a requirement that it should improve effectiveness and efficiency, either in the way that the advice is offered to the farmer, or of the farming operations themselves. Equally important is the requirement that the tool should help to improve the quality of advice and strengthen the advisors' knowledge base, and support the provision of high-quality, reliable information. Also, a few interviewees indicated that the DATS should not only strengthen advisors' capacities, but should also help to empower farmers. These requirements are again linked to the fact that the tools should address a real need and provide clear added value to the end users. Second there are a number of requirements linked to the support of interaction, be it peer-to-peer, farmer-to-advisor or supporting interaction for larger groups. Regarding requirements on the technical aspects of the DATS, having a self-learning system, a system that allows to follow user actions, having the tool available as a mobile application, and tool interoperability were considered important. Specifically for DSTs, an important technical requirement is to have continuous, automated data-input and record keeping, while for knowledge exchange and information sharing platforms having a system in place that supports a push-function, where the information is brought directly to the end-user, and the ability to generate quick or automated responses to users were mentioned as desirable technical features.

3. Implications and conclusion

To conclude, the work presented here, based on work done in 17 very diverse UCs and building on the complementary data obtained through the interviews on the one hand, and the UC descriptions on the other hand, leads to the identification of a number of barriers and supportive factors, in addition to a broad range of so-called influencing factors, requirements and preconditions for success. Despite the diversity in contexts across the UCs, we could identify a number of common factors across UCs. First of all, main drivers for digital transformation and the quest for suitable DATS, appear to be quite universal. COVID-19 has been an important game changer in this respect, but also other ongoing global/societal developments and the challenge to maintain high quality, professional advisory services, in support of efficient and future-oriented farming systems, within this changing environment, were central across all UCs. However, these more universal drivers lead then to different challenges, depending on specific contexts and situations. Central in the search for suitable DATS to address these challenges, is in the first place having a good understanding of the challenge and the different end-users needs. In addition to addressing this real need and thus offering a clear added value to the user, DATS should have the right balance between costs and benefits, and ease-of-use and good functionalities, in addition to a number of UC specific requirements.

Finally, this work can also be seen as an integral part of the Living Lab methodology, with the interviews being a way to help UC partners to reflect on the steps they have taken so far, and how these previous experiences can inform their search for DATS to address the challenge identified for the UC. By discussing early experiences with these pilot DATS, it may help UCs to more clearly define or delineate their specific need, and thus support their search for DATS to successfully address that need.

4. References

Ajzen, I. "The Theory of Planned Behavior," Organizational Behavior and Human Decision Processes (50:2), 1991, pp. 179-211.

Bandura, A. Social Foundations of Thought and Action: A Social Cognitive Theory, Prentice Hall, Englewood Cliffs, NJ, 1986.

Compeau, D. R., and Higgins, C. A. "Computer Self-Efficacy: Development of a Measure and Initial Test," MIS Quarterly (19:2), 1995, pp. 189-211.

Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. "Extrinsic and Intrinsic Motivation to Use Computers in the Workplace," Journal of Applied Social Psychology (22:14), 1992, pp. 1111-1132.

Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," Management Science (35:8), 1989, pp. 982-1002.

Fishbein, M., and Ajzen, I. Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research, Addison-Wesley, Reading, MA, 1975.

Rogers, E. Diffusion of Innovations, Free Press, New York, 1995.

Rose, D.C., Sutherland, W.J., Parker, C., Lobley, M., Winter, M., Morris, C., Twining, S., Ffoulkes C., Amano, T., Dicks, L.V. (2016). Agricultural Systems, 149, 165–174

Thompson, R. L., Higgins, C. A., and Howell, J. M. "Personal Computing: Toward a Conceptual Model of Utilization," MIS Quarterly (15:1), 1991, pp. 124-143.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478.

The Potentials of the use of mobile phone to access agricultural information: Which Factors Matter

Martin Bosompem, Pious Ainoo Cudjoe

Department of Agricultural Economics & Extension,School of Agriculture, College of Agriculture and Natural Sciences, University of Cape Coast, Ghana

Short abstract

Ghana is reported to have the highest mobile penetration in West Africa and already outperforms many of its regional peers. It was estimated that by the year 2019, about 55% of the population adopted the use of mobile phone for various activities and as at January 2022, Ghana had registered about 45 million mobile connections. The number of connections is said to correspond to 140% of Ghana's total population. The use of mobile phone has become important in the agricultural sector especially in agricultural information access and delivery. However, little is known about factors that drive farmers' use of mobile phone to access agricultural information in Ghana. Using the Roger's diffusion of innovation theory and unified theory of acceptance and use of technology (Ventatesh, Morris, and Davis; 2003), we employed correlational survey design to determine the predictors of farmers' level of use of mobile phone to access agricultural information necessary to improve their production and post-harvest activities. Multistage sampling technique and structured interview schedule were used to collect data from 182 farmers in a selected district in Central Ghana. We employed descriptive statistics and regression analysis to explore the potential factors that can drive effective use of mobile phone to access agricultural information. The results show that all the respondents had mobile phones, however, 23% used smart phones. Male farmers' dominated the use of mobile phone to access agricultural information. Respondents' used mobile phones mostly to facilitate their access to financial services, get better access to market information and other value chain actors, obtain information from extension officers and access agricultural input information, however, farmers' knowledge and awareness of the use of mobile phone to access agricultural information were low. High cost of call tariff and difficulty in texting and reading messages were the major challenges of farmers' use of mobile phone. The factors that best predicted farmers' level of use of mobile phone to access agricultural extension information were found to be their (1) level of awareness, and (2) level of knowledge in use of mobile phones, (3) perceived benefit they derived from mobile phone use, (4) their level of educations and (5) the type of mobile phone use (analog or smart phone). These five (5) factors contributed to about 79% variations in their level of use of mobile phone to access agricultural information. We recommend among others the need for telecommunication network companies and Ministry of Food and Agriculture to collaborate to create awareness and provide training to farmers on the various ways they could use mobile phone to access agricultural information.

Can SMS, IVR and apps enhance organic farming practices in Africa?

Selina Ulman, Benjamin Gräub, Faith Maiyo, Lise Dusabe, Dieudonne Sindikubwabo

Research Institute of Organic Agriculture (FiBL)

Short abstract

Over the last three years, the Research Institute of Organic Agriculture (FiBL), together with partners in Kenya, Rwanda, Mali and Senegal has accumulated a wide range of knowledge on how simple technologies can be used to improve access to organic farming knowledge by smallholder farmers. Over 4400 smallholder farmers in Kenya and Rwanda received SMS-based and app-based training on organic agriculture. This presentation showcases the experiences and derived recommendations for the use of digital technologies for capacity development of smallholder farmers in East Africa. Traditional farmer training and farmer field schools are hugely important in farmer education, but many farmers do not have access to them and its high costs limit their scaling. SMS-based or app-based training, as well as training via interactive voice response (IVR), can be a useful addition that are comparatively inexpensive and can more easily reach a large number of farmers. Raspberry Pi computers are found not suitable for farmer training. This work provides insights into the potential of phones, smartphones, tablets, (OTG) USB sticks and Raspberry Pi computers to improve farmer access to information and training on organic agriculture practices and to promote the growth of organic agriculture in East Africa and beyond. We will highlight the principal aspects when planning, developing and implementing digital trainings for farmers smallholder farmers in Africa.

Extended abstract

Purpose

This paper highlights the experiences and derived recommendations for the use of Information and Communication Technologies (ICTs), namely SMS, apps, IVR, Raspberry Pi computers and OTG USB sticks for knowledge transfer to smallholder farmers in Africa. Over the last few years, the Research Institute of Organic Agriculture (FiBL), together with partners in Kenya, Rwanda, Mali and Senegal has accumulated a wide range of knowledge on how simple technologies can be used to improve access to organic farming knowledge by smallholder farmers. Traditional farmer training and farmer field schools lead to positive outcomes for farmers such as empowerment, improved knowledge, increased yields, income and well-being (Friis-Hansen & Duveskog, 2012; Waddington et al., 2014), but many farmers do not have access to them and the high cost limits their scaling (Mapiye et al., 2021). The use of Information and Communication Technologies (ICTs) for farmer education can have positive impacts on farming practices and the farmers well-being in Africa (Hudson et al., 2017; Sennuga, 2020). SMS-based or app-based training, as well as training via interactive voice response (IVR), are expected to be a useful addition that is comparatively inexpensive and can easily reach a large number of farmers. This work provides valuable insights into the potential of digital technology to improve African smallholder farmers access to information and training on organic agriculture practices and to promote the growth of organic agriculture in East Africa and beyond. Additionally, we will highlight the principal aspects to consider when planning, developing and implementing digital trainings for farmers.

Design/Methodology/Approach

FiBL has tested various technologies in Kenya, Rwanda, Mali and Senegal as part of various projects1,2,3. These projects were jointly implemented with the partners Biovision Africa Trust (BvAT) in Kenya and

Rwanda Organic Agriculture Movement (ROAM) in Rwanda, Association of Professional Farmer Organizations (AOPP) in Mali, Fédération Nationale pour l'Agriculture Biologique (FENAB) in Senegal, as well as the technology partners Arifu, Yielder/Fesy and Viamo. App-based and SMS-based trainings were developed in a participatory process. Four modules on introduction to organic farming, indigenous poultry, dairy goats and vegetables were developed, disseminated and evaluated. Raspberry Pi computers and Interactive Voice Response (IVR) were tested as additional technologies, including in West Africa (Mali, Senegal). The results of the projects over the period 2020-2023 are summarised and classified here.

1 Digital Training Materials Pilot Project (Phase 1) in Kenya and Rwanda (2020-2022) was financed by the Leopold Bachmann foundation.

2 Knowledge Centre for Organic Agriculture in Africa (KCOA) is a collaborative country-led partnership funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and non-governmental organisations across Africa. The KCOA aims to scale up adoption of organic/ agroecological farming practices through a network of five Knowledge Hubs in Africa. The project runs from 2019 to 2026.

3 Scaling-Up Digital Training Materials (Phase 2) in Kenya and Rwanda (2022 – 2025) is financed by the Leopold Bachmann foundation.

Findings

SMS-based and app-based training tested in Kenya and Rwanda

In the Digital Training Materials Pilot Project in total, more than 4400 farmers were trained with app-based and SMS-based trainings. The app- and SMS-based training consists of four modules: an introductory course on organic agriculture, a module on indigenous poultry, one on vegetables and one on dairy goats.

The high engagement rate of the training (39 % of invited messages resulted in high engagement with at least one of the 4 modules) and the survey with 203 farmers Kenya who conducted the SMS training indicates that the SMS-training technology was very well received by Kenyan farmers; 94 % of the learners who engaged deeply with the content perceived the SMS training to be helpful for their farming. A majority also reported a significant improvement in their farming practices (89 % of respondents), yields (90 % of respondents), commercial farming income (69 % of respondents), and quality of life (76 % of respondents). (own data: Arifu, 2021)

In contrast to Kenya, the SMS-based training was not received well by farmers in Rwanda (3,7 % of invitations to the training resulted in high engagement). According to users' feedback, the low rate of engagement is mainly due to low literacy skills, poor eyesight and unaccustomedness to using SMS. This underlines that the context matters and that the attitude towards a digital channel may vary greatly between different cultures and people.

The following 11 key learnings were distilled for the use of app-based and SMS-based training materials for smallholder farmers in East Africa:

1. Content development: As the text length on SMS is very limited, concise formulations are necessary. Texts should come in a storytelling format to keep them attractive to read

2. Content adaptation: If the training is used in other countries, it must be adjusted to the local circumstances and languages.

3. Visual elements bring value to training: Videos, graphs, illustrations and pictures photos can make a real difference in farmer training. Complex topics can be visualized, and through videos, the farmers can gain a personal impression of other farmers.

4. SMS & IVR for introductions: SMS training is primarily suitable for introductory content and should be followed or accompanied by further guidance such as in-person training, advisory work, online training, or other ways that allow deepening of specific topics.

5. Finding the right channel: Whether to use SMS, telephone, apps, or other channels should be based on the target group, the type of content, its complexity and the resources available. We learned e.g. that SMS does not work as well in Rwanda as it did in Kenya. It is also recommended to use different channels and link them together.

6. Costs: Compared to content development, dissemination is relatively low in cost, which makes it scalable to a high number of recipients.

7. Cooperation: Good cooperation between technology partners and local partners with strong networks with farmers as well as a profound knowledge base are essential.

8. Make clear what it costs: People might not use the training because they assume that additional costs will follow. It is essential to clarify from the beginning that it is for free or how much it costs.

9. Marketing: Proper promotion of the training material on placards, flyers, the radio and tv to help to make it public is necessary to reach out to a high number of farmers.

10. Reminder messages: More than one invitation message is needed. Farmers should be reminded several times to start or continue with the available training modules to achieve high engagement.

11. Different use of technical devices: Reaching women, older adults and people with illiteracy or bad eyesight is challenging. It is essential to know the social structures and the use of phones within families and communities in order to adapt marketing activities and the training itself. People who cannot read will not benefit from SMS-training if they do not have someone to read the content to them.

IVR-based training tested in Mali

Based on the SMS-training on organic agriculture, dairy goats, vegetables and poultry, IVR-based training modules were developed for smallholder farmers in Mali. 197 farmers were selected in Mali and sent an invitation to the IVR training. The engagement rate of 100 % shows that the training was extremely positively received by the users. Two main reasons for this very high engagement rate are assumed: a pre-selection of potentially interested farmers was made (no mass invitations) and in advance, the users received a phone call from the organization they knew well, which informed them about the offer of the IVR training. The effects of the trainings are currently being examined in an evaluation, the results are still pending.

Raspberry Pi computers tested in Kenya, Rwanda and Senegal

Testing Raspberry Pi computers as alternatives to tablets in farmer training in Kenya, Rwanda and Senegal showed that if used in a set-up where their price is competitive to a tablet's price, they are more error-prone, less user-friendly and judged less useful by users. No clear use cases for Raspberry Pi computers in farmer training were identified.

Overview of the requirements of ICTs to be used in farmer training and their user-friendliness

Find in the following table an overview of the target group, minimum requirements and user-friendliness of the tested ICTs:

Technology	Target group	Minimum requirements for users	Do users need to be literate?	Costs for development and dissemination per user 1 = comparably cheap 5 = comparably expensive	User-friendliness/ difficulty to use 1 = very easy to use 5 = not user-friendly
SMS-based training	Farmers	Phone, coverage	Yes	2	2 (literacy and knowledge on SMS required)
Interactive Voice Response (IVR)	Farmers	Phone, coverage	No	2	1 (only needs a phone)
App-based (in-person) trainings	Multipliers (farmer trainers)	Tablet or smartphone and intermittent internet connection	Yes	5	3 (literacy, internet, tablet)
(OTG) USB sticks	Multipliers (farmer trainers)	Tablet, laptop or computer	Yes	1	3 (needs a device)
Raspberry Pi and display	Multipliers (farmer trainers)	Raspberry Pi, access to electricity and intermittent internet access	Yes	4	5 (user-friendliness limited, needs a screen and access to electricity and intermittent internet access)

Practical Implications

Digital training for farmers and for farmer trainers can be a valuable complement to physical training. Farmers who otherwise do not have access to agricultural training can be reached and connected to existing extension workers or other training materials. As the dissemination of the materials is relatively cheap, they are easily scalable. SMS-based training and training via IVR are particularly suitable as an introduction to new topics. App-based training is also suitable for in-depth engagement, for preparing farmer trainings and as enrichment for physical farmer trainings. Always important is the orientation and adaptation of the training materials to local conditions, such as the prevalence of technologies (e.g. smartphones) among farmers and their attitudes towards them, the interests and previous knowledge on specific topics, the agricultural structures and production methods or the language. It can be concluded that the potential of digital tools is enormous and largely untapped for this purpose.

Theoretical Implications

Recommendations for or against the use of specific digital training materials in farmer training strongly depend on the local context and the resources available for their development and dissemination. Some factors such as literacy, depth of content, topic, field of application, type of training, available resources for development and dissemination, and distribution of smartphones are identified as variables with great influence on the use of SMS, apps and IVR in farmer training. A broad-based framework should be developed, based on these and additional factors, which allows giving targeted recommendations and guidance on the use of digital farmer trainings. The testing of ICT in farmer training should be expanded to other African countries to gather information about the country-specific applicability of different ICTs and to further spread their use.

References

Arifu. (2021). Final Report 2021, Endline Survey Results.

Friis-Hansen, E., & Duveskog, D. (2012). The Empowerment Route to Well-being: An Analysis of Farmer Field Schools in East Africa. World Development, 40(2), 414–427. https://doi.org/10.1016/J.WORLDDEV.2011.05.005

Hudson, H. E., Leclair, M., Pelletier, B., & Sullivan, B. (2017). Using radio and interactive ICTs to improve food security among smallholder farmers in Sub-Saharan Africa. Telecommunications Policy, 41(7–8), 670–684. https://doi.org/10.1016/J.TELPOL.2017.05.010

Mapiye, O., Makombe, G., Molotsi, A., Dzama, K., & Mapiye, C. (2021). Towards a Revolutionized Agricultural Extension System for the Sustainability of Smallholder Livestock Production in Developing Countries: The Potential Role of ICTs. Sustainability, 13(11), 5868. https://doi.org/10.3390/su13115868

Sennuga, O. S. (2020). IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTS) ON AGRICULTURAL PRODUCTIVITY AMONG SMALLHOLDER FARMERS: EVIDENCE FROM SUB-SAHARAN AFRICAN COMMUNITIES EFFECTIVENESS OF TRADITIONAL EXTENSION MODELS AMONG RURAL DWELLERS IN SUBSAHARAN AFRICAN COMMUNITIES View project Evaluation of Small-Scale Women Farmers' Utilization of ICT in Accessing Agricultural Information in Gwagwalada Area Council, Abuja, Nigeria View project. https://www.researchgate.net/publication/341026381

Waddington, H., Snilstveit, B., Hombrados, J., Vojtkova, M., Phillips, D., Davies, P., & White, H. (2014). Farmer Field Schools for Improving Farming Practices and Farmer Outcomes: A Systematic Review. Campbell Systematic Reviews, 10(1). https://doi.org/10.4073/CSR.2014.6

The digitalization of agriculture and the advisors' support. An analysis through the Multilevel Perspective

Taiana Homobono, Fabíola Polita, Lívia Madureira

Centre for Transdisciplinary Development Studies (CETRAD), Universidade de Trás-os-Montes e Alto Douro (UTAD), 5000-801 Vila Real, Quinta dos Prados, Portugal

Short abstract: The article aims to contribute to the comprehension of the technological-driven transition processes in agriculture. The case study of Lezíria do Tejo is focused on the adoption of irrigation control sensor technology for maize, vegetables, and tomato crops. Semi-structured interviews were applied to 22 producers, with the aim of mapping the type of production and the relationship with the technological innovation in question. From the content analysis, it was possible to identify drivers and constraints for consolidation of the probes' adoption, among them, the size and type of property, the cost of the equipment, and the dissemination of information. From the perspective of the Multilevel Perspective, it was possible to identify that, in addition to biophysical and economic factors, the adoption of probes is linked to the process of production and dissemination of knowledge. The advisors' role can be fundamental in the perception of benefits and in the investigation of new possibilities for using technologies as a tool for the transition to sustainability.

Extended abstract

Purpose

Sustainable food production is one of the biggest challenges faced today (De Schutter 2017; Marsden 2012; Fraser et al. 2016), which makes it essential to promote strategies and technologies that meet agricultural water demands in a more sustainable way (Jaafar and Kharroubi 2021). Innovation can be a mean to achieve the transition to the sustainability of the agrifood system (Morrissey, Mirosa, & Abbott, 2014; Oliveira, Gazolla & Carvalho, 2011), as long as it is supported by political, technological, power, economic, business, marketing, cultural, discursive or public opinion (Geels, 2011).

Understanding the adoption of technologies and envisioning transition processes towards sustainability in agriculture involves uncovering the different perspectives and paths for adopting innovations, as well as the barriers and drivers found at the property level (Farhangi et al 2020; Polita & Madureira, 2021). In this research, we propose an analysis centered on the role of advisors and farmers in promoting and adopting technological innovation. The case study focuses on commercial producers of irrigated crops (mainly maize, vegetables, and tomatoes), in the Portuguese region of Lezíria do Tejo. To identify barriers and drivers in the technology-driven transition, as well as the role of advisors in this process, we adopted the Multi-Level Perspective. The Multi-Level Perspective (MLP) has been used and applied in the mapping of transition processes, providing a necessary analytical framework for the transition phenomena of socio-technical systems (Polita & Madureira, 2021).

The article, therefore, seeks to contribute to studies on the transition to sustainability in agriculture, highlighting technological innovation as a tool for this. In addition, the methodology adopted allows for identifying and systematizing similar patterns of behavior related to the adoption of innovation (on a microscale) that can promote the transition to sustainability in agriculture.

Design/Methodology/Approach

The data collection was developed within the purview of the H2020 AgriLink Project, in the Lezíria do Tejo region and focuses on the adoption of smart irrigation sensors by farmers in the Tagus plains region (Lezíria do Tejo, NUTS 3). The research focused mainly on farms in the Northern sub-region, where producers depend mostly on groundwater that they extract from wells by pumping systems, currently using mainly electricity as an energy source.

In the first stage, exploratory research was carried out based on interviews with local actors, namely: pioneer farmers in relation to the innovation in question (probes), digital technologies, and precision agriculture; consultants/technicians hired to support the introduction, development, and implementation of the probes and the farmer in general in terms of the irrigation process; representatives from the high-tech company responsible for software and data management. Based on this information, it was possible to map local actors involved in the probe experimentation project (producers and managers of productive properties), focusing on commercial farmers of irrigated crops, mainly maize, vegetables, and tomatoes for industry, covering the diversity of the group regarding the adoption and non-adoption of smart irrigation sensors, along with the regional heterogeneity in the structures of the farms and in the profile of the farmers. The interview script included questions that could be open or closed, with the objective of mapping qualitative information and quantitative. Thus, in addition to the general characterization of the property, the questionnaire sought to organize information regarding the sociodemographic profile of the farmer or farm manager, the structure of the farm and its business models, and an understanding of the interviewee's relationship with technological innovation. In total, 38 farmers or farm managers were interviewed, of which 20 agreed to have their narratives recorded for future treatment and analysis. The narratives were treated according to the age group of the participants, schooling, an extension of the production area, and posture in relation to technology (adoption, non-adoption, or abandonment).

The transcribed interviews were treated through content analysis, using the Iramuteq software (Interface de R pour les Analysis Multidimensionnelles de Textes et de Questionnaires), alpha version 2 0.7. The software conducts a categorization of the interviewees' speeches, considering mainly the active forms (nouns, verbs, adjectives and some adverbs). Content analysis was performed using descending hierarchical classification, a divisive hierarchical clustering algorithm that identifies co-occurrences of active forms and regroups them into classes, ensuring maximum similarity in classes and maximum dissimilarity between classes (Lahlou, 1996). The adoption of this method makes it possible to identify categories of the interviewees' speeches, as well as to perceive behavioral trends and topics of interest to the interviewees.

The analysis and discussion of the results obtained are carried out under the light of the multilevel perspective, as a way of understanding on a microscale the process of adopting technological innovation as a tool for the transition to sustainability (Farhangi et al 2020).

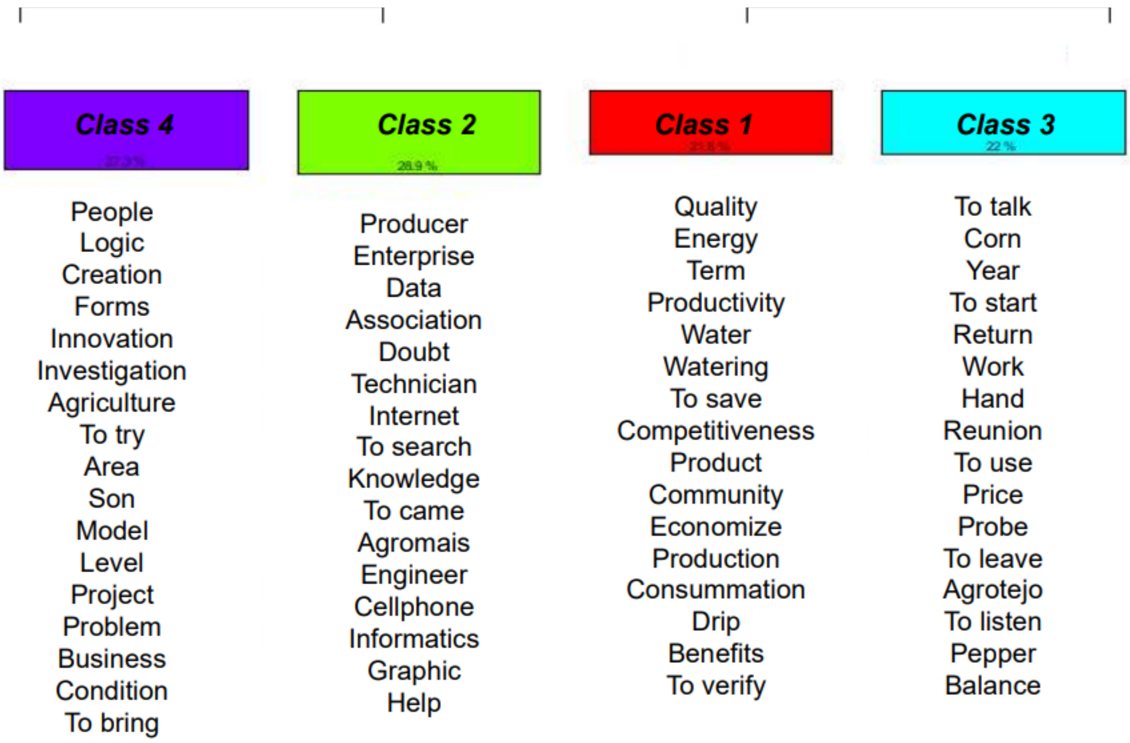
Findings

Of the 22 interviewees, 8 are adopters of the irrigation control probe, 8 have not adopted it and 6 have adopted it, but abandoned it after the trial period. Among the adopters, there are younger producers (under 50 years old) and with some type of schooling/technical education (agricultural). The non-adopters are older producers (over 50 years old) with basic training/education, for the most part. In the case of droppers, there is no pattern in the profile.

The advantages of adopting the irrigation sensors were characterized between productivity benefits and environmental benefits. For 63.6% of respondents, it is possible to have increments and advantages in terms of productivity, while 32% of respondents say that the adoption of probes is irrelevant for increasing or improving agricultural production. The importance of using sensors for environmental issues is a consensus among respondents, more than 80% said that sensors are responsible for ensuring the efficiency of water use. The interviewees also indicate that environmental efficiency is not only linked to water savings, but also to energy savings, thus being an economic benefit for production. Among the Droppers and Non-adopters group, 82% of them indicate that there is a future interest in the use of probes, which indicates that the processes of dissemination and promotion of the use of technology can be evaluated and improved.

Content analysis and hierarchical classification allowed us to outline the main perspectives and concerns regarding the adoption of sensors, aligning them with the profile of producers (adopters, non-adopters, and droppers). Figure 1 presents the dendrogram of the hierarchical classification.

Figure 9 - Descending Hierarchical Classification obtained through Iramuteq software



Class 1 (red) is represented by forms such as 'quality', 'energy', 'water', 'irrigation', and 'conserve', indicating the importance of efficient use of resources in the agricultural production process and, consequently, in the adoption of technology use. This cluster contains a majority of discourses from producers who participated in the experience of using the probe, even though after the initial period they abandoned it, thus being called "*positive experiences*". Cluster 2 (green) presents forms such as 'producer', 'company', 'data', 'association', and 'internet'. This class encompasses speeches from all profiles of respondents. In it, the role of consultants and technicians involved in the experience of adopting the probes is highlighted, highlighting the advantages of the process, the ease of understanding the technology, its use, and monitoring. We call this class "*conventional users*". In cluster 3 (cyan) the forms 'talk', 'corn', 'year', 'beginning', 'work', and 'price' stand out. In this cluster prevail narratives linked, mostly, to producers who did not adopt the probes. The most practical issues related to the barriers to the adoption of probes stand out, that is, factors such as cost, labor, and type of production. The cost of renting equipment can be considered the biggest obstacle, since most producers own properties in smaller areas, producing on a smaller scale and with varied crops. This scenario of fragmented ownership and agricultural crops makes the adoption of probes unfeasible from an economic point of view. This class was named "*barriers and limitations*". Finally, in cluster 4 (purple) the forms 'people', 'logistics', 'creation', 'innovation', and 'research' are highlighted. This class contains respondents who adopt and abandon the probes. It is evident in an analysis of this class that there is a recognition of technology as a tool that goes beyond its basic purpose, irrigation control. Both the adopters and those who abandoned informed that the probe allows the development of a monitoring and control plan to improve the production of their cultures and, consequently, better management of the properties. We call this class "*visionary users*".

We can analyze the hierarchical classification as two large groups. The first group is covered by clusters 1 and 3. Producers in this group recognize the importance, mainly environmental, of adopting the sensor. There is concern about the scenario of scarcity and climate change. However, with regard to productivity, there still seems to be little benefit from the adoption of probes. Barriers related to the cost of the equipment versus the fragmentation of the properties and size of the cultures prevail in the decision not to adopt the probes. The second group is formed by clusters 2 and 4. In this group, producers are more connected to consulting and technical assistance processes, understanding the role of disseminating knowledge for the evolution of technology. Although there are cases of producers who go beyond the use of probes, extracting new information and using them as instruments for managing and improving the property, the dependence of producers on technicians and consultants regarding the use of probes is still notorious.

Practical Implications

The content analysis presented by the hierarchical classification points out important questions about the adoption of humidity control probes for agriculture: the size of the properties and production; the dissemination of knowledge and the role of consultants/technicians; and the cost-effectiveness of adopting the technology.

The scenario of fragmented ownership and agricultural crops discourages the adoption of rigs. Farmers with smaller properties claim that it is not financially possible to maintain the sensors, as the costs outweigh the gain from production. For adopters, generally farmers with more significant properties (above 100ha), sensors are a benefit, not just in terms of productivity. In the long term, the adoption of technology can promote environmental and property management improvements, such as monitoring fertilization rates, soil quality, and crop responses to climate change. Knowledge of these benefits permeates through continuous use, observation, and experimentation. The interviewees highlighted the importance of disseminating information, which means that it is necessary to disseminate the results and discoveries of the adoption of technologies to ensure changes in new ways of doing agriculture, with the role of advisors being vital. Although in the case study, this is considered positive and well established, it became clear, especially on the part of producers who adopt technology as a tool for managing and improving the property, that there is a way to be developed in order to better disseminate the multiple possibilities of the technology in question. As a result, there is an obstacle cited with recurrence throughout the research: the cost. For smaller producers, the rental value of the rigs still overlaps with the gains obtained in production. For these producers, it is important to have other options that meet their needs. Again, a general analysis of the interviews reveals that even though advisors have a consolidated role within this scenario, it is important to assess the type of information and how it has been disseminated. Information dissemination processes may not be enough and lead to an idea of "high costs and small benefits".

Theoretical Implications

Under the light of the Multilevel Perspective, we assume that the niche is represented by the experience of introducing moisture probes in agricultural crops; the regime is represented by rules and measures of the agricultural sector; and the landscape through barriers and territorial drivers (national agricultural development, climate change, scarcity of resources and labor). The classes characterize the action profile of producers in the face of probe technology, which may or may not contribute to the technological transition process (Hosseinifarhangi et al 2019).

The regime defines legal issues and community support that can act as levers or obstacles to the adoption of technology. Agri-environmental measures referring to the efficient use of water (irrigation efficiency, and monitoring of irrigation systems) act as drivers for the adoption and dissemination of the technology of humidity control probes. Agri-environmental measures can and should work not only as incentives for technology adoption but mainly as a source of dissemination and mastery of information that can be obtained through technology to promote more sustainable agricultural management. Improving agricultural digitalization is directly related to promoting policies and strategies that free farmers from the risks and uncertainties related to innovation. In the regime, we can also highlight the actors involved in the counseling and consulting processes. The role of technicians and advisors is to guarantee the use and support of producers, as well as the independence of users. The regime, in the case study, can and should undergo changes from the visionary producers, who have adopted the technology and explore its potential as a long-term management tool.

We defined the landscape of the case study based on the national agricultural scenario, specifically the constraints related to this agricultural scenario and the environmental limitations at a supranational level. Property fragmentation problems result in varied agricultural production and lower volume, consequently making probes an expensive and unfeasible tool. The fragmentation of properties seems to be a national problem that directly interferes with policies and programs to encourage agricultural development (Esgalhado and Guimarães, 2020). Climatic constraints and resource availability can, however, act as active pressures in regime changes. Climate change makes strategies that allow for more efficient agricultural development increasingly urgent.

At the niche level, the different profiles of producers and how we can represent the transition process of innovation. The first two profiles ("positive experiences" and "barriers and limitations") reflect failures in the innovation dissemination and experimentation process. Whether non-adopters or droppers, it is clear the difficulty of perceiving the technological tool as an added value to adhere to the production process. These groups are directly affected by landscape and regime constraints. The third group of users (conventional users), understand the benefits and are positively affected by the regime (agri-environmental measures and their support), however, they depend directly on the knowledge and conduct of the process by the advisors. The last group, the visionary users, manage to overcome the relationship of dependence on the advisors to dominate and exploit the data obtained from the technology and can, in a disruptive relationship, directly influence the regime and, in the long term, the landscape (Ayre et al 2019).

These conclusions reveal that the digitalization of agriculture in the Lezíria do Tejo region takes place in uneven ways at the level of the farmer. The flow of knowledge between the different profiles of farmers limits the transition processes at the same time that it is determined by territorial restrictions (landscape). In this sense, the role of advisors could be fundamental not only in terms of adherence by farmers but especially in terms of perceiving the benefits and investigating new possibilities of use for land management. Although there are territorial and economic barriers (within agricultural production), there is some consensus on the technological tool as a strategy to overcome environmental problems.

References

Ayre, M., Mc Collum, V., Waters, W., Samson, P., Curro, A., Nettle, R., Paschen, J., King, B., Reichelt, N. (2019). Supporting and practising digital innovation with advisers in smart farming. *NJAS - Wageningen Journal of Life Sciences,* 90–91.
De Schutter, O. (2017). The political economy of food systems reform. *European Review of Agricultural Economics*, 44(4), 705-731.

Esgalhado, C., Guimaraes, M.H., 2020. Unveiling contrasting preferred trajectories of local development in southeast Portugal. Land 9.

Farhangi, M. H., Turvani, M. E., van der Valk, A., Carsjens, G. J. (2020). High-Tech Urban Agriculture in Amsterdam: An Actor Network Analysis. *Sustainability,* 12, 3955.

Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1(1), 24–40.

Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, 36(3), 399-417.

Hosseinifarhangi, M.; Turvani, M.; Van Der Valk, A.; Carsjens, G. Technology-Driven Transition in Urban Food Production Practices: A Case Study of Shanghai. Sustainability 2019, 11, 6070

Jaafar, Hadi & Kharroubi, Samer A., 2021. "Views, practices and knowledge of farmers regarding smart irrigation apps: A national cross-sectional study in Lebanon," Agricultural Water Management, Elsevier, vol. 248(C).

Lahlou, S., 1996. A Method to Extract Social Representations from Linguistic Corpora. Japanese J.Exp. Soc. Psychol. 35, 278–291.

Marsden, T. (2013). From post-productionism to reflexive governance: Contested transitions in securing more sustainable food futures. *Journal of Rural Studies*, 29, 123-134.

Morrissey, J. E., Mirosa, M., & Abbott, M. (2014). Identifying transition capacity for agri-food regimes: Application of the multi-level perspective for strategic mapping. *Journal of Environmental Policy & Planning*, 16(2), 281-301.

Oliveira, D., Gazolla, M., Carvalho, C. X. de, & Schneider, S. (2011). A produção de novidades: como os agricultores fazem para fazer diferente?. In S. Schneider, & M. Gazolla (Eds.), *Os atores do desenvolvimento rural: perspectivas teóricas e práticas sociais* (pp. 91-116). Porto Alegre, Brasil: Editora da UFRGS

Polita, F.S., & Madureira, L. (2021).Transition Pathways of Agroecological Innovation in Portugal's Douro Wine Region. A Multi-Level Perspective. *Land* , 10, 322.

Investigating stakeholder perception of virtual fencing technology to promote sustainable grazing management

Juliette Schillings

University College Dublin (UCD, Ireland)

Short abstract:

Considering the importance of sustainable grazing management in terms of its benefits to animal welfare, biodiversity, and landscape conservation, the potential of virtual fencing (VF) systems, which allow the spatiotemporal control of grazing livestock, is increasingly being investigated. This increased interest also stems from the potential of VF to reduce the important material, maintenance, time, and labour costs associated with setting-up physical fences. Thus far, studies investigating VF primarily focused on its efficiency in containing animals and its impacts on animal welfare, whilst fewer studies have explored stakeholders' acceptance and perceptions of VF for livestock grazing management. This study thus aims to address this gap by involving a variety of stakeholders from the island of Ireland (e.g., farmers, advisors, policymakers, researchers, NGOs…) in focus group discussions and in-depth interviews to identify key benefits and concerns in relation to VF technology. The study also involves a survey and a workshop to investigate public perception of VF. The outcomes of this study are used to develop an effective strategy for the promotion of best practices in VF technology, setting up the boundaries for its efficient and ethical use.

Extended abstract

Purpose

The overarching aim of this study is to develop an effective strategy for the promotion of best practices with virtual fencing for sustainable grazing management on the island of Ireland. To this aim, the study involves investigating stakeholders' (including farmers as end-users, farm advisors, policymakers, NGOs, researchers…) perceptions of virtual fencing to identify the factors that can enable or hinder its adoption and effective implementation on farms. It also aims at exploring the public's perception and acceptance of the use of VF to contain grazing animals.

Design/Methodology/Approach

Two stakeholder focus groups comprising public servants, policymakers, researchers, assurance schemes, farmer union representatives and NGOs were conducted to initiate discussions on the perceived benefits and challenges of adopting and implementing VF technology. Through these discussions, key factors are identified and used as a basis for follow-up focus group discussions with farmers (N=6). These will involve four groups of farmers using VF on their farms and two groups of farmers not using VF. Discussions will revolve around users' experiences of implementing and using VF and the factors which affect the adoption of sustainable grazing management practices.

To investigate the public's perception of the use of VF, a survey will be disseminated among citizens from the island of Ireland. The survey will collect socio-demographic data (e.g., age, gender, education, experience with/relation to agriculture) and explore general attitudes towards livestock farming. Following a general introduction to virtual fencing technology, attitudes and perceived benefits and risks will be investigated using ranking questions, Likert scales and open-ended questions.

The outcomes of the survey will be used to conduct a follow-up deliberative workshop with members of the public to increase our understanding of perceptions and acceptance of VF technology. First, initial attitudes will be explored following a brief explanation of how the technology works and its purpose. Then, more detailed information covering different perspectives around VF (e.g., benefits and risks) will be provided, to assess how this impacts participants' perspectives and to foster more in-depth reflections.

Findings

Preliminary results from the stakeholder focus groups highlighted a number of perceived benefits and risks relating to the use of virtual fencing. These include environmental benefits, impacts on farm management (e.g., the technology facilitating herding, grassland management and improved labour) and animal welfare (both positive and negative). Whilst it was believed that the use of VF could encourage animal-centred grazing systems, concerns were raised regarding the aversive nature of the technology and related safety issues (e.g., if the technology fails). There were also concerns regarding a lack of clarity in legislation, as well as around data ownership, access, and use. Biosecurity risks were also considered an important issue, with animals being able to stray in or out. Stakeholders generally had concerns about technical failures and a lack of clarity around cost-effectiveness, which could affect adoption amongst farmers. Stakeholders advised putting an emphasis on supporting farmers (e.g., by providing targeted training and using demonstration farms), which may be supported by government initiatives. Further research was suggested on aspects of system suitability, impacts on animal welfare, and public perception.

Practical Implications

Virtual fencing is a system that enables livestock to be contained using sensory cues rather than physical fences. It offers a less expensive, more flexible alternative to traditional fencing as it can establish boundaries or enclosures without the reliance on physical objects on the landscape (Jachowski, Slotow and Millspaugh, 2014). The technology allows end-users (e.g., farmers) to map exclusion zones such as watercourses and sensitive habitats that they do not want their animals to enter, as well as hazardous areas such as cliff edges, deep drains, and marshland which are often impractical to fence off. In addition, the GPS location of each animal is available in real-time, allowing farmers to track the whereabouts of the flock/herd and identify individual animals staying outside the main flock/herd, which is often an early indicator of ill health. The technology can also notify farmers if animals escape and enable rotational grazing of livestock across upland areas, providing a rest period to grazed areas and allowing vegetation to regenerate. These functionalities can help improve herd management and protect environmentally sensitive areas, while also reducing labour requirements and improving the quality of life of farmers (Campbell et al. 2019).

Whilst the potential of virtual fencing technology is promising, there are concerns over the impacts that VF could have on animal welfare, particularly in relation to the animals' ability to learn to make associations between audio cues and electric shock, which can vary greatly between individuals (Campbell *et al.*, 2019; Aaser *et al.*, 2022). Investigating the effects of VF on animal welfare is particularly important, especially since this may influence consumers' perceptions and acceptance of the technology. As with the wider Precision Livestock Farming literature, fewer studies have investigated the public's perception of VF (Pfeiffer, Gabriel and Gandorfer, 2020; Stampa, Zander, and Hamm, 2020). This represents an important knowledge gap, especially considering consumer demand for pasture-raised products due to perceived higher quality as well as environmental and animal welfare benefits, and the influence this can have in supporting pasture grazing (Stampa, Schipmann-Schwarze and Hamm, 2020). Better identifying and addressing consumers' and other stakeholders' concerns is important to anticipate any unintended consequences and understand the wider socio-ethical impacts of VF, as well as to enhance capability to use VF effectively. One way to do so is to involve relevant stakeholders e.g., citizens, end-users (e.g., farmers), researchers, NGOs, policy organisations, industry… in discussions about the effects of innovation on different societal groups, which is particularly important for responsible innovation of VF (Brier et al., 2020; Horn and Isselstein, 2022).

By exploring stakeholders' perceptions of VF, this study thus has important educational and policy implications, as it is aimed at developing strategies for the promotion of best practices with VF technology based on the outcomes of focus group discussions, surveys, and workshops involving a variety of stakeholders. In an opinion statement released by Defra (UK)[5] on the possible effects of VF on animal welfare, it was concluded that despite its potential welfare benefits, there is still considerable uncertainty regarding the long-term outcomes of using VF, thus further research is required. With even fewer studies having explored stakeholders' perceptions and acceptance of the technology, it is particularly important to address this knowledge gap for VF to be successful at farm level and widely adopted with social license approval from the general public.

Theoretical Implications

Whilst the adoption of smart farming technologies and possible socio-ethical impacts have been explored in the wider literature, fewer studies have focused on the specific case of virtual fencing systems and possible impacts on sustainable grazing management. A recent study by Brier et al. (2020) used New Zealand as a case study to better understand the benefits and barriers of VF and its implications to inform responsible innovation. A range of perceived benefits (e.g., protecting environmentally sensitive areas, improved feed allocation, increased effectiveness of grazing, or saving labour) and barriers (e.g., lack of clarity on the reliability of VF systems and the possible return on investments, possible public and ethical issues (e.g., animal welfare)) were identified. First investigations into public perceptions also include a study conducted in Germany, which suggests that when being presented with information material on VF, consumers generally get a good understanding of the principles of VF and its relevance in terms of animal welfare and biodiversity (Stampa, Zander and Hamm, 2020). There were, however, ambivalent attitudes among consumers due to scepticism around its feasibility, the lack of clarity around animal welfare or environmental impacts, as well as doubts regarding possible social impacts.

These studies have, however, highlighted the need for further foresighting activities to better anticipate the positive and negative implications of VF, and to re-think industry-level extension advice for the provision of adequate support. By involving a variety of stakeholders to gather their perceptions and experiences with VF (including farmers, advisors, or consumers), this study will contribute to the virtual fencing literature and strengthen our understanding of the wider socio-ethical impacts of VF, which is crucial to identify specific supporting functions and promote its efficient and ethical implementation.

References

Aaser, M.F. *et al.* (2022) 'Is Virtual Fencing an Effective Way of Enclosing Cattle? Personality, Herd Behaviour and Welfare', *Animals 2022, Vol. 12, Page 842*, 12(7), p. 842. Available at: https://doi.org/10.3390/ANI12070842.

Brier, D. *et al.* (2020) 'Foresighting for Responsible Innovation Using a Delphi Approach: A Case Study of Virtual Fencing Innovation in Cattle Farming', *Journal of Agricultural and Environmental Ethics*, 33(3–6), pp. 549–569. Available at: https://doi.org/10.1007/S10806-020-09838-9/TABLES/3.

Campbell, D.L.M. *et al.* (2019) 'Virtual Fencing Is Comparable to Electric Tape Fencing for Cattle Behavior and Welfare', *Frontiers in Veterinary Science*, 6, p. 445. Available at: https://doi.org/10.3389/FVETS.2019.00445/BIBTEX.

Horn, J. and Isselstein, J. (2022) 'How do we feed grazing livestock in the future? A case for knowledge-driven grazing systems', *Grass and Forage Science*, 77(3), pp. 153–166. Available at: https://doi.org/10.1111/GFS.12577.

[5] https://www.gov.uk/government/publications/awc-opinion-on-the-welfare-implications-of-using-virtual-fencing-for-livestock/opinion-on-the-welfare-implications-of-using-virtual-fencing-systems-to-contain-move-and-monitor-livestock#recommendations

Jachowski, D.S., Slotow, R. and Millspaugh, J.J. (2014) 'Good virtual fences make good neighbors: opportunities for conservation', *Animal Conservation*, 17(3), pp. 187–196. Available at: https://doi.org/10.1111/ACV.12082.

Pfeiffer, J., Gabriel, A. and Gandorfer, M. (2020) 'Understanding the public attitudinal acceptance of digital farming technologies: a nationwide survey in Germany', *Agriculture and Human Values* [Preprint]. Available at: https://doi.org/10.1007/s10460-020-10145-2.

Stampa, E., Schipmann-Schwarze, C. and Hamm, U. (2020) 'Consumer perceptions, preferences, and behavior regarding pasture-raised livestock products: A review', *Food Quality and Preference*, 82, p. 103872. Available at: https://doi.org/10.1016/J.FOODQUAL.2020.103872.

Stampa, E., Zander, K. and Hamm, U. (2020) 'Insights into German Consumers' Perceptions of Virtual Fencing in Grassland-Based Beef and Dairy Systems: Recommendations for Communication', *Animals 2020, Vol. 10, Page 2267*, 10(12), p. 2267. Available at: https://doi.

Requirements for Adopting Drones by Farmers in Paddy Fields in the Haraz Plain Watershed, Iran

Jamileh Aliloo[1], Enayat Abbasi[2], Esmail Karamidehkordi[2], Ebadat Ghanbari Parmehr[3], Maurizio Canavari[4]

[1]PhD. Student, Department of Agricultural Extension and Education, Tarbiat Modares University, Tehran, Iran.
[2]Associate Professor, Department of Agricultural Extension and Education, Tarbiat Modares University, Tehran, Iran.
[3]Assistant Professor, Department of Surveying Engineering and Architectural Engineering, Babol Noshirvani University of Technology, Babol, Iran.
[4]Professor, Department of Agricultural and Food Sciences, Alma Mater Studiorum University of Bologna, Bologna, Italy.

Short abstract (200 words):

Drone technology has gained popularity in recent years as a sustainable solution to changing agricultural conditions. Using drones in agriculture provides several managerial and environmental benefits. However, the use of drones in paddy fields in Iran is a new phenomenon facing numerous deficiencies, mainly due to the lack of clear standards. This study aims to explore the problems and requirements for using drones in paddy fields and provide practical guidelines for clear requirements in their application. Content analysis was used based on individual qualitative interviews with 15 experts. The results of analyzing the requirements of using drones in paddy fields indicated four categories consisting of "Infrastructures", "Knowledge and Soft Skills", "Effective Governance", and "Awareness and Compliance with Flight Standards". An understanding of these requirements can help policy-makers, specialists, extension agents, and farmers to develop and introduce clear standards and define appropriate practical procedures for the use of drone innovation in paddy fields.

Keywords: Agricultural drones, Content Analysis, Requirements, Paddy Fields.

Extended abstract

Purpose

Iran's largest rice-cultivating area is in Mazandaran province, covering 269,963 hectares and contributing significantly to the country's rice production. The majority (61%) of this area is located in Haraz plain's watershed region (Agricultural statistics of Iran, 2021). Despite the key role of this product in creating food security and employment, the indiscriminate consumption of inputs and the lack of control in the consumption of inputs such as pesticide and chemical fertilisers application leave many destructive environmental effects (Homauini et al., 2017), which is often caused by the use of traditional methods of agricultural activities by farmers (Wachenheim et al., 2021). The reduction of the agricultural workforce presents a challenge to traditional production methods (Yazdi Samadi, 2016). There is a need for reliable solutions that can produce enough food with limited human resources to overcome this problem (Bouguettaya et al., 2022).

Drone technology is a rapidly growing field with numerous applications in various industries, including agriculture, health and the military (Ayamga et al., 2021a; Aswini et al., 2018). The use of drones in agriculture has been gaining popularity in recent years due to their potential for carrying out operations more sustainably (Hafeez et al., 2022; Zhou et al., 2021; Müllerová et al., 2021; Donmez et al., 2021; Librán-Embid et al., 2020; Aydin, 2019). The increasing use of drones in various sectors suggests we are entering the "Drone Age" (Alwateer et al., 2019).

Drones in agriculture provide real-time data to farmers, reducing the need for manual labour and enabling informed decision making on farm inputs (Ayamga et al., 2021a). They are capable of precise operations such as pesticide, fertiliser and watering application, resulting in environmental benefits (Wachenheim et al., 2021; Caturegli et al. 2016). The use of drone technology in agriculture is rapidly growing worldwide (Radoglou-Grammatikis et al., 2020).

In Iran, however, the use of drones in paddy fields is a new phenomenon facing numerous deficiencies, mainly due to the lack of clear standards. Therefore, this research aims to understand the requirements of adopting and using drones by farmers in paddy fields. The results can have practical implications for formulating these standards and approaches and reduce the complexities of this technology use by farmers.

Design/Methodology/Approach

This research used a qualitative approach, collecting data on the issues of drone use in agriculture through individual interviews with key informants and analysing the responses through content analysis. The study was developed in the four stages of the content analysis method, comprising material collection (transcriptions of the interviews), descriptive analysis, category selection and evaluation (Seuring & Gold, 2012).

The first stage of this research included identifying experts in agricultural drones in the Haraz Plain Watershed (including the townships of Amol, Babol, Babolsar, Fereydunkenar, Mahmudabad and Nur). This study used snowball sampling to identify experts, continuing until theoretical saturation was reached and resulting in 15 participants. The interview process consisted of an open-ended question on the requirements of using agricultural drones, followed by more detailed questions. An assistant took notes during the experts' interviews. The descriptive analysis stage involved experts with different backgrounds: one university academic staff member, one agricultural research institute academic staff member, five drone users, six user-experts and two drone experts. In the category selection stage, phrases with similar concepts were categorised and labelled based on the notes taken. The evaluation stage involved re-presenting the categories and terms to the participants to confirm the validity of the findings.

Findings

The data collected from participants were analyzed qualitatively and relevant concepts in the shape of 40 phrases were extracted, then they were classified and labeled in four categories of infrastructures, knowledge and soft skills, effective governance, and awareness and compliance with flight standards.

In the category of "infrastructures", the concepts of the availability of experts, the availability of service provider companies, and internet network coverage were the most repeated concepts. The category of "Knowledge and soft skills" was constructed by the most frequent concepts such as the expertise, training and sufficient knowledge of people (users) regarding drones, improving local communities' knowledge and culture regarding agricultural drones, and the adequate knowledge of information technology. The prominent concepts constructing the category of "effective governance" were financial support, government funding (in practice), facilitating obtaining the required permits, equipping and supporting companies to supply and maintain spare parts, supporting and encouraging the R&D department, and accelerating the formation of regulatory mechanisms through integrating and coordinating different governmental, non-governmental and private organizations, including aviation regulators, agriculture sector and data management sector. The category of "awareness and compliance with flight standards" constructed by the concepts that the participants had consensus on them, such as obtaining the required permits by the operator, the authorized ID registration for drones, the use of trained flight operators (certified operators), the device insurance for drones, the right time to use drones during the day, the accuracy of the results (the need for skilled specialists to control the factors affecting the obtained data), and the report of accidents/collision with objects.

Table 1. Categories and phrases of the requirements for using drones in paddy fields

No.	Categories	Phrases (Concepts)	Frequency
1	Infrastructures	Availability of experts	13
2		Availability of service provider companies	12
3		Network coverage (internet)	12
4		Providing technology through platform operators/contractors	10
5		The presence of airspace management systems at low height	7
6		Existence of specific airlines	7
		Total frequency	**61**
7	Knowledge and soft skills	Expertise, training and sufficient knowledge of people (users) in the field of drones	15
8		Improving community knowledge and culture in the field of agricultural drones	13
9		Adequate knowledge of information technology	13
10		Compliance with ethical principles by users (pilots)	12
11		Familiarity with other sciences, including remote sensing and geographic information system (due to the connection with drones)	12
12		Training of specialised and applied forces in universities and technical and vocational centers	11
13		Showing the benefits and efficiencies of using agricultural drones	11
		Total frequency	**87**
14	Effective governance	Financial support, government funding (in practice)	15
15		Facilitating obtaining the required permits	15
16		Equipping and supporting companies to supply and maintain spare parts	14
17		Supporting and encouraging the R&D department	14
18		Accelerating the formation of regulatory mechanisms in the way of work integration between the government sector, aviation regulators, agriculture sector and data management sector (coordination of relevant organisations)	14
19		Expanding the relevant cooperatives and improving or expanding the network	13
20		Having international connections with skilled and specialised people in the drone industry abroad	13
21		Consolidation of lands	13
22		Compilation of legal and flight safety issues for agricultural drones	12
23		Development of professional training centers for training human resources	12
24		Development of drone manufacturing at the national level	12
25		Approval of the code of industrial conduct and safe practices	11
26		Involvement of stakeholders by the government in policy-making (bilateral communication)	11
27		Connection with other systems to support drone applications (integration with other systems)	11
28		Implementation of safety and regulatory measures by authorised institutions	11
29		Promotion of industrial interaction	10
		Total frequency	**201**
30	Awareness and compliance with flight standards	Obtaining the required permits by the operator	15
31		Authorised ID registration for drones	15
32		Use of trained flight operators (certified operator)	15
33		Device insurance (drone)	15
34		The right time to use drones during the day	15
35		The accuracy of the results (the need for skilled specialists to control the factors affecting the obtained data)	15
36		Report accidents/collisions with objects etc.	15
37		Permissible flight height	14
38		Pre-flight inspection	14
39		Permissible weight of the drone	13
40		Permissible speed of drone flight	11
		Total frequency	**157**

Source: analysis of the interview transcriptions.

Practical Implications

The dependency of the world on agriculture, particularly in the nations where their local communities' livelihoods and economy are highly dependent on this sector, has stimulated nations to adapt smart and modern technologies, including drones. The lack of clear standards in the use of agricultural drones, especially in rice fields, is one of the main limitations of using agricultural drones in developing countries, including Iran. The requirements for the use of agricultural drones identified in this research can help agriculture policymakers, managers, planning programmers and practitioners, including extension agents, to formulate required standards and facilitate their implementation for the adaptation and use of drone technology in paddy fields in a practical sense. What the agricultural extension agents, as the pioneers of transformation and development, should pay more attention to in extension and expanding drone technology among new and old users in the current situation, includes creating conditions for specialized training, encouraging obtaining the required permits, authorized ID, device insurance, pursuing the facilitation of obtaining financial support and required permits, advice on the use of drones at the right time in the field, helping to adopt an approach to improve the accuracy of the results, and also emphasizing the reporting of drone use incidents to the relevant institutions.

Theoretical Implications

The use of drone technology in the agricultural sector is a new phenomenon that is growing rapidly. Due to the rapid emergence of dronestechnology, it regulations (specially Agri-drone) are still embryonic and a heterogeneity of national rules and varying levels of implementation can be observed (Van Blyenburgh, 2016). Moreover, it has attracted limited research attention in agriculture, especially in the social science studies. Ayamga et al., (2021b) draw attention to developing a policy framework for adoption and management of drones in agriculture. Another, (Chamuah & Singh, 2022), focused on responsible governance of civilian Unmanned Aerial Vehicle (UAV) innovations and securing sustainability in Indian agriculture. Also, Chakreeves et al., (2021), have discussed on stakeholder analysis of agricultural drone policy in Thailand. However, by extracting the components of the requirements for the use of agricultural drones, this study will make an important contribution to shaping new insights in the studies of advanced and sophisticated technologies (including drones) in agriculture. Based on this, the results of this study can be used as a basis for future qualitative and quantitative studies in the direction of widespread use of this technology in agriculture in both developing and developed countries.

References

Agricultural Statistics of Iran. (2021). *Agronomic Products*. Deputy of Statistics, Information and Communication Technology Center.

Alwateer, M., Loke, S. W., & Zuchowicz, A. M. (2019). Drone services: issues in drones for location-based services from human-drone interaction to information processing. *Journal of Location Based Services*, *13*(2), 94–127. https://doi.org/10.1080/17489725.2018.1564845

Aswini, N., Kumar, E. K., & Uma, S. V. (2018). UAV and obstacle sensing techniques – a perspective. *International Journal of Intelligent Unmanned Systems*, *6*(1), 32–46.

Ayamga, M., Akaba, S., & Nyaaba, A. A. (2021a). Multifaceted applicability of drones: A review. *Technological Forecasting and Social Change*, *167*(February), 120677. https://doi.org/10.1016/j.techfore.2021.120677

Ayamga, M., Tekinerdogan, B., Kassahun, A., & Rambaldi, G. (2021b). Developing a policy framework for adoption and management of drones for agriculture in Africa. *Technology Analysis and Strategic Management*, *33*(8), 970–987. https://doi.org/10.1080/09537325.2020.1858047

Aydin, B. (2019). Public acceptance of drones: Knowledge, attitudes, and practice. *Technology in Society*, *59*(August), 101180. https://doi.org/10.1016/j.techsoc.2019.101180

Bouguettaya, A., Zarzour, H., Kechida, A., & Taberkit, A. M. (2022). Deep learning techniques to classify agricultural crops through UAV imagery: a review. *Neural Computing and Applications*, *34*(12), 9511–9536. https://doi.org/10.1007/s00521-022-07104-9

Caturegli, L., Corniglia, M., Gaetani, M., Grossi, N., Magni, S., Migliazzi, M., Angelini, L., Mazzoncini, M., Silvestri, N., Fontanelli, M., Raffaelli, M., Peruzzi, A., & Volterrani, M. (2016). Unmanned aerial vehicle to estimate nitrogen status of turfgrasses. *PLoS ONE*, *11*(6), 1–13. https://doi.org/10.1371/journal.pone.0158268

Chakreeves, T., Preittigun, A., & Phu-ang, A. (2021). Stakeholder Analysis of Agricultural Drone Policy: A Case Study of the Agricultural Drone Ecosystem of Thailand. *International Journal of Law and Political Sciences*, *15*(1), 118–123.

Chamuah, A., & Singh, R. (2022). Responsible governance of civilian unmanned aerial vehicle (UAV) innovations for Indian crop insurance applications. *Journal of Responsible Technology*, *9*(January), 100025. https://doi.org/10.1016/j.jrt.2022.100025

Donmez, C., Villi, O., Berberoglu, S., & Cilek, A. (2021). Computer vision-based citrus tree detection in a cultivated environment using UAV imagery. *Computers and Electronics in Agriculture*, *187*(February), 106273. https://doi.org/10.1016/j.compag.2021.106273

Hafeez, A., Husain, M. A., Singh, S. P., Chauhan, A., Khan, M. T., Kumar, N., Chauhan, A., & Soni, S. K. (2022). Implementation of drone technology for farm monitoring & pesticide spraying: A review. *Information Processing in Agriculture*, *xxxx*. https://doi.org/10.1016/j.inpa.2022.02.002

Homauini, Z., Abolhasani, L., & Sabouhi, M. (2018). Environmental Impact Assessment of Different Varieties of Rice (Oryza sativa L.) Paddy in the Kordkoy. *Journal of Agroecology*, *10*(2), 580–602.

Librán-Embid, F., Klaus, F., Tscharntke, T., & Grass, I. (2020). Unmanned aerial vehicles for biodiversity-friendly agricultural landscapes - A systematic review. *Science of the Total Environment*, *732*, 139204. https://doi.org/10.1016/j.scitotenv.2020.139204

Müllerová, J., Gago, X., Bučas, M., Company, J., Estrany, J., Fortesa, J., Manfreda, S., Michez, A., Mokroš, M., Paulus, G., Tiškus, E., Tsiafouli, M. A., & Kent, R. (2021). Characterising vegetation complexity with unmanned aerial systems (UAS) – A framework and synthesis. *Ecological Indicators*, *131*. https://doi.org/10.1016/j.ecolind.2021.108156

Radoglou-Grammatikis, P., Sarigiannidis, P., Lagkas, T., & Moscholios, I. (2020). A compilation of UAV applications for precision agriculture. *Computer Networks*, *172*(February), 107148. https://doi.org/10.1016/j.comnet.2020.107148

Seuring, S. & Gold, S. (2012). Conducting Content-Analysis Based Literature Reviews in Supply Chain Management. *Supply Chain Management: An International Journal*, 17(5), 544-555. http://dx.doi.org/10.1108/13598541211258609

Van Blyenburgh, P. (2016). Harmonising UAS Regulations and Standards; *UAS Special Issue; GIM International*. https://www.gim-international.com/content/article/harmonising-uas-regulations-and-standards

Wachenheim, C., Fan, L., & Zheng, S. (2021). Adoption of unmanned aerial vehicles for pesticide application: Role of social network, resource endowment, and perceptions. *Technology in Society*, *64*(November 2020). https://doi.org/10.1016/j.techsoc.2020.101470

Yazdi Samadi, B. (2017). Role of Prospective Technologies for Food Security in Iran and the World. *The Journal of Strategic Research in Agricultural Sciences and Natural Resources*, 12(1), 15-28.

Zhou, Y., Lao, C., Yang, Y., Zhang, Z., Chen, H., Chen, Y., Chen, J., Ning, J., & Yang, N. (2021). Diagnosis of winter-wheat water stress based on UAV-borne multispectral image texture and vegetation indices. *Agricultural Water Management*, *256*(February), 107076. https://doi.org/10.1016/j.agwat.2021.107076

TOPIC 3 - Learning for innovation and resilience
Session 3A - Extension Tools (A)

Development of an Agricultural Extension Support Tool to Increase Farmer Engagement in Conversations about Climate Change

Niamh Dunphy[1,2], Sinéad Flannery[1], Seamus Kearney[2]

[1]School of Agriculture and Food Science, University College Dublin, Belfield, Dublin 4, Ireland 2Teagasc
[2]Dungarvan Local Advisory Office, Shandon, Dungarvan, Co. Waterford, Ireland

Short abstract

Any new policy measure aiming to mitigate climate change and support adaption in agriculture is implemented at farm scale. This project aimed to support the engagement of farmers in conversations about climate change. An interactive co-creation process was used to develop a support tool to increase farmer engagement in conversations about climate change. Dairy farmers based in the south-east of Ireland were purposively selected as the target test group for this study. Surveys and semi-structured interviews with these farmers informed the development of the support tool. Focus groups with agricultural extension workers and farmers were conducted to pilot the support tool. A one-page calendar was designed and developed as a support tool for both farmers and agricultural extension agents to promote an increase in farmer engagement in conversations about climate change. This study emphasises the lack of support farmers have in relation to climate change at farm level and establishes farmers are willing

Extended abstract

Purpose

The purpose of this paper is to support farmer engagement in conversations about climate change by developing an extension support tool suited to farmers' needs. Diverse, severe, and location-specific impacts on agricultural production are anticipated with climate change (Alteri et al., 2015). The last Intergovernmental Panel on Climate Change (IPCC) report indicates that the rise of CO2 and associated greenhouse gases could lead to a 1.4°C to 5.8°C increase in global surface temperatures, with subsequent consequences on precipitation frequency which will inevitably have a detrimental effect on farming communities worldwide (Field and Barros, 2014). Globally, agricultural production contributes substantially to anthropogenic greenhouse gas emissions (IPCC, 2019). Hence, there is a need to actively encourage farmer engagement in conversations about climate change. Agricultural extension services have a role to play in this regard. Ireland's agricultural emissions are dominated by methane, 80% of which is attributable to bovine and ovine enteric fermentation (Lanigan et al., 2018). In 2016, Ireland's agriculture sector emitted 19.25 million tonnes (Mt) of CO2e (Carbon dioxide equivalent), which is 2.65% above 2005 levels (Lanigan et al., 2018). Agriculture emissions increased by 2.7% in 2016 relative to 2015. Since the removal of the milk quota in 2015, there has been a 31% increase in milk production (2012-2016), with an 8% increase in emissions (Duffy et al., 2018). In 2020, agriculture in Ireland accounted for 37.1% of GHG emissions (EPA, 2021), a rise of 1.4% in emissions from 2019. In order to develop the capacity and capabilities of farmers in addressing climate change challenges facing the sector, an understanding of the climate change narrative, within agriculture, as well as the identifying and developing a support tool to increase farmer engagement in conversations about climate change is needed. This paper sets out to address this need.

The farming community has been identified as the most vulnerable community to climate change due to its dependency on agricultural production for their livelihoods (Morton, 2007). Climate change presents significant challenges to agriculture and society (Coumou & Rahmstorf, 2012). Adaption to climate change in agricultural production refers to a change in farming activities or methods to lessen the resultant potential damages from changes in climatic conditions (Nantuni et al., 2012). Farmers are at the frontier of adapting or responding to the impacts of climate change in agriculture (Lal et al., 2011). Thus, there is a need for agricultural extension services to better support and promote farmer engagement in conversations about climate change to reduce emissions arising from agriculture.

Methodology Approach

A mixed methodological approach was applied using surveys, semi-structured interviews and focus groups. An online survey (n=176) of the population of dairy farmers in the south-east of Ireland (10% response rate) and semi-structured interviews (n=9) were carried out in phase one of the data collection process. The purpose of this phase was to allow farmers identify a suitable support tool to increase farmer engagement in conversations about climate change. The COM-B model of behavioural change was applied to this study as the theoretical framework. The survey design and semi-structured interview guide were both informed by this theoretical model. Following analysis of phase one, tool development began and a one-page calendar was developed. Two focus groups were conducted to gain insights from dairy farmers and agricultural extension workers (advisors) on their opinion on the developed tool. Following analysis of the findings from the two focus groups, a final version of the support tool was developed. A second online survey was carried out to establish the effectiveness of the developed support tool.

Findings

The online surveys captured farmers' attitudes and opinions on climate change whilst also identifying areas they are lacking support in relation to climate change. 86% of farmers said they are happy to take advice about managing the natural environment on their farm in relation to hedgerows, water quality and reducing greenhouse gas emissions. A large majority (77%) of farmers feel any loss of agricultural income due to conservation of nature on their farm should be fully compensated by the government. However, 77% of farmers agree with the statement 'achieving a good quality of life is more important to me than maximising farm income'. Finally, 73% of farmers surveyed feel all farmers should have to manage some of their land for environmental objectives – bird habitats, climate change and water quality.

Farmer Engagement in Conversations about Climate Change:

One-fifth of farmers think about climate change on a daily basis, 36% on a weekly basis and 11% on a monthly basis. 22% of farmers only think about it when they hear it on the news or in passing. 1% of farmers have never thought about climate change.

In relation to having a conversation about climate change, 5% of farmers surveyed have a conversation about climate change on a daily basis (compared to 20% that think about climate change on a daily basis). 38% of farmers have a conversation about climate change on a weekly basis and 18% on a monthly basis. 22% of farmers only have a conversation about climate change when they are triggered i.e. when they hear about climate change in the news/in passing. 2% of farmers have never had a conversation about climate change.

Nearly half, 49%, of conversations that farmers have about climate change are with other farmers. 22% of conversations farmers have about climate change are with their spouse/partner and 7% of conversations are had with farmer's children. Agricultural advisors represent 8% of the conversations had with farmers about climate change while friends accounted for 5%.

18% of farmers surveyed do not feel climate change is a serious issue in today's world. 76% of farmers do think climate change is a serious issue in today's world. 6% of farmers think climate change might be a serious issue in today's world.

67% of farmers surveyed think climate change will affect future generations of farmers in Ireland. 3% of farmers don't think climate change will have any effect on future generations of farmers with the remaining 30% thinking it will affect them to some extent.

74% of farmers feel they are not given adequate support in relation to climate change. Only 7% feel they are given adequate support while 19% are unsure. Improving nitrogen use efficiencies and clover incorporation are the two most popular areas farmers are seeking support in. The use of protected urea, improving water quality, increasing biodiversity and grass measuring are all areas that farmers would like more support in.

Farmer feedback on the developed support tool was positive and farmers identified the tool as being useful to their climate change journey: "There's basically everything in it [the developed calendar], there's a lot of detail in it, it's very easy to follow and the month by month gives you a chance to plan ahead (Farmer Focus Group Participant)".

Similarly, advisors deemed the support tool both practical and beneficial: "This will absolutely help farmers reduce emissions and it's a great prop for a discussion group" (Advisor Focus Group Participant). Advisors believed the developed support tool would increase farmer engagement in conversations about climate change "By actually not giving too much information on the actions it prompts the farmer to ask a question and become engaged in a conversation about climate change" (Advisor Focus Group Participant).

Establishment of Developed Support Tool:

There was an increase in the frequency of how often farmers thought about climate change after being exposed to the developed support tool. All farmers exposed to the developed support tool (n=17) think about the topic of climate change more frequently after exposure.

The developed tool was also successful in increasing farmer engagement in conversations about climate change. All farmers surveyed either have a conversation as frequent or more frequently as a result of the developed support tool. The developed support tool also increased farmers' awareness around the topic of climate change and how urgent the effects of it need to be dealt with. The table below shows the mean score pre and post intervention.

Table 1 – Farmers' mean score attitudes towards climate change

Statement	Pre Intervention	Post Intervention
How often do you think about climate change?	2.5	3.5
How often do you have a conversation about climate change?	1.75	3
On a scale of 1-5, how urgent do you think the effects of climate change need to be dealt with?	4.00	4.25

Practical Implications

Implementation of climate change mitigation actions at farm level is a huge challenge facing the European and Irish agricultural sector to ensure sustainable agricultural production for future generations and to meet emission reduction targets by 2030. This paper set out to increase farmer engagement in conversations about climate change via a developed support tool. The survey shed light on farmers' current engagement in conversations about climate change and their attitudes towards climate change. The survey also gave an insight into the interconnectedness between thinking about climate change and engaging in a conversation about it. The survey highlighted farmers feel they do not receive adequate support in relation to climate change and reducing emissions. This evidence suggests agricultural extension service providers and policy stakeholders should provide farmers with more support in relation to climate change. Educating farmers on the topic of climate change could provide sufficient support to farmers and result in an increase in farmer engagement in conversations about climate change. Finally, this paper had a physical output; a one-page calendar. The one-page calendar was identified and co-designed by farmers as a support tool farmers could use to both increase engagement in conversations about climate change and reduce greenhouse gas emissions at farm level. The developed support tool was successful in engaging farmers in conversations about climate change and in supporting agricultural advisors when working with farmers. This tool can be used by both farmers and advisors to increase engagement in conversations about climate change and implement climate change mitigation actions at farm level.

Theoretical Implications

The capability, opportunity and motivation behavioural model (COM-B model) was used as the theoretical framework for this study to examine farmers' engagement in conversations about climate change. This study proves there is value in moving from behavioural frameworks which focus solely on individual constructs as 'barriers to adoption' towards using frameworks which account for both cognitive and non-cognitive factors to the individual. The COM-B model accounts for non-cognitive factors that may affects farmers' decisions to engage in a conversation about climate change e.g. social relationships. This study builds on previous studies carried out in Europe and worldwide that used different behavioural models to explore farmers' engagement in conversations about climate change. This is the first time the COM-B model has been used to increase farmer engagement in conversations about climate change in an Irish context. In summary, the findings provide unique insights into why, or why not, farmers engage in conversations about climate change.

References

Altieri, M.A., Nicholls, C.I., Henao, A. and Lana, M.A., 2015. Agroecology and the design of climate change-resilient farming systems. Agronomy for sustainable development, 35(3), pp.869-890.

Coumou, D. and Rahmstorf, S., 2012. A decade of weather extremes. Nature climate change, 2(7), pp.491-496

Duffy, P., Black, K., Hyde, B., Ryan, A.M., Ponzi, J. & Alam, S. 2018. Greenhouse gas emissions 1990-2016 reported to the United Nations Framework Convention on Climate Change.

EPA, 2021. Environmental Protection Agency. Agriculture – Greenhouse gas emissions. Accessed at https://www.epa.ie/our-services/monitoring--assessment/climate-change/ghg/agriculture/ Field, C.B. and Barros, V.R. eds., 2014. Climate change 2014–Impacts, adaptation and vulnerability: Regional aspects. Cambridge University Press.

IPCC, 2019. Climate Change and Land, an IPCC Special Report on Climate Change, Diversification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems.

Lal, R., Delgado, J.A., Groffman, P.M., Millar, N., Dell, C. and Rotz, A., 2011. Management to mitigate and adapt to climate change. Journal of Soil and Water Conservation, 66(4), pp.276-285. Lanigan, G., Donnellan, T., Hanrahan, K., Carsten, P., Shalloo, L., Krol, D., Forrestal, P.J., Farrelly, N., O'Brien, D., Ryan, M. and Murphy, P., 2018. An analysis of abatement potential of Greenhouse Gas emissions in Irish agriculture 2021-2030. Teagasc.

Morton, J.F., 2007. The impact of climate change on smallholder and subsistence agriculture. Proceedings of the national academy of sciences, 104(50), pp.19680-19685.

Nantui, M.F., Bruce, S.D. and Yaw, O.A., 2012. Adaptive capacities of farmers to climate change adaptation strategies and their effects on rice production in the northern region of Ghana. Russian Journal of Agricultural and Socio-Economic Sciences, 11(11).

A reflective practice framework to support social learning in the context of a multi-actor project setting

Sangeun Bae, Andrea Knierim

University of Hohenheim, Institute of Social Sciences in Agriculture

Short abstract

To address the multi-dimensionality of challenges facing the agricultural sector, there is a growing emphasis on more interactive and participatory approaches to knowledge production. In this context, learning, particular social learning, has become a ubiquitous term in diverse disciplinary communities. However, despite its widespread use, social learning is often used in a normative sense with little evidence for the outcomes of such social learning processes. In this paper, we take an individual-centric approach to understanding social learning to investigate how discursive interactions in an ongoing multi-actor project enable changes in individual's knowledge. Our rationale is that reflective practice, when operationalised as a visible practice, can be a key enabler of such learning processes at the individual level. Building on theories from the well-established field of educational sciences and management sciences, we introduce in this paper an operational framework for reflective practice, which is currently being implemented in an on-going EU Horizon 2020 multi-actor research project, with the aim to systematically support and document the on-going learning journey of individual project partners. Using preliminary results from our study, we show how reflective practice, when organised as a visible practice that is supported by tools, frames, and organisational structure, has the potential to facilitate social learning processes at the individual level.

Key words: reflective practice, social learning, multi-actor approach

Extended abstract

Purpose

To address the muti-dimensionality of challenges facing the agricultural sector, there is a growing emphasis on more interactive and participatory approaches to knowledge production. Knowledge sharing and knowledge creation are fundamentally learning processes. A shift in the understanding from a "monoculture of scientific knowledge towards [an] ecology of knowledge" (p.2, Moschitz et al., 2015) means that we must re-evaluate the learning process, that is, what learning is and how new knowledge is gained. In recognition of this importance, learning has thus become ubiquitous in various fields related to sustainability transitions, and in recent years, particularly social learning (Cundill and Rodela, 2012). Social learning emphasises the importance of actor diversity, in terms of knowledge, values, interests and goals, which are seen as important for dealing with complex problems (Wals, 2007). Social learning is said to occur when heterogenous actors share their perspectives and experiences to create common understandings, new knowledge, and trust, which serve as the basis for collective action. (Schusler et al., 2003). Beyond such discursive interaction, social learning is also said to occur through reflective action, which involves an iterative process of action and reflection, in search of what works and what does not work.

Learning can also take place at different social levels; at the individual, group/networks of actors, and innovation system level (van Mierlo and Beers, 2020). However, as these authors point out, there is an apparent discrepancy between the in-depth understanding of learning that occurs at the individual level and the more abstract understanding of learning within organisations and in innovation systems. Is it important to support and monitor individual learning or does it suffice only to focus on organisational and system learning? In line with Brymer et al., (2018), we argue that individual learning outcomes are an important first step, as the nature of understanding is not homogenous. Therefore, we focus on the individual dimension of learning in this paper. In so doing, we highlight the significant gap in the social learning literature, concerning the lack of guidance on design processes that support learning (Eriksson et al., 2019). Building on experiential and transformational learning theories from the educational sciences as well as from organisational management sciences, we argue that reflective practice when organised as a visible practice that is supported by suitable organisational structures and frames, has the potential to facilitate learning processes. We introduce in this paper an operational framework for reflective practice, which is currently being implemented in an on-going EU Horizon 2020 multi-actor research project, with the aim to systematically document the on-going learning journey of individual project partners. The presentation of the framework in this paper thus has a demonstration character to highlight its potential in supporting individual learning journeys as a result of stakeholder interaction and joint action.

Design/Methodology/Approach

Project context

This study reports on an action-research approach taken in developing and implementing a framework for reflective practice in the context of an on-going EU Horizon 2020 project, i2connect: connecting advisors to boost interactive innovation in agriculture and forestry. The project started in November 2019 and rans until October 2024, with the aim to fuel the competencies of advisors who will support and facilitate interactive innovation processes in agriculture and forestry. To achieve this objective, the project brings together a broad range of actors from 42 organisations in 21 European countries in a multi-actor consortium that includes farm and forestry advisory staff and management, researchers and university lecturers and public authorities.

To systematically support such learning processes and to capitalise on the insights from these learnings at the project level, one core task in the project is to develop and implement the reflective capitalisation approach, a term that was coined by within the project to refer to "the process of structured stock-taking (capitalisation) of insights resulting from reflective practice with the aim of inspiring, informing, and supporting both theory and practice". Such a process is to ensure that (i) at the individual level, partners have the possibility to reflect on action so as to engage in a process of continuous learning and (ii) at the project level, the results of such reflections are embraced, documented and shared.

Reflective practice framework

In recognition of reflection as socio-cognitive process but also as an organising process that is enabled by structures, processes, and practices, we operationalised reflective practice in three dimensions, which is illustrated in Figure 1.

The first dimension relates to **conceptual support**, which was aimed at establishing common understanding among project partners on the purpose and key aspects of reflective practice. The second dimension,

Figure 10 Framework for reflective practice in i2connect

sc vas

used to offer project partners a structured opportunity to reflect on their experiences. Lastly, the third dimension of **organisational support**, refers to the processes and structures at the project management level, that were implemented to make visible the value, time, and space for reflection.

Data collection and analysis
Reflections that were submitted by project partners since the implementation of the reflective practice framework, from September 2020 to January 2023, were analysed for this study. Qualitative data on the content of the reflections was analysed using a coding structure based on the two different domains of learning derived from the transformational learning theory – namely instrumental learning and communicative learning. These were further divided into secondary subcategories that were based on Moyer and Sinclair (2020).

Findings

General statistics on the use of the reflection tool
A total of 81 partners registered to use the reflection tool since it was first introduced in August 2020. Out of these registered users, 66 submitted their reflections - 42 with one reflection so far, 16 with 2 reflections and 3 with 4 reflections. 2 partners contributed with more than 5 reflections. A total of 106 reflections were received from the time period between September 2020 to January, 2023.

In terms of the project contexts in which the reflections happened, 83 of the reflections were submitted after a planned project event (general assemblies, trainings, webinars, workshops etc.), whereas 23 of the reflections were submitted spontaneously, in relation to a project activity.

Content of the submitted reflections
In terms of the learning outcomes of the reflections, partners reflected on a range of topics. Instrumental outcomes were the most common among project partners. Examples of themes that generated the most attention were conceptual understandings on key terms used in the project, such as interactive innovation, the innovation spiral, warm and cold processes, networks, etc ; knowledge and/or skills in the use of tools and methods, e.g. circle of coherence, triangle of co-creation, network analysis, active listening, role play, use of interactive methods in training etc. Other less frequent learning outcomes were organisational skills, cause and effect relationships and understanding of the wider social and institutional context.

Analysis of the data also revealed a fairly substantial amount of communicative learning outcomes. For example, the reflections revealed a significant number of learning outcomes related to cooperation and collaboration - on the importance of creating more space and time for interaction; key attitudes such as trust, empathy, integrity, open-mindedness; group dynamics; role of effective facilitation, etc. Communication strategies and methods were also a common theme – clarifying roles, balance between listening and giving input, how to be inclusive of silent partners, speaking concisely, etc. Another common theme was on other's perspectives/values/interests where many partners reflected on apparent differences in visions and objectives of fellow project partners; the diversity in assumptions and understandings of key concepts; diverse needs of advisory services in the different contexts, importance of diverse perspectives for a holistic understanding, etc.

Practical Implications
In this study, we demonstrate how reflective practice, when organised as a visible practice supported by suitable organisational structures and tools, can facilitate individual learning processes in the context of a multi-actor project setting. In so doing, we provide a operational framework for reflective practice which can be used in other multi-actor project settings.

Theoretical Implications

This article contributes to an understanding of the detailed learning by individuals in a social learning context which so far has received very little attention. Using a simple online tool, we also contribute to an expanded analytical strategy for assessing the outcomes of social learning at the individual level.

References

Brymer, A. L. B., Wulfhorst, J. D., & Brunson, M. W. (2018). Analyzing stakeholders' workshop dialogue for evidence of social learning. *Ecology and Society*, *23*(1).

Cundill, G., & Rodela, R. (2012). A review of assertions about the processes and outcomes of social learning in natural resource management. *Journal of environmental management*, *113*, 7-14.

Eriksson, M., van Riper, C. J., Leitschuh, B., Bentley Brymer, A., Rawluk, A., Raymond, C. M., & Kenter, J. O. (2019). Social learning as a link between the individual and the collective: evaluating deliberation on social values. *Sustainability Science*, *14*, 1323-1332.

Moschitz, H., Roep, D., Brunori, G., & Tisenkopfs, T. (2015). Learning and innovation networks for sustainable agriculture: processes of co-evolution, joint reflection and facilitation. *The Journal of Agricultural Education and Extension*, *21*(1), 1-11.

Moyer, Joanne M., and A. John Sinclair. "Learning for sustainability: Considering pathways to transformation." *Adult Education Quarterly* 70, no. 4 (2020): 340-359.

Schusler, T. M., Decker, D. J., & Pfeffer, M. J. (2003). Social learning for collaborative natural resource management. *Society & natural resources*, *16*(4), 309-326.

Van Mierlo, B., Halbe, J., Beers, P. J., Scholz, G., & Vinke-de Kruijf, J. (2020). Learning about learning in sustainability transitions. *Environmental Innovation and Societal Transitions*, *34*, 251-254.

Wals, Arjen EJ, ed. *Social learning towards a sustainable world: Principles, perspectives, and praxis*. Wageningen Academic Publishers, 2007.

A sustainable game changer? Systematic review of serious games using for agriculture

Sylvain Dernat[1], Myriam Grillot[2], Gilles Martel[3]

[1] INRAE UMR Territoires and GAMAE, France
[2] INRAE UMR AGIR, Toulouse, France
[3] INRAE UMR BAGAP and GAMAE, France

Short abstract (200 words):

This communication aims to analyse the use of serious games in agriculture. Specifically, it examines the contribution of serious games to sustainable transitions. To do this, a systematic review of the literature is performed using the PRISMA method, followed by a bibliometric analysis (VoSviewer and Cortext) and a comprehensive analysis. It resulted in a corpus of 287 articles, which underscores the substantial growth in the utilisation of serious games in agriculture in recent times. The data reveals that these games are mainly used in case studies in Southern countries as a tool for consultation, with the primary objective of fostering cooperation and mutual understanding among key players in the agriculture industry. The research findings indicate that serious games offer a favourable systemic analysis, supporting the implementation of sustainable transitions in the agriculture sector. These results are important in highlighting the potential benefits of serious games in both agricultural education and agricultural advice. As a tool for agricultural innovation and sustainable approaches, serious games can be a valuable asset in the toolkit for promoting sustainable agriculture. However, it is crucial to evaluate the full extent of their impact and to ensure that their use is efficient and non-partial, through appropriate support. By doing so, we can unlock their full potential as a tool for promoting sustainable transitions in the agriculture sector.

Extended abstract

Purpose

Agriculture needs to evolve due to environmental challenges like climate change and biodiversity loss (Howden *et al.*, 2007). These sustainability transitions in agriculture are complex and call for a renewal of approaches (Slimi *et al.*, 2021).

In their review "What is Sustainable Agriculture?", Velten *et al.* (2015) propose a framework for analysing sustainability in agriculture. The framework has three elements: goals, fields of action, and strategies. Balancing economic, social, and environmental goals is crucial for achieving sustainability in agriculture, according to the authors. The five key areas of action are resource management, production systems, food systems, governance, and social-ecological systems. A combination of technical, institutional, and behavioural strategies is necessary to achieve sustainability in agriculture, the authors suggest.

In this way, de Boon *et al.* (2022) and Prost *et al.* (2023) noted that there is an increasing interest in tools that can support these transformations, both for professional actors, policymakers, and citizens alike.

Serious games have been widely studied as a tool for environmental engagement, education, and decision-making (Flood *et al.*, 2018; Galeote *et al.*, 2021). The concept of serious games was first introduced by Abt in the 1970s as a type of game that is more useful than entertaining. These games are characterised by the use of game mechanisms to serve a specific purpose and are designed to be immersive and promote co-constructed thinking (Engström & Backlund, 2022). The use of serious games has been shown to increase environmental awareness, knowledge, and decision-making skills, and to improve policy making processes.

Despite a frequent use of serious games in education and extension, there is limited literature on the use of serious games in agriculture specifically (Hernandez-Aguilera *et al.*, 2020). This article aims to analyse the literature on the use of serious games in agriculture for sustainable transitions by using the framework for analysing sustainability in agriculture proposed by Velten *et al.* (2015). The goal is to gain a better understanding of how serious games address sustainability issues in agriculture and how they contribute to education & extension services.

This article proposes to make an exhaustive review of the international publications (coming from the main scientific databases) highlighting the use of serious games in agriculture. It focuses on serious games to avoid the epistemic problems associated with games in the economic sense (and inspired by game theory). It considers the scales of the parcel or farm and their practices (individual level), the production area, the territory, the sector (collective level), and the scale of global expectations such as animal health or the well-being of farmers at work (societal level). Using a bibliometric and comprehensive analysis of the literature, we analyse whether the mobilisation of serious games in agriculture contributes to sustainable transitions, and if so, what are the modalities and effects.

Design/Methodology/Approach

The research method involves a systematic literature review based on the PRISMA process (Page *et al.*, 2021). The data collection was done by searching electronic databases (Web of Science and Scopus) using keywords related to serious games and agriculture. The search was limited to English language articles and duplicates were removed. The eligibility criteria included articles focusing on serious games in the context of agriculture and excluding economic games based on game theory, editorial articles, grey literature, and conference papers. The manual screening of the articles was done by reading the title, abstract, and keywords to check their relevance and exclude articles that did not match the purpose of the study.

The analysis of the database of articles obtained was then conducted using two methods. Firstly, a bibliometric analysis was performed using both the Vosviewer software to highlight the evolution of trends in the corpus over time, and the Cortext software to perform a geospatial analysis of authors in relation to the themes studied. Secondly, a comprehensive analysis was also conducted. A reading grid was developed based on Velten *et al.*'s framework (2015) to highlight elements related to sustainability in the use of serious games in agriculture.

This bibliometric and comprehensive analysis provides a more nuanced understanding of the utilisation of serious games in agriculture and the ways in which they are contributing to sustainable transitions. By combining the outputs of both software tools and the comprehensive analysis, the research was able to shed light on the evolving trends and key actors in this area, as well as the specific elements related to sustainability that are driving the use of serious games in agriculture. This holistic approach to the analysis of the data enhances the validity and reliability of the research results, and provides a robust foundation for future studies on the use of serious games in the agriculture sector.

Findings

The uncovered database includes 287 scientific articles from 1968 to early 2023. Serious game mobilisation was rather weak in the academic field during the first thirty years and focused on teaching in an economic perspective. At the turn of the 2000s, a widening of serious game mobilisation occurred. The analysis notably shows a very significant acceleration of serious game mobilisation in agriculture in the last decade, similar to the results obtained in other publications (Dernat *et al.*, *in press*). These games are mostly analog games, with a high proportion of board and role-play games.

It is interesting to note that, even though the vast majority of articles have authors from developed countries (especially the USA and France), many experimentation fields are located in Southern countries. This underlines an interest in using games in the context of sometimes poorly literate populations, but also a weakness in associating researchers from these countries.

There is an over-representation of consultation/prospective games, which shows a major interest in this area of application. The game is mobilised for social innovation purposes to find new forms of organisation, integrate new actors in decision-making processes (citizens...). This aspect highlights the importance of framing the game in a process and not using it in a disembodied way. These games are mostly role-playing and/or board games (putting players in relationships) and often articulated with a digital device supporting a simulation of the effects of the decisions took by the players on the sustainable variables monitored. The game is, at a minimum, supplemented by a debriefing that allows reconnecting the issues addressed with reality and even inserted into a long-term work process with farmers, articulating several games to help change practices.

At the thematic level, there is a significant shift between the first games mobilised in the 1960s-1970s, mostly in education and aimed at optimising the economic performance of farms, towards nowadays more systemic games addressed to groups of farmers or territories. Thus, for the past 15 years, the theme of water and its management has been the major area of mobilisation in connection with the previous questions of consultation. Forage issues are also central. In themselves, these two themes are often correlated with issues of climate change, particularly drought and crop/animal feeding. There is a lack of games dedicated to themes that are nevertheless prevalent in society, such as animal welfare or the quality of farmers' work.

On sustainability issues, the analysis is complex. The criteria set out by Velten *et al.* (2015) help to better highlight the truly sustainable scope of the proposed games. Some games clearly engage in sustainable changes both in goals, strategies, and the mobilised action field. Other games do not clearly show a sustainable intention, but are so in the mechanics of the game and its use. Conversely, other games that focus on sustainability issues seem to be confined to reduced approaches, particularly environmental and/or techno-economic questions.

However, these sustainability elements are limited by the evaluations proposed. The question of evaluating the effects of games remains a weakness that is not without recalling the conclusions drawn from other reviews of games (Flood *et al.*, 2018; Galeote *et al.*, 2021). Thus, even though games are often evaluated, this remains often limited to short-term effects, during the game and/or the debriefing. The follow-up of the effects of the game and their contributions to real changes remain poorly studied.

These results show that there is a triple interest in investing serious games in the mobilisation made in agriculture:

- To invest serious games in other fields of agriculture that have not been addressed so far: work, quality management, know-how...
- To apply serious games to other modalities such as assistance in choosing practices or assisting in testing real practices (simulation at the farm level)
- To take a look of games outside the academic field (as in Dernat *et al.* in press)

Practical Implications

This research contributes to the field of agricultural education and extension tools by exploring how serious games can contribute to achieving sustainability goals. In particular, it highlights how serious games are tools that can be used by education and counselling actors to support sustainable transitions. Games appear as a sustainable game changer because they can be a frugal and low-cost innovation (in terms of mobilisation and animation). Thus, they make it easy to address aspects of sustainable transitions in education, as well as in the field with more remote populations, particularly in developing countries.

The results also highlight the necessary support for these games in the field. They are not omniscient tools, and their use in teaching (in a pedagogical sequence) and especially in agricultural counselling must be carefully considered. Many studies focus on the game itself but do not highlight the context, the project management in which it is used, or even the follow-up taken in the field, such as implementing actions, projects, etc. This remains fundamental for agricultural extension.

This work highlights the relevance of games in approaching sustainable transitions in agriculture. It discusses various issues raised by the review of publications and provides a solid basis for the international literature. The results show that a large proportion of the games focus on one or two pillars of sustainability. There is still a lot of work to be done in order to produce games dealing with all three pillars. This requires encouraging interdisciplinary collaborations while continuing to rely on stakeholders in the field to co-construct these games. Moreover, it emphasises the need for better assessment of these games to gain a real understanding of their impact on both representations and practices in agriculture. It also shows the need for an accessible database to provide information for discovering and easily finding these games.

Theoretical Implications

This research addresses a gap in the literature regarding the use of games in agriculture and their potential for facilitating sustainable transitions. It provides valuable insights into the evolution of social innovation tools used in agricultural advice and serves as a basis for future research. The evaluative aspects of games are particularly relevant for researchers in the agricultural education and extension community. As recently noted by Klerkx (2021), the use of games is an issue that needs to be better understood in the future.

For research specifically focused on games, this work challenges the existing typologies of games that aim to effect change in the real world. While the terms "persuasive games" and "change games" are often used, their definitions do not fully capture certain games identified in this review. In particular, some games aim to bring about change through collaboration and co-design in agriculture. It seems possible to describe these games as "sustainable games," as they address sustainability goals, strategies for action, and fields of action.

References

Abt, C. (1970). *Serious games*. University press of America.

de Boon, A., Sandström, C., & Rose, D. C. (2022). Governing agricultural innovation: A comprehensive framework to underpin sustainable transitions. *Journal of Rural Studies*, *89*, 407-422. https://doi.org/10.1016/j.jrurstud.2021.07.019

Dernat, S., Terrier-Gesbert, M., Martel, G., Johany, F., Revalo, A. (*in press*). Les jeux sérieux, des innovations au service de transitions agroenvironnementales et alimentaires durables dans les territoires. Une enquête menée en France. *Technologie et Innovation*.

Engström, H., & Backlund, P. (2022). Serious games design knowledge: Experiences from a decade (+) of serious games development. *EAI Endorsed Transactions on Serious Games*, *6*(1), 1-13. http://dx.doi.org/10.4108/eai.27-5-2021.170008

Flood, S., Cradock-Henry, N. A., Blackett, P., & Edwards, P. (2018). Adaptive and interactive climate futures: systematic review of 'serious games' for engagement and decision-making. *Environmental Research Letters*, *13*(6), 063005. https://iopscience.iop.org/article/10.1088/1748-9326/aac1c6

Galeote D.F., Rajanen M., Rajanen D., Legaki N.Z., Langley D.J., Hamari J. (2021). Gamification for climate change engagement: review of corpus and future agenda. *Environmental Research Letters*, 16(6), 063004. https://doi.org/10.1088/1748-9326/abec05

Hernandez-Aguilera, J. N., Mauerman, M., Herrera, A., Vasilaky, K., Baethgen, W., Loboguerrero, A. M., ... & Osgood, D. (2020). Games and fieldwork in agriculture: A systematic review of the 21st century in economics and social science. *Games*, *11*(4), 47. https://doi.org/10.3390/g11040047

Klerkx, L. (2021). Digital and virtual spaces as sites of extension and advisory services research: social media, gaming, and digitally integrated and augmented advice. *The Journal of Agricultural Education and Extension*, *27*(3), 277-286. https://doi.org/10.1080/1389224X.2021.1934998

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Systematic reviews*, *10*(1), 1-11. https://doi.org/10.1136/bmj.n71

Prost, L., Martin, G., Ballot, R., Benoit, M., Bergez, J. E., Bockstaller, C., ... & van der Werf, H. (2023). Key research challenges to supporting farm transitions to agroecology in advanced economies. A review. Agronomy for Sustainable Development, 43(1), 1-19. https://doi.org/10.1007/s13593-022-00855-8

Slimi, C., Prost, M., Cerf, M., & Prost, L. (2021). Exchanges among farmers' collectives in support of sustainable agriculture: From review to reconceptualization. *Journal of Rural Studies*, *83*, 268-278. https://doi.org/10.1016/j.jrurstud.2021.01.019

Velten, S., Leventon, J., Jager, N., & Newig, J. (2015). What is sustainable agriculture? A systematic review. *Sustainability*, *7*(6), 7833-7865. https://doi.org/10.3390/su7067833

Combining serious games contributes to changes of farmers' practices

Rébecca Etienne[1], Stéphane Ingrand[2], Cyrille Rigolot[1], Sylvain Dernat[1]

[1] INRAE, UMR Territoires, 63178 Aubière, France
[2] INRAE, dép. PHASE, Site de Theix 63122 SAINT-GENÈS-CHAMPANELLE, France

Short abstract : A support approach based on the combination of serious games was tested with a group of farmers of a small French cheese PDO area to support them towards more sustainable practices adapted to climate change. Three serious games were combined with other forms of interventions such as trainings, on farm experiments and field visits. The mid-term effects of this support process on changes of farmers' practices are evaluated thanks to a systematic innovating assessment method. They reveal that the games bring positive reactions of farmers, allow the elaboration of new strategies of adaptation of farming systems, provide changes in behavior and tend towards changes of practices. They bring farmers into action and collective decision making. Further results should be run in the long term to confirm these findings. These findings highlight the added value of combining serious games in order to contribute to changes of farmers' practices, at individual and collective level. Our method contributes to extension practitioners tooling and research on the effects of serious games in the field.

Key words: support tools, serious games, climate change, adaptation, PDO

Purpose

Farm advisory services today faces a major challenge which is to support farmers in the process of transition to more sustainable systems, taking advantage of the principles of agroecology (Darnhofer *et al.*, 2012 ; Martin *et al.*, 2018). Extension and advisory services are essential to co-produce solutions with farmers and to help develop knowledge and skills (Labarthe *et al.*, 2013 ; Klerkx, 2020 ; Koutsouris, 2018). New tools and processes that combine local, experiential and scientific knowledge (Rigolot *et al.*, 2019) based on co innovation approaches and participative methods show relevant results (Dumont *et al.*, 2020).

Among the operational tools allowing this support, "serious games" occupy a growing place (Flood *et al.*, 2018 ; Hernandez-Aguilera *et al.*, 2020 ; Dernat *et al.*, *in press*). The objective of these games goes beyond entertainment, pleasure and fun (Michael and Chen, 2005). Indeed, they allow to simplify situations, make projections or imitate real situations by reducing risk-taking; induce a shared reflection (Stanitsas *et al.*, 2019 ; Den Haan, 2020) and are boundary objects that allow a shared representation of a situation (Morris *et al.*, 2020).

However, transitions in agriculture are part of a fundamental process, involving a complete redesign of systems (Hill and MacRae, 1995) and can be considered as wicked situations (Martin *et al.*, 2018 ; Darnhofer, 2022) that are not limited to one objective.
Firstly, it seems important to underline the limitation of use of serious games that are created to meet one objective (Emmerich and Bockholt, 2016) instead of using one serious game to meet several objectives simultaneously (Dolinska, 2017), that cannot be easily adapted to several contexts (Andreotti et al., 2020). Combining serious games in order to accompany farmers towards their transitions appears to be a solution close to real life problematics. We find examples of compatibility of different serious games (Célerier, 2018 ; Martin *et al.*, 2018 ; Ryschawy *et al.*, 2022). Games may also be combined with other participative methods like trainings (García-Barrios *et al.*, 2017), companion modelling and role play games (Souchère *et al.*, 2010), backcasting workshops (Andreotti *et al.*, 2020) or other boundary objects (Morris *et al.*, 2020).
In addition, it has been proven the interest of the iterative effect that can concern the repetition of the same game or with other games or tools (Martin *et al.*, 2011, 2012 ; Sautier, 2013).

It is secondly necessary to assess the long-term consequences of the use of serious games. Research has not yet proved the concrete impacts of serious games on the field which limits the proof that the aim of the game is fulfilled (Emmerich and Bockholt, 2016). The assessment models of serious games are mostly limited to short term assessment (Vasconcelos *et al.*, 2022) ; evaluation of individual gamer experience out of professional area (Steiner *et al.*, 2015) ; and individual or social learning effects (García-Barrios *et al.*, 2017 ; Den Haan and Van der Voort, 2018). These effects are not sufficient enough to prove the impact in changes of practices but only an intention of change (Martin, 2015). Besides, most of the assessment methods from research are not directly usable for practitioners (Andreotti *et al.*, 2020). We have not found evaluation of a combination of different serious games.

A support approach based on a combination of serious games was tested for a case study in order to accompany changes in farmers' practices, at the individual and collective levels. The mid-term effects on changes of practices are assessed based on an evaluation model. We thus question the interest of combining serious games to support transition in agriculture and their practical use for agricultural support.

Design/Methodology/Approach

The case study is situated in a French cheese Protected Designation of Origin (PDO) of Massif Central for which a research action program (Trans[Fourm]ation) was carried out at the request of the PDO board in 2018. This program was built on game-based learning and meant to initiate a collective dynamic and to carry out a participatory foresight (Dernat, Rigolot, *et al.*, 2022). Different guidelines were decided among which adaptation of current livestock systems in a context of climate change. One of the problematic of the PDO is to find levers of adaptation for the farmers that are congruent with individual strategies, PDO specifications and global issues (climate change). Indeed, some levers can be assimilated as "buffer" capacity instead of adaptative or transformative capacity (Darnhofer, 2014) and are sometimes not coherent with the collective project or a perspective of sustainability. As PDO farmers are facing a double constraint, the articulation between individual and collective scale is thus essential.

A small group of 15 PDO breeders was especially created in 2021 based on volunteer participation, co-animated by searchers, PDO employee and two referent breeders. It aims at collectively exchange and test innovated solutions on the field (Dernat, Etienne, *et al.*, 2022) designed by farmers (Le Gal *et al.*, 2011). A collaborative support process based on serious games and other forms of interventions (trainings, farm visits and on farm experimentations), was suggested and adapted along the way (Etienne *et al.*, *in press*) in order to remain adequate to farmers' needs.

Three serious games are combined in order to firstly define a collective strategy and choose few levers of adaptation with "Lauracle" (Célerier *et al.*, 2018), then design farm level adaptation levers with "Forrage rummy" (Martin *et al.*, 2011) adapted on two farms of the group and finally design territorial scale scenarios of forage exchanges with an adaptation of "Dynamix" (Ryschawy *et al.*, 2018, 2022). The games were chosen, ahead or during the process, because of their link with the thematic of forage system adaptation to climate change; they are collaborative (Den Haan and Van der Voort, 2018), intervention games (Rodela *et al.*, 2019), and integrate tradeoffs between individual and collective (Ryschawy *et al.*, 2018). Their characteristics will be described in the presentation.

In order to assess the effects of this game-based support methodology, we mobilize the adaptation of the NWKM's four levels (Kirkpatrick and Kirkpatrick, 2016) previously described (Etienne *et al.*, *in press)* which is adapted to evaluate agricultural education and extension program (Murphrey *et al.*, 2018 ; Dernat, Etienne, *et al.*, 2022) . This model is particularly interesting because it is oriented toward action and evaluates beyond individual reactions and learnings. It is constituted of four levels of evaluation that are not detailed: 1. Reactions; 2. Learnings; 3. Behaviors et 4. Results. In this presentation, we will not focus on the "monitor and adjust" of the approach as in Etienne *et al.* (*in press*) but on the evaluation of the four levels after the support process was carried out. The objective is to evaluate possible contributions of games to change of practices instead of trying to attribute the effects to games (Douthwaite *et al.*, 2003 ; Bakker, 2017) among all other sources of support to which farmers participate.

In order to draw a systematic evaluation, we combine assessment tools in the game (observation grid based on Hassenforder *et al.* (2020) ; video and audio recording, just after game sessions (*debriefing cards* based on (Quach, 2019)), ongoing observation (participant observation of meetings (Musante and DeWalt, 2010)), and a *pre/post* analysis, conducted before and after the support process, based on comprehensive interviews (Kaufmann and Singly, 2016) and technical diagnosis (Farruggia *et al.*, 2012). We draw an individual analysis of each farmer and then compare between farmers the different effects depending on their participation to the different games. Our analysis is based on grounded theorizing qualitative analysis (Lejeune, 2019).

Findings

We describe in this section the contribution of the serious games-based support approach to change of practices. The levels of NWKM are progressively reached by means of the combination of games.

The evaluation of level 1 (satisfaction, level of participation, engagement, relevance) reveals that the peasants are mostly satisfied right after the game sessions but also suggest some upgrades; 8 farmers participate in average to the interventions. 7 farmers have participated to one game session, 4 to two game sessions and one to three game sessions. We mainly base this evaluation on observation, recordings and debriefing of game sessions, supplemented by verbatim from *post* interviews.

The evaluation of level 2 considers the diversity of strategies of adaptation of forage systems chosen by farmers. We classify these levers according to the long term/short term and anticipation/reaction strategies (related to "buffer capacity" described by Darnhofer (2014)). Results of the game sessions and *pre/post* interview analysis reveal that short term (annual forage crops like sorgho or moha) and reaction (early grazing) levers progressively turn toward long term (double-ended meslin) and anticipation (diversified grasslands, muslin, seeding techniques…). The support approach and particularly Lauracle permits to identify the first levers of adaptation that are then deepen with Forage Rummy or Dynamix at different scales. 21 levers of possible adaptation in total were finally identified through games, at farm or territorial level.

For level 3, we observe two levels of behaviours, at farm level and at territorial scale. First, experiments are set up by farmers (long lasting adapted to drought multi-species grassland). This corresponds to an "attitude towards action" and it allows a better articulation between individual and collective levels, as it permits farmers to observe the results of the experimentations of their pairs. Six farmers among the group decided to set up on farm tests. They all have participated to at least one Forage Rummy session. In order to accompany these experiments, a technical animator-advisor is involved. He brings technical knowledge and helps to observe and analyse the results of the experiments (Klerkx *et al.*, 2010). A few farmers also impulses, with the PDO syndicate, the creation of a seeds brush machine in order to collect on farm grassland seeds. These experimentations are at the interface of individual and collective practices, as well as technical and organisational innovation.

Second, we observe forage exchanges after the "Dynamix" session between at least two participants. The game allows to consider the expectations both of breeders and forage sellers. We rely our results on verbatim from participant observation, games and debriefing sessions, as well as interviews analysis.

Finally, the results of level 4 should lead to a better forage autonomy at farm level (ex: new grassland implementation, seeds brushing) and at territorial level based on the relocalisation of forage exchanges inside the PDO geographical area. The *post* interviews reveal that most farmers who tried the new grass seeds in 2022 intended to buy the same seeds in 2023 and intend to organise new field experiments and trainings with the help of the advisor. The seeds brush machine will also be used by farmers during next spring. The group also intends to create a forage bank and a new meeting to discuss the exchange of forage inside the PDO geographical area.

Our results show that the possible adaptations are not only technical (individual practices) ones but also socio-organisational (trainings, meetings, share of experience, sharing of a machine…). Indeed, agroecological transition is then not only based on technical innovation but also social innovation (Tchit and Dumont, 2016).

These results are context dependant and limited to a small sample of farmers. They emerge from a group of farmers that has been involved in a reflexion process for 5 years, in link with the project Trans[Fourm]ation. Our findings are also limited to short and middle term effect. A long-term analysis would permit to confirm the trend that we could observe in this study.

Practical Implications

Our findings reveal that the combination of games progressively leads to change of farmers' practices, at the farm level and at the territorial level.
Some games are particularly interesting to bring farmers towards action and change (Forage Rummy and Dynamix) as these results confirm as long as experiments. The other game (Lauracle) and trainings are further steps in the accompaniment process and allow to reach the upper levels (behaviour change and results). This is a proof of concept that the games combined with other forms of interventions, mostly participative ones, are a good way to reach farmers' changes of practices.
We draw this evaluation based on an adaptation of NWKM. The four levels of NWKM are not equally evaluated. On the one hand, the levels 1 and 2 can be easily evaluated and attributed to each game. On the other hand, levels 3 and 4 are more difficult to evaluate and are aggregated and due to the whole support process instead of each game. These two last levels are the most interesting for the agroecological transition because they ensure real changes of practices. Some other results may appear in the long term which are not visible yet in this study.

These findings can be useful for practitioners who want to use and combine serious games as support tools to accompany farmers towards transition. Thanks to our method, we provide relevant results on impacts of a combination of serious games on farmers in the field, both at individual and collective levels. They are also addressed to advisors who already use serious games in order to help them precise their support approach. Any game or combination of games can be mobilised by advisors, but has to be adapted to the support's objective, the context and farmers' needs and has to be evaluated.
This method could be simplified in order to facilitate its appropriation by advisors. It could also be adapted along the way by advisors themselves as it is not a ready-to-use protocol.

Theoretical Implications

Our method has promising possible uses for future research on serious games as agricultural support tools. In this case study, the combination of serious games permits to reach technical and social innovation, brings farmers into action, decision making, collective conception and simulation, and also concertation between farmers. Finally, these results also contribute to the research on evaluation of the effects of serious games and provide an innovating assessment method of a support process based on serious games. This systemic method evaluates not only reactions and learning effects but also changes in behaviours and broader results which is adapted to the accompaniment towards transformation of production systems.

References

Andreotti, F., Speelman, E. N., Van den Meersche, K., Allinne, C., 2020. Combining participatory games and backcasting to support collective scenario evaluation: an action research approach for sustainable agroforestry landscape management, *Sustainability Science*, 15, 1383–1399. doi: 10.1007/s11625-020-00829-3.

Bakker, T., 2017. *Effets des démarches participatives sur les changements de pratiques agricoles : cas des champs-écoles en Afrique de l'Ouest.*, These de doctorat. Montpellier, SupAgro. (online: https://www.theses.fr/s192743).

Célerier, A., 2018. *Quels leviers d'autonomie fourragère face au changement climatique ? apports du Rami Fourrager®*, Guide méthodologique Melibio. (online: https://www6.toulouse.inrae.fr/agir/Publications-et-outils/Outils/LAURACLE).

Célerier, A., Vallas, M., Thénard, V., Martin, G., Lubac, S., Madeline, L., 2018. Lauracle : 40 leviers pour l'autonomie fourragère, in, *24 èmes Rencontres Recherches Ruminants. Paris*, *24 Rencontres Recherches Ruminants*, p. 116. (online: https://www.inrae.fr/actualites/lauracle-jeu-cartes-collaboratif-42-leviers-dautonomie-fourragere).

Darnhofer, I., 2014. Resilience and why it matters for farm management, *European Review of Agricultural Economics*, 41, 3, 461–484. doi: 10.1093/erae/jbu012.

Darnhofer, I., 2022. Researching the Management of Family Farms: Promote Planning or Bolster Bricolage?, in Larcher, M. and Schmid, E. (Eds.), *Alpine Landgesellschaften zwischen Urbanisierung und Globalisierung*, Wiesbaden, Springer Fachmedien Wiesbaden, pp. 229–242. doi: 10.1007/978-3-658-36562-2_13.

Darnhofer, I., Gibbon, D., Dedieu, Benoit, 2012. Farming Systems Research: an approach to inquiry, in Darnhofer, I., Gibbon, D., and Dedieu, Benoît (Eds.), *Farming Systems Research into the 21st Century: The New Dynamic*, Dordrecht, Springer, pp. 3–31. (online: http://link.springer.com/10.1007/978-94-007-4503-2_1).

Den Haan, R.-J., 2020. *Games to Collaboratively Explore Environmental Complexity: Designing the Virtual River Game*, PhD. University of Twente. doi: 10.3990/1.9789036549653.

Den Haan, R.-J., Van der Voort, M. C., 2018. On Evaluating Social Learning Outcomes of Serious Games to Collaboratively Address Sustainability Problems: A Literature Review, *Sustainability*, Multidisciplinary Digital Publishing Institute, 10, 12, 4529. doi: 10.3390/su10124529.

Dernat, S., Etienne, R., Hostiou, N., Pailleux, J.-Y., Rigolot, C., 2022. Ex-post consequences of participatory foresight processes in agriculture. How to help dairy farmers to face outcomes of collective decisions planning?, *Frontiers in Sustainable Food Systems*, 6, 776959. doi: 10.3389/fsufs.2022.776959.

Dernat, S., Rigolot, C., Vollet, D., Cayre, P., Dumont, B., 2022. Knowledge sharing in practice: a game-based methodology to increase farmers' engagement in a common vision for a cheese PDO union, *The Journal of Agricultural Education and Extension*, 28, 2, 141–162. doi: 10.1080/1389224X.2021.1873155.

Dernat, S., Terrier-Gesbert, M., Martel, G., Johany, F., Revalo, A., in press. Les jeux sérieux, des innovations au service de transitions agroenvironnementales et alimentaires durables dans les territoires. Une enquête menée en France, *Technologie & Innovation*.

Dolinska, A., 2017. Bringing farmers into the game. Strengthening farmers' role in the innovation process through a simulation game, a case from Tunisia, *Agricultural Systems*, 157, 129–139. doi: 10.1016/j.agsy.2017.07.002.

Douthwaite, B., Kuby, T., van de Fliert, E., Schulz, S., 2003. Impact pathway evaluation: an approach for achieving and attributing impact in complex systems, *Agricultural Systems*, (Learning for the future:

Innovative approaches to evaluating agricultural research), 78, 2, 243–265. doi: 10.1016/S0308-521X(03)00128-8.
Dumont, B., Modernel, P., Benoit, M., Ruggia, A., Soca, P., Dernat, S., Tournadre, H., Dogliotti, S., Rossing, W. A. H., 2020. Mobilizing Ecological Processes for Herbivore Production: Farmers and Researchers Learning Together, *Frontiers in Sustainable Food Systems*, 4, 544828, 15. doi: 10.3389/fsufs.2020.544828.
Emmerich, K., Bockholt, M., 2016. Serious Games Evaluation: Processes, Models, and Concepts, in Dörner, R., Göbel, S., Kickmeier-Rust, M., Masuch, M., and Zweig, K. (Eds.), *Entertainment Computing and Serious Games. Lecture Notes in Computer Science*, Cham, pp. 265–283. (online: https://doi.org/10.1007/978-3-319-46152-6_11).
Etienne, R., Dernat, S., Rigolot, C., Ingrand, S., in press. Évaluation et ajustement chemin faisant de la mobilisation de jeux sérieux afin d'accompagner les éleveurs dans leurs changements de pratiques. Etude de cas dans l'AOP Fourme de Montbrison, *Natures Sciences Sociétés*.
Farruggia, A., Lacour, C., Zapata, J., Piquet, M., Baumont, B., Carrère, P., Hulin, S., 2012. DIAM, un diagnostic innovant déclinant les équilibres, production, environnement et qualité des fromages au sein des systèmes fourragers des zones AOP du Massif central., in, *19. Rencontres Recherches Ruminants*, Institut de l'Elevage (IDELE), Paris. (online: https://hal.inrae.fr/hal-02750394).
Flood, S., Cradock-Henry, N. A., Blackett, P., Edwards, P., 2018. Adaptive and interactive climate futures: systematic review of 'serious games' for engagement and decision-making, *Environmental Research Letters*, 13, 6, 063005. doi: 10.1088/1748-9326/aac1c6.
García-Barrios, L., Cruz-Morales, J., Vandermeer, J., Perfecto, I., 2017. The Azteca Chess experience: learning how to share concepts of ecological complexity with small coffee farmers, *Ecology and Society*, 22, 2, 20.
Hassenforder, E., Dray, A., Daré, W., 2020. *Manuel d'observation des jeux sérieux*, Montpellier: CIRAD, p. 68. doi: 10.19182/agritrop/00113.
Hernandez-Aguilera, J. N., Mauerman, M., Herrera, A., Vasilaky, K., Baethgen, W., Loboguerrero, A. M., Diro, R., Tekeste, Y. T., Osgood, D., 2020. Games and Fieldwork in Agriculture: A Systematic Review of the 21st Century in Economics and Social Science, *Games*, Multidisciplinary Digital Publishing Institute, 11, 4, 47. doi: 10.3390/g11040047.
Hill, S. B., MacRae, R. J., 1995. Conceptual Framework for the Transition from Conventional to Sustainable Agriculture, *Journal of Sustainable Agriculture*, 11.
Kaufmann, J.-C., Singly, F. de, 2016. *L'entretien compréhensif*. 4e éd, Paris, Armand Colin (128).
Kirkpatrick, J. D., Kirkpatrick, W. K., 2016. *Kirkpatrick's four levels of training evaluation*, Alexandria, VA, USA, ATD Press.
Klerkx, L., 2020. Advisory services and transformation, plurality and disruption of agriculture and food systems: towards a new research agenda for agricultural education and extension studies, *The Journal of Agricultural Education and Extension*, Routledge, 26, 2, 131–140. doi: 10.1080/1389224X.2020.1738046.
Klerkx, L., Aarts, N., Leeuwis, C., 2010. Adaptive management in agricultural innovation systems: The interactions between innovation networks and their environment, *Agricultural Systems*, 103, 6, 390–400. doi: 10.1016/j.agsy.2010.03.012.
Koutsouris, A., 2018. Role of Extension in Agricultural Technology Transfer: A Critical Review, in Kalaitzandonakes, N., Carayannis, E. G., Grigoroudis, E., and Rozakis, S. (Eds.), *From Agriscience to Agribusiness: Theories, Policies and Practices in Technology Transfer and Commercialization*, Cham, Springer International Publishing (Innovation, Technology, and Knowledge Management), pp. 337–359. (online: https://doi.org/10.1007/978-3-319-67958-7_16).
Labarthe, P., Caggiano, M., Laurent, C. C., Faure, G., Cerf, M., 2013. *Concepts and theories available to describe the functioning and dynamics of agricultural advisory services*, Research Report. European Union's Seventh Framework Programme for research, technological development and demonstration under, p. 21. (online: https://hal.archives-ouvertes.fr/hal-01593195).
Le Gal, P.-Y., Dugué, P., Faure, G., Novak, S., 2011. How does research address the design of innovative agricultural production systems at the farm level? A review, *Agricultural Systems*, 104, 9, 714–728. doi: 10.1016/j.agsy.2011.07.007.
Lejeune, C., 2019. *Manuel d'analyse qualitative. Analyser sans compter ni classer*, De Boeck Superieur (Méthodes en sciences humaines).

Martin, G., 2015. A conceptual framework to support adaptation of farming systems – Development and application with Forage Rummy, *Agricultural Systems*, 132, 52–61. doi: 10.1016/j.agsy.2014.08.013.

Martin, G., Allain, S., Bergez, J.-E., Burger-Leenhardt, D., Constantin, J., Duru, M., Hazard, L., Lacombe, C., Magda, D., Magne, M.-A., Ryschawy, J., Thenard, V., Tribouillois, H., Willaume, M., 2018. How to address sustainability transition of farming systems? A position paper, in, *13th European IFSA Symposium, International Farming Systems Association(IFSA)*, Chania, Greece, p. 23. (online: https://hal.inrae.fr/hal-02737989).

Martin, G., Felten, B., Duru, M., 2011. Forage rummy: A game to support the participatory design of adapted livestock systems, *Environmental Modelling & Software*, 26, 12, 1442–1453. doi: 10.1016/j.envsoft.2011.08.013.

Martin, G., Felten, B., Magne, M.-A., Piquet, M., Sautier, M., Theau, J. P., Thenard, V., Duru, M., 2012. Le rami fourrager : un support pour la conception de scénarios de systèmes fourragers avec des éleveurs et des conseillers, *Fourrages*, 210, 119–128.

Michael, D. R., Chen, S. L., 2005. *Serious Games: Games That Educate, Train, and Inform*. Thomson Course Technology, Boston.

Morris, J., Ensor, J. E., Pfeifer, C., Marchant, R., Mulatu, D. W., Soka, G., Ouedraogo-Kone, S., Wakeyo, M. B., Topi, C., 2020. Games as boundary objects: charting trade-offs in sustainable livestock transformation, *International Journal of Agricultural Sustainability*. doi: 10.1080/14735903.2020.1738769.

Murphrey, T., Koswatta, T., Dooley, K., Edgar, L., 2018. An Analysis of Evaluation Methods Implemented in Studies Published in the Journal of International Agricultural and Extension Education from 1994 to 2018: A 25 Year Review, *Journal of International Agricultural and Extension Education*, 25, 27–39. doi: 10.5191/jiaee.2018.25402.

Musante, K., DeWalt, B. R., 2010. *Participant Observation: A Guide for Fieldworkers*, Rowman Altamira.

Quach, A., 2019. *Debriefing Cards*, *#OpenSeriousGames*. (online: https://openseriousgames.org/).

Rigolot, C., Martin, G., Dedieu, B., 2019. Renforcer les capacités d'adaptation des systèmes d'élevage de ruminants: Cadres théoriques, leviers d'action et démarche d'accompagnement, *INRA Productions Animales*, 32, 1, 1–12. doi: 10.20870/productions-animales.2019.32.1.2414.

Rodela, R., Ligtenberg, A., Bosma, R., 2019. Conceptualizing Serious Games as a Learning-Based Intervention in the Context of Natural Resources and Environmental Governance, *Water*, 11, 2, 245. doi: 10.3390/w11020245.

Ryschawy, J., Charmeau, A., Pelletier, A., Moraine, M., Martin, G., 2018. Dynamix, un 'jeu sérieux' pour concevoir des scénarios d'achat-vente entre céréaliers et éleveurs : une application en Ariège, *Fourrages*, 235, 207–212.

Ryschawy, J., Grillot, M., Charmeau, A., Pelletier, A., Moraine, M., Martin, G., 2022. A participatory approach based on the serious game Dynamix to co-design scenarios of crop-livestock integration among farms, *Agricultural Systems*, 201, 103414. doi: 10.1016/j.agsy.2022.103414.

Sautier, M., 2013. *Outiller l'adaptation des élevages herbagers au changement climatique : de l'analyse de la vulnérabilité à la conception participative de systèmes d'élevage*, thèse de doctorat. Université de Toulouse.

Souchère, V., Millair, L., Echeverria, J., Bousquet, F., Le Page, C., Etienne, M., 2010. Co-constructing with stakeholders a role-playing game to initiate collective management of erosive runoff risks at the watershed scale, *Environmental Modelling & Software*, (Thematic Issue - Modelling with Stakeholders), 25, 11, 1359–1370. doi: 10.1016/j.envsoft.2009.03.002.

Stanitsas, M., Kirytopoulos, K., Vareilles, E., 2019. Facilitating sustainability transition through serious games: A systematic literature review, *Journal of Cleaner Production*, 208, 924–936. doi: 10.1016/j.jclepro.2018.10.157.

Steiner, C. M., Hollins, P., Kluijfhout, E., Dascalu, M., Nussbaumer, A., Albert, D., Westera, W., 2015. Evaluation of Serious Games: A Holistic Approach, in, *8th International Conference of Education, Research and Innovation*, Seville, Spain, IATED Academy, pp. 4334–4342. (online: https://library.iated.org/view/STEINER2015EVA).

Tchit, M., Dumont, B., 2016. L'agroécologie : origines, bases scientifiques et déclinaisons en élevage, in Jouven, M., , *L'agroécologie du nouveau pour le pastoralisme ?* Association Française de Pastoralisme Cardère éditeur.

Vasconcelos, L., Sousa, M., Ferreira, F., Pinheiro, J., 2022. COLLABORATING: modern board games and collaboratories as a tool for capacity building, *SN Social Sciences*, 2, 9, 190. doi: 10.1007/s43545-022-00472-y.

Micro-AKIS of new entrants in agriculture

Sara Mikolič

University of Ljubljana, Faculty of Arts, Department of Geography

Short abstract (200 words):

With low levels of farmers occupational mobility and high levels of intergenerational transfers, the bonds in farming communities in some ways are very strong. On the other hand, the low levels of people entering the farming industry would suggest that the opportunities for most members of this community to have new flows of information and to be exposed to new and innovative ways of thinking would also be very modest. Generational renewal of agriculture across Europe is insufficient and new entrants, with and without family background in agriculture, are needed for rejuvenation of agriculture.

This study draws on Agricultural Knowledge and Innovation System (AKIS) literature to further the understanding of the development of micro-AKIS by new entrants in agriculture. 25 semi-structured interviews with new entrants in Slovenia were conducted, each farmer explaining three innovations implemented on their farm in last 10 years and who supported it in innovation process. Through this, we aim to elucidate the potentially unique needs and challenges of new entrants' innovation ecosystem. Our findings suggest that new entrants find ways to obtain knowledge outside of established networks.

Extended abstract

Purpose

The number of young famers in the EU is declining and older farmers are not passing on their farms to the new generation at a sufficient replacement rate for rejuvenation, innovation, and resilience in agriculture across Europe. In Slovenia, where small scale holdings are more prevalent, shortage of new entrants in agriculture is even more prevailing.

Definitions of what constitutes a 'new entrant' to farming differ. Given the propensity for families to pass farm between generations it is possible to distinguish between 'intergenerational new entrants' (where the occupation of farming as well a frequently the farm itself has been passed between generations), also called 'successors', and a 'newcommer' or 'ex-nuovo farmer' (someone who has never farmed before and does not come from an active farming family). For the purposes of our research new entrants were defined as those who entered farming in the last ten years via various routes including inheritance of inactive farm, succession of an active farm and transferred its business model totally, farm purchase and/or leasing and share farming/partnership with land owners. New entrant can be with or without a family background in farming. Regardless of the definition employed it is apparent that the entry into farming is very low.

In many ways the farming community is very resilient. Positive resilience helps to cope with challenges, pressures and disturbances helping to avoid breakdown of business model, people, communities, or systems by retaining the core functions and characteristics (Meuwissen et al., 2022). Negative resilience links to persistence of characteristics which block sustainable change. For example, traditional farming community may be resilient against newbies in agriculture sector. Specifically, we considers negative resilience in terms of innovation ecosystem, which may require change to enable and catalyse new entrants in agriculture. Based on studies of social capital and embeddedness (Cofré-Bravo et al., 2019), with low levels of physical/occupational mobility and high levels of intergenerational transfers, the bonds in farming communities in some ways are very strong. However, the low levels of people entering the industry would suggest that the opportunities for most members of this community to have new flows of information and to be exposed to new and innovative ways of thinking would also be very low.

Understanding how the relationship between new entrants and their enabling environment may facilitate (or restrain) innovation was the focus of my research. This study draws on Agricultural Knowledge and Innovation System (AKIS) literature (Dhiab et al., 2020; Laurent et al., 2022; Šumane, 2018; Sutherland,

2012) to further the understanding of the development of innovation by new entrants in agriculture. The role and influence of AKIS actors in the decision-making process of farmers is well studied, but these pathways specifically for newcomers are still poorly understood.

Design/Methodology/Approach

25 semi-structured interviews with new entrants in Slovenia were conducted in 2022, each explaining three innovations implemented on their farm in last 10 years and who supported it in innovation process. Most of the surveys consisted of online interviews.

First, we were interested in what triggers/motivators initiated the innovation. We consider that innovations are motivated to address specific needs, improve the existing situations or to move towards desirable futures. Secondly, we were interested in specific roles that diverse actors (also catalysts) play in innovation process and how big influence did they have in concrete innovations. For concrete innovations emerging, it means rearranging the innovation ecosystem. We asked which concrete innovations were developed (three identified per farmer), how financially risky it was and what impacts had this innovation on further business development of farm/sustainability. We collected 75 innovations in total.

Findings

The farm succession in Slovenia has been characterised as problematic for several decades. While family farms dominate in Slovenia and usually new entrants start their career in farming as family farm successor, it is interesting, that there is a significant share of successions with a leap of generation (taking over of an unactive farm from grandparents, transforming it into profitable farm). The another type are (complete) newcomers with a new farm business, they access to resource by purchase or leasing. The innovative models such as share farming is rare in Slovenia. We were especially interessted in who compose their micro-AKIS in innovation process.

In 75 innovations implemented by 25 interviewed farmer, more than 85 different types of members of AKIS were identified. It shows a high diversity of sources of information/advise. To be able to compare microAKIS, we have grouped the sources of advice into 20 broad categories, based on type of organisation and the nature of bonding with farmers. The diversity of advise presented represents the spectrum of the suppliers of advice reported by the farmers of our sample, either for the general management of their farm (whole-farm microAKIS) or for a given innovation area (innovation micro-AKIS). Our survey shows that prevailing farmer advisors in Slovenia such as public farmer advisory service (FAS), which is organised under the Chamber of Agriculture and Forestry, with 315 advisors divided into three levels (field advisors, specialist advisors and coordinating advisors) is well-recognised network, but its advice has modest impact on innovation process of new entrants in Slovenia. The type of information and advice needed for innovation on their farms seek at public advisors in Slovenia is rather related to administrative tasks (application to public funds) than to sector specific innovations or the entry model in agriculture without family background. Private advisors in micro-AKIS of new entrants are nodes with high impact on innovation process, advising on diverse types of innovations (e.g. digital, technological, financial). Many of actors mentioned by farmers are not specialized in advisory service and they combine advice with other commercial activities (companies – suppliers) or are specialised in non-agricultural advise (e.g. business incubation at Regional Development Agencies, LEADER approach and partnerships in Local Action Group). For new entrants, also different associations, NGOs, that they are members of, have a moderate presence and relatively high impact on innovation process at its farm. New information and communication technologies have greatly facilitated remote communication and farmers' access to information shared by geographically distant sources or relatives and friends act as an intermediaries. Social media (Facebook, Instagram, YouTube, etc.) are prevailing against traditional media. Despite the diversity, there are still topics which are rarely covered by advisory services (legal advice, tax advice, psychological and sociological advice, etc.).

Table 2 : Diversity of micro-AKIS of new entrants in Slovenia and impact of its advise on innovations.

		PRESENCE				
		Node				*Network*
IMPACT	*Modest*	Accountancy				
		Cooperative	Municipality		Public advisors (FAS)	
	Moderate		Friend non-farmer, Research institute, Company - suppliers, LAG, traditional national media	HEI/VET, associations/NGOs		
			Bank, ministry, international media and literature	Social media	Another farmer	Parents and grandparents
	High	Private advisor, Regional development agency				Spouse

Practical Implications

This results can contribute to better understanding of micro-AKIS of new entrants in agriculture. Therefore to facilitate public debates on the enabling environment for new farmers and improve efficiency of interventions in AKIS for new entrants.

Theoretical Implications

These results can help to fully understand the innovation ecosystem that farmers personally build (formal and informal). This include the range of individuals and organisation from whom they seek advice, information and services and with whom they exchange knowledge, as well as the process involved and how this is translated into innovative decisions on farms, in other word, their micro-AKIS.

References

Cofré-Bravo, G., L. Klerkx, and A. Engler. 2019. Combinations of Bonding, Bridging, and Linking Social Capital for Farm Innovation: How Farmers Configure Different Support Networks. Journal of Rural Studies, 69, 53–64.

Dhiab, H., P. Labarthe, C. Laurent, 2020. How the Performance Rationales of Organisations Providing Farm Advice Explain Persistent Difficulties in Addressing Societal Goals in Agriculture. Food Policy, 95, 1-12.

Laurent, C., G. Nguyen, P. Triboulet, M. Ansaloni, N. Bechtet, P. Labarthe, 2022. Institutional continuity and hidden changes in farm advisory services provision: evidence from farmers' microAKIS observations in France. Journal of Agricultural Education and Extension, 28, 5, 601-624.

Madureira, L., Labarthe, P., Marques, C. S., Santos, G., 2022. Exploring MicroAKIS: Farmer-Centric Evidence on the Role of Advice in Agricultural Innovation in Europe. The Journal of Agricultural Education and Extension, 28, 5, 549-575.

Meuwissen P.M., M., P. H. Feindt, A. Spiegel, W. Paas, B. Soriano, E. Mathijs, A. Balmann, J. Urquhart, B. Kopainsky, A. Garrido, P. Reidsma, 2022. SURE-Farm Approach to Assess the Resilience of European Farming System. In: Resilient and Sustainable Farming Systems in Europe. Cambridge University Press, Cambridge, 1-13.

Stefano, P., de-Magistris, T., 2011. The effects of changing regional Agricultural Knowledge and Innovation System on Italian farmers' strategies. Agricultural Systems, 104, 746-754.

Sutherland, L.-A., R. J. F. Burton, J. Ingram, K. Blackstock, B. Slee, and N. Gotts. 2012. Triggering Change: Towards a Conceptualisation of Major Change Processes in Farm Decision-making. Journal of Environmental Management, 104, 142–151.

Šūmane, S., I. Kunda, K. Knickel, A. Strauss, T. Tisenkopfs, I. des Ios Rios, M. Rivera, T. Chebach, A. Ashkenazy, 2018. Local and Farmers'Knowledge Matters! How Integrating Informal and Formal Knowledge Enhances Sustainable and Resilient Agriculture. Journal of Rural Studies, 59, 232–241.

Session 3B – Extension Tools (B)

The role of boundary objects as a multi-actor and value connector in agricultural programmes

Jorie Knook[1], R. Knopp[2], G. Beck[2], K. Mitchelmore[2], L. Beehre[3], C. Eastwood[4]

[1]Land Management and Systems, Faculty of Agribusiness and Commerce, Lincoln University, Lincoln, 7647, Christchurch, New Zealand
[2] Scarlatti, Waikato Innovation Park, 1 Melody Lane, Ruakura, Hamilton 3216, New Zealand
[3] Northland Inc., Level one/35 Walton Street, entrance, Whangārei 011, New Zealand
[4] DairyNZ Ltd., Lincoln 7608, New Zealand

Short abstract

The agricultural sector needs to address environmental and social challenges, while having to maintain profitability. As a country characterised by relatively low government intervention in the agricultural sector, Aotearoa New Zealand relies heavily on voluntary actions from farmers to address these challenges. So called 'good farmers' are seen to make changes, but reaching the 'middle farmers' seems to be more challenging. This paper reports on an agricultural programme focused on increasing profitability, environmental performance and farmer wellbeing amongst the 'middle' farmers. We explore how a boundary object can enhance connectedness amongst actors in an extension programme, as well as engage and communicate the underlying values of actors. The research provides change agents and developers of extension programmes with greater knowledge of the potential for 'boundary objects' in such programmes, as well as the mechanisms associated with this change. Insights from this research can be used to guide the framing and organisation of future extension initiatives.

Extended abstract

Purpose

Aotearoa New Zealand (A-NZ) has a commitment to mitigate climate change effects by reaching net-zero emissions by 2050 (Ministry for the Environment New Zealand, 2023), mitigate biodiversity decline (Department of Conservation, 2023) and improve water quality by making 90 percent of rivers and lakes swimmable by 2040 (Ministry for the Environment, 2021). To achieve such targets, there is a need to adapt on-farm management. The agricultural sector is also struggling to retain staff (Eastwood et al., 2019) and remain profitable, which is leading to wellbeing issues (Knook et al., 2022). Given the A-NZ agricultural sector is characterised by having low government intervention and reliance on self-regulation (Knook et al., 2020), there is an important role for industry organisations to support farmers on their journey of change. Extension and education programmes have been widely developed to support farmers in changing their values, beliefs and practices, from having a strong monetary focus, towards more inclusion of environmental and wellbeing values (Knook and Turner, 2020). Considering the high investment in these programmes, it is important to understand both the change achieved by these programmes, and the mechanisms that contribute to this change. Previous research has shown that change in profitability, environmental performance and wellbeing values are achieved by programme participation (Knook et al., 2022). A key tool in achieving change is the 'the planning wheel': a planning tool to help with goal setting (Figure 1). As this 'planning wheel' was identified as part of a wider study, but not yet studied in depth (Knook et al., 2022), this study takes a closer look at this. We use an institutional theory lens and connect it with the concept of 'boundary objects' (Star and Griesemer, 1989 P. 393). The contribution of this research is two-fold. Firstly, it elaborates institutional change theory by connecting it with a concept from science and technology studies: boundary objects. Secondly, from a practical perspective, it provides change agents and developers of extension programmes with greater knowledge of the change established due to programme participation, as well as the mechanisms associated with this change.

Design/Methodology/Approach

Theoretical framing

Institutional logics consist of practices, beliefs, and values that are underlying a certain action (Knook and Turner, 2020). Deriving from organisational studies literature (Thornton and Ocasio, 2018), it is increasingly applied within the rural sociology literature (e.g. Knook and Turner, 2020; Osei-Amponsah et al., 2018). Logics together make up an institution, and represent 'the more-or-less taken-for-granted repetitive social behaviours, which give meaning to social exchange and enable self-reproducing social order' (Greenwood et al., 2008 p.5). Institutional change theory studies the change in those values, beliefs and practices over time (Micelotta et al., 2017).

This study expands on institutional change theory by connecting it to a concept from science and technology studies: boundary objects. A boundary object (BO) is defined as 'an entity shared by several different communities but viewed or used differently by each of them, being both flexible enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites' (Star and Griesemer, 1989 P. 393). BOs can be both tangible or intangible, and create an interface for communication and interaction amongst their participants (Star and Griesemer, 1989).

Case study

The specific programme focused on in this study, Extension 350, was a participatory extension programme focused on increasing resilience in profitability, environmental performance and human wellbeing (Knook et al., 2022). The programme was implemented in Northland, the northern-most region of A NZ, where while the agricultural sector contributes to 31.8% of Northland's gross domestic product there is potential for further growth (Extension 350, 2021). This opportunity led to the development of 'Extension 350' (E350) in 2016. The aim of the programme was to stimulate the growth of the Northland pastoral sector (sheep, beef and dairy farm businesses) through increased farm business resilience—including financial, environmental and wellbeing resilience. The farmers targeted were 'middle farmers', also known as 'hard to reach' farmers (Kinsella, 2018; White et al., 2021), a group not often targeted, but from which understanding and 'moving' them is key to achieve environmental and social targets (Manaaki Whenua - Land Care, 2021).

E350 was initiated in 2016 and ran until 2022. Farmers participated in the programme for a period of three years, with cohorts of farmers beginning in 2017, 2018 and 2019. As part of the E350 programme, monthly meetings were conducted that included the participating farmer, a mentor (a well-established and respected peer farmer) and a farm consultant. During these meetings the performance of the farm was discussed, as well as environmental and social topics. In addition to the monthly meetings, there were also bi-annual field days involving the wider farming community and other experts such as government representees and bankers, to provide additional feedback and support to the participating farmers. A key tool used in all discussions was called 'the planning wheel', a tool that allowed participating farmers to identify their aims and goals from an economic, environmental and wellbeing perspective (Figure 1).

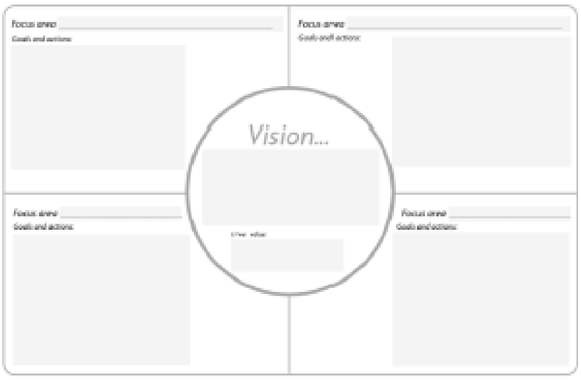


Figure 1: An example of a planning wheel template as used by participating farmers (Source: DairyNZ, New Zealand)

Participant selection

In E350, three cohorts of farmers were involved over a period of six years. In this study, we selected farmers from all these three cohorts, to have a representative sample. There were 26 participants representing 16 farms included in our interviews: 4 participants from cohort 1, 6 participants from cohort 2 and 16 participants from cohort 3. Cohort 3 farms were over-represented in the study due to availability of farmers. To gain understanding of the participants experiences during E350, semi-structured interviews were conducted (Bryman, 2012). Each interview lasted between 45 minutes and 1 hour and were audio-recorded and transcribed. The interviewee(s) were asked to talk about their planning wheel, and questions asked included: What were their farm business goals; how did those goals develop over the 3 years of E350?; What were farming-related changes that they were most proud of?; Who or what were key influences in helping them achieve this change? The research followed human ethics processes used at the authors' institutions.

Findings

This section provides a brief overview of two of the initial themes identified. A more detailed overview of the findings will be presented at the ESEE conference.

Planning and vision

Most of the participants interviewed engaged with the goal setting, personality profile and comparing visions for the business. The planning wheel was seen as a living document for many, an easy to locate tool in the office or other visible location. E350 provided a focus on planning that gave participants a wider range of benefits, from a focus on debt management, having explicit goals, getting the small things right and then moving to strategic planning, seeing other properties and getting inspiration/ideas.

Interviewee 16 highlights this by stating:
We had to draw those goals and we did ours separately from each other, not sitting next to each other. And then we came back, they were essentially the same picture. So it's quite good that we knew that we were on the same page, not only the next three years but probably for life. – Interview 16

Changing wellbeing: the role of the planning wheel

Discussions around wellbeing seemed to have come a long way over the period of E350. Wellbeing aspects were explicitly listed in most of the planning wheels, often focussed on work-life balance, family time, and time away from the farm. Farmers had generally made progress on these wellbeing goals, but there was still work to be done in terms of work-life balance.
From using the planning wheel, a wellbeing score was developed which appeared to be highly effective to initiate conversations around the topic. For one farmer, there were big changes in the wellbeing space with 'wellbeing is almost at the top'. Often wellbeing came through in the goals as interconnected social factors, e.g. more time for the kids, holidays, date nights. There was general acknowledgement that wellbeing is important and part of the bigger picture of successful farming.

Practical Implications

This study provides change agents and developers of extension and education programmes with communication and engagement tools (boundary objects) to change participants practices, beliefs and values around complex and 'new' topics such as wellbeing and the environment.

Theoretical Implications

This study expands on institutional change theory by connecting it with a concept from science and technology studies: boundary objects. Furthermore, this study focuses on 'the middle' farmer and provides insights into how to 'move' these middle farmers. This study will not only draw conclusions in relation to this specific case study, but will also draw comparisons to other projects in the agricultural sector currently being conducted in A-NZ.

References

Bryman, A., 2012. Social research methods, 4th ed. Oxford University Press, Oxford.

Department of Conservation, 2023. Predator free 2050 [WWW Document]. URL https://www.doc.govt.nz/nature/pests-and-threats/predator-free-2050/ (accessed 2.6.23).

Eastwood, C.R., Greer, J., Schmidt, D., Muir, J., Sargeant, K., 2019. Identifying current challenges and research priorities to guide the design of more attractive dairy-farm workplaces in New Zealand. Anim. Prod. Sci. 60, 84–88. https://doi.org/10.1071/AN18568

Extension 350, 2021. Extension 350 farmers learning from farmers: annual report 2020-2021. Whangarei.

Greenwood, R., Oliver, C., Suddaby, R., Sahlin, K., 2008. The SAGE handbook of organizational institutionalism, 2nd ed. SAGE Publications, Ltd, London. https://doi.org/10.4135/9781849200387

Kinsella, J., 2018. Acknowledging Hard To Reach Farmers : Cases From Ireland. Int. J. Agric. Ext. 61–69.

Knook, J., Dynes, R., Pinxterhuis, I., de Klein, C.A.M., Eory, V., Brander, M., Moran, D., 2020. Policy and practice certainty for effective uptake of diffuse pollution practices in a light-touch regulated country. Environ. Manage. 65, 243–256. https://doi.org/10.1007/s00267-019-01242-y

Knook, J., Eastwood, C., Mitchelmore, K., Barker, A., 2022. Wellbeing, environmental sustainability, and profitability: Including plurality of logics in participatory extension programmes for enhanced farmer resilience. Sociol. Ruralis. https://doi.org/10.1111/soru.12413

Knook, J., Turner, J.A., 2020. Reshaping a farming culture through participatory extension : An institutional logics perspective. J. Rural Stud. 78, 411–425. https://doi.org/10.1016/j.jrurstud.2020.06.037

Manaaki Whenua - Land Care, 2021. Moving the middle.

Micelotta, E., Lounsbury, M., Greenwood, R., 2017. Pathways of institutional change: An integrative review and research agenda. J. Manage. 43, 1885–1910. https://doi.org/10.1177/0149206317699522

Ministry for the Environment, 2021. National targets for improving water quality for swimming [WWW Document]. URL https://environment.govt.nz/acts-and-regulations/national-policy-statements/national-policy-statement-freshwater-management/improving-water-quality-swimming/ (accessed 2.6.23).

Ministry for the Environment New Zealand, 2023. Emissions reduction targets [WWW Document]. URL https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/emissions-reduction-targets/ (accessed 1.22.23).

Osei-Amponsah, C., van Paassen, A., Klerkx, L., 2018. Diagnosing institutional logics in partnerships and how they evolve through institutional bricolage: Insights from soybean and cassava value chains in Ghana. NJAS - Wageningen J. Life Sci. 84, 13–26. https://doi.org/10.1016/j.njas.2017.10.005

Star, S.L., Griesemer, J.R., 1989. Institutional Ecology , ' Translations ' and Boundary Objects : Amateurs and Professionals in Berkeley ' s Museum of Vertebrate Zoology , 1907-39 Author (s): Susan Leigh Star and James R . Griesemer Source : Social Studies of Science , Vol . 19 , No . 3. Soc. Stud. Sci. 19, 387–420.

Thornton, P.H., Ocasio, W., 2018. Institutional logics, in: Greenwood, R., Oliver, C., Suddaby, R., Sahlin, K. (Eds.), The SAGE Handbook of Organizational Institutionalism. SAGE Publications Ltd, London, pp. 99–128. https://doi.org/10.4135/9781526415066

White, V., Hurley, P., Hall, J., Lyon, J., Tsouvalis, J., Rose, D.C., Little, R., 2021. Engaging ' harder to reach ' Research summary. https://doi.org/10.15131/shef.data.14806629

The role of boundary objects and shared governance in the social learning of innovation networks: the case of NEFERTITI

Laure Triste[1], Rebekka Frick[2], Annie McKee[3]

[1]ILVO, [2]FiBL, [3]James Hutton Institute

Short abstract (200 words):

This paper investigates the development of boundary objects in the H2020 project NEFERTITI (2018-2022). A longitudinal analysis of documents and reports developed in the course of the project were analysed to detect needs reported by the networks. The results show that network needs changed during the course of the project, and in response the project management developed 'boundary objects' such as artefacts (e.g. guidelines, reflection tools, a platform), procedures (e.g. for cross visits, for network reflection and for continuous evaluation, learning and improvement) and discourses (e.g., through the artefacts and procedures, and during annual meetings). Boundary objects developed throughout the project spanned both the local and regional networks within NEFERTITI, as well as wider European communities (e.g. other H2020 projects and agricultural communities). We show how project management used a collaborative and shared governance model during the development of boundary objects, with positive implications for network sustainability and social learning within and between networks. The paper highlights the balance between being prescriptive to allow functioning within the H2020 context, as well as and stimulating creativity and initiative within the networks to increase ownership and sustainability.

Extended abstract

Introduction

The challenges facing agriculture in Europe are complex and require multi-stakeholder participation to ensure a sustainability transition (Hermans et al., 2015). Over recent years, research findings and knowledge exchange advancements have demonstrated that innovation and uptake of new farming practices are better supported by co-production through stakeholder interactions in non-linear knowledge networks or systems (cf. Wielinga et al., 2017; Faure et al., 2019). Innovation is viewed as a systematic and interactive process that emerges from social networks (Wielinga et al., 2017). There is also a clear direction within European research funding (for example, the historic H2020 and current Horizon Europe programmes) to support multi-actor and transdisciplinary approaches to the identification and development of innovative solutions for European agricultural sustainability, as well as the sharing of solutions through knowledge networks (cf. Sutherland and Marchand, 2021). One such project granted under a H2020 call was NEFERTITI-Networking European Farms to Enhance Cross Fertilisation and Innovation Uptake Through demonstration (2018-2022). NEFERTITI was a large project comprising 32 partners that established 10 interactive thematic networks, bringing together 45 regional clusters (hubs) across 17 countries.

Social networks are critical to the achievement of social learning, which is in turn crucial for sustainability transitions (Loeber et al, 2007). Social learning can be defined as learning beyond the individual, including information gathering and changing understanding between members of society or communities of practice (after McKee et al., 2015; Eastwood et al., 2022; Reed et al., 2010). A social learning process allows network members to interact and build social relationships that influence them, including identifying new roles, re-evaluating values and undertaking behavioural changes (Spangenberg et al., 2002 *in* Dlouhá et al., 2013). Characteristics of social learning processes include: (i) communication, i.e. in order to develop a shared understanding and create conditions for action; (ii) cooperation, including social networks and collaborative approaches; (iii) action, i.e. where actors are willing to participate in making changes; and (iv) reflection, where actors are invited to evaluate the process and transform the process into behaviour change (e.g. the uptake of innovative practices) (Dlouhá et al., 2013).

However, where there is a lack of strategic approach or common vision, social learning efforts may have a limited effect (Leeuwis, 2002). This paper highlights that learning in multi-actor settings requires a common understanding of the system in focus; indeed, Oreszczyn et al. (2010) underlines that boundaries are an important feature of successful social networks. As Tisenkopfs et al (2015, p.15) mention, "*to achieve learning and innovation in hybrid networks, actors have to align their diverse attitudes, motivations and values in to shared knowledge pool and collective or concerted action*". Accomplishing this requires boundary work that improves connections between different life-worlds, facilitate learning across the boundaries of these life-worlds and transformation of knowledge into innovation (Tisenkopfs et al., 2015). Tisenkopfs et al. (2015) refer to boundary work as the management or enabling of knowledge processes across these boundaries of different life-worlds. Wenger (1998) adopted the concept of boundary objects in social learning theory, to refer to artifacts that function at the boundaries between communities of practice. A 'boundary object' is shared by different communities but used differently by each of them according to their own context (Tisenkopfs et al., 2015). They can take the forms of (i) artefacts, such as tools, documents or models; (ii) discourses, i.e. a common language that allows people to communicate and negotiate meanings across boundaries; or (iii) processes, therefore shared processes, including explicit routines and procedures that allow people to coordinate their actions across boundaries. (Wenger 1998, 2000; *in* Moschitz and Home, 2012). Tisenkopfs et al (2015) acknowledge a link between network development and boundary objects, and the transition from early to more evolved development stages, requiring more complex boundary work to achieve goals.

The NEFERTITI project also dealt with another level of complexity, relating to the multiple thematic networks in the project and their role in an EU project. Even in projects consisting of one thematic network, network facilitation is necessary for establishing network structures, arranging activities within a network, and coordinating knowledge transfer and knowledge exchange (Mueller, 2021). Network facilitation, as a form of network governance, can be complicated as network facilitators must respond to multiple relationships, diverse capacities and opinions within networks and "*balance the tension between organisational and network interests*" (Wincent et al., 2013 *in* Mueller, 2021: 82). As Lambrecht et al. (2018: 2) explain, network governance involves the "*use of institutions and structures of authority and collaboration to direct, administer and control joint actions across the whole network*". In NEFERTITI, the governance was complicated with multiple networks that had to be aligned to fit within a joint project. Therefore, boundary objects created within NEFERTITI were not only required to serve the networks themselves, but also the exchange between the networks to enable collaboration within the project.

This paper highlights tensions between an apparent 'top-down' approach of prescriptive EU funding models and resultant projects, as well as the challenges and opportunities of working with a diversity of partners, and the need for organic, bottom-up network creation, that embeds network ownership with the participants from the outset. These 'tensions' and opportunities for sustainability are detailed in a longitudinal analysis of the networking approach adopted by the NEFERTITI project.

Methodology

NEFERTITI was a H2020 project running from 2018 to2022 (https://nefertiti-h2020.eu/), within which 10 interactive, thematic networks were established bringing together 45 regional clusters (hubs) of demonstration farmers and other key actors (e.g. advisors, NGOs, industry, education, researchers and policy makers) across 17 countries. NEFERTITI focused on creating added value from the exchange of knowledge between networks in order to boost innovation uptake, and to improve peer-to-peer learning and network connectivity between farming actors across Europe.

Given the size and the complexity of the project, several governance units were set up:

- An Executive Committee (ExCom) representing all work package leaders, that oversaw the delivery of the project outputs and outcomes as approved in the Grant Agreement by the EU.
- Networks: that involved a network leader and 4 to 6 hub coaches working on a shared theme in different countries. In this paper, we will describe the hub coaches and network leaders as network members.
- Hubs: representing a hub coach, farmers and other actors organising 15 demonstration events on a specific theme in the course of the project. In this paper, we will describe them as network participants.

In the course of the project, a range of documents were developed and identified as data sources for analysis. These documents included: Dynamic Action Plans developed by the networks, minutes and reports from workshops during the annual meetings, minutes from reflection sessions with networks, as well as short qualitative surveys with network leaders and hub coaches. This diversity of data sources allowed for a rich data set that was the focus for a longitudinal analysis reflecting the occurrence and mitigation of challenges facing the networks. We performed a thematic analysis on all data sources. We analysed the data manually using the online tool Mural to collate nodes under codes. We added a colour coding to the different types of sources, in which we analysed using a deductive approach. The research team exists of one person who was part of the ExCom, one person who was a hub coach and one person who was not actively involved in the project. This diversity of perspectives was important to help to mitigate unconscious bias, but also added to a better understanding of the data sources.

Findings

We clustered our findings starting from the needs reported by the networks in the course of the project, followed by the boundary objects generated in the project to answer those needs.

At the outset of the project (i.e. during Year one), the following needs were reported by the networks: the need for clarity on expectations from the project; the need for ownership building, team building and trust building; and the need to build network relationships. During this phase it appeared that all project participants were searching for clarity on project direction, to find their place within the project and their network, and to try to establish the expectations of the project. After this first year when expectations, network structures and processes were clarified, the identified needs shifted towards the need for knowledge exchange activities and methods to capture the knowledge exchanged, the need for capacity building on network facilitation and knowledge exchange methodologies, and a need for network management tools. Only in the final years of the project, the networks expressed a need for a network sustainability approach.

Multiple boundary objects were developed in the course of the project to respond to these needs, including artefacts, processes, discourses and shared languages. Important artefacts were developed (i.e. tools and documents), including multiple guidance documents on how to set up a network or a hub, templates for reflection, a platform for farmer and demo event registration, and the Farm Demo Training Kit (trainingkit.farmdemo.eu), which collated useful information on how to organise a farm demo event. Shared processes and procedures were put in place, such as for the organisation of cross visits, continuous evaluation, learning and improvement procedures (e.g., for demo event organisation) and for reflection (e.g. the annual review and adaptation of the network's Dynamic Action Plans). Both these artefacts and processes contributed to the development of a common language which enabled communication within the project across the networks, for example on best practice farm demo organisation. Project meetings, such as (physical) annual meetings, contributed to the generation of this shared discourse within NEFERTITI.

The initial aim of boundary object development was to facilitate network functioning and thus the successful implementation of the project. They contributed to clear communication and collaboration between the ten networks within the project. At a later stage, some of the artefacts generated for the purpose of good project functioning, were translated into useful tools for the broader farming and project community outside of NEFERTITI. For example, this led to the development of the FarmDemo Training Kit, translated into 23 EU languages, and accompanied by multiple training events on best practice in on-farm demonstration. The boundary objects therefore contributed highly to project impact.

Many boundary objects were developed based on the principle of providing enough flexibility and adaptability to the different networks and regional contexts, whilst still allowing exchange and comparable results for the production of project deliverables. Typically, after an expression of needs by the network members, the ExCom initiated the development of procedures and artefacts, after which they informed, consulted and trained the network participants (e.g. during project meetings) and eventually adapted the procedures and artefacts according to participant feedback. This procedure was highly defined by the way the H2020 project was set up, namely with an ExCom responsible for developing project procedures, and practitioner partners applying the procedures in the field. Because the project had to report about 10 networks in a coherent way, top-down procedures were imposed on the networks. Such an approach involves a risk of over-structuring the networks, thus limiting the creation of ownership within the networks. This was also seen in course of NEFERTITI, evidenced by the limited initiative within the networks to deal with some of the needs they detected, for example, the need for ways to capture the knowledge exchanged and learning within the networks. They often expected that the ExCom took the initiative in responding to this need. This could be related to the networks becoming reliant on the ExCom to deliver such boundary objects, and to the networks' budget.

Our analysis also shows that objectives and needs of the networks changed during the project. At the beginning, network participants reported very diverse objectives for the networks, ranging from learning from each other on the network themes, raising awareness on the networks' themes, solving big problems in agricultural sectors, exchanging and participating in EU projects. Specifically, learning from each other on agronomic aspects of the network themes was seen as the main focus of the networks at the start of the project. The project objective of learning how to organise effective farm demonstrations was largely not recognised by the network members at the start of the project, despite that it was one of the themes that was shared amongst all ten networks. During the project, however, and due to the development of the boundary objects by the ExCom which forced the networks to reflect on the organisation of their demo events, the focus shifted. This shift in focus was very apparent during the COVID crisis, when networks suddenly started to report the need to exchange experiences on how to organise virtual demo events.

The COVID crisis clearly indicated how boundary objects in the project were the result of a shared governance approach. The ExCom, therefore, initiated the development of boundary objects based on a need expressed by the network members for information on how to proceed organising farm demonstrations during the COVID crisis. In order to respond to this need, the ExCom reviewed available literature and translated key messages into useful guidelines for the networks and virtual training sessions for all hub coaches. Later, the ExCom organised several exchange sessions at the request of network members, during which hub coaches exchanged their experiences regarding organising virtual demo events. Frequently asked questions from hub coaches were also gathered and answered by the ExCom in a shared document. This intensive exchange of experiences and knowledge between the ExCom and the networks contributed to steep learning curves on virtual demo events amongst network members, which is a great example of the social learning processes taking place in NEFERTITI. At the end of the project, the primary guidelines for virtual demonstrations, the shared experiences of the hub coaches, the frequently asked questions, and some testimonials from hub coaches, were translated into a new boundary object by the ExCom, namely the demo design guide for virtual and hybrid demo events. This output has proven useful for a wider community of other EU projects, thus supporting the project sustainability.

Practical and theoretical implications

The longitudinal analysis of this critical case study illustrates how the management of an EU project responded to the needs of participating networks through the provision of supportive tools and procedures (i.e. boundary objects), and in so doing, established a collaborative and shared governance model, with positive implications for network sustainability and social learning by network participants. This analysis highlights the important balance between being prescriptive to allow functioning within the H2020 context, and stimulating creativity and initiative within project networks to stimulate ownership and sustainability, post project.

This paper illustrates how boundary objects developed collaboratively through the NEFERTITI project responded to the multiple and changing needs of the network actors. The concept of boundary objects helped to conceptualise the practical work in the project. It shows how boundary objects can be used to create opportunities for social learning, therefore promoting knowledge exchange of innovative practices and supporting reflective practice. We show that tools developed in the project spanned both the local and regional networks, as well as wider European communities of practice, therefore demonstrating the value of generating boundary objects for project sustainability.

References

Dlouhá, J., Barton, A., Janoušková, S., & Dlouhý, J. (2013). Social learning indicators in sustainability-oriented regional learning networks. *Journal of Cleaner Production*, *49*, 64-73.

Eastwood, C. R., Turner, F. J., & Romera, A. J. (2022). Farmer-centred design: An affordances-based framework for identifying processes that facilitate farmers as co-designers in addressing complex agricultural challenges. *Agricultural Systems*, *195*, 103314.

Faure, G., Knierim, A., Koutsouris, A., Ndah, H. T., Audouin, S., Zarokosta, E., ... & Heanue, K. (2019). How to strengthen innovation support services in agriculture with regard to multi-stakeholder approaches. *Journal of Innovation Economics & Management*, *28*(1), 145-169.

Hermans, F., Klerkx, L., & Roep, D. (2015). Structural conditions for collaboration and learning in innovation networks: using an innovation system performance lens to analyse agricultural knowledge systems. *The Journal of Agricultural Education and Extension*, *21*(1), 35-54.

Lambrecht, E., Crivits, M., Lauwers, L., & Gellynck, X. (2018). Identifying key network characteristics for agricultural innovation: a multisectoral case study approach. *Outlook on Agriculture*, *47*(1), 19-26.

Leeuwis, C., Pyburn, R., & Röling, N. G. (2002). *Wheelbarrows full of frogs: social learning in rural resource management: international research and reflections*. Koninklijke Van Gorcum.

Loeber, A., van Mierlo, B., Grin, J. & Leeuwis, C., 2007. The practical value of theory: conceptualising learning in the pursuit of a sustainable development. In: A. E. J. Wals, (Ed.), Social learning towards a sustainable world. Wageningen, The Netherlands: Wageningen Academic Publishers, pp. 83–97.

McKee, A., Guimaraes, M. H., & Pinto-Correia, T. (2015). Social capital accumulation and the role of the researcher: An example of a transdisciplinary visioning process for the future of agriculture in Europe. *Environmental Science & Policy*, *50*, 88-99.

Mueller, E. F. (2021). Towards a theory of network facilitation: a microfoundations perspective on the antecedents, practices and outcomes of network facilitation. *British Journal of Management*, *32*(1), 80-96.

Oreszczyn, S., Lane, A. & Carr, S., 2010. The role of networks of practice and webs of influencers on farmers' engagement with and learning about agricultural innovations. Journal of Rural Studies, 26(4), pp.404–417.

Reed, M. S., Evely, A. C., Cundill, G., Fazey, I., Glass, J., Laing, A., ... & Stringer, L. C. (2010). What is social learning?. *Ecology and society*, *15*(4).

Sutherland, L. A., & Marchand, F. (2021). On-farm demonstration: enabling peer-to-peer learning. *The Journal of Agricultural Education and Extension*, *27*(5), 573-590.

Tisenkopfs, T., Kunda, I., Šūmane, S., Brunori, G., Klerkx, L., & Moschitz, H. (2015). Learning and innovation in agriculture and rural development: The use of the concepts of boundary work and boundary objects. *The Journal of Agricultural Education and Extension*, *21*(1), 13-33.

Wenger, E. (1998). Communities of practice: Learning as a social system. *Systems thinker*, *9*(5), 2-3.

Wielinga, E., Koutsouris, A., Knierim, A., & Guichaoua, A. (2017). Generating space for innovations in agriculture: the AgriSpin project. *Studies in Agricultural Economics*, *119*

Supporting collaborative and participative learning through cross-cases quali-quantitative analysis. The case of the European project DiverIMPACTS

Margot Leclere[a,b], L. Gorissen[b,c], Y. Cuijpers[b], L. Colombo[d], M. Schoonhoven-Speijer[d], W.A.H. Rossing[d]

[a] Université Paris-Saclay, INRAE, AgroParisTech, UMR Agronomie, 91477, Palaiseau, France
[b] Farming Systems Ecology Group, Wageningen University and Research, PO Box 430, 6700AK Wageningen, The Netherlands
[c] University of Twente, Section of Science, Technology and Policy Studies (STePS), Netherlands
[d] FIRAB, Fondazione Italiana per la Ricerca in Agricoltura Biologica e Biodinamica, Rome, Italy

Short abstract:

Diversified cropping systems can contribute to the fundamental reorientation of food production. However, changes towards crop diversification will need to rely on the coordinated mobilization of many stakeholders. A way to stimulate this mobilization for change is through the formation of innovation niches. Various authors have pointed at the lack of operational guidance from high-level theories on innovation governance for actors in innovation niches, having to cope with the inherent complexity and unpredictability. As a result, researchers and other societal actors involved in crop diversification initiatives often lack concrete action perspectives, referring to ideas and expectations on what they can do to achieve their goals. The aim of this study was to support actors in coping with complex and unpredictable situations, and the associated task uncertainty by sharing empirical examples of real-world crop diversification initiatives. First, we proposed a framework to describe how actors within innovation niches organized themselves, worked and learned together to stimulate a transition towards crop diversification. Then, we performed a cross-analysis of 25 multi-actor initiatives on crop diversification spread across 10 European countries to highlight patterns in their ways of working towards crop diversification. We assume that these results are valuable for project leaders of innovation niches to monitor and analyse their change processes toward sustainability jointly with practitioners.

Extended abstract

Purpose

There is growing evidence that diversified cropping systems can contribute to the fundamental reorientation of food production by simultaneously improving multiple outcomes of agricultural production systems, such as enhancing soil and water quality, biodiversity, and climate change mitigation and adaptation (Beillouin et al., 2021). However, changes towards crop diversification will need to rely on the coordinated mobilization of many stakeholders as part of system innovation and transition (Meynard et al., 2018). A way to stimulate this mobilization for change is through the formation of innovation niches. Innovation niches are physical, ecological, technological, and virtual spaces where a diversity of stakeholders come together to develop and experiment with new modes of production and institutional arrangements that enable interactions across boundaries (Schot and Geels, 2008). Agricultural innovation niches are nested within overarching agricultural innovation systems, which are increasingly understood as complex adaptive systems (CAS). Various authors have pointed at the lack of operational guidance by high-level theories on innovation governance for actors in innovation niches, having to cope with CASs' inherent complexity and unpredictability (Douthwaite and Hoffecker, 2017; Ingram et al., 2020). As a result, researchers and other societal actors involved in crop diversification initiatives often lack concrete action perspectives, referring to ideas and expectations on what they can do to achieve their goals (Roorda, 2020). Therefore, theory development is needed around questions of how actors in innovation niches deal with task uncertainty and the processes of how they formulate concrete action perspectives fostering food system transitions. The aim of the study is twofold: to fill this scientific gap by developing a middle-range theory to address the 'how to' question, and to share empirical examples of real-world crop diversification initiatives to provide guidance to support actors in coping with complex and unpredictable situations and the associated task uncertainty. We performed a cross-analysis of 25 change-oriented Case Studies (CSs) consisting of existing and newly elaborated multi-actor initiatives on crop diversification spread across 10 European countries and considered as innovation niches. This work also aims to illustrate how such reflexive cross-analysis in research and innovation projects can contribute to enhancing social learning and keeping the energy high among the partners.

Design/Methodology/Approach

DiverIMPACTS (Diversification through rotation, Intercropping, Multiple Cropping, Promoted with Actors and value-Chains Towards Sustainability) was a five-year (2017-2022) European project that aimed 'to achieve the full potential of diversification of cropping systems for improved productivity, delivery of ecosystem services and resource-efficient and sustainable value chains' (https://www.diverimpacts.net/). At the beginning of the project, a network was set up of 25 change-oriented Case Studies (CSs) consisting of existing and newly elaborated initiatives on crop diversification spread across 10 European countries. As part of this project, the CSs were embedded in an actor-oriented approach called co-innovation. Co-innovation is based on jointly identifying problems and co-creating potential solutions through a collective learning process of a range of actors and builds on insights from niche governance, participatory impact pathway analysis, and outcome mapping, mobilizing various reflexive monitoring tools (Rossing et al., 2021). An important dynamic monitoring and evaluation element involved semi-structured self-assessments of the CSs. These helped the CS participants become aware of where they stood, where they wanted to go, and make their hypotheses of how to get there explicit, while taking into account the complexities and unpredictability of the system they had to cope with. These reflexive self-assessments constitute this paper's primary data sources, supplemented with participatory observations during the three rounds of co-innovation workshops, the annual project meetings, and various ad hoc meetings.

First, drawing on insights from transition and innovation theory and our own experiences in innovation projects, we developed a descriptive framework that aimed to unpack the key components in the CSs' ways of working towards crop diversification. We considered change towards crop diversification as a dynamic process during which a diversity of actors (farmers, consumers, advisors, researchers, policymakers, etc.), in response to an unsatisfactory situation, collectively and collaboratively explore, design, implement, and assess various options to work towards a shared overarching objective. We also assumed that, as part of this process, learning based on reflexivity allows for changing and adapting processes to generate desired results. Therefore, for each CS, we gathered and formalized information about motivations (reasons for emergence of the CS), participants (diversity of actors and stakeholders involved in the CS), intervention levels (levels at which the CS worked and aspired to induce change), activities (main types of activities of the CS and their sequence in time), and learnings (lessons learned in dealing with uncertainties).

Next, we cross-analysed results to highlight patterns among the CSs in their ways of working towards crop diversification combining complementary approaches. Borrowing from work on 'modes of ordering' and mobilizing our empirical knowledge of the CSs, we first inductively grouped the 25 CSs showing similarity. Then, to enhance the robustness of this grouping, we performed complementary statistical Multiple Factor Analysis (MFA). MFA is a multivariate data analysis method used to summarize and visualize data in which a set of individuals is described by several groups of variables (Pagès, 2002). This method takes into account the contribution of all groups of variables to define distances between individuals.

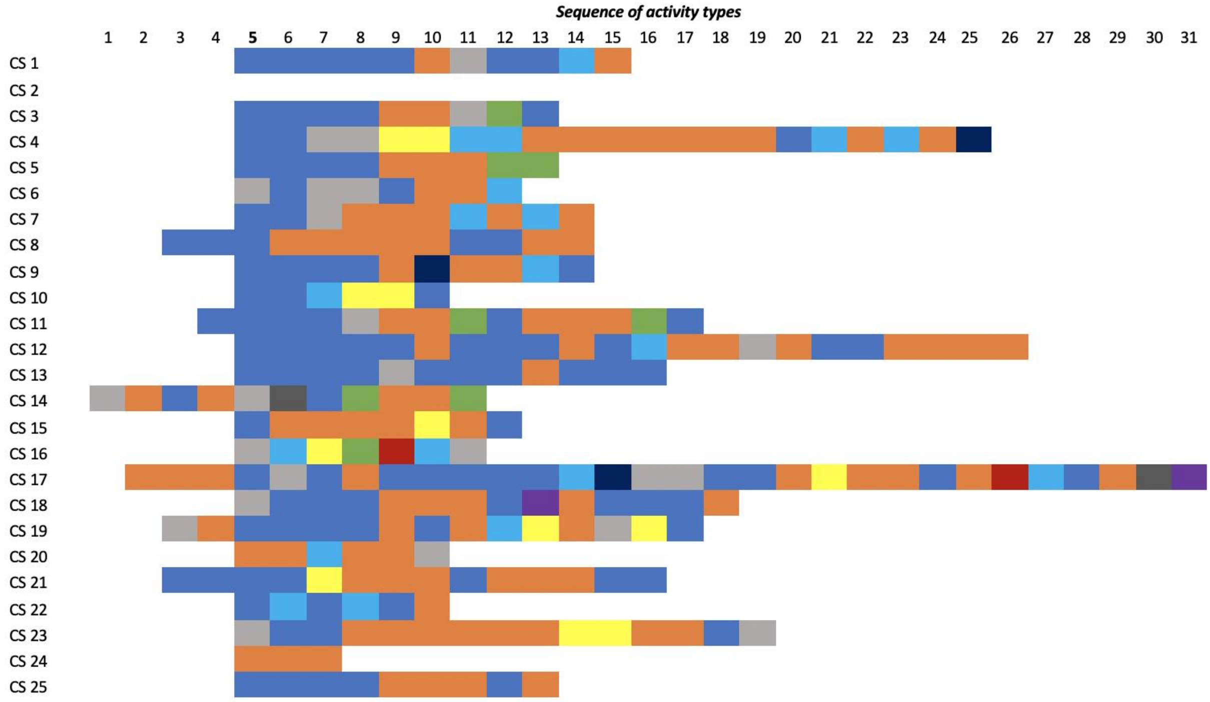
Findings

Diversity across the 25 CSs of DiverIMPACTS in their ways of working towards crop diversification.

The analysis highlighted the diversity in the way of working towards crop diversification across the 25 CSs. Each CS revealed to be motivated by a specific combination of pedoclimatic, agronomic, environmental, economic, organizational, political and/or societal reasons, involved a unique panel of participants, and developed its own sequence of activities (Fig. 1). The learning profiles resulting from this process were also unique to each CS.

Figure 1: Sequences of the activity types developed by the 25 CSs during DiverIMPACTS (Events 5 to 31) and before (Events 1 to 5). Each sequence is composed by a succession of events classified into eleven types of activities. Each type of activities has been coded into one specific colour: blue = action plan development; orange = generating knowledge; grey = building partnerships/alliances; light blue = promoting certain models; green = technical assistance; yellow = knowledge dissemination; dark blue = direct advocacy and lobby; dark grey = expand geographically; red = influence public policy; purple =

packaging/licencing. No sequence is presented for CS2 as they did not report on their sequence of events in their learning history.



Inductive identification of patterns in the ways of working towards crop diversification.

In total, seven groups of CSs were defined based on the inductive approach (Figure). The *first group* gathered CSs that worked on fostering co-learning between farmers and developing participatory approaches. In this group, farmers are the main actors involved. The core teams, mainly formed by actors from advisory structures or technical institutes, play a key role in facilitating the farmers' network, but also contribute to the production of knowledge to be shared within the network. Activities within the CSs of this group are centred on generating knowledge, mainly through on-farm trials and field visits, and on knowledge dissemination through the publication of different written documents (scientific papers, article in farmers magazine, technical guides, etc.). The *second group* gathered CSs that specifically worked on enhancing cooperation between farmers. The shared ambition of the CSs of this group was to develop sustainable and viable partnerships between arable and livestock farmers. To do so the CSs brokered, documented, and evaluated ongoing cooperation among a few pioneers in order to communicate their results to a wider group of farmers aiming to expand the practice to a bigger scale. The *third group* promoted strip cropping through the development of a community of practice, defined as 'a group of people who share a concern or passion for something they do and learn how to do it better as they regularly interact'. In terms of activities, a lot of energy is put into the promotion of the strip cropping model, the dissemination of knowledge using different communication media (e.g. posters, brochures, pictures) and into the expansion of the actor network (meetings, awareness campaigns, etc.). The *fourth group* was concerned with gradually removing lock-ins to support the introduction of diversifying crops. The common strategy embraced by the CSs was to support the introduction of new crops by concomitantly addressing agronomic issues, developing niches for the commercialization of these new crops or their derived products, and removing technological and regulatory barriers at the value-chain level when necessary. This group is characterized by the involvement of upstream and downstream actors and policy makers, in addition to farmers. The *fifth group* dealt with CSs that worked at aligning actors to create value chains to enhance grain legume production, with a specific focus on low input or organic legume-cereal intercropping. A specificity of this group is that the CSs are organized around institutional entrepreneurs that are negotiating with upstream or downstream actors to structure the value-chain and develop fair prices all along it. The *sixth group* was about fostering locally integrated food systems for legumes and vegetables in response to a growing interest from consumers in local, organic and/or vegetarian food. This group is characterized by the central positioning of the consumers within the overall dynamic of the CSs. One of the specificities of this group in terms of activities is to achieve consumer-oriented actions, such as food jams, food tasting, consumer preferences surveys, or awareness-raising campaigns (storytelling, TV reports and shows, etc.). The *seventh group* gathered CSs that all shared the objective of creating sustainable, future-proof farming systems as solutions to regional 'wicked' situations with multiple intertwined problems. As a consequence, the shared strategy is to empower and support the stakeholders by exploration of ideas, renewing their way of working, etc., to find a way out of the wicked situation. A specificity of this group is that the participants are mainly involved as stakeholders, meaning that the more active actors are the CS core teams, oftencoming from research or technical institutes or advisory structures

Robustness of the grouping based on the MFA approach
Using the first four dimensions of the MFA, explaining 41% of total variance, proximities between CSs of some of the groups were confirmed. For instance, CSs in the sixth group were also identified as close with the MFA because they all had societal motivations, involved consumers and worked at the food system level. The MFA also showed that CSs that were identified as very close with the inductive approach (e.g., CSs from group 4) were quite different, in that case in the type of activities performed. Finally, the MFA highlighted proximities between CSs that were assigned to different groups. For instance, CS14 and CS17 (respectively identified as part of groups 1 and 5) were showed as close because of the common types of activities they were implementing to "scale-up" their learnings and methods.

Practical Implications

The results of the quali-quantitative framework describe how actors within innovation niches organized themselves and worked and learned together to stimulate a transition towards food systems based on crop diversification in the DiverIMPACTS project. They were used within the project context to stimulate reflection of case study leaders on their way of working by comparison and discussion with peer case studies. Outside the project the approach is proposed as a means to enhance reflexivity among actors involved in innovation niches. The groups identified halfway through the 5-year project may serve other projects by acting as examples of how actors organize themselves in order to bring about changes focusing at different levels and mobilizing different activity types.

Theoretical Implications

We developed a framework to highlight how actors in innovation niches deal with task uncertainty and the processes of how they formulate concrete action perspectives fostering transitions towards diversified crop production. Within the DiverIMPACTS project, we used the results to inform social learning cycles that may be used to reduce task uncertainty of innovation niche actors by revealing past actions in their niche in comparison with those in other niches, and the action perspectives that emerge from the analysis.
In terms of methods, this study showed how combining inductive and statistical approaches brought out relevant similarities and differences among the CSs that provided input for reflection and cross-case study learning.

References

Beillouin, D., Ben-Ari, T., Malézieux, E., Seufert, V., Makowski, D., 2021. Positive but variable effects of crop diversification on biodiversity and ecosystem services. Glob. Change Biol. 27, 4697–4710. https://doi.org/10.1111/gcb.15747

Douthwaite, B., Hoffecker, E., 2017. Towards a complexity-aware theory of change for participatory research programs working within agricultural innovation systems. Agric. Syst. 155, 88–102. https://doi.org/10.1016/j.agsy.2017.04.002

Ingram, J., Gaskell, P., Mills, J., Dwyer, J., 2020. How do we enact co-innovation with stakeholders in agricultural research projects? Managing the complex interplay between contextual and facilitation processes. J. Rural Stud. 78, 65–77. https://doi.org/10.1016/j.jrurstud.2020.06.003

Meynard, J.-M., Charrier, F., Fares, M., Le Bail, M., Magrini, M.-B., Charlier, A., Messéan, A., 2018. Socio-technical lock-in hinders crop diversification in France. Agron. Sustain. Dev. 38, 54. https://doi.org/10.1007/s13593-018-0535-1
Pagès, J., 2002. Analyse factorielle multiple appliquée aux variables qualitatives et aux données mixtes. Rev. Stat. Appliquée 50, 5–37.
Roorda, N., 2020. Fundamentals of Sustainable Development, 3rd ed. Routledge, London. https://doi.org/10.4324/9781003052517
Rossing, W.A.H., Albicette, M.M., Aguerre, V., Leoni, C., Ruggia, A., Dogliotti, S., 2021. Crafting actionable knowledge on ecological intensification: Lessons from co-innovation approaches in Uruguay and Europe. Agric. Syst. 190, 103103. https://doi.org/10.1016/j.agsy.2021.103103
Schot, J., Geels, F.W., 2008. Strategic niche management and sustainable innovation journeys: theory, findings, research agenda, and policy. Technol. Anal. Strateg. Manag. 20, 537–554. https://doi.org/10.1080/09537320802292651

The Eco Analysis: a tool for facilitating co-creative processes

Bowine Wijffels[1] and Eelke Wielinga[2]

[1]Province of South Holland / Netwerk&Co
[2] LINK Consult / Netwerk&Co

Short Abstract

Interactive innovation is at the core of EU policies for stimulating innovations in agriculture. For the major challenges facing agriculture today the Transfer of Technology approach in innovation support is not enough. Efforts for finding sustainable solutions should also go beyond the delivery mode: clients will not ask for what they don’t know or should know. The key question is what key actors can make possible together if they share their resources in innovation networks and embark on a discovery journey.

Facilitation in this co-creation mode requires more than discussion techniques. Tools for co-creation allow for recognising patterns in collaborative processes and identifying possible options to intervene in the situation that occurs. Examples are the Spiral of Innovations, the Circle of Coherence, the Triangle of Co-Creation, and the Network Analysis (Wielinga et al 2008, 2009, 2020).

In this contribution we add another tool to this package: the Eco-Analysis. Although we work with it already for some time, a scientific description has not been published so far. *The Eco-Analysis explores the viability of a network.* A vital network is responsive: it is capable of generating effective responses to changes in its environment and it will renew itself. In interactive innovation it is crucial that actors build such networks with the right partners and maintain healthy relationships in order to overcome barriers and to find sustainable solutions.

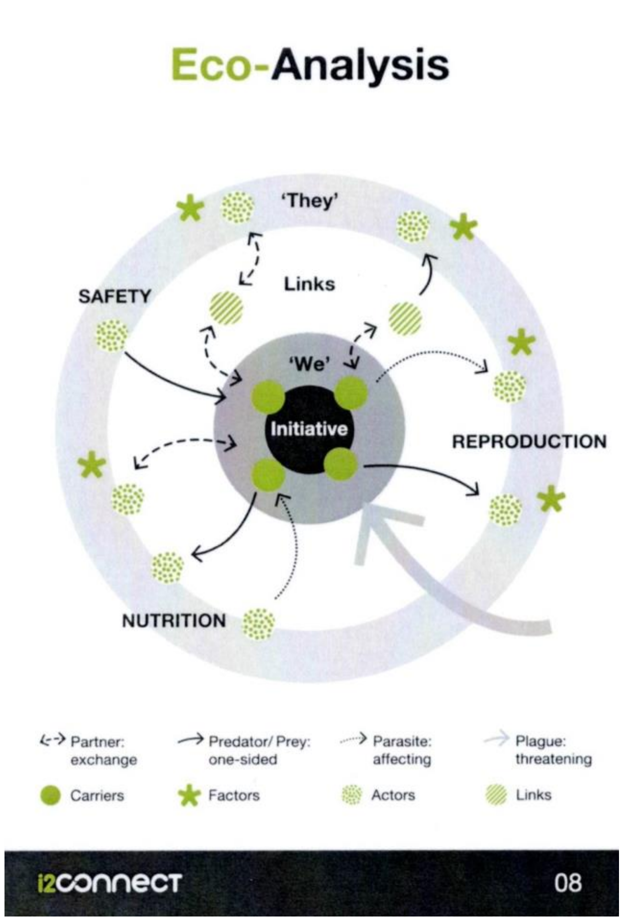


Figure 1 : The Eco-Analysis.
Quick Reference Card set i2connect project

This contribution builds on the work of the Biomimicry movement (Janine Beyus, Biomimicry.net) and the Living Networks theory (Wielinga 2001, 2020). It offers a theoretical framework with practical implications for trainers and facilitators in co-creative processes.

Extended abstract

More than communication techniques

Facilitators need good communication skills: the ability to listen, to show empathy, to structure interactive meetings, to stimulate dialogue, etc. On top of such skills, interactive innovation processes require the ability to navigate in unknown areas. The outcome is unknown (otherwise nothing new comes out), and the path to follow needs to be discovered. Multiple actors are involved, each with their own reasons to embark on the discovery journey. Here, the art of facilitation is to recognise patterns in interaction and to act accordingly, in order to maintain and increase the ‘vital space’ of the network (Wielinga 2001, 2020) in which actors are willing to collaborate for finding solutions. The above-mentioned tools for co-creation have been designed for this purpose.

The Eco-Analysis brings the larger context into the picture in which the innovation network operates. The chance that an interactive innovation process will lead to valuable and sustainable solutions depends on the viability of the network of actors engaged. This viability is not only related to the internal communication, but also to the connections between the network and its external environment. Does the network have access to essential resources? What is its position in the larger power structure? And what does it contribute to the larger whole?

An ecological view on innovation networks

Much is known about the resilience of ecosystems. Gunderson (2010) describes two types of ecological resilience: *ecological resilience* and *operational resilience*. The first is defined as the capacity of an ecosystem to change into another ecosystem in order to be more adapted to the changed environment. Operational resilience is the capability of an ecosystem to 'absorb' changes by making internal changes. Resilience in general is described as the speed in which as system can adapt. Berkes (2002) draws lessons from social-ecological systems for building resilience in complex human systems. Hawken (1999) proposes the concept of *natural capitalism* for creating a next industrial revolution. And Bateson (1987, 2000) speaks of an *ecology of mind*. According to the Living networks theory, human networks are living creatures, following the same organising principles as any organism in nature. Any cell, individual, or ecosystem has an energy management system for maintaining its internal processes and its connections to the larger system it is part of. An organism is viable as long as it is connected and responsive: capable of renewing itself in response to changes in its environment.

According to the design principles of Biomimicry and the work of Hutchkins (2012) each organism has three basic needs in order to survive: [1] Nutrition, [2] Safety, and [3] Reproduction. This distinction offers a tool to explore to what extend the network is connected to necessary actors in the world outside. Furthermore, the position of other creatures vis-à-vis an individual in nature can be characterised as [a] partner, [b] predator, [c] prey, [d] parasite, or [e] plague. This distinction leads to analysis of the quality of relations between a network and actors outside. These eight parameters form the basis of the Eco Analysis. In the next paragraph these parameters will be further explained.

The Network Analysis

The Eco-Analysis builds upon the Network Analysis. This tool takes the *initiative* as point of departure: the idea for which people started an action. An initiative is not equal to a goal. A goal is the visualisation of the end result, whereas the initiative expresses the desire to change. The process might lead to different outcomes. It is the desire which provides the energy to act.

People who carry this initiative form a *'We' network*. The initiative becomes successful if actors in the outside world will move. They form the *'They' network*. Most of these actors cannot be influenced directly by the carriers. Therefore, the crucial step in the Network Analysis is to identify '*Links*': actors who can act as intermediaries between the carriers in the '*We'* network and people in the '*They'* network. This analysis leads to a strategy for whom to approach, by whom, and with what request.

The Network Analysis distinguishes factors, aspects of the change to be addressed, and actors: people who embody this factor. For example: if the public opinion is a factor to be influenced, then journalists are actors to be reached. Which persons within reach of one of the carriers could link the '*We'* network to those journalists?

The Network Analysis leaves some important questions open to the analysts. When is the picture of actors in the '*They'* network sufficiently complete? And, how to deal with actors who actively counteract the initiative? For these two questions, the Eco-Analysis helps to make further steps.

Basic Needs in the Eco-Analysis

In order to identify actors which are important for the initiative to yield results, the three basic needs are helpful as main categories of factors.

[1] Nutrition, refers to all resources an organism needs to maintain itself and to fulfil basic tasks. It needs nutrients, water, and energy.

Human networks need resources like money, knowledge, instruments and working power. They need energy too. A healthy network generates energy, because it fuels the hope of network members that the ambitions which they share can be realised by collaborating. But it starts with the energy individuals are contributing with their motivation.

[2] Safety, refers to all factors that protect or threaten the organism. Decay and death are part of nature. If an organism cannot perform its function anymore it will be destroyed. Life is a continuous balancing act between constructive and destructive powers.

Human networks always operate in a context of power relationships. Some can be supportive, others are threatening.

[3] Reproduction, refers to the processes through which organisms ensure the survival of the species while individuals have a limited lifespan. In ecosystems all species have their function. At the level of an ecosystem, reproduction is about the maintenance of these functions.

Human networks are viable when they are serving. Working on ambitions gives genuine fulfilment when these ambitions reach beyond the interests of the individual. Reproduction in the human context refers to the factors which call for change. The network might be temporary, and the network members might continue working for the same purpose in a different network composition.

In sum, the Eco-Analysis adds three questions to the network analysis while identifying factors and actors to be influenced:

- How to ensure essential resources?
- How to create a safe space for developing the initiative?
- How to secure the contribution of the network to the larger entity it is part of?

Five types of relationships

Bugs, snakes, and other organisms in the soil shelter under a stone (safety). Flowers treat bees on a nice meal (nutrition) to attract them for pollination purposes (reproduction) and so on. In order to meet the basic needs all organisms relate somehow to their biotic and a-biotic environment. Some types of relationships are more reciprocal than others. 'Eat or be eaten' is common in nature. Competition is essential for keeping balance at the level of an ecosystem, although the rabbit being chased by a fox probably will not feel fulfilment in being part of it. At the higher level of ecosystems, evolution is thriving for complementarity. Systems with a rich biodiversity are more resilient and responsive than monocultures. The same is true for human systems: reciprocal relationships create more vital space. Therefore, it is relevant to explore different types of relationships and seek options to curb detrimental relations into healthy ones.

[a] Partners, relate to each other to the benefit of both. There are many symbiotic relationships in nature. 'Win-win' in human relations can range from single transactions to stable relationships which allow for specialisation and task division.

[b] Predators, feed themselves on their prey. Predation means using biotic elements for food. Healthy living systems create a surplus (Wielinga 2020), and for keeping balance predators are essential. Predators can also compete with each other. Healthy competition stimulates the strengthening qualities and specialisation. When it comes to fighting, the gain of one is the loss of the other. The same mechanisms are recognisable in human systems.

[c] Preys, serve as feed for their predators. In human systems, preys are the losing part of the competition.

[d] Parasites, are intruding and live at the cost of their host organism. Parasites are important for cleaning up what does not function well anymore. In human systems, there are always parasites probing the mechanisms which protect the identity of a network.

[e] Plagues, are overwhelming attacks in large numbers. Their function in ecosystems is to clean up unhealthy monocultures. In human systems, plagues can be recognised in powerful phenomena which threaten healthy relationships in networks. Examples are widespread corruption, criminality, authoritarian regimes, fanaticism. Sometimes social media serve as channel for plagues.

Building the larger network: options for action

After completing the picture with the central initiative, actors to be influenced, and identifying the relationships the 'we' network has to deal with, the next question is: what can be done? The answer is different for each type of relationship.

<*a*> *Partnerships*: This is what the carriers are hoping for: relationships for mutual gain. Vital space which allows for task division and specialisation, for learning and creativity. Such space requires conscious maintenance. Investing in partnerships contributes to the vitality of a network and its capacity to respond to challenges.

<*b*> *Predators:* In human networks, dealing with predators means competition or fight. Fight causes damage, but sometimes it is inevitable when losing would be even more detrimental. Predators should be kept away from vital and scarce sources of the 'we' network. Competing can be stimulating. In the larger context, the aim is to look for complementarity, creating balance between give and take, and making use of all qualities for a purpose that goes beyond individual interests.

<*c*> *Preys:* Actors as preys serve others at the cost of themselves. If their function is to be continued, the balance between costs and benefits needs to be improved towards partnership.

<*d*> *Parasites:* In human networks, parasites are those who abuse common structures for their own benefit. Every network has an identity, with rules, procedures, and benefits for those who are part of it, as well as defensive mechanisms in order to keep its internal interactions stable and beneficial (Wielinga 2020). Parasites break through this defence and profit from the benefits without contributing what it takes to keep the network healthy. When parasites appear, this is a signal of weaknesses in the defence, which are to be repaired. Self reflection might be needed to investigate signs of decay which made the network attractive to parasites.

<*e*> *Plagues:* In human networks, plagues are too big to be countered by the 'we' network. They are part of destruction after which a new order will emerge. New life always starts small, with healthy nuclei which connect and form larger structures. In the transition theory of Rotmans (2017) and Loorbach (2016) this is visualised in an X curve. The declining line shows old structures which cannot cope with the actual challenges anymore, while the upgoing line is initiated by small groups of initiators which connect and form larger structures which gradually take over. The lesson for 'we' networks in times of plagues is to first of all invest in keeping the internal relationships healthy and the spirit alive, and then to look for allies for making the movement stronger.

Concluding remarks

The complexity of themes to deal with in agriculture and rural development today calls for approaches that go beyond technology transfer and market delivery. Co-creation means investing in relationships, assuming that a healthy innovation network is better capable of generating sustainable solutions than single experts.

The eco-analysis takes a holistic view on innovation processes. It looks beyond individual interests, and it takes initiatives for innovations as actions that ultimately are supposed to contribute to the healthiness and responsive capacity of the (human) ecosystem of which the initiators are part. Ecosystems tend to make optimal use of available energy by striving for complementarity, task division and specialisation. In nature, at smaller scale the mechanisms may consist of eat or being eaten and survival of the fittest, but evolution would never have developed without this other tendency towards complementarity. The more complex ecosystems become, the more refined mechanisms for attuning develop.

The present eco-challenge represents a turning point in human development: it is the era in which it becomes clear that human consciousness of being part of its ecological environment needs to prevail over individual and short-term interests, and in which it becomes obvious that depleting natural resources and exploiting one another ultimately is at the cost of the entire human species. Looking at innovation processes through the glasses of the eco-analysis offers a small contribution to this huge challenge.

References

Bateson, G. (1987): *Steps to an Ecology of mind.*

Bateson, G. (2000): *Steps to an Ecology of mind. Collected essays* , University of Chicago Press USA.

Berkes Navigating Social-Ecological Systems, building resilience for complexity and change (2003 Cambridge University Press UK.

Biomimicry 3.8 - Innovation Inspired by Nature.

Biomimicry www.asknature.org.

Gunderson et al (2010): *The Evolution of an Idea – the Past, Present and Future of Ecological Resilience.* Island Press, USA.

Hutchkins (2012): *The Nature of Business. Redesigning for Resilience* (Cambridge Limited).

Loorbach, D., Avelino, F., Haxeltine, A., Wittmayer, J., O'Riordan, T., Weaver, P., & Kemp, R. (2016). *The economic crisis as a game changer? Exploring the role of social construction in sustainability transitions.* Ecology and Society, 21(4).

Rotmans, J. (2017): *Change of Era. Our world in transition.* Meppel, Boom.

Wielinga, H.E. (2001): *Netwerken als levend weefsel. Een studie naar kennis, leiderschap en de rol van de overheid in de Nederlandse landbouw sinds 1945. [Networks as Living Tissue. A Study on Knowledge, Leadership and the Role of Government in Dutch Agriculture since 1945],* PhD Thesis Wageningen University. Uilenreef Publisher, 's Hertogenbosch.

Wielinga, H.E., Zaalmink, B.W., Bergevoet, R.H.M., Geerling-Eiff, F.A., Holster, H, Hoogerwerf, L., Vrolijk, M. (2008): *Networks with free actors: encouraging sustainable innovations in animal husbandry by using the FAN approach.* Wageningen University and Research.

Wielinga, H.E., Vrolijk, M. (2009a): *Language and Tools for Networkers*. The Journal of Agricultural Education and Extension (15)2 pp 205-217.

Wielinga, H.E., Geerling-Eiff, F.G.E. (2009b): *Networks with Free Actors.* In: Poppe, K.J., Termeer, C., Slingerland, M. (2009); *Transitions towards sustainable agriculture and food chains in peri-urban areas* pp 113-137. Wageningen Academic Publishers.

Wielinga, H.E., Robijn, S. (2020): *Energising Networks: Tools for Co-Creation.* Wageningen Academic Publishers.

Art and Agriculture; inspiring learning for sustainability transitions

Jorieke Potters

Wageningen University and Research

Short abstract

This paper explores the relation between art and agriculture and more precisely looks into the potential of art to inspire the transition to sustainable agriculture. It starts by identifying a gap between the need and desire for transformative change and the current predominant practices to foster innovation and learning for sustainable agriculture. It argues that an integration of art and artists could be beneficial. To do so the paper first compares artists and farmers and the nature of the activity of art and agriculture. At the heart of the paper, an examination of the general role of art in society, is the basis for exploring the potential of art to inspire the sustainability transformation in agriculture.

The paper offers suggestions how art and artists can contribute to learning for transformative change in agriculture, and raises important questions and areas for further research and exploration. It is argued that bringing in artists in the agricultural innovation arena and valuing the diverse talents and knowledge of farmers, artists, researchers and other stakeholders, can enrich the learning and collaboration for innovation towards a more sustainable and equitable food system.

Extended abstract

"When tillage begins other arts follow. The farmers therefore are the founders of human civilization" Daniel Webster

Purpose

This paper explores the relation between art and agriculture and more precisely looks into the potential of art to contribute to the transition to sustainable agriculture. The urgency to achieve transformative change facing climate change and biodiversity loss is now broadly shared (Loorbach, 2022) the transition to agroecology or sustainable foodsystems requires new paradigms, new practices, new ways of thinking, valuing and perceiving. To support innovation multi actor approaches are promoted and new interactive constellations such as innovation platforms and living labs are developed. These arenas for innovation have proven to be valuable spaces for joint learning and co-creating solutions and innovations. On the other hand often the same AKIS actors are invited to join these processes, whichmay lead to not fully realizing the creative potential of such Living Labs. Art and design are creative activities that can bring fresh air and new perspectives (Kay, 2000). In different corners of the transition domain the inspiring integration of design and transition is being explored (Loorbach, 2022). Building on these observations the paper explores the potential of integrating art and artists in agroecological transition processes. It further suggests how this could be operationalised. Instead of providing answers it is the purpose of this explorative paper to invite new thinking, ask new questions and explore new perspectives, thus broadening our scope and thinking about learning for sustainability.

Design/Methodology/Approach

This paper is an interdisciplinary exploration of the potential of art to boost creativity in the sustainability transition in agriculture. It combines methods from social science with approaches from the humanities and draws on three decades of practical and academic experience with participatory research in agricultural transition and rural development. The central question of the paper is how art can contribute to boosting creativity in the sustainability transition and sub questions explore the relationship between art and agriculture in terms of the role of the main actor the farmer and the artis and the nature of the main process. The paper also explores practical approaches to operationalize the potential of cross fertilization in a living lab setting. As such the paper aims to contribute to the thinking and acting on education and learning for sustainability. By bringing together social science, humanities and practical experiences the author explores radical new ways of thinking about and approaching the complex challenges of sustainable agriculture and food systems.

Findings

Traditionally agriculture is a laborious practice which requires dedication and perseverance. Despite the widespread discourse on innovation and transition in agriculture, the evolution of agriculture has predominantly been shaped by subsequent solving the problems that farmers encounter in their day to day practice following the natural seasons. By nature change in agricultural practices has a slow pace, as it depends on the growing seasons and investment capacity. Furthermore, farms are often family businesses, passing on farm and knowledge from parents to children. Also agricultural education strongly builds on sectoral ties and there is a strong bond between research, extension and education. Within this steady regime of progress and continuity, the invention of artificial fertilizers and the tractor are two technical innovations that have importantly shaped modern agriculture. Both are technical innovations that produce direct economic benefits. Summarizing one can say the agricultural sector is by nature characterised by perseverance, tradition, a technical perspective and incremental innovation mainly driven by economic benefits. This approach has worked very well for increasing food production to levels never preceded. Scholars agree that the current sustainability challenges in terms of climate, water quality, nature and biodiversity are of a different nature and require radical change in agriculture a transformative change. It is by no means the to deny the crucial importance of sectoral knowledge and experience in development of innovation and change processes.

However, a gap can be observed between the need and societal desire for transformative change in the food system and the traditional existing practices to foster innovation and learning for sustainable agriculture. Vogl et all () indicate 'It will be important to pick up the insights on the relation between creativity and learning, e.g. for answering the question on how to facilitate creative learning processes that lead to creativity, farmers experimenting and relevant innovations for a sustainable future of farming. Many constructive attempts are made to bridge the gap; resulting in a multitude of innovation projects, innovation networks and Living labs. However often the same actors are involved. As the call for the 26th ESEE conference states 'Education and Advisory services are expected to be major drivers of these transitions, by co-producing knowledge with farmers and farm workers, enhancing their competences and supporting their innovation processes'. While education and advisory services indeed have significant role to play in supporting sustainable transition in agriculture, bringing in outside actors can invite inspiration and help open-up new development pathways. From a traditional culture in agriculture it is logical to build on the strong problem solving tradition and to support the close involvement of farmers, advisors and value chain actors. This is indeed important, however I argue that transformative change and new methods to support the contribution of advice & education to the various dimensions of sustainability it can importantly benefit from interaction with more radical fresh perspectives and sources inspiration.

In the transitions in energy, mobility and also food the fields of Design and Transitions are increasingly seen as complementary in the pursuit of achieving sustainable, just and resilient futures (Loorbach, 2022) The intersection of agriculture and art is worth exploring. As Loorbach (2022) argues we need to be able to imagine and communicate alternative futures, but we also need to inspire and mobilize people on a large scale to embrace the transformative journey ahead. Bringing together arts and agriculture has potential to contribute importantly to this journey.

A philosophical perspective sheds a first light. The comparison between the farmer and the artist may seem odd but it appears to be an inspiring one, as it illustrates the different but complementary roles they play in society. The farmers knowledge and skills are focused on working with natural creative power of the land, and producing healthy and nutritious food for the human and animal body. Farmers must understand the intricacies of soil health, plant biology and animals husbandry, and use this knowledge to produce crops and livestock in a sustainable and efficient way. On the other hand the artist's knowledge and skills are focused on working with the spiritual creative power of the human imagination, and creating beauty, esthetical value and emotional reaction. Artists must understand the nuances of colour, form and composition, and use this knowledge to create works of arts that evoke emotion and inspire creativity. While the farmer and the artist may seem very different at first glance, they both play essential roles in society. The farmer provides the basic sustenance that we need to survive, while the artist provides beauty and inspiration that makes life worth living. By bringing together these two worlds, we can explore new ways of thinking about sustainability and creativity.

Though somewhat romantic, these philosophical contemplations can evoke an inspiring perspective on farmers and farming. This is especially welcome in times where the news is full of messages about the negative impact of agriculture for nature and society, leaving farmers feel undervalued. Recognition of the important role that farmers and farming plays in our society and to value farmers dedication and craftmanship creates a constructive starting point for fostering greater collaboration between farmers, policymakers, researchers and artists in shaping the future of agriculture.

In general art can serve a variety of purposes depending on the individual artist, the cultural context in which the art is created and the intended audience. Sometimes art is an act of expressingemotions, experiences and perspectives of the artist. In other instances it inspires or challenges the viewer, it communicates ideas and beliefs or brings aesthetic pleasure to the world. Art can also serve a variety of practical purposes, such as documenting events, advocating a certain vision or as a means of social critique and activism. Art has the power to evoke emotions, communicate ideas and experiences, and enrich our understanding of ourselves and the world around us. These qualities of art have the potential to enrich the practice and theory of agricultural innovation and transition.

Art and artist who create from inspiration and imagination can have a valuable contribution to the search for sustainable ways forward and shaping of sustainable futures. Art has the potential power to inspire creativity, promote experimentation, foster new collaborations, raise awareness, engage emotions, challenge assumptions and existing practices and inspire action. This potential can be capitalized in different modalities:

• Inspiration: Artists can create space and inspire new ways of thinking about agriculture and its relationship between agriculture, the environment and society, promoting creativity, experimentation, and innovation.

• Visualization: Artists can help visualize the potential of new technologies and sustainable agricultural practices through art installations, murals, and other visual media.

• Co-creation: Artists can work alongside farmers and researchers to co-create new solutions to promote sustainability. Concretely artists can play a role in agenda setting, exploring perceptions and alternatives, proposals, testing and anchoring of innovation.

• Engagement: Artists can engage with the broader community through exhibitions, workshops, and other events to raise awareness about the importance of sustainable agriculture or specific solutions and promote social change.

• Story telling: Artists can use their talents and craftsmanship to tell the stories of unsustainable practices, or illustrate the alternative options and visions for the future.

If we combine these roles of art and artists with the phases of the innovation spiral (Zaalmink et al, 2016), the role of the artist is especially obvious during the phase of the early idea and the inspiration phase and during the dissemination phase and the embedding phase. However, involving artists as innovation partners throughout the entire innovation process, including in the planning, development and realization phase, is certainly also an inspiring option. It is important to prevent involving the artist from becoming a trick.

It can be inspiring to study the learning effects of involving artists and art in agricultural innovation from the perspective of boundary crossing. It goes too far for this abstract to elaborate on this, but the four categories of learning potential that Akkerman & Bakker (2014) identified on the basis of literature study, namely; i) Identification ii)) Coordination iii). Reflection and iv). Transformation. These categories may be useful in further understand how involving artists in agriculture can trigger innovation and learning.

Overall, the potential of the connection between art and agriculture for innovation and transformation seems significant, and further exploration and experimentation are needed to fully realize this potential

Practical Implications

Though increasingly artists are engaging with societal problems and sustainability challenges, this generally remains in the domain of arts or society in general. The effective integration of artists and arts in the world of agriculture is an exciting one especially because of the cultural differences mentioned in this paper. When creating platforms and networks that bring together artists with the usual agricultural actors such as farmers, researchers, policy makerscreating an atmosphere of mutual respect, appreciation and a save meeting space deserves a lot of attention. The insights into the artist and the farmer can be an inspiring starting point.

This explorative paper identified the potential of the connection of art and agriculture for innovation and transformation in terms of co-creation, visualisation, engagement, inspiration and storytelling. Capitalising on this potential requires courageous experimentation with bringing in more creative forces in agricultural innovation processes. Living labs as spaces for exploring alternative options and co-creating more sustainable solutions and practices seem to be an powerful setting for experimenting with the cross fertilization between art and agriculture. During the identification of the participants of a living lab, adding a category of inspirational actors next to the infuential and interested would be first step. The question how to practically make space for the potential of art and artists during each of the steps of the living lab process requires further exploration and learning by doing. The insights and lessons learned from such experimentation can inform the development of new approaches and best practices for integrating art and artists into agricultural innovation processes.

Theoretical Implications

The identified potential of arts in agriculture has several theoretical implications First this has been a first exploration which obviously requires further examination and elaboration. To further optimize the functions of arts in agriculture, it is important to better understand the conditions and modalities that enable effective collaboration between artists and other stakeholders. It is also important to examine the role of art in breaking path dependency, lock-ins, and other systemic barriers to innovation in agriculture

Further exploration and cross-fertilization of concepts, perspectives, and paradigms from social, technical, and natural sciences with humanities is also valuable to fully understand the potential of arts in agriculture. This will require interdisciplinary collaboration and the development of new research methodologies and will inspire new research questions.

Finally, lessons can be learned from other sectors and academic schools that have more experience in collaborating with art and artists. These lessons can inform the development of best practices and guidelines for effective collaboration between artists and other stakeholders in agriculture.

References

Akkermans en Bakker, 2014.The learning potential of boundaries: A theoretical basis. In book Between education and vocational practice: The potential of boundary crossing Chapter: 2 Publisher: Van Gorcum. Editors: Arthur Bakker, Ilya Zitter, Simon Beausaert, Elly de Bruijn Loorbach, D.A. 2022. Designing radical transitions: a plea for a new governance culture to empower deep transformative change. City Territ Archit 9, 30 (2022). https://doi.org/10.1186/s40410-022-00176-z Kay, Alan, 2000. Art and community development: the role the arts have in regenerating communities, Community Development Journal, Volume 35, Issue 4, October 2000, Pages 414–424, https://doi.org/10.1093/cdj/35.4.414

Vogl, Christian Reinhard; Kummer, Susanne; Schunko, Christoph (2016). Farmers' experiments and innovations: A debate on the role of creativity for fostering an innovative environment in farming systems. Paper presented at the 12th European IFSA Symposium 12-15 July, Newport (UK), Harper Adams University. Newport (UK), Harper Adams University, 12-15 July 2016.

Zaalmink, B.W., C.T. Smit, H.E. Wielinga, F.A. Geerling-Eiff, L. Hoogerwerf, 2016. Netwerkgereedschap voor vrije actoren Methoden en technieken voor het succesvol begeleiden van netwerken Wageningen University & Research, The Netherlands

Session 3C – Education

Strengthening the future advisors' capacity to support innovation through interactive training

Eleni Zarokosta, Alex Koutsouris

Agricultural University of Athens

Short Abstract

This work presents evidence from a summer school interactive training, carried out in the framework of the I2CONNECT Horizon project with the aim to enhance the capacity of future rural advisors (and researchers) to support interactive innovations. The training consisted of two online sessions and a 4-day course (physical presence), covering basic concepts for delivering advisory work, a variety of methodological tools and interactive exercises triggering students' active participation. The findings indicated trainees' overall satisfaction and progress, confirming the effectiveness of interactive training in cultivating skills and attitudes that enable interactive innovations. The results, also, imply the need for modifications of the traditional university education with the integration of participatory learning and methodological knowledge on interactive advisory processes into university curricula. Such changes could enhance the design and implementation of interactive projects helping advisors and researchers navigate through innovative ecosystems.

Extended abstract

Purpose

Given the limitations of the Transfer of Technology (TOT), top-down and linear approach, focus has been gradually given way to an emphasis on joint (social) learning and innovation generation in networks. In this respect, systemic thinking on innovation (Agricultural [Knowledge and] Innovation Systems/A[K]IS), claims that the process of innovation is messy and complex with new ideas being developed and implemented by actors who engage in networks and make adjustments in order to achieve desired outcomes. Consequently, along with pluralistic extension/advisory services' landscapes, the need for new innovation support service (ISS) approaches emerges (see, inter alia, Cristóvão et al. 2012; Knierim et al. 2017; Koutsouris 2018).

Nowadays, such multi-actor/interactive innovation approaches and ISS are gaining ground including (i) the European Innovation Partnership 'agricultural productivity and sustainability' (EIP-AGRI); (ii) the multi-actor approach that has become a key component in a number of Horizon 2020 projects, and (c) a high-level, multi-actor reflection group, the Strategic Working Group on 'Agricultural Knowledge and Innovation Systems' of the Standing Committee on Agricultural Research of the EU (SWG SCAR-AKIS). These approaches, which embrace actors' meaningful interaction and networking, are characterized by the engagement of all relevant actors throughout the entire innovation process. In an innovation initiative the relevant actors (such as researchers, educators, governmental officers, NGO, farmers/farmer groups, advisors, enterprises, etc.) are the owners of the same complex problematic situation, though from different angles. In parallel, they are sources of complementary types of knowledge and bearers of perspectives, values, interests (Beers & Sol 2009) and practices that potentially lead to viable solution(s), if they are put together. The recognition that complex problems require the engagement of diverse (groups of) actors in networks allowing for and promoting social learning and the co-generation, dissemination and use of innovations entails the need for new ways of mobilization and coordination, which facilitate knowledge co-creation and social learning (Knierim et al. 2020). Thus, a major role of ISS is that of the co-learning facilitator (usually found in literature as 'facilitators' or 'brokers') aiming at the development of shared meaning and language between dialogue partners in order to stimulate change and develop solutions and innovation (Cristóvão et al. 2012).

In this framework, a new set of ISS functions emerges as compared to that of 'conventional' advisory services. proposed the following functions: access to knowledge; advisory, consultancy and backstopping;

marketing and demand articulation; networking facilitation and brokerage; capacity building; access to resources; institutional support for niche innovation and scaling mechanisms stimulation (see, inter alia, Mathe et al. 2016; Faure et al. 2019). Thus, relevant new tasks and roles emerge for advisors such as demand articulation (vision building, diagnosis, foresight); strategic network formation and facilitation, technical backstopping, mediation of conflicts and capacity building. As a result, advisors need new knowledge about the principles underpinning interactive innovation processes and skills along with a methodological tool-box to successfully shape and provide advisory services tailored to their clients' needs.

Gerster-Bentaya et al. (2009) recognize five main topics relevant to the qualification of interactive innovation advisors. According to these, the possession of a basic disposition and attitude forms the foundation of advisors' competencies, i.e. that advisors should be able to understand their roles and responsibilities throughout an advisory process as well as to build a relationship with their clients based on congruency, empathy and appreciation. Second, advisors must have credibility and sufficient knowledge on the subject matter while also been able to understand the specific social context in which advisory work is provided. Third, advisors must poses methodological competence, including diagnostic, analytical and communication skills in order to be able to interpret clients' behavior, gain an empathetic understanding and guide an effective dialogue. Forth, it is critical for an advisor to possess managerial and organizational competence (self-organisation and self-management skills), so as to be able to align the advisory work with clients' needs and objectives. Finally, it is crucial particularly for professional advisors to be able to reflect on their own work as well as utilize others' constructive feedback in order to improve the quality of their services. The adoption of a life-long learning attitude is, also, important to this end. According to Hoffmann et al. (2009) training is critical for acquiring competence and improving skills, since it is based on a diagnosis that certain knowledge and competence gaps exist. Another mode of learning is facilitation, which, unlike training, emphasizes on collective action rather than pre-defined learning objectives to deal with a problem or achieve a goal that may emerge as the facilitation process develops. Facilitation fosters synergies, while empowering and enabling the members of a group to share experiences, resources, ideas and encouraging their critical thinking on their needs and priorities (Debruyne & Lybaert 2020).

Within the I2CONNECT project these concepts and modes of learning were combined to set up three summer schools during the period the period 2022-2024. A non-directive, participant and problem-solving oriented training approach has been adopted, meaning that trainers "should … assist learners to acquire knowledge and skills through their own effort" (Hoffmann et al. 2009, Debruyne & Lybaert 2020). Therefore, the i2connect summer school(s) attempt to initiate and support trainees in their own learning about concepts and methods appropriate for interactive innovation, utilizing participatory methods and examples (Koutsouris & Zarokosta 2022). The purpose of this work is to present the experience of the interactive training in the context of the first I2CONNECT summer school and the lessons learned, paving the way for future similar efforts.

Design/Methodology/Approach

The first summer school was organized by the Agricultural University of Athens with the close collaboration of trainers and facilitators from the University of Hohenheim, the University College Dublin, the Széchenyi István University and the Berner Fachhochschule. Following an open call for participation, released in early 2022, 26 MSc and PhD students from Irish, Slovenian, Italian, French, Spanish, Lithuanian, Serbian, Belgian, Swedish, German and Greek universities were selected to participate.

The summer school was carried out in 3 stages, including two, two-hour-online (Zoom) meetings and a five-day course with physical presence. The first online meeting (June the 28th, 2022), aimed at familiarizing participants with each other, the objectives, the structure and the basic concepts of the training, notably interactive innovation, as well as assigning them to identify and study (to be able to present) an interactive project.

The course (physical presence) took place from the 23rd till the 29th of July 2022 at the Mediterranean Agronomic Institute of Chania, Crete. The course covered basic concepts for delivering advisory work in the framework of innovation networks (Table 1). The trainers/facilitators utilised a variety of interactive exercises to trigger trainees'/participants' active engagement and trigger their creativity (e.g., cross the river, guiding the blind, AKIS analysis, controlled dialogue, egg dropping, role playing in facilitation, walk and talk, etc.). This way trainees were sensitized and learned the roles undertaken and the competencies needed for successfully delivering (interactive) advisory services. In this respect a variety of methodological tools were also used, such as the Spiral of Initiatives/Innovations and the Circle of Coherence (Wielinga & Sjoerd 2020). Furthermore, the trainees participated in a farm visit to interview local actors engaged in an ongoing innovation project and put the tools they had learned about into practice.

At the end of the course, the trainees evaluated the school with a questionnaire comprising 34 Likert-type questions, and 4 open questions regarding a) what they liked best about the training, b) which topics/needs were not covered /covered insufficiently, c) their suggestions for improvements, and d) feedback about their personal learning.

The second online meeting (November the 2nd, 2022), provided the trainees the opportunity to reflect on their learnings and further strengthen their personal linkages. The participants were invited to discuss and exchange experiences in small groups inspired by the following questions: Q1: What feelings do occur when thinking of the summer school in Chania?, Q2: What is most prominent in my mind related to the summer school?, Q3: In what way did the learnings of the summer school change my way of thinking/worldview?, and Q4: What could you put into practice so far? When? How did it feel?.

Table 1: Overview of the structure and topics covered in the Summer School

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Morning sessions		• Types of advisory approaches • The AKIS concept	• Spiral of innovation; Cold & warm processes • The role of advisors in innovation process	• Debriefing of field visit conclusions • Facilitation • introduction	• Networking • My own role as an advisor • Evaluation
Afternoon Sessions	• Introduction	• Interactive approaches • Competencies of advisors • Communication	• Farm visit -Preparation -Field trip	• Facilitation exercises • Debriefing & conclusions	

Findings

According to the quantitative analysis of the evaluation questionnaires, the summer school exceeded the expectations of the trainees, who rated their overall satisfaction from the course at 3.83 out of 4. More specifically, the course was found to be well planned and organized (rated at 4.7 out of 5) and the content of the training quite comprehensive (4.17); the training was adjusted to their current capabilities (4.09) while the involvement of trainees with different backgrounds was positive (4.67). The teaching aids used were helpful (4.74); the methods used made the understanding of the tools easy (4.46), thus increasing trainees' confidence in making use of them in the future (4.54). Furthermore, the trainees were particularly satisfied with their cooperation with the trainers (4.78), who were found knowledgeable about the training topics (4.65), able to explain concepts and tools clearly (4.35), supportive and helpful when needed (4.91). The trainers were found excellent in encouraging active participation and interaction among trainees (4.91) and creating a constructive working atmosphere (4.91). This, along with trainees' good cooperation (4.75) influenced positively peer-to-peer interactions, resulting in increasing trainees' collaborative attitude (4.83) and their motivation to pursue further learning (4.65). As a result the trainees found that the course was useful, particularly as regards their professional growth (4.42).

The qualitative part of the evaluation confirmed the abovementioned findings. According to the trainees' comments, the training combined learning and fun, with the trainees enjoying a dynamic and inspiring environment when working in small groups, which helped them to keep their energy high throughout the training. The training *"was fun"* and "at the same time interesting" and "*a true co-learning experience*". Trainees got "*good knowledge"* and, although "*the training was pretty different from what I expected … it was better this way"*. As some trainees pointed out they "*learned a lot… methodologies …[how] to involve people*" but what they particularly liked were "*the practical side of learning (no boring lectures in a classical classroom)"* and, also, that *"I was able to learn about myself and gain confidence in what I am capable of"*. Another trainee summarized his/her experience as follows: "*I built a network of people that study and work in the sector; learned about innovation approaches; used new tools and expressed myself at the facilitation exercise*".

Overall, most students bade farewell to the summer school with enthusiastic feelings and an appetite "to learn even more". An indication of this appetite is their suggestions that a summer school should cover topics, such as facilitation of farmers' discussion groups, project management, conflict management, etc. Thus, their recommendations for the next Summer School included the extension of its duration to five full days and the enrichment of certain thematic areas (e.g. AKIS) with the provision of more detailed knowledge. Additionally, more time should be devoted to examples of advisory work in various countries and developing certain facilitation competences as well as to outdoor (vs. in-class) activities. Furthermore, more time and effort should be devoted the field visit (including its planning and the engagement of stakeholders).

The follow up online meeting confirmed that the experience of the summer school continued inducing feelings of happiness and excitement among the trainees, been connected through the course's active learning processes. Communication skills, particularly active listening and exercising patience, better understanding of networking and exercising self-confidence were among the most prominent learnings and skills/attitudes enhanced. Moreover, certain facilitation activities and tools were put in practice by trainers, after the course, indicating the impact and the effectiveness of interactive training in cultivating skills and attitudes that enable interactive innovations.

Practical Implications

This work provides empirical evidence which, in turn, suggests the need for changes with regard to the traditional (top-down/ ex-cathedra) agronomic education offered to future advisors in Higher Education Institutes, especially with a view to the emerging 'paradigm' of interactive innovations. Participatory learning emerges as an essential pillar of advisors' education, indicating the integration of methodological knowledge about shaping and facilitating interactive process into university curricula. Such knowledge is useful not only for advisors but academics/researchers as well, helping with tasks such as analysing innovation networks, identifying the roles of relevant actors and navigating through innovation ecosystems. The expected benefits include more effective integration of actors and better design/implementation of interactive projects (e.g., HORIZON and EIP-AGRI).

Theoretical Implications

This work adds empirical evidence, derived from an interactive educational process, on the training of (future) rural advisors regarding the new roles as well as the knowledge and competencies needed to boost innovation within a multi-actor environment.

Acknowledgements

The authors wish to express their gratitude to the training team (Maria Gerster-Bentaya, University of Hohenheim, Germany; Stefan Dubach, Berner Fachhochschule, Switzerland; Andras Ver, Széchenyi István University, Hungary; and, Monica Gorman, University College of Dublin, Ireland), as well as to all the participants in the 1st i2connect summer school.

References

Beers, P. J., & Sol, J. (Eds.) (2009). Guiding multi-actor innovation and education projects: INEA.

Cristóvão, A., Koutsouris, A., & Kügler, M. (2012). "Extension Systems and Change Facilitation for Agricultural and Rural Development." In: *Farming Systems Research into the 21st Century: The New Dynamic*, edited by Darnhofer, I., D. Gibbon and B. Dedieu, 201-227. Dordrecht: Springer Science.

Debruyne. L., & Lybaert, S. (2020). Repository of required competencies of an innovation advisor. i2connect, Deliverable 1.4 Available online at: https://i2connect-h2020.eu/wp-content/uploads/2021/09/Deliverable-1-4-1.pdf

Faure, G., Knierim, A., Koutsouris, A., Ndah, T., Audouin, S., Zarokosta, E., Wielinga, E., Triomphe, B., Mathé, S., Temple, L., & Heanue, K. (2018). (2019) How to strengthen innovation support services in agriculture with regards to multi-stakeholders approaches. *Journal of Innovation Economics & Management* 2019/1 no. 28: 145-169.

Gerster-Bentaya, M., Hoffmann, V., Christinck, A., & Lemma, M. (2009). Rural Extension Handbook, Volume III: Training Concepts and Tools. https://doi.org/10.16309/j.cnki.issn.1007-1776.2003.03.004

Hoffmann, V., Gerster-Bentaya, M., Christinck, A. & Mamusha Lemma, M. (2009). Rural Extension handbook, Volume I: Basic issues and concepts. Weikersheim, Germany: Margraf Publishers.

Knierim, A., Gerster-Bentaya,M., Mekonnen Birke,F., Bae, S. & Kelly, T. (2020). Innovation advisors for interactive innovation process: Conceptual grounds and common understandings. i2connect, Deliverable 1.1 Available online at: https://i2connect-h2020.eu/wp-content/uploads/2021/09/i2connect_Final_Deliverable-1.1_correctedversion.pdf

Knierim A., Labarthe, P., Laurent, C., Prager, K., Kania, J., Madureira, L., & Ndah, T. (2017). Pluralism of agricultural advisory service providers – facts and insights. Journal of Rural Studies 55: 45-58.

Koutsouris, A. (2018). "The role of Extension in Agricultural Technology Transfer: A critical review." In: *From Agriscience to Agribusiness - Theories, Policies and Practices in Technology Transfer and Commercialization*, edited by Kalaitzandonakes, N., E. Carayannis, E., Grigoroudis, and S. Rozakis, 337-359. Cham: Springer.

Koutsouris, A. & Zarokosta, E. (2022). Summer school programme and training materials. i2connect, Deliverable 3.5.

Mathe, S., Faure, G., Knierim, A., Koutsouris, A., Ndah, T., Temple, L., Triomphe, B., Wielinga, E., & Zarokosta, E. (2016). Typology of innovation support services. Available online at: https://agrispin.eu/wp-content/uploads/2016/10/Report_Typology.pdf.

Wielinga, E. & Sjoerd, R. (2020). Energizing networks. Tools for co-creation. Wageningen, NL: Wageningen Academic Publishers.

Developing the self-positioning Master students' capacity through a collaborative learning on a scientific analysis of the glyphosate controversy

Simon Giuliano[1], Adeline Bouvard[1], Philippe Cousinié[2], Alain Rodriguez[3]

[1]INP Ecole d'Ingénieurs de Purpan/UMR 1248 AGIR/RMT GAFAd
[2]DGER/SDRICI/BDAPI/Réso'them),
[3]ACTA/RMT GAFAd

Short abstract

The Master students shared their difficulty in developing their own opinion and debating the many controversies faced by the agricultural sector. An educational module dedicated to the study of the use of glyphosate in agriculture was created to deal with these difficulties. It was based on a pluri-disciplinary and collaborative approach to acquire scientific knowledge and to debate. The students were asked to position themselves on a set of affirmations, at the beginning and at the end of the module. Now that this module has been used 4 times, the choices made will be discussed in regards to the achievement of the educational objectives set. The scientific data collected at group level allowed each student to position themself more easily on the various issues related to the controversy: the ability of positioning was 15% higher at the end of the module. The ability of the students to self-position changed greatly during the module with a globally strong agreement on environmental and health impacts of glyphosate. And there was a more balanced positioning on socio-economical affirmations. In addition, by studying a targeted controversy, it was possible to lead more general discussions on the link between science and society and to discuss desirable outcomes and ways to implement agroecological transition.

Extended abstract

Purpose

Substitute reserves, bears reintroduction, glyphosate ban... European agriculture is a sector plagued by many controversies, widely reported by the media. Faced with the important issues affecting the agricultural sector, these controversies quickly become sources of tension in relation with questions of transitions and the agricultural models of tomorrow. These tensions affect even students– future professionals in the agricultural world – who point out their difficulties in taking a position and putting their ideas into dialogue. This led a pair of teachers in agronomy and agroeconomics to create an educational module that aimed at helping students to get an opinion based on scientific data and more generally to have a collaborative reflection about knowledges and debates on these controversies?

In research, controversies have been studied for several years through their conflictual process, used as an indicator of power relations. These dispute processes are also analysed by some researchers as generating times for collective actions leading to the transformation of the social world (Lemieux, 2007). In higher education, some establishments have introduced the study of controversies into the teaching modules for a few years. These modules aim at making students discover these power relationships and their evolution. They also aim at designing methods of accompaniment.

To achieve our pedagogical objective, the choice was to focus the module on giving students tools for a collaborative acquisition of scientific knowledge relating to the controversy rather than to analyse deeply the actors' game or the support methods. It aimed at improving students knowledge about the different aspects of a controversy (environmental, social, economic, health…) and at more easily discussing their points of view even if they were contradictory. Finally, it also aimed at making them to step back on scientific knowledge production and on debates.

The article explains the pedagogical choices made according to the listed objectives. It also discusses these choices in regard with the achievement of the objectives and the reflection arose from the realization of four sessions of this module.

Design/Methodology/Approach

The educational module created took place in the second (and last) year of a Master Science in agriculture, in a class of 25 students that started a specialisation in "agroecological transition" at their beginning of their MSc. Two entire days (12h) are dedicated to this module focused on the glyphosate controversy. The choice of this controversy was made for several reasons. Firstly, it has been one of the most mediatized controversies in the agricultal sector in the last years. Therefore, students – in majority (>70%) not coming from a farmer's family – are often questioned on their opinion on glyphosate by their friends, family… That controversy was strengthened by political announces made by French president Emmanuel Macron in 2017 to ban glyphosate by the end of 2020 that finally is still not applied. Moreover, glyphosate is also the most common pesticide applied on French agricultural land with 7765 t applied in 2021, 18% of the total of pesticides applied in France (MTE, 2022). Furthermore, glyphosate molecule is quite old, applied as an herbicide since 1975 and, because of its extended use, has been very studied and reported in scientific literature with 14545 publications in a wide range of disciplines (figure 1). Finally, an existing guide was previously built and published by Philippe Cousinié for agricultural students which helped to start with that new module (Cousinié, 2022) and it also corresponded to the area of expertise of one of the two assistant-professors that coordinate that module.

Four sessions were organized between spring 2020 and autumn 2022, first with two virtual sessions because of COVID-19 then with two face-to-face sessions. In total, 88 students attended fully to the module.

The sequencing of the module consists in four consecutive half days distributed as:

- **First half-day:** self-positioning of the students in respect with several social, environmental, technical, and economical affirmations. Then the knowledge about the controversy and the actors is realized together by the entire group of students.
- **Second half-day:** individual work to summarize knowledge from literature about a specific scientific question related to the controversy.
- **Third half-day:** students are divided into four groups, by thematic. Each group share information and created a poster. Then, they restore their synthesis to the rest of the students thanks to this poster and get questions from them. This restitution is evaluated by the teachers. At the end of the restitution, the students realise a second self-positioning in respect with the same affirmations encountered at the beginning of the module.
- **Fourth half-day:** a collective debate in the presence of experts from the sector leading to a reflection on possible ways forward.
-

The Q methodology is used to understand what the student viewpoint is at the beginning and at the end of the module (Exel and Graaf, 2005). That methodology consists in confronting students with 19 affirmations on glyphosate about its toxicity in general, its environmental and sanitary impacts and on technical considerations (annex 1). For each affirmation, the students have to position according to the following Likert scale (Likert, 1932) : "strongly agree", "somewhat agree", "somewhat disagree", "strongly disagree" and a fifth category including "don't know" and "without opinion", called "unknown" hereafter. This methodology allows us to see the evolution in the position taken by the students after their individual and collective work to enhance their knowledge.

Finally, each module is followed by two feedback sessions (one right after the module and another one a few weeks after). These feedbacks, together with the teacher's evaluations, were used to discuss students reaction about the module and the achievement of the pedagogical goals.

Findings

First of all, the evaluations by the professors of the literature review and the restitution made by each group of students revealed the good quality of the work carried out. The restitutions showed the students' ability to synthesize, and the care taken to make themselves intelligible to other ones.

Secondly, the analysis of the Q sort students' answers at the beginning of the module revealed the diversity of points of view and level of knowledge. For each session, even within a specialized class on the agroecological transition, opinions diverge on that controversy.

Globally, for all the students positioning on all the affirmations (*n=1672* for the initial Q sort and *n=1444* for the final Q sort), the percentage of the students that answered "without opinion or don't know" reduces from 21% (initial Q sort) to 6% (final Q sort), showing the improved students' ability to position. In more details, the most unknown affirmations at the beginning were relative to plant or human health (e.g. 60.3% relative to kidney disease, 53.4% on digestive system) and to the glyphosate toxicity (e.g. 38.6% on the multiplied effect of glyphosate by adjuvants, figure 2). Interestingly, these affirmations are the ones that are the most unanimously agreed at the end of the third half day. It is also important to note that several affirmations remained with an important frequency of inability to position (>7.5%). It concerned general affirmations on toxicity, specific affirmations on environment and two technical affirmations (annex I).

Another important result is that students' perception changed during the module even if that change really differed according to the affirmation considered (annex I). Indeed, different patterns can be distinguished according to the affirmation considered:

Position reinforcement (8 affirmations out of 19). A frequent pattern is the reinforcement of the initial positioning as suggested by figure 2-A: the students mostly "somewhat agreed" with the affirmation on glyphosate toxicity at the beginning of the module and "strongly agreed" at the end, except for a minority that reinforced their positioning towards a strong disagreement. These affirmations were mostly linked with human health (5 out of 8) that were among the most unknown aspects at the beginning and that have an important scientific literature showing the negative glyphosate impact.

Status quo (6 affirmations out of 19) is also a frequent pattern exhibited by the study. All but one of these affirmations were affirmations with very few "unknown" at the beginning and at the end of the module. They corresponded mostly to area of expertise of the students, developed during their 5-years training course since 4 of these affirmations are linked with technical management of agroecosystems.

Positioning change (4 affirmations out of 19): in the case of figure 2-B ("glyphosate affects 100% of French population), the positioning of the students was very balanced at the beginning of the module (45% agreement, 43% disagreement) then changed towards a clear agreement (81.6%). The other three affirmations concerned by position evolution were the offensiveness of glyphosate, the justification of glyphosate ban because of its toxicity and the responsibility of glyphosate for new plant disease. These three affirmations led to balanced positioning at the end of the module. Surprisingly, these affirmations had very few "unknown" answers at the beginning of the module.

Extremes reduction (2 affirmations out of 19): finally, a last pattern of evolution was a particular positioning change that concerns the reduction of "extremes" (*ie* strong agreement or disagreement) between the beginning and the end of the module. It concerned two very controversial aspects of the controversy: the carcinogenicity of glyphosate and the impact of glyphosate ban of glyphosate on agriculture CO_2 emissions.

In coherence with the position evolution, final student positioning was "stronger" at the end of the module in respect with the beginning: 7 out of the 19 affirmations were dominated by a strong agreement or disagreement in the final Q sort while it was only present in 1 case at the beginning. For 13 out of the 19 affirmations, students positioning at the end of the module was very clear (>65% agree or disagree). The more balanced affirmations (from 52.6% to 61.8%) concern technical aspects but also general considerations according to the toxicity ("glyphosate ban is justified by its high toxicity") or to the offensiveness of the molecule ("glyphosate is harmless at low dose").

At the end of the module, students had unfavourable position on glyphosate use on 14 out of the 19 affirmations. All these affirmations were linked with the human health and the environment. In contrary, all but one affirmation for which the students position favourably in respect with glyphosate included a technical-economic aspect of crop management, which illustrates the lack of continuity of positioning between health and environmental aspects and technical considerations. In that continuity, the complex question of glyphosate ban, only considered in the first affirmation ("glyphosate ban is justified by its high toxicity") showed a more balanced positioning at the end of the module (56.6% general agreement) in respect with the beginning of the module (79.5% general agreement), which was unexpected before module start.

Finally, the last half day dedicated to the collective exchange and the feedbacks provided by the students allowed to appreciate the reflexions born thanks to the module. Different experts external from the University were invited, presented their work (Rodriguez et al., 2019), and took part in the collective discussion. The first element noticed by the students was the fact that the existing scientific knowledge is limited. "*It is difficult to admit that we do not have all the answers*". That knowledge appeared more and more incomplete as the fields of investigation were extended (other pesticides, other agricultural management) as well as the disciplines mobilized to understand the various stakes of the controversy (social, psychological, political…). Secondly, the students noticed that contradictory conclusions could be formulated on the same subject, which raised questions. "*Perhaps in 10 years a new study will come out and say just the opposite*". In addition, the students wondered about the nature of the debate and pointed out the need to transform the question asked. "*In fact, "for" or "against" is not the right question*". Faced with the complexity of the issue, the questions raised were linked to agricultural models and couldn't be resolved in the choice for or against often offered by the controversies. "*It comes down to ethics. It is interesting to take a step back and ask us if we have a lot of data to debate"* (*all quotes from students*, October 2022).

Other specific questions were putting into discussion by the students following the various sessions, showing the capacity of this module to generate discussions beyond the specific issue of glyphosate. In 2020, the students debated about workforce and robotics in agriculture. In 2021, they pointed out eco-anxiety as a growing phenomenon.

Practical Implications

This module appeared interesting in view of the objectives. However, it required a long time (2 entire days) and mobilized a substantial animation team (2 to 3 animators as well as professionals from the sector for the last half-day). The number of students attending the module was also an important factor: 20 to 25 students were necessary to investigate the various issues related to the controversy, but it also constituted a limit to be able to exchange and debate. To continue in improving this module and better take into consideration social, economic, and geopolitical aspects of the controversy – and more generally of the agroecological transition the set of affirmations was enriched in autumn 2022.

Theoretical Implications

While positioning was more frequent and increased unfavourably to glyphosate on health and environmental affirmations during the module, it was a little surprise to see that positioning in regard with glyphosate ban *because of its toxicity* decreased during the module. It remained unclear if that decrease was due to the formulation of the affirmation or because students were more generally favourable to use of glyphosate in agriculture. Indeed, the technical affirmations remained globally favourable to glyphosate but with some uncertainties: agreement was generally low on these affirmations and part of the "unknown" answers stayed elevated. This could reveal that the actual alternatives to glyphosate, especially if considered as « substitution » solutions (mechanical weeding instead of glyphosate) appeared not technically mature enough. In that case, the use of glyphosate could appear as a « lesser evil » solution despite the risks on the health and environment that are often identified by the students to « *laboratory studies, not always representative of what happens in reality on farmers and people exposure* ». These perceptions, at the end of the module, showed, for some students, that scientific studies that proved the toxic effect of glyphosate are not perceived as sufficiently representative to farmers and consumers exposure. For others, it reveals that political decisions (probable European glyphosate reauthorization to 2025) were not in line with scientific consensus on the dangerousness of the molecule. In the conclusion of the module, students both claimed to more "realistic" scientific studies and understood that this claim can be vertiginous when they considered that 319 pesticides are authorized in France (INRAE, 2021) and that they can interact together which mean that it will be necessary to position despite partial data.

Finally, the most important result of that collaborative approach was that glyphosate controversy was an entry point to discuss on the conditions and the feasibility of an agroecological transition of French agriculture and the necessity of a systemic approach of these controversies.

References

Cousinié, P., 2022. Guide sur les controverses autour du glyphosate et de ses impacts, 21p.URL https://adt.educagri.fr/fileadmin/user_upload/Documents/Outils/Ressources/APA/Controverses_autour_du_glyphosate/Guide_controverses_glyphosate_10_2022.PhC_.pdf

Exel, J., Graaf, G., 2005. Q Methodology: A Sneak Preview.

INRAE, 2021. Produits phytopharmaceutiques, comment sont-ils réglementés ? [WWW Document]. **INRAE Institutionnel**. URL https://www.inrae.fr/actualites/produits-phytopharmaceutiques-comment-sont-ils-reglementes (accessed 1.26.23).

Lemieux, C., 2007. À quoi sert l'analyse des controverses ? Mil Neuf Cent n° 25, 191. https://doi.org/10.3917/mnc.025.0191

Likert, R., 1932. A technique for the measurement of attitudes. Arch. Psychol. 22 140, 55–55.

MTE, 2022. Publication des données provisoires des ventes de produits phytopharmaceutiques en 2021 [WWW Document]. Ministères Écologie Énerg. Territ. URL https://www.ecologie.gouv.fr/publication-des-donnees-provisoires-des-ventes-produits-phytopharmaceutiques (accessed 1.24.23).

Rodriguez A., Bonin L., Buridant C., Duroueix F., Duval R., Gautelier-vivioz L., Labreuche J., Perriot B., Vuillemin F., 2019. Retrait du glyphosate : analyse comparative de faisabilité et d'efficacité des pratiques agronomiques de remplacement. Journées internationales de lutte contre les mauvaises herbes, Conférence du COLUMA, Orléans. 3, 4 et 5 décembre 2019.

Figures

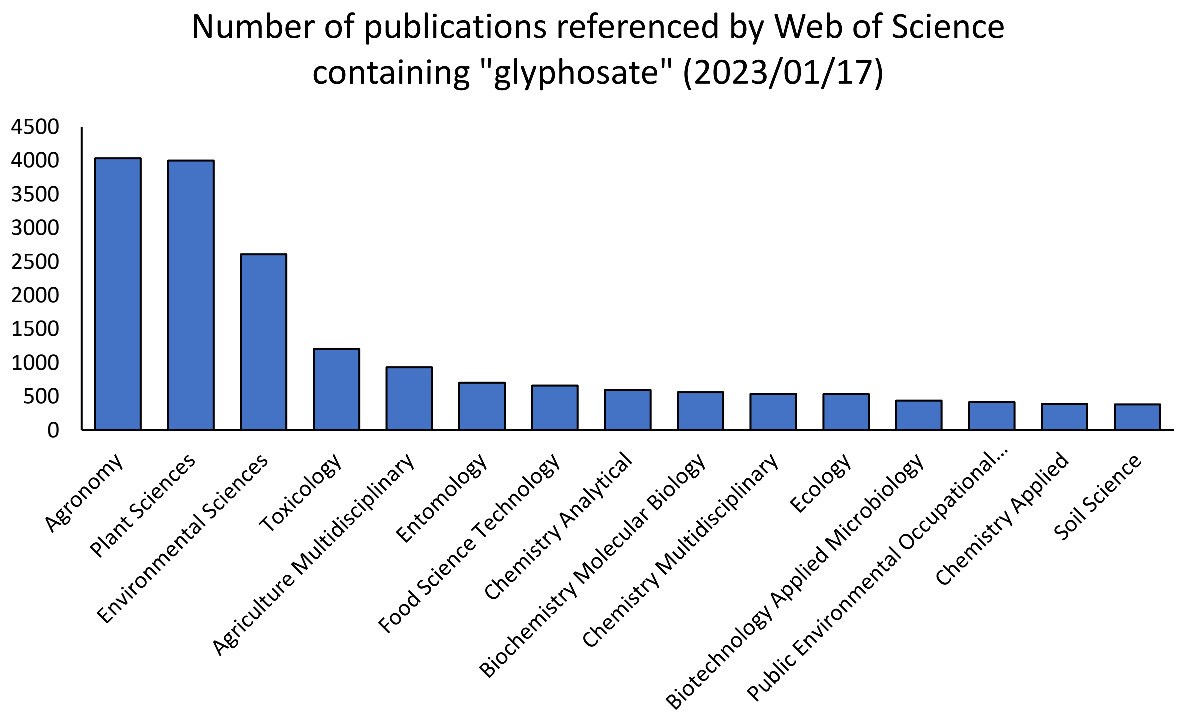


Figure 1: number of publications referenced by Web of Science containing "glyphosate" (on 2023 January the 17th), ranged by disciplines. Research equation was ALL=glyphosate

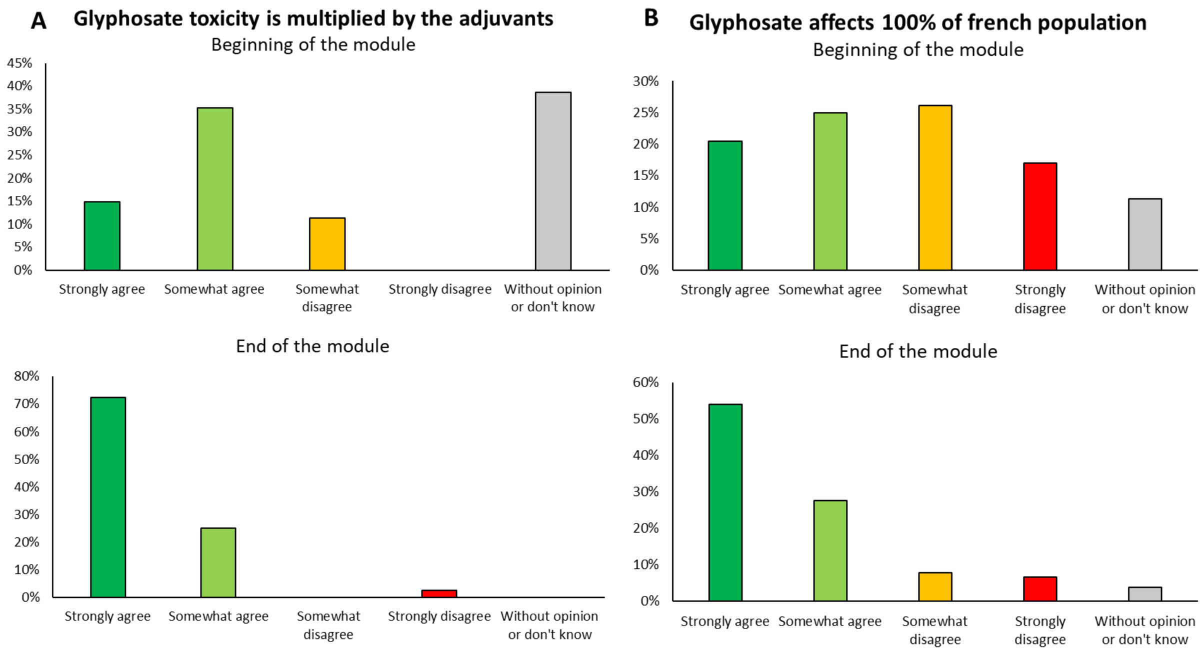


Figure 2: contrasted students self-positioning evolution on 2 out of the 19 affirmations of the Q sort between the beginning and the end of the module

Annex I: dashboard on the 19 Q sort affirmations with final student self-positioning and self-positioning evolution between initial and final Q sort

		END					EVOLUTION					
Affirmations	*category*	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Without opinion or don't know	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Without opinion or don't know	Positioning evolution
glyphosate ban is justified by its high toxicity	*health*	18,4%	**38,2%**	25,0%	10,5%	7,9%	-2,0%	-20,9%	11,4%	4,8%	6,8%	Positioning change
		56,6%		35,5%								
glyphosate toxicity is multiplied by the use of adjuvants	*health*	**72%**	25%	0%	3%	0%	57,6%	-10,2%	-11,4%	2,6%	-38,6%	Position reinforcement
		97,4%		2,6%								
glyphosate has a short hal-life which makes it not very toxic	*health*	0,0%	10,5%	**42,1%**	**42,1%**	5,3%	-1,1%	2,6%	5,7%	13,7%	-19,7%	Status quo
		10,5%		84,2%								
glyphosate is persistent in soils and water	*environment*	26,3%	**57,9%**	9,2%	3,9%	2,6%	0,2%	3,3%	-2,2%	1,7%	-3,1%	Status quo
		84,2%		13,2%								
glyphosate is harmless at low dose	*health and environment*	1,3%	22,4%	**31,6%**	30,3%	14,5%	-2,1%	8,7%	-18,4%	8,7%	3,1%	Positioning change
		23,7%		61,8%								
glyphosate affects 100 % of french population	*health*	**54%**	28%	8%	7%	4%	33,5%	2,6%	-18,2%	-10,5%	-7,4%	Positioning change
		81,6%		14,5%								
glyphosate is an endocrine disruptor	*health*	34,2%	**50,0%**	6,6%	3,9%	5,3%	11,5%	9,1%	-2,5%	3,9%	-22,0%	Position reinforcement
		84,2%		10,5%								
glyphosate is carcinogenic	*health*	17,1%	**64,5%**	11,8%	1,3%	5,3%	-15,8%	20,2%	5,0%	0,2%	-7,2%	Position reinforcement and extremes reduction
		81,6%		13,2%								
glyphosate affects digestive system	*health*	**56,6%**	40,8%	0,0%	0,0%	2,6%	44,1%	15,8%	-9,1%	0,0%	-50,8%	Position reinforcement
		97,4%		0,0%								
glyphosate is harmful or even lethal to kidney system	*health*	43,4%	**50,0%**	1,3%	0,0%	5,3%	34,3%	27,3%	-6,6%	0,0%	-55,0%	Position reinforcement
		93,4%		1,3%								
glyphosate has an antibiotic effect on humans, animals and environment (soils)	*health and environment*	26,3%	**51,3%**	9,2%	2,6%	10,5%	25,2%	41,1%	-10,1%	-24,6%	-31,5%	Position reinforcement
		77,6%		11,8%								
glyphosate contaminates and affects pollinators	*environment*	**57,9%**	40,8%	0,0%	0,0%	1,3%	21,5%	2,2%	-9,1%	-4,5%	-10,0%	Position reinforcement
		98,7%		0,0%								
glyphosate stop generates higher CO2 agriculture emissions	*technical and environment*	18,4%	**47,4%**	23,7%	5,3%	5,3%	-2,0%	6,5%	11,2%	-8,4%	-7,2%	Extremes reduction
		65,8%		28,9%								
glyphosate is responsible for new plant diseases	*environment*	21,1%	**39,5%**	23,7%	7,9%	7,9%	18,8%	17,9%	-1,3%	-0,1%	-35,3%	Positioning change
		60,5%		31,6%								
glyphosate is necessary to some crops and some crop contexts	*technical*	11,8%	**40,8%**	28,9%	10,5%	6,6%	-2,9%	-4,7%	5,1%	2,6%	-1,4%	Status quo
		52,6%		39,5%								
glyphosate is responsible for the appearance of weed tolerances and resistances	*technical and environment*	**60,5%**	28,9%	6,6%	2,6%	1,3%	12,8%	-5,1%	-2,5%	0,4%	-5,5%	Status quo
		89,5%		9,2%								
glyphosate stop will be responsible for a crop yield reduction	*technical*	6,6%	**44,7%**	27,6%	11,8%	9,2%	3,2%	7,2%	-14,4%	1,6%	2,4%	Status quo
		51,3%		39,5%								
Without glyphosate, some agricultural practices (conservation agriculture, slope farming, etc.) become impossible	*technical*	14,5%	**40,8%**	34,2%	10,5%	0,0%	3,1%	6,7%	-9,0%	4,8%	-5,7%	Status quo
		55,3%		44,7%								
The use of glyphosate is more profitable than mechanical weeding	*technical*	**38,2%**	35,5%	13,2%	2,6%	10,5%	22,2%	-7,7%	-0,5%	-3,1%	-11,1%	Position reinforcement
		73,7%		15,8%								

Legend	**40,80%**	majority final positioning (in bold)
		majority position (>65%), unfavourable to glyphosate
		majority position (>50% and <65%), unfavourable to glyphosate
		majority position (>65%), favourable to glyphosate
		majority position (>50% and <65%), favourable to glyphosate
		"without opinion or don't know" >10% at the end of the module
		"without opinion or don't know" >7,5% at the end of the module
		evolution between beggining and end of the module >20% or <-20%
		evolution between beggining and end of the module >15% and <20% or <-15% and >-20%

What farmers learn for sustainable development through participatory farming system inquiry: a case study of student–farmer action learning projects

Åsmund Steiro

Norwegian University of Life Science

Short abstract (200 words):

In order to achieve a necessary sustainable development of contemporary food and farm systems farmers must be involved in both problem definition and knowledge production activities in a participatory, action-oriented manner (Lacombe et al., 2018). In this multiple case study we examine to what extent farmers involved in student–farmer action learning projects increase their sustainability competences (i.e. learn for sustainable development). Five student–farmer action learning cases were studied by observing the action learning activities, scrutinising project reports and conducting follow-up interviews with the involved farmers. Data is analysed using the Constant Comparative Method (CCM) and through a preliminary analysis we have developed three main categories characterising farmers' learning for sustainable development in participatory, action-oriented projects: "experiencing an unconventional process", "co-learning with students" and "learning by reflecting on the process". Preliminary findings suggest that farmers involved in participatory, action-oriented projects demonstrated both an increased ability to 'see the whole' and expressed increased capacities to tackle sustainability challenges, which we define as indicators of sustainability competences. This study may provide empirical evidence for understanding how to reorganise current Agricultural Knowledge and Innovation Systems (AKIS) from processes based on linear knowledge transfer to processes where co-creation of knowledge and co-learning happens.

Extended abstract

Purpose

Multiple studies (e.g., Cristofari et al., 2018; Lacombe et al., 2018; Aare et al., 2021) suggest that enabling sustainable development of farm systems is most successful if farmers are involved in both problem definition and knowledge production activities in a participatory, action-oriented manner. Lacombe et al. (2018) found that while many projects claim to operate based on a participatory co-design approach, researchers tend to "focus on results in terms of knowledge that has been created rather than the outcome of the participatory process for the farmers". (Lacombe et al., 2018, p. 216). In this study, we focus on farmers' learning outcomes from having been involved in a participatory action learning project.

In this paper, the term "learning" is understood as a "sustained change in behaviour, or potential behaviour as a consequence of an experience or a new insight"[6] (Stræte et al., 2018, p. 26). Consequently, the result of learning is not merely an increase in knowledge, but increased competence, which following the definition of Wiek et al., (2011, p. 204) is a "functionally linked complex of knowledge, skills, and attitudes that enable successful task performance and problem solving." To tackle sustainability challenges, key sustainability competences are needed, which Wiek et al. (ibid.) defined as competences "with respect to real-world sustainability problems, challenges and opportunities." Therefore, to sustainably develop their farm systems, farmers need to increase their mastery of (i.e., learn) key sustainability competences.

To study farmers' learning for sustainable development, a case study was conducted of student–farmer projects in the 2021 and 2022 editions of the Agroecology M.Sc. course "Agroecology: Action Learning in Farming and Food Systems" at the Norwegian University of Life Sciences (NMBU). Several studies are published with a focus on describing the learning activities and the learning

[6] Original quote in Norwegian, translated by first author.

outcomes of the students in this course (e.g., Lieblein et al., 2012; Lieblein et al., 2004; Østergaard et al., 2010). While there are good reasons to assume that such student–farmer projects have been beneficial for the farmers involved, no studies have been published on the matter. The aim of this study is, however, to contribute to improved understanding of how farmers learn for sustainable development through investigating the process of such student–farmer action learning projects. The study is framed by the following research question: *What characterises farmers' learning for sustainable development in student–farmer action learning projects?*

Design/Methodology/Approach

We chose to conduct a multiple case study, which according to Creswell & Poth (2018) may allow us to show different perspectives of farmer's learning and draw conclusions that would not be possible by studying a single case. Following the advice of Gobo (2004) to sample incidents or actions instead of people, the key events (figure 1) in the student–farmer projects represent incidents where farmers engage in action learning. Consequently, the cases in this study are the student–farmer projects themselves and are bounded in time from when the farmers' are recruited to when the reports were received and potentially read by the farmers (figure 1).

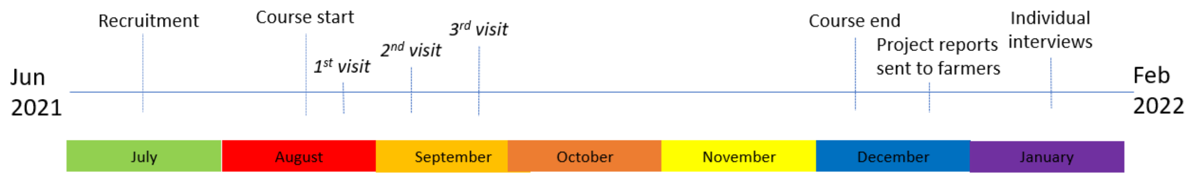


Figure 11: Timeline of key events in student–farmer projects involved in the present investigation.

During the 2nd and 3rd visit (figure 1), participant observations were made of all projects by visiting the farms while students and farmers were actively engaging in the project work. After the visits were conducted the students authored a project report, which were distributed to the farmers and also used as data in this study. Finally, in-depth interviews were conducted at each case farm, where the farmers were asked questions regarding their motivations, expectations and perceptions related to the steps in the project process.

The method of analysis is inspired by the constant comparative method (CCM), however it is separate from traditional grounded theory in that we do not seek to arrive at a normative theory. Analysis of data using CCM is described by Postholm (2019) as taking place in three stages; 1) open coding, where the data is assigned codes and sorted into categories; 2) axial coding, where the coded material is being further structured into sub-categories by determining under which circumstances the categories materialise; and 3) selective coding, where the core category is developed to capture the essence of all the other categories. After all data was collected and transcribed, they were imported into the software NVivo© for further analysis.

(Preliminary) Findings

At this current moment, data from three cases during the 2021 course has been collected and analysed. Data has been collected from four cases from the 2022 course, however, they have not yet been analysed. Thus, the findings presented here are only preliminary and will be supplemented ahead of the conference.

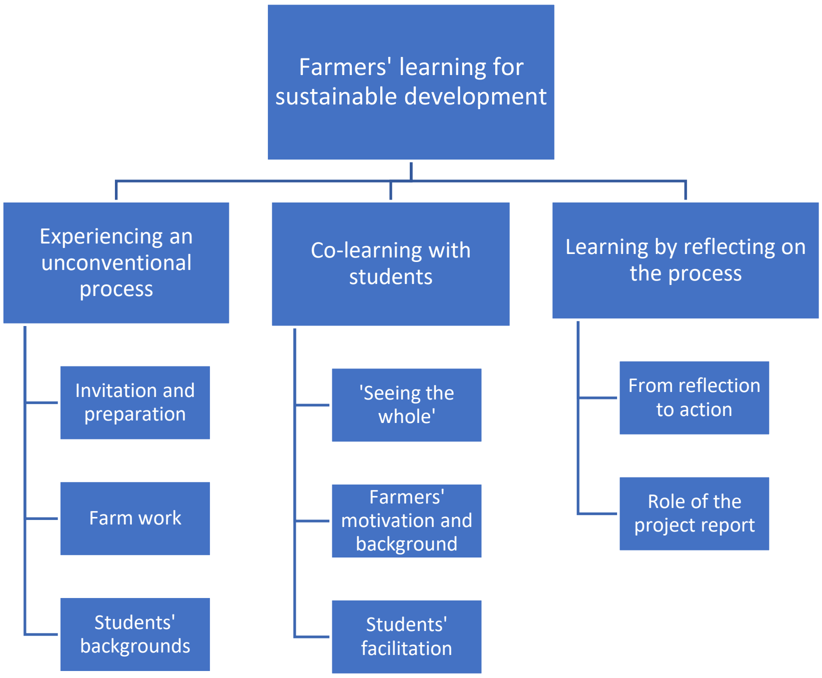


Figure 12: Overview of the categories

In our preliminary analysis we found that farmers' learning for sustainable development while being involved in student–farmer action learning projects is characterised by the categories presented in figure 2.

The first main category, "experiencing an unconventional process" relates to instance where farmers described and demonstrated a reaction to being involved in a process they had not taken part of before. For instance, in an interview, when asked whether he got anything out of the project, one farmer stated: "«Yes, but it's mostly to interact with other ways of thinking. Because you muddle around in your own stuff. And when you get other input. For me that was…[the outcome]"

The second main category, "co-learning with students" relates to instances where farmers described and demonstrated relevant learning outcomes while engaging with students in the case activities. During one of the visits, a farmer described that they had viewed their apple orchard almost as a nuisance where they felt guilty each fall for not having the surplus time and energy to take care of the crop the way they felt it should be done. However, as a consequence of the project work, they now viewed the apple orchard as a resource that could be used. Their seemingly increased ability to 'see the whole' can be interpreted as an achievement of one of the described learning goals.

The third main category, "learning by reflecting on the process" relates to instances where farmers described or demonstrated having reflected on the process after the final student visit. As an example, upon returning to one of the case farms and conducting an interview with the two farmers residing there, they stated having talked a lot about the topics raised by the students in the weeks after the student visits. Furthermore, they stated that they had actually followed up on several of the agreed-upon action items.

While many of the results indicate that the involved farmers did increase their sustainability competences, certain aspects of the action learning process were found to not support farmers learning. For instance, the student reports were not read by all farmers mainly due to a language barrier where the reports were written in English, which the involved farmers perceived as a barrier.

Practical Implications

This study may serve as empirical grounding for developing and involving activities in Agricultural Knowledge and Innovation Systems (AKIS) that are based on participatory approaches. This is in line with recent Common Agricultural Policy (CAP) reforms where abandoning a reliance on linear knowledge transfer to a an updated "AKIS 2.0" where co-creation of knowledge happens through sharing of experiences and expertise in a system based on two-way flows of information (European Commision2019). Furthermore, the concrete findings in this study related to which factors support and hinder learning in such participatory projects may be translated to other practical applications of participatory action-oriented learning activities.

Theoretical Implications

The cases are part of a M.Sc. course in agroecology, which has been studied from different angles previously. In one of these studies, Østergaard et al. (2010, p. 32) stated that the main contribution from the stakeholders (e.g., farmers) in this course is that they "provide students and teachers with lived experiences that encourage the students to develop as professionals…". Taken together with the finding in this study that farmers are surprised by the unconventional process, and that they seemingly were unprepared for the process, we may infer that farmers could have benefitted from being more included from the beginning of the learning projects as learners themselves, which is in line with previous studies (e.g., Cristofari et al., 2018; Lacombe et al., 2018; Aare et al., 2021). While the farmers were surprised and unprepared, they did not demonstrate frustration, which is often the case for students the first few weeks of encountering the unconventional learning process (Lieblein et al., 2012). Conversely, most farmers expressed being happy to have interested students with interesting backgrounds at their farms and when reflecting on their involvement were all satisfied with having agreed to participate.

To be developed further…

References

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry & research design : choosing among five approaches* (4th ed.). Sage.

Cristofari, H., Girard, N., & Magda, D. (2018). How agroecological farmers develop their own practices: a framework to describe their learning processes. *Agroecology and Sustainable Food Systems*, *42*(7), 777-795. https://doi.org/10.1080/21683565.2018.1448032

EC. (2019). *Building stonger agricultural knowledge and innovation systems (AKIS) to foster advice, knowledge and innovation in agriculture and rural areas*. European Commision. Retrieved Accessed 13.11.2020 from https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/key_policies/documents/building-stronger-akis_en.pdf

Gobo, G. (2004). Sampling, Representativeness and Generalizability. In S. Clive, G. Giampietro, S. David, & G. Jaber (Eds.), *Qualitative Research Practice* (pp. 436-456). SAGE Publications Ltd. https://doi.org/10.4135/9781848608191.d34

Lacombe, C., Couix, N., & Hazard, L. (2018). Designing agroecological farming systems with farmers: A review. *Agricultural systems*, *165*, 208-220. https://doi.org/10.1016/j.agsy.2018.06.014

Lieblein, G., Breland, T. A., Francis, C., & Østergaard, E. (2012). Agroecology education: Action-oriented learning and research. *The Journal of Agricultural Education and Extension*, *18*(1), 27-40. https://doi.org/10.1080/1389224X.2012.638781

Lieblein, G., Østergaard, E., & Francis, C. (2004). Becoming an agroecologist through action education. *International Journal of Agricultural Sustainability*, *2*(3), 147-153. https://doi.org/10.1080/14735903.2004.9684574

Stræte, E. P., Hårstad, R. M. B., Ystad, E., Kvam, G.-T., Mørch, A. I., Klev, R., & Haugum, M. H. (2018). Kompetanse og rådgivning i jordbruket: Kunnskapsoversikt, aktuelle problemstillinger og analytiske perspektiver for studier av bønders kompetanse som samspill mellom bønder, rådgivning og forskning.

Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: a reference framework for academic program development. *Sustainability science*, *6*(2), 203-218. https://doi.org/10.1007/s11625-011-0132-6

Østergaard, E., Lieblein, G., Breland, T. A., & Francis, C. (2010). Students learning agroecology: Phenomenon-based education for responsible action. *Journal of Agricultural Education and Extension*, *16*(1), 23-37. https://doi.org/10.1080/13892240903533053

Aare, A. K., Lund, S., & Hauggaard-Nielsen, H. (2021). Exploring transitions towards sustainable farming practices through participatory research–The case of Danish farmers' use of species mixtures. *Agricultural systems*, *189*, 103053. https://doi.org/10.1016/j.agsy.2021.103053

Responsible training for responsible agricultural digitalization: Some preliminary remarks

Chrysanthi Charatsari[1], Evagelos D. Lioutas[2], Anastasios Michailidis[1]
[1]Aristotle University of Thessaloniki, School of Agriculture, Department of Agricultural Economics
[2]International Hellenic University, Department of Supply Chain Management

Short abstract:

This study presents the initial steps of a process aiming to design a socially responsible training program for potential adopters of digital agricultural technologies. By conducting a workshop involving farmers, advisors, and researchers, we draw an impact ripple canvas, presenting some possible effects of digitalization on farmers and society. Then, we invited experts to reflect upon the canvas and translate the themes presented in it into training content. The process uncovered that the responsible design of a training program targeted at facilitating agricultural digitalization requires complex thinking, integration of social issues into its agenda, a shift in focus from how-to-use approaches to how to determine the impacts of digitalization for farms, farmers' lives and the society, and a decoupling of digitalization training from the promotion of digital technology adoption.

Extended abstract

Purpose

Agricultural digitalization arose as an answer to the pressing demand for producing high quality food products in efficient and sustainable ways. Nevertheless, its emergence opened up many crucial questions that social science must address to ensure that digitalization will help farmers improve the performance of their enterprises, serving, in parallel, societal purposes (Lioutas et al., 2019; Ingram et al., 2022). In one of the most comprehensive efforts to taxonomize the strands of social science literature on digitalization and list the questions aligning with them, Klerkx et al. (2019) call for future research on the responsible design of digitalization process (i.e., how to integrate societal interests in the designing of the transition to digital agriculture), also stressing the need to focus on farmers' reskilling.

Although both farmers' training and responsible digitalization received considerable attention, the link between them remains largely unexplored. In other words, the question of how to design programs aiming at helping farmers build the skills necessary to deal with digital technologies while ensuring a societally responsible digital transition remains open. Some first empirical evidence provided by Soma and Nuckchady (2021) suggests that existing agricultural education and training efforts have not yet embraced societal issues associated with food systems. In many cases, training and education on digital agriculture are viewed as means to promote adoption or improve farmers' capacity to operate and extract value from technological advancements, while the need to build skills referring to the responsible exploitation of digital technologies is less frequently mentioned in the literature (Chamuah and Singh, 2022; Zscheischler et al., 2022).

In this study, our purpose is to present an approach used to design a responsible training intervention for potential adopters of digital agricultural technologies. The initiative was taken within the framework of the research and innovation project "SFSCs 4.0," which aims to identify barriers and opportunities for digitalizing short food supply chains (SFSCs) in Greece. The approach followed has its theoretical roots in the life-centered design (Borthwick et al., 2022), considering the training needs of potential adopters in tandem with the need to reduce the risk of rebound societal effects of agricultural digitalization. In the following sections, we present the design approach used and outline some of the results and conclusions that emerged.

Design/Methodology/Approach

To design our training program, we followed a sequential approach. As a first step, we conducted a workshop, inviting seven Greek farmers who distribute their products through SFSCs, five farm advisors, and two researchers already involved in the agricultural digitalization process. During the workshop, we asked participants to think of the digitalization process and describe their digitalization experiences. Then, through an interactive discussion, we developed an impact ripple canvas to portray the intended and unintended impacts (both positive and negative) of digitalization on farmers and society. Tomitsch et al. (2021) and Borthwick et al. (2022) suggest using such a canvas to identify and illustrate the potential hidden impacts of technology at different levels of human activity, social life, and socio-ecological systems. To frame our canvas, we exploited the METUX model (Peters et al., 2018), which uses six spheres of impact to distinguish the outcomes of the human-technology interaction experience: *adoption* of technology, *interface* with technology, *task* (the ways technology facilitates, or changes, discrete activities performed by users), overall technology-supported *behavior* (that for the purpose of the present study refers to the management of farms), changes in user's *life*, and *society* (that refers to the direct and indirect impacts of technology on societal wellbeing). Albeit originally developed to explain how technology design can affect human psychological autonomy and wellbeing, the model can be – and already has been – used to frame the impacts of agricultural digitalization on farmers and other social groups (Charatsari et al., 2022). In our research, following previous work (Lioutas et al., 2021; Shepherd et al., 2020; Regan, 2019), we divided the social impacts into environmental, societal, ethical, and cultural.

After collating semantically close concepts into overarching themes, our canvas took its final form (Figure 1). In the next step, the list of themes, as hierarchized during the workshop, along with their descriptions, was administered to a panel of eight experts with experience in designing adult education programs. Panel participants were asked to reflect on themes and categories and offer suggestions for topics that can be incorporated into training programs targeted to adopters of digital farming technologies. Experts followed a "deliberation-negotiation-reaching of agreement" process to develop a list of training topics. At the end of the procedure, we asked participants to reflect on it, express the difficulties they encountered in selecting training content, and offer suggestions for improving the potential of the process.

Findings

The analysis uncovered a variety of impacts that digital technologies may have on farmers and society. As Figure 1 illustrates, these impacts concern all the six cycles used in our conceptualization. Interestingly, most of the 30 overarching categories concern negative impacts. Workshop participants also reflected on the interrelations among these impacts. For instance, in their view, farmers' limited ability to effectively handle technologies (human-technology conflicts) increases their sense that they lack control over digital tools. In its turn, that feeling creates emotional distress (emotional burden) that, in combination with the need to serve debts related to the purchase of technologies (debt distress), has negative effects on farmers' lives (occupational stress). Nevertheless, due to space constraints, we cannot present a full map outlining the paths of impacts here.

The list of themes and a brief description for each one of them, as emerged during the workshop, were given to the expert panel. Experts noted that translating themes referring to "purely technical" aspects of digitalization into meaningful training content was a relatively manageable task. For example, even though farmers may not be familiar with the concept of business models, designing relevant training programs is relatively easy. However, themes associated with "handling emotions when technologies act incomprehensively" (as a participant put it) require more systemic efforts, like teaching tactics to deal with stress and mindfulness training. Nevertheless, learning how to interrelate with technologies was considered by experts as a first step to developing competencies needed to reduce techno-anxiety and deal with human-technology conflicts.

However, integrating societal concerns into farmers' training programs was evaluated as a complex and challenging task. According to experts, a critical duty for training designers is to prevent the emergence of negative societal impacts by emphasizing the cause-effect relationships between actions and potential outcomes. During the workshop, the need to decouple digitalization training from the promotion of digital agriculture and expose the risks that accompany the adoption of digital technologies – not only for farmers but also for other social groups – emerged as a priority. Experts also noted the importance of moving beyond simple "how-to-use" approaches and incorporating what-if thinking in the design of training programs.

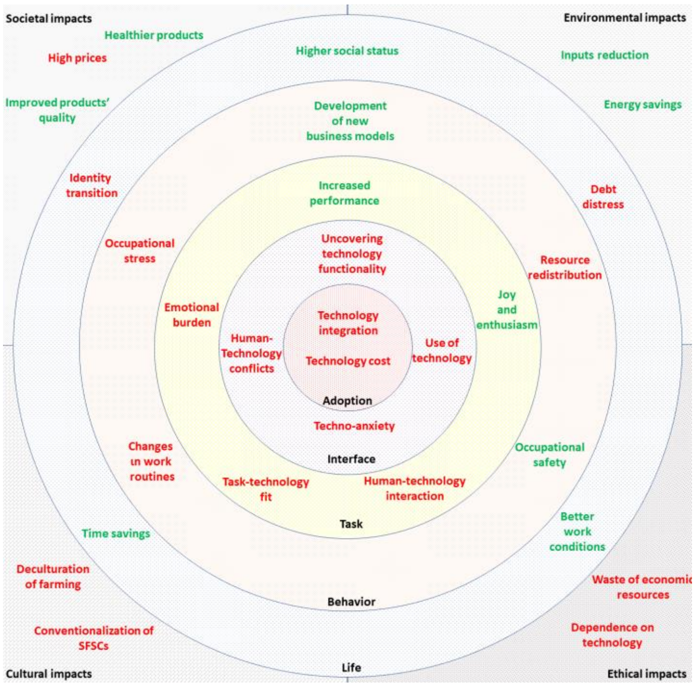


Figure 1. A ripple canvas portraying positive (in green font) and negative (in red font) impacts of agricultural digitalization on farmers and the society

Practical Implications

The approach followed in the present study indicates that adding a societal responsibility dimension to farmers' training programs is a complicated process, requiring careful consideration of the complex interrelations between entangled phenomena. The use of tools like the impact ripple canvas can help expose critical points that deserve attention during the design of digitalization training projects.

Theoretical Implications

From a theoretical point of view, the work presented herein indicates that designing societally responsible training programs is a process that should move beyond technical knowledge, involving societal concerns and considering the impacts that digitalization may have beyond the farm fence.

References

Borthwick, M., Tomitsch, M., & Gaughwin, M. (2022). From human-centred to life-centred design: Considering environmental and ethical concerns in the design of interactive products. *Journal of Responsible Technology*, *10*, 100032.

Chamuah, A., & Singh, R. (2022). Responsible governance of civilian unmanned aerial vehicle (UAV) innovations for Indian crop insurance applications. *Journal of Responsible Technology*, *9*, 100025.

Charatsari, C., Lioutas, E. D., Papadaki-Klavdianou, A., Michailidis, A., & Partalidou, M. (2022). Farm advisors amid the transition to Agriculture 4.0: Professional identity, conceptions of the future and future-specific competencies. *Sociologia Ruralis*, *62*(2), 335-362.

Ingram, J., Maye, D., Bailye, C., Barnes, A., Bear, C., Bell, M., ... & Wilson, L. (2022). What are the priority research questions for digital agriculture? *Land Use Policy*, *114*, 105962.

Klerkx, L., Jakku, E., & Labarthe, P. (2019). A review of social science on digital agriculture, smart farming and agriculture 4.0: New contributions and a future research agenda. *NJAS-Wageningen Journal of Life Sciences*, *90*, 100315.

Lioutas, E. D., Charatsari, C., & De Rosa, M. (2021). Digitalization of agriculture: A way to solve the food problem or a trolley dilemma? *Technology in Society*, *67*, 101744.

Lioutas, E. D., Charatsari, C., La Rocca, G., & De Rosa, M. (2019). Key questions on the use of big data in farming: An activity theory approach. *NJAS-Wageningen Journal of Life Sciences*, *90*, 100297.

Peters, D., Calvo, R. A., & Ryan, R. M. (2018). Designing for motivation, engagement and wellbeing in digital experience. *Frontiers in Psychology*, *9*, 797.

Regan, Á. (2019). "Smart farming" in Ireland: A risk perception study with key governance actors. *NJAS-Wageningen Journal of Life Sciences*, *90*, 100292.

Shepherd, M., Turner, J. A., Small, B., & Wheeler, D. (2020). Priorities for science to overcome hurdles thwarting the full promise of the 'digital agriculture'revolution. *Journal of the Science of Food and Agriculture*, *100*(14), 5083-5092.

Soma, T., & Nuckchady, B. (2021). Communicating the benefits and risks of digital agriculture technologies: Perspectives on the future of digital agricultural education and training. *Frontiers in Communication*, *6*, 259.

Tomitsch, M., Fredericks, J., Vo, D., Frawley, J., & Foth, M. (2021). Non-human personas: Including nature in the participatory design of smart cities. *Interaction Design and Architecture(s)*, *50*(50), 102-130.

Zscheischler, J., Brunsch, R., Rogga, S., & Scholz, R. W. (2022). Perceived risks and vulnerabilities of employing digitalization and digital data in agriculture–Socially robust orientations from a transdisciplinary process. *Journal of Cleaner Production*, *358*, 132034.

Acknowledgment

The study is part of an ongoing project titled "Digitalizing Short Food Supply Chains" (SFSCs 4.0). The research project was supported by the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "3rd Call for H.F.R.I. Research Projects to support Post-Doctoral Researchers" (Project Number: 7762).

Developing competences for modern rural advisors: Nature connectedness, ethos and professional ethics

Ioanna G. Skaltsa[1], Alex Koutsouris[1], Katerina Kasimatis[2]
[1]Department of Agricultural Economics & Development, School of Applied Economics & Social Sciences, Agricultural University of Athens (AUA), Athens, Greece.
[2]Department of Education, School of Pedagogical and Technological Education (ASPETE), Athens, Greece

Short abstract.
Modern rural advisors (MRAs) are called to act as change agents supporting farmers' decision-making with a view to sustainability. Combining scientific knowledge, skills and values, they need to raise collective agency, i.e. a sense of active and responsible participation in a community that would support their mediation and actions with a sense of common purpose. In this respect, Higher Education Institutions (HEI) have to transform their educational methodologies, preparing students to solve real life problems and act in-line with professional ethos and responsibility, which will support the wellbeing of the community and the sustainability of our planet. In this paper, we present part of the findings from an extra, online (due to COVID-19 restrictions) three-hour participatory session concerning the mindset and the development of competences of future MRAs. In this piece of work we focus on students' nature connectedness and ethos and professional ethics and thus on agency. Students participated in pre and post-surveys with focus groups and observation also been utilized to further explore and validate quantitative data.

Extended Abstract

Purpose

Becoming an Agricultural Extension Agent/Advisor is an important career choice for Agricultural University of Athens (AUA) graduates. Nowadays, in addition to 'traditional' definitions of extension (Maunder 1972) referring to the dissemination of innovations to farmers, through appropriate teaching/communication techniques, and non-formal, short-term training (Coombs & Ahmed, 1974), it is essential to enhance MRA's profile with competences such as communication, collaboration, reflection, ethos, professional ethics and empathy (Charatsari et al., 2021). Additionally, according to Skaltsa et al., 2023, under review) MRAs need to develop "anthropomorphic" empathy for the environment, in order to frame their decisions and actions with the necessary responsibility for the wellness and the sustainability of the community and our planet. Therefore, our interest in this paper is to explore the contribution of HEIs in professional ethics development. This study explores the impact of students' learning experience following a three-hour experiential learning (EL) class, in relation to the development of ethical values and professional ethics. The objective of the participatory class was to explore: a) students' mindset regarding the MRA's profile and their responsibility vis-à-vis sustainability and b) the impact of Nature Connectedness (NC) on students' ethos and professional ethics. Following the COVID 19 restrictions, the class and the participatory activities were implemented online, adopting relevant techniques and tools.

Design/Methodology/Approach

The importance of enhancing the profile of MRAs with competences is undoubtable. Analytical and inquiring thinking, collective and responsible acting, empathy, "anthropomorphic" empathy for the environment and professional ethos are crucial competences for MRAs (Charatsari et al., 2021; Skaltsa et al., 2023 (under review)).

Hence, in order to prepare students for their future career as MRAs, Agronomic HEIs should adopt policies that focus towards students' competences development, together with educational methodologies that support that objective. In this respect, EL has been shown to play an all-important role (Roberts, 2006). When EL is successfully implemented, the transformation of the experience that occurs supports students in retaining information (knowledge), growing their technical skills and advancing their social competences, thus in their personal growth (Knapp &

Benton 2006). Therefore, EL creates the necessary environment for students to communicate efficiently and collaborate successfully with their peers in solving real-life problems; furthermore, students learn to take initiatives, to reflect and act in-line with ethos and responsibility for themselves, for others, and for our planet. Hence, they are best prepared for the future and to act as change agents, since they develop the will and the ability to act responsibly to effect change, while developing an identity and a sense of belonging, i.e. student agency that, in turn, can lead to professional agency (OECD, 2019). Indeed research shows that agronomy students feel more confident when they acquire and/or develop competencies and self-efficacy during their studies (Charatsari et al., 2021) thus supporting our focus on MRAs' competence development in HEIs, based on EL methodology.

Methodology. The study methodology was designed between January and March 2021 and was applied in March and April 2021. Following a call to AUA students enrolled in two subjects, 57 volunteered to participate in an extra three-hour online class.

The class used the EL approach (Kolb's circle), aiming at exploring the MRA's ethos and professional ethics with a view to community wellness and planet sustainability. To obtain our aims, participatory activities were applied inspired amongst others by the Biophilia values approach (Lumber et. al., 2018).Students' interaction with nature was investigated using in particular activities based on the Symbolic, Humanistic and Moralistic values. Aiming to trigger students' emotional bond with nature and ethical concerns, activities were designed based on metaphors and examples from art, such as "the 3rd Paradise" (Pistoletto, 2014). To investigate further students' NC, a new activity, called "'anthropomorphic" empathy map', was designed. As planet earth/Nature literally has no human appearance, character, qualities, feelings or behavior, we introduced the term 'anthropomorphic' empathy map. According to the Oxfords dictionary anthropomorphic means treating gods, animals or objects as if they had human qualities, an explanation of animal behavior in anthropomorphic terms. Furthermore, in order to connect students to their inner drive and passion that drives them towards their acts, Otto Scharmer's EGO to ECO framework and Theory U model was used (Scharmer, 2018). Theory U, investigates the links between the open mind, the heart and the will, and supported an activity regarding students' reflection on MRA's profile and their own role(s) as future MRAs.

Due to COVID-19 restrictions, online teaching using Microsoft Teams was adopted and online interactive tools were used. A 2-hour preparatory online meeting, supported students to both get familiar with the online tools and get to know each other; icebreakers and energizers were used to create the frame of collaboration necessary for the forthcoming class. In EL tools like work in teams, reflection, journaling and brainstorming were used. The evaluation adopted a mixed research design using quantitative, qualitative and observation tools. Students, before and after classes, filled an online quantitative questionnaire (google forms). The instrument consisted of a 5-point Likert scale, multiple choice, and open-ended questions.

The questionnaire included the Mayer and Frantz (2004) Connectedness to Nature Scale (CNS) which, measures the degree to which people feel emotionally connected to nature/natural world (see, MEMO, Table 1), In parallel, eight items were used to investigate MRAs ethos and professional ethics (see, Table 1).

Quantitative data were analyzed using SPSS version 28. For further assessment and validation of the quantitative data, online focus groups and observation were used. The focus groups were recorded with students' consent. Qualitative data analysis followed the thematic content analysis approach (Gibbs, 2007).

Findings

The majority of the students that participated in the research are 20 years old (54.4%), in their second year of studies (70%), females (63%) and grown in big cities/urban areas (67.4 %).

Quantitative data

Experiential learning. Considering the impact of EL in relation to the students' change of opinion about the importance of ethos and professional ethics for MRA a statistically significant positive change was observed (χ^2 =6.582, P=0.037).
Nature connectedness (NC). The comparison between the overall NC (NC pre-test) and the overall ReNC (NC post-test) does not yield statistically significant results at 0.05 level (M_{PRE}=3.66, M_{POST}=3.73; Z=-1.76, r= -0.17, P=0.078). Nevertheless, the following 4 out of the 14 NC items show positive and statistically significant differentiation: a) I have a deep understanding of how my actions affect the natural world (M_{PRE}=4.09 M_{POST}=4.37, P=0.009), b) I feel that all inhabitants of Earth, human, and nonhuman, share a common "life" (M_{PRE}=3.61, M_{POST}=4.00, P=0.05), c)I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees (M_{PRE}=3.09, M_{POST}=3.72, P<0.001), d) My personal welfare is independent of the welfare of the natural world (M_{PRE}=2.33, M_{POST}=2.88, P=0.005).

Ethics. With regard to ethics, statistically significant increase is observed in 2 out of 8 items: a) In your opinion are moral values and professional ethics necessary for the MRA's job placement (M_{PRE}=3.89 M_{POST}=4.19, P=0.048), b) In your opinion are moral values and professional ethics necessary for the MRA's career development? (M_{PRE}=4.18, M_{POST}=4.42, P=0.025)

Link between NC and ethics. The links between NC and ethics have been strengthened after the class. While before the class only three of the items had statistically significant correlation with NC after the class all but one of the ethics items (item 5: Studies in AUA equip students with ethos and professional ethics.), show statistically significant correlation with NC.

Qualitative data

With regard to the open-ended questions included in the on-line questionnaire, the focus groups and the observation during the class, students reported that the activities helped them to investigate and/or learn new things about themselves and the profile and competences of MRAs. Excerpts from students' statements regarding their experience follow:

During the class, I realized/understood: "Without ethics and respect we cannot work as a team; in order to achieve my team's goals, I had to respect my peers and act with empathy and responsibility; I felt responsible while I was representing my team for both my sayings and my actions".

The class supported me to understand better: "T*he complexity of MRA's profile; the important role of MRA, I hadn't so far realized his impact in common wellbeing; that I am part of the whole picture and my actions as a future MRA have an important impact to my community and to environmental sustainability; the responsibility of my discipline actions and decisions towards environmental protection and sustainability; that as future MRA I have many ways to change the world; the value of "anthropomorphic " empathy in understanding and acting towards sustainability; that my dreams are in line with my peers' dreams; how much I rely on our planet and therefore I have to respect and protect it as my home; the importance to reflect on my own experiences and make proposals as a member of a future MRAs scientific group.'*

Additionally students reported that as a future MRA they could support sustainability and wellness: *[By] 'enhancing human-nature relationship; enhancing values towards sustainability; adopting and promoting "anthropomorphic" empathy and collaborating with other disciplines for the protection of our planet; using scientific knowledge to heal nature from our mistakes; counseling farmers towards sustainability and wellbeing; working as a team member towards common goals'.*

Furthermore, they stated that as future MRAs their vision is to: *'Transmit to farmers ethics and inspiration; inspire environmental awareness; influence enterprises towards the environmental sustainability; contribute to a greener* *planet; contribute to saving rare plant species for future generations' [make others] appreciate and not underestimate the environment; work towards a more sustainable/ecological way of thinking; Impact fair treatment for nature'.*

Practical Implications

Our results show that students/future MRAs' ethos and professional ethics were positively affected even by an extra 3-hour (short) experimental class. Additionally, activities that explore the «anthropomorphic» empathy towards our planet, strengthens students' nature connectedness and ethos and professional ethics. The experimental class also raised their awareness and responsibility towards the common goods and the sustainability of our planet, supporting their professional identity. Overall, both quantitative and qualitative findings support the implementation of participatory EL activities in HEIs.

Theoretical Implications

Our research findings contribute to the dialogue about the importance of adopting (novel) participatory educational methodologies in HEIs, towards a curriculum that will include modules regarding students' competences development. Students' nature connectedness (even indirect) and ethos and professional ethics and thus agency are among the topics of such modules.

References

Charatsari, C., Jönsson, H., Krystallidou, E., & Lymberopoulos, A. (2020). Agronomic education at a crossroad: providing skill sets or developing mindsets? https://lucris.lub.lu.se/ws/portalfiles/portal/84225307/Charatsari_et_al_AGRONOMIC_EDUCATION_AT_A_CROSSROAD.pdf

Gibbs, G. R. (2007). Thematic coding and categorizing. Analyzing qualitative data. *London: SAGE Publications.*

Knapp, D. & Benton, G. M. (2006). Episodic and semantic memories of a residential environmental education program. *Environmental Education Research*, 12, 165-177.

Lumber, R., Richardson, M., & Sheffield, D. (2018). The seven pathways to nature connectedness: A focus group exploration. https://dora.dmu.ac.uk/bitstream/handle/2086/17231/Seven%20Pathways%20to%20Nature%20Connection%20Pre-Publication%20Copy.pdf?sequence=1

Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology*, 24(4), 503–515.

OECD (2019*). Future of education and skills 2030: OECD learning compass 2030.* https://www.oecd.org/education/2030-project/about/documents/E2030%20Position%20Paper%20(05.04.2018).pdf

Pistoletto, M. (2014). Il terzo paradiso. Venezia: Marsilio Editori spa.

Roberts, T. G. (2006) A philosophical examination of experiential learning theory for agricultural educators. *Journal of Agricultural Education*, 47(1): 17-19.

Scharmer, O. (2018).The essentials of Theory U: Core principles and applications. Oakland, CA.: Berrett-Koehler Publ.

Skaltsa, I., Koutsouris, A. & Kasimatis, K. (under review). Exploring nature connectedness and 'anthropomorphic' empathy in an on-line experiential learning class, for future rural advisors. *Journal of Adventure Education & Outdoor Learning.*

Table 1. Ethos and professional ethics correlation with NC, before and after class implementation (N=57)

	ITEMS (ethos and professional ethics)	1. How important is for MRA to have ethos and professional ethics?	2. Are ethos and professional ethics necessary for MRA-agent-of-change career placement?	3. Are ethos and professional ethics necessary for MRA-agent-of-change social and professional collaborations	4. Are ethos and professional ethics necessary for MRA-agent-of-change career development?	5. Studies in AUA equip students with ethos and professional ethics	6. MRA should make decisions based on the collective interest.	7. MRA should be aware of the consequences of his/her choices, taking the responsibility for his/her words and actions	8. MRA should adopt ethos and act with professional ethics
NC	***r***	.27*	-0,060	.23*	0,130	-0,040	0,070	.24*	0,110
	P	**0,012**	0,537	**0,031**	0,197	0,665	0,529	**0,030**	0,300
ReNC	***r***	.452**	.344**	.332**	.347**	0,132	.358**	.223*	.306**
	P	**0,000**	**0,001**	**0,002**	**0,002**	0,203	**0,001**	**0,045**	**0,006**

MEMO: * Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed)

NC comprises the following 14 items: a) I often feel a sense of oneness with the natural world around me, b) I think of the natural world as a community to which I belong, c) I recognize and appreciate the intelligence of other living organisms, d) I often feel disconnected from nature, e) When I think of my life, I imagine myself to be part of a larger cyclical process of living, f) I often feel a kinship with animals and plants, g) I feel as though I belong to the Earth as equally as it belongs to me, h) I have a deep understanding of how my actions affect the natural world. I) I often feel part of the web of life, j) I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force', k) Like a tree can be part of a forest, I feel embedded within the broader natural world, l) When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in Nature, m) I often feel like I am only a small part of the natural world around me, and that I am no more important, than the grass on the ground or the birds in the trees, n) my personal welfare is independent of the welfare of the natural world.

Session 3D – Supporting farmers

A social cognitive framework for learning processes in communities of practice on integrated pest management

Simon Lox
ILVO

Short abstract

Examples show that farmer-to-farmer discussion and demonstration groups can help to advance Integrated Pest Management on farms to reduce the use of harmful crop protection products. However, it is unclear how these groups facilitate a social learning process that can enable a participating farmer to advance her/his IPM strategy. To get more insights in the learning processes in these groups a framework based on the 'Communities of Practice' theory and the Experiential Learning theory is used to analyse observations in farmer groups of the IPMWORKS project. Preliminary findings suggest that the intertwining of social and cognitive learning in these groups engages farmers in complex and supporting understandings of IPM.

Extended abstract

Purpose

Integrated Pest Management (IPM) is a farming strategy composed of several practices and principles, with the goal to decrease the use of harmful crop protection products on farms. Training on IPM for professional users is an essential policy measure in the renewal of the SUD 2009/128/EC that is being discussed at European level. Adoption literature on the barriers to IPM repeatedly advises to make use of peer and social learning in these trainings (Bjørnåvold et al., 2022; Creissen et al., 2021). In the terms of Loeber et al. (2009), IPM can be seen as a radical, contestable and normative set of principles that therefore requires social learning for farmers to be able to understand why and how IPM can be implemented. IPM is contestable, because there are still research needs on how to design effective IPM strategies, it is radical, because it often requires farmers to make drastic changes to the way they are used to farm, and it is normative, because it proposes a 'right' direction, while in first instance IPM should always be adapted to the ever changing and specific contexts of a farm, and in second instance it not always complies with productivist norms many farmers adhere (Bakker et al., 2021; Burton, 2004; Deguine et al., 2021; Lamichhane et al., 2015; Loeber et al., 2009). Social learning as an experience based and social process of exchange and reflection, should help farmers to together overcome these barriers (Loeber et al., 2009). Which in practice is proven by the farmer-to-farmer discussion and demonstration groups that effectively helped farmers transition to IPM. (Deperrois et al., 2022; Lapierre et al., 2019; Prager & Creaney, 2017). However, it is unclear how these groups facilitate a social learning process that can enable a participating farmer to advance her/his IPM strategy. In other words, what is the relation between social (ie. interaction with others) learning processes and cognitive (ie. reasoning, knowing, understanding) learning processes in farmer-to-farmer discussion and demonstration groups? Can for example the construction of a common identity in the group facilitate a critical, analytical, and rational reflection on IPM? Subsequently, both social as cognitive learning processes are expected to evolve over time, but it has not been researched thoroughly how this evolution looks like and can be facilitated by an advisor. In this paper, I introduce a framework to analyse the intertwining of social and cognitive learning processes in a farmer-to-farmer discussion group, with a methodological approach that enables for practical descriptions and capturing evolutions over time. This framework is used to analyse case studies of such groups in the H2020 IPMWORKS project, which has the purpose to bring groups of 10-15 farmers together per sector and per region to visit each other farms and learn on IPM in facilitated discussions.

Design/Methodology/Approach

Analytical framework

Direct experiences and others' experiences are learning sources that can provide reflective moments and new perspectives on usual ways of working. Typical for adult learning is the focus on experiences and applicable knowledge, which is especially true for farmers who repeatedly indicate to prefer learning from learning-by-doing, from observable and trialable information, from peers, focused on practice, and in sensorial and real-life settings (Franz et al., 2010; Ingram et al., 2018; Merriam, 2001). Especially to advance IPM strategies on farm the type of knowledge and support needed specifically requires learning processes and learning environments that focus on social interaction and experience. As explained before, the contestable, radical, and normative nature of IPM requires social learning to engage with these barriers. Therefore, to provide tactile and situated learning experiences with peers, the farmer groups in the IPMWORKS project focus on demonstration and farm visits, and on facilitated discussion. The idea of the combined social and experiential learning environments on pest management strategies is not new. It originates in the FAO's Farmer Field School concept (van den Berg et al., 2020) and is since then applied in many contexts and forms (Charatsari et al., 2020; Tafesse et al., 2020; Vaarst et al., 2007).

To grasp the learning processes on IPM in these groups I chose to assemble a framework based on the 'communities of practice' theory (CoP) and the 'experiential learning' theory (EL). The CoP framework is a social theory of learning that makes it possible to research the interplay between evolving social interactions in the farmer group and the development of a social learning process (Illeris et al., 2009). In the words of Wenger himself to locate this experience [of learning] in the relation between the person and the social world as they constitute each other (Farnsworth et al., 2016, p. 4). EL theorises a cognitive process from experience to knowledge, mostly used to frame an individual learning process, but is also applicable for processes developing cognition on a social level (Malinen, 2000). I come to the following framework based on Wengers description of a social theory of learning in Illeris et al. (2009), and on the interpretation of different EL theories by Malinen (2000).

Theoretical framework			
Construct		**Definition**	**Analytical question**
CoP	Domain	Joint enterprise of the community that defines the identity and value of that community.	How do participants define the objectives of the group and their activities?
	Community	Mutual engagement of the members and regulation of how the community functions.	How do participants engage with each other?
	Practice	Development of a shared repertoire and communal resources.	Which shared vocabulary enables the participants to define and discuss IPM as a practice?
	Meaning	Negotiation of the meaning of the domain, community and practice.	What is the relevance and motivation to join the group and learn about IPM?
EL	Temporal	Referencing to previous experiences and thoughts.	Do they refer to past group activities and personal experiences?
	Critical	Defining contradictions, deficiencies, and limits of understanding.	How do group members critique each other pest management strategies?
	Analytical	Analysing why previous conceptions are wrong or incomplete.	How does the group analyses threats and opportunities in the demonstrated pest management strategies?
	Rational	Searching for new perspectives on (previous) experiences.	Are the principles of IPM interpreted by the group as possible solutions on presented problems?
	Personal	Interpreting the relevance and value of new perspectives for all previous and future experiences.	How does the group assesses the relevance, applicability and priority of presented pest management strategies?

Both theories separately have their value to describe learning processes in the farmer groups of the IPMWORKS project, but part of the research work will be to combine these theories to analyse these groups as learning environments were social and cognitive learning processes constantly interact and co-evolve. It is assumed that social and cognitive learning processes interact both between the group and the individual, as between 'interaction' and 'understanding'. As Lankester (2013) explains, experiential learning is a good conceptual starting point to understand learning, but should be embedded in dynamic social learning processes that transforms individual experiences in process' of creating shared perspectives, reflection, sharing, contextualising, etc. Conversely, these social learning processes will be influenced by the individual input, which places both theories in a mutual relation. The outcomes of this back-and-forth process are both social and cognitive types of knowledge, that situate both on the group as on the individual level.

Methodology

Concerning Lüders in Flick et al. (2004) I will conduct ethnographic research, because the purpose is to give a description of the farmer groups as small life-worlds in which a culture with embedded forms of knowledge is produced by the participating farmers. By doing participant observations in these groups I gather data by note-taking on: what they say (ie. the content of the questions they pose and the examples and opinions they share), how they say it (ie. the tone of a conversation), when they say it (ie. when in a conversation and in which context of their learning environment), and on the roles of the facilitator of the group plays. In a later stage I will focus on the 'why' of what they said in interviews. In order to grasp evolutions in these interactions, the research is based on long-term case studies. For a minimum of two years, five groups in the IPMWORKS project will be followed. The groups are located in Belgium and The Netherlands, and focus on IPM in strawberries, zucchini, arable crops and outdoor vegetables. I can participate during their activities organised by the group facilitator, like farm demonstrations, visits to research farms, group discussions, evaluation and planning meetings, etc.

In the analytical phase the theoretical constructs of the framework are used to label the quotes, their tone and their context, as exemplified further in the findings. Cross-case analysis of the theoretical constructs enables to describe what this construct means in a context of farmer-to-farmer discussion and demonstration groups on IPM and how it develops over time, showing the different kind of learning processes and social developments in these groups. This first analytical step is essential for the second round of within-case analysis of sequences and co-appearances of the theoretical constructs to answer the research question on how these groups facilitate a social learning process that can enable a participating farmer to advance her/his IPM strategy. Relations between constructs show the mutuality of social and cognitive learning processes and describe patterns of learning behaviour (ie. (inter)actions of participants that enable learning) in the specific context of the farmer groups (farmer CoP's on IPM).

Findings

The study is still ongoing. In the following I present an example of one observation in one case, of how I use the framework to analyse the data, to indicate which kind of results come out of the study. The analysis are preliminary and should be further elaborated with more data.

Step 1: analysis of theoretical constructs

Example:

Notes: After the presentation of financial data of a research farm there is a discussion on how this data should be presented to policy makers, because they fear misinterpretations. They collectively decide that they want to think along on how to communicate these data. In a following discussion on their motivation to join the group they also stated the importance of the group as a platform of communication to policy and public.

Analysis: Because of the current public attention for farming, they saw the importance of what is communicated from their group. Therefore they adopted this 'communication check' as a new task for their group, defining the domain of their tasks as a group and of their practice by communicating on the practical implications of research.

Example:

Notes: Quote farmer: "I don't look to environmental points like different substances in the soil or water. I look at what is present of natural enemies, to biodiversity and the effectivity of it."

Analysis: The farmer wanted to open a conversation to limit the practice of IPM, in which one should take into account multiple aspects, to effectivity and the issues of biodiversity and more specific to natural enemies. So he shared his vision on IPM as a practice with the group.

Example:

Notes: The farmers state that big companies of crop protection products don't bring their new products on the European market, because there is too much bureaucracy to get the products accepted. Therefore they find it important to stay up to date of the alternatives that come out of research or that are tried by colleagues.

Analysis: They share the argument that the options of crop protection products are declining and that therefore looking for alternatives is a priority that is worth investing time to learn (meaning). So the motivation to learn is partially based on external push from market and regulatory changes that make the way they used to farm very difficult.

Example:
Notes: Farmer A shares the problem that the wind dries out the soil by having a chimney effect over the soil pores and so he searches for a way to loosen up the upper soil layer, which would in his idea both help for moist regulation and make a false seedbed against weeds. (Temporal / Critical)
Farmer B: "But isn't that just dependent on the spring?" (Critical)
Farmer C: "How do you incorporate the fertiliser if you don't go that deep?" (Critical)
Farmer D: "Actually I also do it like that with machine X. It is difficult to get rid of the grasses, but I have the feeling that it works in the beets." (Analytical / Personal)
Farmer A will try his technique in Sorgum and mais. (Rational / Personal)
Analysis: By referring to a problem, farmer A tries to situate a temporal experience and the critical recognition that something is wrong. Farmer B and C pose critical questions on the idea of farmer A to get to know if the new idea is correct. Farmer D makes an analytical remark by analysing in which situations the idea might work, adding a personal remark by stating that he does not really has proof, but personally beliefs it can work. Farmer A decides to try the technique and thereby being open to new experiences and perspectives (rational) and taking a personal risk on his farm.

Step 2: analysis of interaction between constructs

Example:
Notes: Farmer A explains that he will do a trial with a robot.
Farmer B asks for the order of magnitude of the investment.
Farmer A replies "80000 euro for 20ha, for sowing and hoeing. It works autonomous for both crops."
Analysis: In this excerpt of a conversation between two farmers of the group they are trying to define automated practices as a 'practice' of IPM. Farmer B poses an analytical question to delineate the opportunity of the proposed practice, probably to define the personal relevance of the practice. In doing so farmer B opens up a space for discussion on what the factors of 'meaning' of IPM practices are. Farmer A engages in this discussion by interpreting the factors that make the meaning of a practice as resources, applicability, and (multi)functionality. The consequence of this analysis is that the definition of a practice in a CoP requires an analytical discussion in which the participants put together their opinions on what makes a practice relevant to use. This discussion defines the meaningfulness of a practice for both the community as for its participants. As a facilitator of a CoP one can for example prepare and moderate a discussion on a new IPM practice by focussing on the conditions in which this practice is applicable, before discussing on the why and the how of that practice.

Example:
Notes: Farmer C who is very active in the group discussions and is involved in several research projects with his farm, questions the others: "are there still farmers who spray weekly based on a spraying scheme?". He stated this with an authoritative tone. Some others of the group agreed that this is not the way anymore to decide when to spray and they share examples of how they get to know when to spray. Not everyone openly agreed on this statement and some tried to nuance the usefulness of having a spraying scheme as a basic reference for timing.
Analysis: Farmer C poses a critical question to the other farmers. Because he is a committed and respected member of the group, he has the power to impose an identity and 'domain' to the community as 'the farmers who don't spray based on spraying schemes'. In doing so he starts a discussion on which practices are appropriate in IPM, picked up by the other farmers who share their practices. The consequence of this analysis is that hierarchies can stimulate critical questioning of practices and that critical questioning is an essential part of defining the domain of the community. A defined domain might motivate farmers to achieve this communal norm, but could possibly also exclude others. As a facilitator of a CoP one needs to be attentive for normative statements and seize them to embark on a critical discussion in which the perspectives of all members are shared.

Practical Implications

By comparing different cases I will assemble an image of what farmers understand and value in IPM, which can serve as a guideline for future research, as also for policies that want to stimulate advanced implementation of IPM. By systematising the different kind of discussions on IPM farmers have in these groups, I demonstrate how farmers can develop an advanced understanding of IPM in group. Insights in the interaction between social and cognitive learning processes will form the basis for guidelines for advisors on how to organise farmer-to-farmer discussion groups and on how to facilitate their learning process.

Theoretical Implications

The framework tries to bring in a theoretical adjustments to the CoP framework. By not focussing on learning as a group process where the group learns as a whole or on learning as an individual process where the individual learns from the group, but on learning as the interaction between these two levels. I conceptualise social learning as the perpetual interplay between individual contribution and collective processing of this contribution. Methodologically, the participant observations make it possible to work with real-life examples (ie. not in a closed research setting like an interview) and enables to place these examples in the context they happen in, resulting in practical descriptions. The data analysis would be strengthened by triangulating it with the perspective of the facilitator and the farmers on what happens in the groups and how they perceive the importance of the interactions. So to come to theoretical conclusions extra interviews or focus groups would be necessary.

References

Bakker, L., Sok, J., van der Werf, W., & Bianchi, F. J. J. A. (2021). Kicking the Habit: What Makes and Breaks Farmers' Intentions to Reduce Pesticide Use? *Ecological Economics*, *180*. https://doi.org/10.1016/j.ecolecon.2020.106868

Bjørnåvold, A., David, M., Bohan, D. A., Gibert, C., Rousselle, J. M., & van Passel, S. (2022). Why does France not meet its pesticide reduction targets? Farmers' socio-economic trade-offs when adopting agro-ecological practices. *Ecological Economics*, *198*. https://doi.org/10.1016/j.ecolecon.2022.107440

Burton, R. J. F. (2004). Seeing through the "good farmer's" eyes: Towards developing an understanding of the social symbolic value of "productivist" behaviour. *Sociologia Ruralis*, *44*(2), 195–215. https://doi.org/10.1111/j.1467-9523.2004.00270.x

Charatsari, C., Lioutas, E. D., & Koutsouris, A. (2020). Farmer field schools and the co-creation of knowledge and innovation: the mediating role of social capital. *Agriculture and Human Values*, *37*(4), 1139–1154. https://doi.org/10.1007/s10460-020-10115-8

Creissen, H. E., Jones, P. J., Tranter, R. B., Girling, R. D., Jess, S., Burnett, F. J., Gaffney, M., Thorne, F. S., & Kildea, S. (2021). Identifying the drivers and constraints to adoption of IPM among arable farmers in the UK and Ireland. *Pest Management Science*, *77*(9), 4148–4158. https://doi.org/10.1002/ps.6452

Deguine, J.-P., Aubertot, J.-N., Flor, R. J., Lescourret, F., Wyckhuys, K. A. G., & Ratnadass, A. (2021). Integrated pest management: good intentions, hard realities. A review. *Agronomy for Sustainable Development* , *41*(38). https://doi.org/10.1007/s13593-021-00689-w/Published

Deperrois, R., Fadhuile, A., Subervie, J., Deperrois, R., Fadhuile, A., & Subervie, J. (2022). Social Learning for Pesticide Reduction: Evidence from the French Ecophyto Plan Social Learning for Pesticide Reduction Evidence from the French Ecophyto Plan. *16èmes Journées de Recherches En Sciences Sociales*, *15*.

Farnsworth, V., Kleanthous, I., & Wenger-Trayner, E. (2016). Communities of Practice as a Social Theory of Learning: A Conversation with Etienne Wenger. *British Journal of Educational Studies*, *64*(2), 139–160. https://doi.org/10.1080/00071005.2015.1133799

Flick, U., von Kardorff, E., & Steinke, I. (2004). *A Companion to QUALITATIVE RESEARCH*. SAGE.

Franz, N., Piercy, F., Donaldson, J., Richard, R., & Westbrook, J. (2010). HOW FARMERS LEARN: IMPLICATIONS FOR AGRICULTURAL EDUCATORS. *Journal of Rural Social Sciences*, *25*(1), 37–59.

Illeris, K., Jarvis, P., Kegan, R., Engeström, Y., Elkjaer, B., Mezirow, J., Gardner, H., Alheit, P., Heron, J., Tennant, M., Bruner, J., Usher, R., Ziehe, T., Lave, J., Wenger, E., Wildemeersch, D., & Stroobants, V. (2009). *Contemporary Theories of Learning: Learning theorists … in their own words*. Routledge.

Ingram, J., Chiswell, H., Mills, J., Debruyne, L., Cooreman, H., Koutsouris, A., Pappa, E., & Marchand, F. (2018). Enabling learning in demonstration farms: a literature review. *International Journal of Agricultural Extension*. https://www.collinsdictionary.com/dictionary/english/

Lamichhane, J. R., Barzman, M., Booij, K., Boonekamp, P., Desneux, N., Huber, L., Kudsk, P., Langrell, S. R. H., Ratnadass, A., Ricci, P., Sarah, J. L., & Messéan, A. (2015). Robust cropping systems to tackle pests under climate change. A review. In *Agronomy for Sustainable Development* (Vol. 35, Issue 2, pp. 443–459). Springer-Verlag France. https://doi.org/10.1007/s13593-014-0275-9 Extended Abstract for the 26th ESEE conference

Lankester, A. J. (2013). Conceptual and operational understanding of learning for sustainability: A case study of the beef industry in north-eastern Australia. *Journal of Environmental Management*, *119*, 182–193. https://doi.org/10.1016/j.jenvman.2013.02.002

Lapierre, M., Sauquet, A., & Julie, S. (2019). *Providing technical assistance to peer networks to reduce pesticide use in Europe: Evidence from the French Ecophyto plan*. https://hal.archives-ouvertes.fr/hal-02190979v2

Loeber, A., van Mierlo, B., Grin, J., & Leeuwis, C. (2009). The practical value of theory: Conceptualising learning in the pursuit of a sustainable development. In A. Wals (Ed.), *Social learning towards a sustainable world* (pp. 83–98).

Malinen, A. (2000). *TOWARDS THE ESSENCE OF ADULT EXPERIANTIAL LEARNING*. SoPhi. www.isbs.com.

Merriam, S. B. (2001). Andragogy and Self-Directed Learning: Pillars of Adult Learning Theory. *W DIRECTIONS FOR ADULT AND CONTINUING EDUCATION*, *89*.

Prager, K., & Creaney, R. (2017). Achieving on-farm practice change through facilitated group learning: Evaluating the effectiveness of monitor farms and discussion groups. *Journal of Rural Studies*, *56*, 1–11. https://doi.org/10.1016/j.jrurstud.2017.09.002

Tafesse, S., van Mierlo, B., Leeuwis, C., Lie, R., Lemaga, B., & Struik, P. C. (2020). Combining experiential and social learning approaches for crop disease management in a smallholder context: a complex socio-ecological problem. *Socio-Ecological Practice Research*, *2*(3), 265–282. https://doi.org/10.1007/s42532-020-00058-z

Vaarst, M., Nissen, T. B., Østergaard, S., Klaas, I. C., Bennedsgaard, T. W., & Christensen, J. (2007). Danish stable schools for experiential common learning in groups of organic dairy farmers. *Journal of Dairy Science*, *90*(5), 2543–2554. https://doi.org/10.3168/jds.2006-607

van den Berg, H., Phillips, S., Dicke, M., & Fredrix, M. (2020). Impacts of farmer field schools in the human, social, natural and financial domain: a qualitative review. *Food Security*, *12*(6), 1443–1459. https://doi.org/10.1007/s12571-020-01046-7

Inquiry, a framework to support the transformation of farmers' activity in agroecological transition

Celina Slimi[a], Marianne Cerf[a], Lorène Prost[a], Magali Prost[b]
[a] AgroParisTech, INRAE, UMR-SADAPT, Université Paris-Saclay, Paris, France
[b] Université de Bretagne Occidentale, Brest, France

Short abstract

Supporting farmers in the context of agroecological transitions is a challenge for the agricultural extension services and training. In order to contribute to support such services in facing this issue, we built a conceptual framework that allowed us to analyse how farmers' activity is transformed by agroecological transition. We then propose recommendations for services oriented towards the support of such transitions. More precisely, we highlighted five main principles of farmers' activity during an agroecological transition: the progressivity of change, the singularity of the knowledge involved, observation and experimentation, the reconfiguration of "values" and cooperation and participation in peer groups. Based on the theory of inquiry of John Dewey, we propose a conceptual framework that makes it possible to grasp all these principles together to analyse farmers' activity during their agroecological transition in a systemic way. We then highlight the need for new advisory skills so that advisors can induce and support farmers' inquiry.

Extended abstract

Purpose

The purpose of this work is to build a conceptual framework for studying and supporting farmers' professional transition in the context of agroecology. The agroecological systems require a singular management that transform the way of doing, thinking and valuing the farming work (Duru et al., 2015; Coquil et al., 2017; Chizallet et al., 2020). It does not only need specific knowledge but also renew the farmers' activity itself. Thus, it seems important to build a conceptual framework that makes it possible to grasp the principles of farmers' activity renewed by agroecological transition (AET), with the broader objective of developing adequate support for farmers. The theory of inquiry (Dewey, 1938) gives some interesting key elements to identify relevant advisory skills for supporting farmers in the activity performed during an AET.

Design/Methodology/Approach

We first conducted an exploratory analysis of the literature on farmers' agroecological transitions at the farm scale. We selected articles emphasising one of these topics: trajectories of technical change, learning processes, farmers' motivations, situated ways of acting, factors and strategies driving farmers' choices. This enabled us to identify some principles of farmers' activity during AET and thus to complete the ones already well known regarding the agronomic and socio-economic dimensions. We also followed up some farmers and their peer group to better understand the support each participant seeks or gets through peers' exchanges (Slimi et al., 2021a, 2022). In particular, we conducted interviews with each of the four farmers in a peer group in order to understand their current activity and how it could be influenced by peers. These farmers were engaged in AET through diversification of their system with livestock or no-till organic farming practices.

From both analyses, we formulated a conceptual framework based on the theory of inquiry developed by John Dewey (1938). The theory of inquiry describes the process through which habits and experience are transformed. It is an epistemic proposal that is particularly well suited to account for the intelligibility of human activities in professional situations (Thievenaz, 2014). Our framework is based on some key concepts of the inquiry process, deeply rooted in a reflection-in-action perspective (Schön, 1983). It is meant to grasp the transformation of the way of doing, thinking and valuing farmers' activity during AET.

Findings

Several studies have contributed to highlighting some principles of farmers' activity during AET (Lamine et al., 2009; Van Dam et al., 2010; Chantre and Cardona, 2014; Coquil et al., 2017; Dupré et al., 2017; Catalogna et al., 2018; Cristofari, 2018; Girard and Magda, 2018; Navarrete et al., 2018; Lucas et al., 2019; Toffolini et al., 2019; Chizallet et al., 2020). These studies are based on various theoretical and methodological frameworks and various disciplinary grounds (e.g., rural sociology, design ergonomics, agronomy). Across such studies, we identified five key principles to characterise farmers' activity during AET:

- **Progressivity of change:** AET is a process of progressive reorganisation of experience and in particular by going through phases of coherence and stability of the techniques and decision rules applied by the farmer (Lamine et al., 2009; Chantre and Cardona, 2014; Dupré et al., 2017)
- **Singularity of the knowledge involved:** AET relies on actionable knowledge, which is produced through interaction with the environment (social and soil-climate) and reflects variations and uncertainty arisen in the course of activity. Such knowledge is difficult to standardise (Girard and Magda, 2018; Chizallet et al., 2020).
- **Observation and experimentation:** AET requires monitoring in order to early detect potential problems and adjust the agroecosystem state (Cristofari, 2018), and experimenting in order to find solutions to problems encountered or to understand the mechanisms underlying a practice (Catalogna et al., 2018, 2022).
- **Reconfiguration of values and professional norms:** AET requires a distancing from the values and knowledge relevant to conventional agriculture in order to be able to define new standards of work satisfaction, more appropriate to sustainable agriculture (Van Dam et al., 2010; Lémery, 2011; Barbier et al., 2015; Coquil et al., 2017)
- **Cooperation and participation in peer groups:** AET relies on initiatives to mitigate the risks and uncertainties associated with a new activity (e.g., pooling of machinery resources (Lucas et al., 2019)) and meeting with peers to share information, experience and knowledge to support farming system change (Slimi et al., 2021b).

While these principles, taken one by one, are not specific to AET, their combination makes it possible to characterise the activity of farmers engaged this process. According to these principles, we can point out the need for supporting farmers according to a transformative perspective of experience and learning. Such a perspective can use the key concepts of the inquiry theory. Briefly, these concepts are:

- **Continuity of experience:** each experience borrows something from past experiences and, in some way, modifies the quality of subsequent experiences. In order to develop progressive change in a fruitful way, we have to consider the meaning of the experience and build a direction for change rooted in experiential continuity.
- **The situation as a transaction between subject and environment:** a situation is the "interweaving" of two dimensions of experience, an active dimension linked to the action of the subject on the environment and a passive dimension linked to the action of the environment on the subject. Consequently, it is necessary to consider the subject (e.g., her/his habits and norms) and her/his environment as both acting in structuring the situation. The singularity of farmers' knowledge is thus constructed through that transaction, so it prompts a particular understanding of the extent to which "the environment" affects the farmer in a specific situation.
- **Indeterminacy:** it is a characteristic of a situation creating tension and discomfort. It can be caused by inconsistencies with activity routines or what is taken for granted, lack or excess of references and resources of different natures to deal with a new phenomenon, failures to adapt the means to an end, etc. When farmers address the indeterminacy and engage in a process of inquiry, they give the new experience a meaning rooted in the situation.

- **Reciprocity of ends and means:** action is structured by the search for means, to discover new ends or to broaden the scope of the ends already envisaged. These ends guide the choice between the different possibilities of action, and are in turn influenced by the use of the chosen means. Considering reciprocity suggests not to reduce the means of action to their purely instrumental role (i.e., a mere tool for achieving present objectives). This implies to think about the singularity of farmers' knowledge as situated in a process of co-definition of means and ends of action.
- **Observation and experimentation:** they are a set of operations to look for contrast, exceptions and cases that contradict an established rule. Their role in challenging the subject's habits and beliefs makes it easier to open new points of view. The interest of this pragmatist understanding of observation and experimentation lies in its inscription in an inquiry process leading to the problematisation of the situation and the orientation of reflection-in-action.
- **Valuation activity:** it takes two forms through inquiry. First, it leads to an immediate appreciation (or depreciation) and evaluation of an object or phenomenon. It involves driving affective and intellectual components that engage the subject in an "action" of valuing, desiring, cherishing, etc. or their opposite. Second, valuation activity involves the development of propositions (rules, criteria, norms, etc.) indicating the "best" way to achieve ends and thus allowing the value of the chosen rule of action to be judged. The understanding of the re-configuration of values and norms through the prism of the activity of valuation makes it possible to put the values at the centre of the subjects' actions and no longer as an inaccessible interiority.

These key concepts are interdependent and cover most of the principles pointed above, apart from the collective dimension, which is not directly grasped by the inquiry theory. We suggested (Slimi et al., 2021b) that the collectives can be thought as a way to support the induction or the development of the inquiry process. Therefore, we argue the relevance of considering inquiry as an epistemic proposition for analysing and supporting the activity of farmers in AET.

Practical Implications

The issue of supporting farmers is no longer simply a question of providing missing knowledge to farmers but of facilitating farmers' activity reconfigured by agroecological transition. For Coquil et al. (2018), advisory services have to consider their intervention as one potential contribution to developing the farmer's experience and activity. Our framework based on the inquiry theory provides considerable support to achieve this. Supporting farmers' inquiry means to enable farmers in building problems and solutions situated in the way they and their environment are "tight together". The advisor has to understand how the farmers make sense to various components of their environment in relation to ends and means. For example, a cover crop can mean either binding political regulations or agronomic support to prevent soil erosion or feed for ewes. So paying attention to the meaning given to this element can help understand what is seen as problematic and open new avenues to be considered to overcome this situation. Furthermore, in facilitating a deliberation process among farmers, an advisor has to consider what matters to farmers, through paying attention to their valuation activity and and questioning the way they value various elements of their situation to induce indeterminacy. For example, by debating about what is valid ? Whether it is a practice, an observation, or an indicator to create a space where they can highlight the norms and rules that drive the practice and its consequences.

Some other practical implication is related to the training of farmers and advisors. We support the idea of developing new skills as the "inquiry habit", proposed by Bousbaci (2020), to practise questioning habits, beliefs and experiences in order to work with uncertainty. Developing an "inquiry habit" comes from a practice of inquiry on how advisors can support farmers. This practice can take place in the facilitation of advisors' peer exchanges to be rooted in a problematic situation. The Agroseil guid (Cerf et al., 2013) can be a useful tool to practice inquiry to question the advisory situation. Advisors can also learn to work from an indeterminate situation in the activity of farmers to support the definition of realistic and suitable end and means by using the GERDAL approach (Darré, 2006) for example.

This is a considerable change in the way supporting farmers is approached. It's no longer about encouraging farmers to adopt practices but about encouraging the idea of farmers' creativity of action (Joas, 1999).

Theoretical Implications

This work leads us to consider that an agroecological transition is not only a matter of agronomic and economic issues for the adoption of new practices. Analysing farmers' activity during an agroecological transition as an inquiry process that questions and reconfigures farmers' situations urges advisors to take into account how farmers value and evaluate the situation and the meaning given to each component of their environment. It also urges advisors to consider the environment as not only a "context" but also an active and operant element in the way the farmers experience their action according to the transaction built with their environment. Embracing the entire process by which farmers reconfigure their activity, at farm level, provide grips to apprehend farmers' barriers to engage in agroecology: the barriers are not only to be sought in "the heads of farmers" but also in a more complex relationship between farmers and their environment. This work is an invitation, through the proposed framework of inquiry, to reinforce the theoretical contributions to support the development of skills needed by farmers and those who support them in the transformation of their activity.

References

Barbier, C., Cerf, M., Lusson, J.-M., 2015. Cours de vie d'agriculteurs allant vers l'économie en intrants : les plaisirs associés aux changements de pratiques. Activités 12. https://doi.org/10.4000/activites.1081

Bousbaci, R., 2020. L'Homme comme un «être d'habitude». Essai d'anthropologie et d'épistémologie pour les Sciences du design. Presses de l'Université Laval.

Catalogna, M., Dubois, M., Navarrete, M., 2018. Diversity of experimentation by farmers engaged in agroecology. Agron. Sustain. Dev. 38, 50. https://doi.org/10.1007/s13593-018-0526-2

Catalogna, M., Dunilac Dubois, M., Navarrete, M., 2022. Multi-annual experimental itinerary: an analytical framework to better understand how farmers experiment agroecological practices. Agronomy for Sustainable Development 42, 20.

Cerf, M., Omon, B., Guillot, M.-N., Olry, P., Petit, M.-S., 2013. Guide « L'Agroseil » - Vademecum pour échanger sur le métier de conseiller ou animateur en agronomie, RMT Systèmes de culture innovants, 64 pages.

Chantre, E., Cardona, A., 2014. Trajectories of French Field Crop Farmers Moving Toward Sustainable Farming Practices: Change, Learning, and Links with the Advisory Services. Agroecology and Sustainable Food Systems 38, 573–602. https://doi.org/10.1080/21683565.2013.876483

Chizallet, M., Prost, L., Barcellini, F., 2020. Supporting the Design Activity of Farmers in Transition to Agroecology: Towards an Understanding. Trav. Hum. 83, 33–59.

Coquil, X., Cerf, M., Auricoste, C., Joannon, A., Barcellini, F., Cayre, P., Chizallet, M., Dedieu, B., Hostiou, N., Hellec, F., Lusson, J.-M., Olry, P., Omon, B., Prost, L., 2018. Questioning the work of farmers, advisors, teachers and researchers in agro-ecological transition. A review. Agronomy for Sustainable Development 38. https://doi.org/10.1007/s13593-018-0524-4

Coquil, X., Dedieu, B., Béguin, P., 2017. Professional transitions towards sustainable farming systems: The development of farmers' professional worlds. Work 57, 325–337. https://doi.org/10.3233/WOR-172565

Cristofari, H., 2018. Une analyse pragmatiste des processus d'apprentissage en agroécologie: le cas de l'agriculture de conservation. Université Paul Sabatier-Toulouse III.

Darré, J.-P., 2006. La recherche coactive de solutions entre agents de développement et agriculteurs. Ed. du GRET, Montpellier, France.

Dewey, J., 1938. Logique: la théorie de l'enquête.

Dupré, M., Michels, T., Le Gal, P.-Y., 2017. Diverse dynamics in agroecological transitions on fruit tree farms. European Journal of Agronomy 90, 23–33. https://doi.org/10.1016/j.eja.2017.07.002

Duru, M., Therond, O., Fares, M., 2015. Designing agroecological transitions; A review. Agron. Sustain. Dev. 35, 1237–1257. https://doi.org/10.1007/s13593-015-0318-x
Girard, N., Magda, D., 2018. The interplays between singularity and genericity of agroecological knowledge in a network of livestock farmers. Revue D'Anthropologie Des Connaissances 12, 199–228. https://doi.org/10.3917/rac.039.0199
Joas, H., 1999. La créativité de l'agir, trad. De l'allemand par Pierre Rusch (éd. Cerf) Paris.
Lamine, C., Jean-Marc, M., Perrot, N., Bellon, S., 2009. Analyse des formes de transition vers des agricultures plus écologiques: Les cas de l'Agriculture Biologique et de la Protection Intégrée. Innovations Agronomiques 4, 499–511.
Lémery, B., 2011. Les agriculteurs: une profession en travail. Le travail en agriculture: son organisation et ses valeurs face à l'innovation, Paris, L'Harmattan 243–254.
Lucas, V., Gasselin, P., Van der Ploeg, J.D., 2019. Local inter-farm cooperation: A hidden potential for the agroecological transition in northern agricultures. AGROECOLOGY AND SUSTAINABLE FOOD SYSTEMS 43, 145–179. https://doi.org/10.1080/21683565.2018.1509168
Navarrete, M., Brives, H., Catalogna, M., Gouttenoire, L., Heinisch, C., Lamine, C., OLLION, E., Simon, S., 2018. Farmers' involvement in collective experimental designs in a French region, Rhône-Alpes. How do they contribute to farmers' learning and facilitate the agroecological transition?, in: 13th European IFSA Symposium (IFSA 2018). La Canée (Crete), Greece.
Schön, D.A., 1983. The Reflective Practitioner : How Professionals Think in Action. Basic Books, New York.
Slimi, C., Marianne, C., Prost, L., Prost, M., 2021a. Building narratives of farmers' experiencing agroecological transition and peer group support, in: International Symposium on Work in Agriculture.
Slimi, C., Prost, M., Cerf, M., Prost, L., 2022. Les échanges entre agriculteurs dans un contexte de transition agroécologique. Revue d'anthropologie des connaissances 16. https://doi.org/10.4000/rac.26704
Slimi, C., Prost, M., Cerf, M., Prost, L., 2021b. Exchanges among farmers' collectives in support of sustainable agriculture: From review to reconceptualization. Journal of Rural Studies. https://doi.org/10.1016/j.jrurstud.2021.01.019
Thievenaz, J., 2014. L'intérêt de la notion d'«enquête» pour l'analyse du travail en lien avec la formation. Travail et apprentissages 14–33.
Toffolini, Q., Cardona, A., Casagrande, M., Dedieu, B., Girard, N., Ollion, E., 2019. Agroecology as farmers' situated ways of acting : a conceptual framework. Agroecology and Sustainable Food Systems 43, 514–545. https://doi.org/10.1080/21683565.2018.1514677
Van Dam, D., Nizet, J., Dejardin, M., 2010. La transition des agriculteurs conventionnels vers le bio : une dynamique cognitive et émotionnelle: Les Cahiers Internationaux de Psychologie Sociale Numéro 85, 159–181. https://doi.org/10.3917/cips.085.0159

Exploring the role of knowledge sources in innovation adoption through a farmer typology

Mertijn Moeyersons
KU Leuven

Short abstract

Farmers are increasingly relying on digital as well as traditional advice and information sources to make considered farm decisions. This study investigates how farmers mobilize their different learning sources during this decision-making. More specifically, it aims to elucidate the ways in which they combine their own experience with external learning sources and whether this influences the innovations they adopt. Using Archetypal analysis, we develop a farmer profile based on the learning strategies of Flemish farmers. The profile reveals that farmers do not distinguish between different types of decisions and exhibit the same strategies for all. We furthermore find that three distinct groups exist: (1) farmers who combine information, their own experience and external advice, (2) farmers solely relying on their own experience and (3) farmers who solely rely on the two external learning sources. Lastly, we find that these profiles are significantly correlated with several important farm decisions.

Extended Abstract

Purpose

With the rise of new insights in innovation adoption pathways and with farmers increasingly relying on digital as well as traditional advice and information sources, policy makers are exceedingly pressured to develop a strong and reliable knowledge network that through learning fosters innovation and sustainable farming practices. It is therefore important for policy makers to understand the processes underlying farmer decision making in general and how they mobilize learning sources in particular.

Previous studies revealed that farmers mobilize a multitude of information sources for learning, the reliance upon which varies between decision types and different phases of the decision-making process, but also highlighted the importance of farmer characteristics (Ford & Babb, 1989; Patrick & Ullerich, 1996; Solano et al., 2003). These early studies conceptualizing learning behavior highlighted the correlation with age, experience and affinity for digital media (Diekmann et al., 2009; Gloy et al., 2000) or the context-specific nature of the results (Tucker & Napier, 2002). More recently, the emphasis has shifted towards the role of information and advice in the adoption of innovations. Researchers approach the complexity in different ways and highlight its importance in peer-to-peer learning (Blesh & Wolf, 2014; Joffre et al., 2019), trainings (Bavorová et al., 2020), expertise (Alarcon et al., 2014; Ingram, 2008) or financial advice (Hilkens et al., 2018), while simultaneously highlighting the necessity of trust (Alarcon et al., 2014; Ingram, 2008; McKitterick et al., 2019). On the other hand, Revoyron et al. (2022) show that there are multiple pathways for European farmers to innovation, not all of which rely on advice and knowledge networks. Similarly, Koutsouris and Zarokosta (2021) documented how Greek farmers often innovate without relying on any external advice. Okumah et al. (2021), Cruz et al. (2022) and Osterman et al. (2021) found that while advisors play an important role in innovation adoption, individual farmer experience is more important. To further the understanding of how farmers mobilize learning sources, this paper aims to understand how farmers value their own experience compared to information and external advice when making decisions and whether this influences innovation adoption.

Design/Methodology/Approach

Data was collected in May 2013 and in August 2018 and concerns farmers in the region of Flanders in Belgium. In May 2013 a first survey was sent out through e-mail invitations and convenience sampling. After 5 years a follow-up survey on applied strategies and innovations was constructed and send out to all farmers who participated in the initial survey in 2013. From the initial sample a total of 232 farmers also participated in the follow-up survey in a usable way. Hence, our data is split in two parts: (1) the survey from 2013 including questions on the reliance on information sources during decision-making and (2) the survey from 2018 including questions on the applied farm strategies and innovations. Our dataset covers a wide range of sectors, but presents a slight bias towards farmers with larger farm area.

Our analysis is focused on two sets of variables of interest. Firstly, farmers indicated the degree in which they rely upon information sources, external advice and/or their own experience for strategic, sales and day-to-day decisions. Secondly, farmers reported if they applied any strategies or innovations in the 5 years following the survey from 2013. To identify patterns in the reliance on learning sources by farmers and its relation with innovation we construct a typology utilizing an archetypal analysis.

Archetypal analysis aims to identify underlying patterns in a dataset by constructing new observations which represent individuals fully committing to a given pattern (Cutler & Breiman, 1994). It utilizes an alternating constrained least squares algorithm to identify this set of mixtures of individuals or archetypes. Afterwards, the archetypes can be utilized as centroids of clusters by classifying observations to the archetype they are most similar to. The resulting typology is then compared to the applied strategies and innovation by the members within each cluster.

Findings

Archetypal analysis was performed on 232 observations using 9 variables. We identified three distinct archetypes. We interpret the archetypes as follows.

Archetype 1 represents farmers who have a high and consistent reliance on all sources of knowledge. They use a combination of information, their own experience and external advice whenever they make any decision, be it day-to-day, sales related or strategic. Archetype 2 represents farmers who rely on information and external advice, but do not rely on their own experience. This pattern is weaker for day-to-day decisions (a weaker preference for information and advice and a weaker aversion towards their own experience) than for strategic and sales decisions. Interestingly, there is a slightly higher aversion towards their own experience for sales decisions, then for strategic decisions. There is also a slightly lower preference for information. Archetype 3 represents farmers who have a significant preference for their own experience and a striking aversion towards external advice. They have a slight preference for information during strategic decisions, but neutral when making sales or day-to-day decisions. The number of farmers in each cluster are as follows: 30, 51 and 29 for Archetype 1, 2 and 3, respectively. This leaves 122 farmers in cluster 4 which is not associated with one of the archetypes. These four clusters will constitute the profiles within our typology.

We observe several significant differences in the applied strategies and innovations by farmers from different information mobilization clusters. Membership of a cluster is significantly correlated with these five decisions: (1) cooperation with others, (2) adopted new pest mitigation techniques, (3) simply working harder, (4) learning from others, (5) utilized price contracts. As membership is determined up to 5 years prior to the decision-making, reversed causality is not possible, so the decision-making process itself cannot influence membership of a cluster. Profile 1, combining all three sources, is significantly more likely to implement new pest mitigation techniques, simply working harder and utilizing price contracts. Profile 1 farmers are also somewhat less likely to learn from others. Profile 2 farmers, combining information and advice, are significantly more likely to cooperate with others. They are also less likely to adopt pest mitigation techniques, simply working harder, learning from others and price contracts. Profile 3 farmers, solely own experience, are significantly more likely to learn from others. They are much less likely to utilize price contracts. Farmers not classified in any archetype are less likely to cooperate with others. We observe no significant differences concerning the decisions such as 'technology', 'income outside agriculture', 'taking extra insurances' and 'keeping costs flexible'. The observation that profile 3 farmers are more likely to learn from others and that they are not less likely to utilize market information is somewhat surprising. These preliminary results will be further expanded utilizing a Hierarchical clustering on Principal Components (HCPC) to create a typology for the strategies and innovations.

Table 1. Correlation between membership of a cluster in 2013 and applied strategies or innovations in 2018

Strategy	Total	Arch 1	Arch 2	Arch 3	No arch
Financial buffer	0.55	0.57	0.58	0.58	0.52
Cooperation with others	**0.12****	**0.13****	**0.24****	**0.10****	**0.08****
Cooperative membership	0.35	0.36	0.35	0.34	0.34
Low debt	0.37	0.50	0.29	0.34	0.37
Technology	0.16	0.20[1]	0.08[1]	0.17	0.17
Pest mitigation	**0.24****	**0.40****	**0.14****	**0.17****	**0.25****
Working harder	**0.42***	**0.60***	**0.32***	**0.48***	**0.40***
Non-agr income	0.22	0.23	0.22	0.14	0.23
Experimental agr	0.08	0.00	0.09	0.07	0.10
Multiple suppliers	0.45	0.40	0.35	0.45	0.50
Learning from others	**0.14*****	**0.10*****	**0.06*****	**0.34*****	**0.14*****
Extra insurances	0.10	0.13	0.10	0.07	0.11
Price contracts	**0.20****	**0.30****	**0.14****	**0.03****	**0.24****
Market information	0.24	0.33	0.18	0.17	0.26
Product diversification	0.17	0.23	0.15	0.24	0.15
Income diversification	0.17	0.17	0.27[2]	0.07[2]	0.16
Flexible costs	0.11	0.10	0.14	0.17	0.08
Flexible timing	0.08	0.17	0.02	0.07	0.08
Farm visitors	0.09	0.10	0.12	0.07	0.09

Note: Test statistics were obtained through a Monte Carlo simulation of the Pearson's Chi-squared test. *, ** and *** denote statistical significance at the 0.10, 0.05 and 0.01 levels.

1. This correlation has only a p-value of 0.3838.

2. This correlation has a p-value of 0.1019.

Practical Implications

Our study shows that farmers can be differentiated by the degree in which they mobilize different knowledge sources when making farm decisions and suggest that these differences lead to differing innovation and strategic decision patterns in the future.

Through archetypal analysis we identified three distinct profiles in our dataset. We observe a group of farmers who utilize all three sources intensively, a group that focusses on information and advice as well as a group that solely relies on their own experience. Interestingly, we did not observe groups who combine their own experience with either information or external advice. This might suggest that Flemish farmers do not differentiate between external knowledge sources, instead solely deciding on whether to utilize their internal knowledge and whether to combine it with external knowledge. This is not what Rust et al. (2022) found, as they identified farmers who do combine information and their own experience without relying on advice. While we did observe some strategies or innovations that were more likely to be applied by some of the farmer profiles, many did not. Important categories for policy makers such as 'technological innovation', 'cooperative membership', 'product diversification' and 'income diversification' were not significantly correlated with profile membership. This suggests that for these strategies or innovations the introduction of policies or measures related to learning and advice would not have an impact on the rate of adoption.

Theoretical Implications

Our results show that even farmers who solely rely on their own experience adopt new innovations and strategies in a similar degree as those who supplement their own experience with external sources for learning. This is confirming observations from recent studies such as the work from Mc Fadden et al. (2016), Koutsouris and Zarokosta (2021) and Revoyron et al. (2022) who found that some farmers innovate despite not utilizing external knowledge. However, further investigation may identify innovation profiles which bundle strategic decisions in broader innovation strategies. Our analysis of individual decisions might fail to identify broader patterns as these strategic decisions cannot necessarily be taken completely independent from one another. This is illustrated by the somewhat surprising observations concerning profile 3, whose decisions seem to contradict their information behavior. To construct these broad strategies, a Hierarchical Clustering on the Principal Components may be adopted to reduce dimensionality. Correlation between a farmer's information profile and the innovation cluster he or she belongs to is to be expected.

Lastly, while we did observe a substitution effect between external and internal learning sources, this effect only applies between farmers, not within farmers between their decisions. Each archetype has strikingly set preference for the three sources, regardless of the decision type and any variation between the different preferences is rather small. This could suggest that observations made for a specific type of decision might be generally applicable for all observations made by that farmer.

References

Alarcon, P., Wieland, B., Mateus, A. L. P., & Dewberry, C. (2014). Pig farmers' perceptions, attitudes, influences and management of information in the decision-making process for disease control. Preventive Veterinary Medicine, 116(3), 223–242. https://doi.org/10.1016/j.prevetmed.2013.08.004

Bavorová, M., Unay-Gailhard, I., Ponkina, E. V, & Pilařová, T. (2020). How sources of agriculture information shape the adoption of reduced tillage practices? Journal of Rural Studies, 79, 88–101. https://doi.org/10.1016/j.jrurstud.2020.08.034

Blesh, J., & Wolf, S. A. (2014). Transitions to agroecological farming systems in the Mississippi River Basin: toward an integrated socioecological analysis. Agriculture and Human Values, 31(4), 621–635. https://doi.org/10.1007/s10460-014-9517-3

Cruz, J. L., Albisu, L. M., Zamorano, J. P., & Sayadi, S. (2022). Agricultural interactive knowledge models: researchers' perceptions about farmers' knowledges and information sources in Spain. Journal of Agricultural Education and Extension, 28(3), 325–340. https://doi.org/10.1080/1389224X.2021.1932537

Cutler, A., & Breiman, L. (1994). Archetypal Analysis. Technometrics, 36(4), 338–347. https://doi.org/10.1198/000313007X190079

Diekmann, F., Loibl, C., & Batte, M. T. (2009). The economics of agricultural information: Factors affecting commercial farmers' information strategies in ohio. Review of Agricultural Economics, 31(4), 853–872. https://doi.org/10.1111/j.1467-9353.2009.01470.x

Ford, S., & Babb, E. (1989). Farmer Sources and Uses of Information. Agribusiness, 5(5), 465–476. http://dx.doi.org/10.1016/j.jaci.2012.05.050

Gloy, B. A., Akridge, J. T., & Whipker, L. D. (2000). Sources of information for commercial farms: Usefulness of media and personal sources. International Food and Agribusiness Management Review, 3(2), 245–260. https://doi.org/10.1016/s1096-7508(01)00046-5

Hilkens, A., Reid, J. I., Klerkx, L., & Gray, D. I. (2018). Money talk: How relations between farmers and advisors around financial management are shaped. Journal of Rural Studies, 63, 83–95. https://doi.org/10.1016/j.jrurstud.2018.09.002

Ingram, J. (2008). Agronomist-farmer knowledge encounters: An analysis of knowledge exchange in the context of best management practices in England. Agriculture and Human Values, 25(3), 405–418. https://doi.org/10.1007/s10460-008-9134-0

Joffre, O. M., Poortvliet, P. M., & Klerkx, L. (2019). To cluster or not to cluster farmers? Influences on network interactions, risk perceptions, and adoption of aquaculture practices. Agricultural Systems, 173(July 2018), 151–160. https://doi.org/10.1016/j.agsy.2019.02.011

Koutsouris, A., & Zarokosta, E. (2021). Farmers' networks and the quest for reliable advice: innovating in Greece. Journal of Agricultural Education and Extension. https://doi.org/10.1080/1389224X.2021.2012215

Mc Fadden, T., & Gorman, M. (2016). Exploring the concept of farm household innovation capacity in relation to farm diversification in policy context. Journal of Rural Studies, 46, 60–70. https://doi.org/10.1016/j.jrurstud.2016.05.006

McKitterick, L., Quinn, B., & Tregear, A. (2019). Trust formation in agri-food institutional support networks. Journal of Rural Studies, 65, 53–64. https://doi.org/10.1016/j.jrurstud.2018.11.008

Okumah, M., Martin-Ortega, J., Chapman, P. J., Novo, P., Cassidy, R., Lyon, C., Higgins, A., & Doody, D. (2021). The role of experiential learning in the adoption of best land management practices. Land Use Policy, 105(March), 105397. https://doi.org/10.1016/j.landusepol.2021.105397

Osterman, J., Landaverde-González, P., Garratt, M. P. D., Gee, M., Mandelik, Y., Langowska, A., Miñarro, M., Cole, L. J., Eeraerts, M., Bevk, D., Avrech, O., Koltowski, Z., Trujillo-Elisea, F. I., Paxton, R. J., Boreux, V., Seymour, C. L., & Howlett, B. G. (2021). On-farm experiences shape farmer knowledge, perceptions of pollinators, and management practices. Global Ecology and Conservation, 32(November). https://doi.org/10.1016/j.gecco.2021.e01949

Patrick, G. F., & Ullerich, S. (1996). Information sources and risk attitudes of large-scale farmers, farm managers, and agricultural bankers. Agribusiness, 12(5), 461–471. https://doi.org/10.1002/(SICI)1520-6297(199609/10)12:5<461::AID-AGR5>3.0.CO;2-4

Revoyron, E., Le Bail, M., Meynard, J. M., Gunnarsson, A., Seghetti, M., & Colombo, L. (2022). Diversity and drivers of crop diversification pathways of European farms. Agricultural Systems, 201(November 2021), 103439. https://doi.org/10.1016/j.agsy.2022.103439

Rust, N. A., Stankovics, P., Jarvis, R. M., Morris-Trainor, Z., de Vries, J. R., Ingram, J., Mills, J., Glikman, J. A., Parkinson, J., Toth, Z., Hansda, R., McMorran, R., Glass, J., & Reed, M. S. (2022). Have farmers had enough of experts? Environmental Management, 69(1), 31–44. https://doi.org/10.1007/s00267-021-01546-y

Solano, C., León, H., Pérez, E., & Herrero, M. (2003). The role of personal information sources on the decision-making process of Costa Rican dairy farmers. Agricultural Systems, 76(1), 3–18. https://doi.org/10.1016/S0308-521X(02)00074-4

Tucker, M., & Napier, T. L. (2002). Preferred sources and channels of soil and water conservation information among farmers in three midwestern US watersheds. Agriculture, Ecosystems and Environment, 92(2–3), 297–313. https://doi.org/10.1016/S0167-8809(01)00293-6

Focussing on mindset to engage the elite

Amy Hughes[1], Arron Nerbas[2]
[1]Agriculture and Horticulture Development board (AHDB) Beef & Lamb sector and British Cattle Breeders Club.
[2]Nerbas Bros. Aberdeen Angus, Canada.

Short abstract:
Embracing change is a concept that is constantly directed at UK farmers in today's world. But how do we engage with the elite on this subject? We may think that these producers, academics and industry members are at the forefront of change, but after embracing learning throughout their lives, it would seem that there comes a point where they become disengaged with the standard learning that is being presented to them. Their mindset seems to differ from that of the industry in general and so they no longer place value on education in its generic form. Challenging the traditions of the industry and focussing on mindset whilst bucking the trends, proved to be a successful method of engaging with these people at the 75th British Cattle Breeding conference and subsequent on-farm events held in January 2023 across England. The British Cattle Breeders Club, AHDB Beef & Lamb and the Aberdeen-Angus Cattle Society collaborated to bring experience from Canada across to the UK in order to create discussion and debate surrounding our current traditions within the industry, presenting the science and taking a pragmatic approach to its application on English farms in order to work towards a more sustainable suckler beef industry.

Extended abstract

Purpose

As a Senior Knowledge Exchange (KE) manager within AHDB Beef & Lamb, it had become apparent to me that within our general KE activity, we were failing to engage the elite members of our industry with the messaging and topics of discussion that we were choosing for our events and online KE outputs. Attendance at our events was generally low and feedback on our digital offering (webinars, podcasts and social media posts) was generally indifferent. Although these people had not become detractors of AHDB and were generally supportive of our mission, it seemed that they found little value, personally, in our KE offering. As leaders of the industry, these people are our ambassadors and often the route to less engaged levy payers and stakeholders. We are a team of 11 individuals that serve the whole of England and some 60,000 beef and lamb levy payers and so it is vital that we leverage advocacy and collaboration to achieve maximum exposure and reach. As a team the elite inspire us and without meaningful interaction, it felt as though much of our activity was not worthwhile. The KE team as whole was becoming disheartened and struggled to focus on new and innovative methods and messaging for KE. Many of our elite levy payers also pay the biggest sum of levy, so engagement with them is key to our job roles. A need to focus on what drives their desire to learn and what messages and methods within the industry inspired them was identified, along with an evaluation of what messages and methods of KE within the industry demotivated them. I had also been elected as the Chair of the 75th British Cattle Breeding conference, hosted by the British Cattle breeders club. The club's ethos focusses on putting science into practice in the areas of bovine breeding and genetics. The committee had identified a need to attract more leading farmers and industry members to the annual conference to further promote best practice messaging. There was also a need to bolster the club's reputation as being the only organisation that focussed solely on this area with its activities.

Design/Methodology/Approach

Initial fact finding was undertaken with the elite members of the industry that were consistently promoters of AHDB and, the KE activity that we deliver. These people had, in the past, taken a lot from AHDB KE work and seen benefits to their business as a result. The talks were undertaken with farmers, academics and other industry stakeholders. They were predominantly asked why they no longer engaged with AHDB KE as much as previously and a general discussion about the mindset of the industry was undertaken. I also asked them what educational resources or KE activity they were engaging with now and who's opinions and advice they valued along with what particularly demotivated them from engaging with KE that was available to them within the industry. Another key question that was posed to those that I knew had a particular interest in cattle breeding was, "Why do you not attend the British Cattle Breeding Conference?" and "What content would attract you to attend the conference?" Interviews were also conducted with farmers and industry members that had not engaged with AHDB and the British Cattle Breeders club for several years. The same conversations were had, and the answers documented. Guidance was sought from the British Cattle Breeders club committee members in what messages were currently pertinent to the industry and what challenges the industry was likely to face in the coming years. Observations were also documented regarding events that seemed to attract these key people. What were the messages? What mindset did they aim to promote? Which farmers did they incorporate and what were their key attributes? How did they advertise the events? Was there any international influence? Were they collaborative between more than one company?

Research was also undertaken into potential international speakers that would attract the attention of the elite. Social media was used to firstly identify those that were farming in a way that aligned with the key messages that those interviewed had identified. A mindset that was positive and open to change was, however, the most important trait that was searched for when researching potential speakers. International collaborators needed to appear humble, confident in their approaches and open to change to create a more sustainable suckler beef system. Identification of people that consistently promoted the benefits to biodiversity and soil health of their systems and those that appeared to challenge the traditions of conventional farming methods in favour of a low input, simple and profitable system was key.

On completion of interviews with UK suckler farmers and industry members, the key areas of suckler beef production that they wished to learn more about were identified. A clear picture of the interviewees overarching mindset and goals was also developed along with key issues and messaging within the industry that they had become disengaged with.

Findings
During the interview process, the most frequent areas of demotivation to engage with generic KE identified were.

- Demotivating narrative from pertinent industry representatives
- Resistance to change within the industry.
- A move towards high inputs and the associated costs
- Best practice messaging that was not pragmatic
- Best practice messaging that was repetitive and not innovative
- Traditions within the industry that were deemed to be slowing progress.
- Personal judgement within farming communities that was deemed to be providing a barrier to change.
- Best practice messaging that promoted over-management of cattle and the associated costs
- A lack of focus on a systems-based approach to suckler beef production
- A general feeling within the industry that farmers had adopted the mindset that they were not "in control of their own destiny".

The most frequent areas of inspiration and things that would attract people to engage with AHDB KE and the British Cattle Breeding conference were.

- Opinions and messages that would challenge the traditions of the industry.
- High level learning (not necessarily in technical content, but in taking account of the broader picture of British Agriculture)

- Science that could be easily and cost effectively implemented on farm for greater profit and greater environmental benefit.
- Learning from likeminded farmers that were confident in their abilities and open to sharing their experience whilst also accepting the opinions of others.
- Better collaboration between deliverers of KE to better advertise opportunities.
- International learnings that had relevance to British farming
- An emphasis on farming with nature in line with industry challenges
- Steering away from the "norm" in terms of best practice messaging whilst still ensuring science led advice was given.

Several farmer interviewees that I deemed to be AHDB KE ambassadors cited Arron Nerbas, Nerbas Brothers Aberdeen Angus, Canada, as someone whom they would like to hear more from. Having also followed Nerbas. Bros. Aberdeen Angus (NBA) on social media for some time, it was evident that Arron held a mindset that was very open to change and that challenged the traditional methods of farming. Dismissing high inputs and intensive farming practices, NBA focussed on a systems-based approach to suckler beef production whilst using the genetic tools that were available to them to progress their herd. There was a clear focus on farming with nature and allowing system selection pressure to breed a cow that was profitable and functional. NBA's key performance indicators met and, in most cases, exceeded industry targets and so fit with best practice messaging that was important for AHDB to adhere to. NBA also had a huge social media following from farmers and people involved in the industry, all over the world, this would aid in creating interest and demand in the months prior to the conference and the AHDB KE activity.

Upon contacting Arron to gauge his interest in being involved with the conference and subsequent KE activity, I ensured that the opinions and information that I had gathered from following NBA on social media, were correct. His farming practices were discussed in great detail, and I observed his mindset towards conventional farming practices to ensure that his presence in the UK would challenge the traditions of our farming systems whilst still being applicable to our industry, landscape, climate and markets. His mindset was incredibly open to change, clearly identifying opportunities and being aware of growing consumer trends and environmental concerns. However, he was also humble and open to debate with those of differing opinions and was also keen to learn as much as possible from our industry.

Practical Implications

On completion of the initial research a theme was chosen for the 75th British Cattle Breeders conference of "Challenging traditions" AHDB beef & Lamb agreed to sponsor Arron Nerbas to come over to the UK to speak at the conference and then subsequently speak at 3 on-farm events in the following days. I also sought collaboration from the Aberdeen Angus Cattle Society as there was a clear link there with regards NBA and it gave another route to advertising the conference and events to the elite members of our industry.

The additional speakers that were invited to present at the British Cattle Breeders conference were also chosen based on their ability to convey the need for change within the industry and to present in a positive manor; Communicating the need for change and encouraging delegates to think differently and be open to adapting whilst using the science and technology that was available to them. I ensured the speakers were a mix of famers, academics, and industry stakeholders to give a broad picture of the need for change and to challenge as many traditions within the industry as possible. This also ensured that different learning styles were catered for and that all delegates at the conference understood how to apply the learnings to their own businesses.

The content of the 3 on-farm events was based around the feedback that I had gained from interviews with the elite. The messaging was based around farming with nature in mind and building a profitable and resilient suckler beef system with minimal inputs and management. The focus was placed on using the system that best fit your farm, to apply selection pressure to the cattle and breed a cow that fit and thrived within the system, thus maximising profits. Less emphasis was put on "textbook" best practice messaging and as such, no consultants or 'experts' were employed to be part of the events. Instead, I chose to focus on the experience of Arron and that of the host farmer, to deliver the key messages and create discussion and debate between attendees. Our role as facilitators was to ensure that everyone's opinion was herd, and that 'best practice' was still incorporated into the discussions to avoid false information being adopted.

The hosts were chosen from elite farmers that I was already familiar with. I ensured their systems closely followed that of Arron's in order to demonstrate the relevance of his practices to British agriculture. Mindset, again, was the key determinant in approaching these farmers to host. They had to be approachable, humble but highly capable and running a profitable suckler beef enterprise. They also needed to be open to discussion and questioning and have a clear vision for their business that incorporated low production costs and an awareness of consumers trends and global environmental issues.

The events incorporated presentation from Arron and the host farmer, on their system and the theory behind their decision making and discussion was heavily encouraged and facilitated. Before embarking on the presentations, attendees were asked to write down why they were attending and what they had come to learn. This information was used to facilitate discussion and ensure that the attendees needs were met on a KE basis. Following the presentation of practices and theory, a farm walk was undertaken to see the theory in action. Further discussion around profitability, animal performance and animal management using systems pressure for selection was encouraged and facilitated.

Engagement with the elite for both the conference and the on-farm events was accomplished in a variety of ways. Using contacts within the national farming press, I was able to publish articles which both promoted the overall conference and ones which gave greater insight into NBA, their system and their practices. Arron and I also worked together on a social media plan which encompassed various posts to promote his presence in the UK and by producing media that gave an overview of his system and what would be discussed whilst he was over. These were used across NBA, AHDB, British Cattle Breeders club, Aberdeen-Angus cattle society and my personal social media platforms.

Additional detail to the norm was placed on the event invites so that potential attendees had a good idea of the system they were coming to view. Taking into account information gathered from initial interviews, key management practices such as "low input" "bale grazing" and "simple systems" were highlighted in order to provoke interest from the elite.

The conference and the on-farm events were hugely successful. Record numbers attended the British Cattle Breeding conference and the 3 on-farm events, registered 205 people (the actual number in attendance was higher) The feedback gained from the events gained a Net Promoter score of 83 (see references).

An overview of the coverage in national farming press, podcasts, blogs, and social media can be found below.

Pre and post coverage of the week (see references for links)

Item	Description	Publisher
1	Double page article on NBA with specific focus on epigenetics	Farmers Weekly
2	Double page article on NBA following on-farm events	Farmers Guardian
3	Podcast with Arron Nerbas (released April 2023)	The Pasture Pod
4	Podcast with Arron Nerbas (released 6th March 2023)	AHDB
5	4-page article on key messages from the British Cattle Breeding conference	Farmers Weekly
6	3-page article on key messages from the British Cattle Breeding conference	Farmers Guardian

7	2-page article promoting the themes and speakers at the British cattle breeding conference	National beef association magazine
8	2-page article on key messages from the British Cattle Breeding conference	Cow management magazine
9	Feature on the British Cattle Breeding conference	BBC Radio 2 breakfast show
10	Social media activity from AHDB, NBA, Amy Fawcett-Hughes, British cattle breeders club, Aberdeen-Angus cattle society (68009 impressions)	Twitter
11	Blog post by Sarah Penrose	AHDB
12	Opinion piece by Amy Fawcett-Hughes	Farmers Weekly
13	Online article summarising Arron's key messages from the week	FarmingUK
14	Online article summarising Arron's key messages from the week	Aberdeen-Angus Society

Theoretical Implications

The programme delivered throughout the week clearly identified a need for challenging messaging to be incorporated within AHDB and British Cattle Breeders KE going forward. The elite members of our industry are those that are ready for change and have become disheartened by the status quo. Although best practice that is influenced by science is of great importance, our messaging must be delivered in a pragmatic way and whilst taking the whole farming system into account. Advice that incorporates high inputs and levels of management of livestock, is no longer attractive to the elite and they are looking for ways to balance farming with lifestyle, environment, and profitability. They are also acutely aware of changing consumer demands and are looking for ways to better promote red meat as a sustainable choice within people's diets. Arron and I discussed the mindset of the host farmers and those in attendance at the conference and on-farm events in great detail. He observed that these elite members of our industry are positive, resilient and progressive in terms of their willingness to change and therefore, our KE delivery must match this. It is also apparent that in seeking advice and opinions from these people, the first step towards engagement is taken. We must no longer assume that we know what these people want from a KE offering and ongoing fact and opinion seeking must be undertaken to ensure KE delivery is current and valuable.

References

1. https://www.fwi.co.uk/livestock/livestock-breeding/how-a-canadian-breeder-has-created-a-simpler-suckler-system

2. 

LIVESTOCK

Upping forage production in the Canadian prairies

A Canadian beef enterprise has been able to double average annual forage production after switching from a low input, set-stocked system to a more grazing-focused approach. **Hannah Park** reports.

Brothers Shane (left) and Arron Nerbas on their 2,024-hectare (5,000-acre) ranch in Manitoba, Canada.

Taking a fresh approach to grazing management has been a turning point for the family beef business at Nerbas Bros Angus.

The third generation ranch, situated about three hours north of the US border, is run by Arron Nerbas, together with his brother Shane, parents, Gene and Cynthia, who have taken a back seat but remain involved, and their respective families.

A cow-calf operation first and foremost, the business runs a nucleus herd of 75 pedigree, unrecorded Aberdeen-Angus females, alongside 475 pure-bred Aberdeen-Angus commercial cows.

Land across the 2,024-hectare (5,000-acre) ranch, a split of owned and rented ground, is all down to perennial forage with cattle grazed across 1,821ha (4,500 acres) of this. The remaining 202ha (500 acres) is used for hay production.

The turning point which led to overhauling the approach to grazing management, Arron said, came in 2005 after the family took a holistic management course.

Speaking at an AHDB- and Aberdeen-Angus Cattle Society-organised meeting in Northumberland, he said: "The course prompted us to think about where we were as a business. Prior to [2005], grazing was managed in a low-input way, but very much followed a set-stocked system.

"With land prices continuing to rise, we considered it a no-brainer to 'create' more land in a sense. Increasing grazing for us has reduced our costs and led to higher profitability."

Changes to grazing management have allowed the business to double average annual forage production from less than two tonnes of dry matter (DM)/ha (0.8t DM/acre) to 3.5t DM/ha (1.4t DM/acre) now.

While figures may seem low compared to UK systems, Arron pointed to the big differences in land value between Canada and the UK, the differing climates and short growing season as a result, and the fact that the ranch uses no artificial fertiliser.

Arron said: "Land values in Canada are much less than in the UK, meaning we cannot necessarily extract the same value of profit on a per acre basis. We will generally experience about a 100-day frost-free growing season and we do not use any artificial fertiliser."

Investment in infrastructure, such as fencing and water, he added, had been offset by reduced costs and higher profitability, as well as saving time and labour and being beneficial to the land and environment.

> Land values in Canada are much less than in the UK meaning we cannot necessarily extract the same value of profit on a per acre basis
> ARRON NERBAS

The farm's cattle are all out-wintered on a bale grazing system.

Fencing

Ground across the 1,821ha (4,500-acre) grazing area is now split into 120 paddocks with permanent fencing, which range from 32ha-50ha (80-120 acres) in size, which are then often split further by temporary wires.

Arron said: "We want to be grazing for eight months of the year. This is not the norm in Canada as our winters are pretty severe.

"We work on the principle of keeping 95 per cent of the grazing area in a recovery state at any one time, with cattle on two to three day moves.

Unlike many other systems in Canada, where it would be typical to feed out stored winter feed for six months of the year, the cattle are all out-wintered on a bale grazing system.

Arron said: "Ground is completely frozen with us from December 1 to March 30, which works in our favour for this system.

"Typical daytime winter temperatures average about -15degC to -20degC, while cold snaps can see periods where night temperatures will dip to -40degC. We operate the bale grazing using a modified pod style system. Each seven- to eight-acre pod carries enough feed for generally 21 days at a time, which can be dictated either way slightly by weather and temperatures. For our cows, this equates to roughly 350 bales per pod or close to 50 bales/acre.

"Bales are placed directly in the wintering sites once made or bought-in, with twines or wrap removed in September before conditions freeze up.

"We find leaving bales flat as they would come out of the baler is the most efficient way to get the best utilisation.

Access

"Single strand fencing is put around each pod before cows are put on, but once on a pod, no cross fencing is needed. Cows have access to a bush area for shelter and will walk to water supplied via a well about half a mile away.

"We currently buy up to two-thirds of our winter hay needs, as 500 acres is not enough for our overall hay requirement. It a function of our management and choice. We could make all our own hay if we wanted, but it would mean either having less cattle overall or less grazing days."

The bale grazing system accounts for 80 per cent of winter feeding at the ranch, with the entire cow herd grazed together in one group on the system for 120 days from the start of December to the end of March.

Some other management groups, including heifers and sale bulls, are managed elsewhere.

Although the bale grazing was started with labour and cost saving on equipment in-mind, there has also been marked improvements to the land as well as to the health of the cattle, Arron said.

Breeding-wise and the herd has been closed for the last 20 years, with the nucleus herd's primary function to produce stock bulls for use in the commercial enterprise.

AI sires are therefore selected to use across the pedigree cows using specific selection criteria.

Arron said: "We have bought-in semen mostly from North America, the US and Canada, alongside some from New Zealand and Scotland. We are careful to understand the bull on paper, but also the type of system it is coming from.

"We select AI sires based on data including expected progeny differences, frame score and mature weight. Genetic lineage is also important, alongside type and character. Strong maternal considerations are also included, including a dam's productive history, which is also very important."

Selected

Surplus bulls are marketed for sale privately, while the top two-thirds of heifers across both herds are selected as replacements by eye at seven months old off the cow, although pedigrees and families are considered in the pure-bred herd to keep things balanced here.

Arron said: "From there, these animals get entered into the system, after which it is up to our system, our management, environment pressure and population genetics within our herd to determine who stays and who goes at that point."

Bulls which do not make the grade as breeders are castrated and sold and remaining heifers sold for breeding free from the bull.

Cows are weaned in December, going onto the bale grazing directly after that.

Having a system-first approach, instead of focusing on individuals is one Arron and Shane have taken and one which he said pays off for them.

Arron said: "In Canada, and I am sure it is the same elsewhere, most suckler systems will start with the cow and cater around her needs in terms of feed, facilities, equipment and labour. Our approach is to flip that and determine what system we want to run.

"By not focusing on individuals and instead looking at the type of cow we want in the herd, we have been able to breed in consistency.

"Focusing on and evaluating individual animal performance would lead to a herd with varying input requirements, which would not work for us. We want a herd of cows which genetically will thrive in our system."

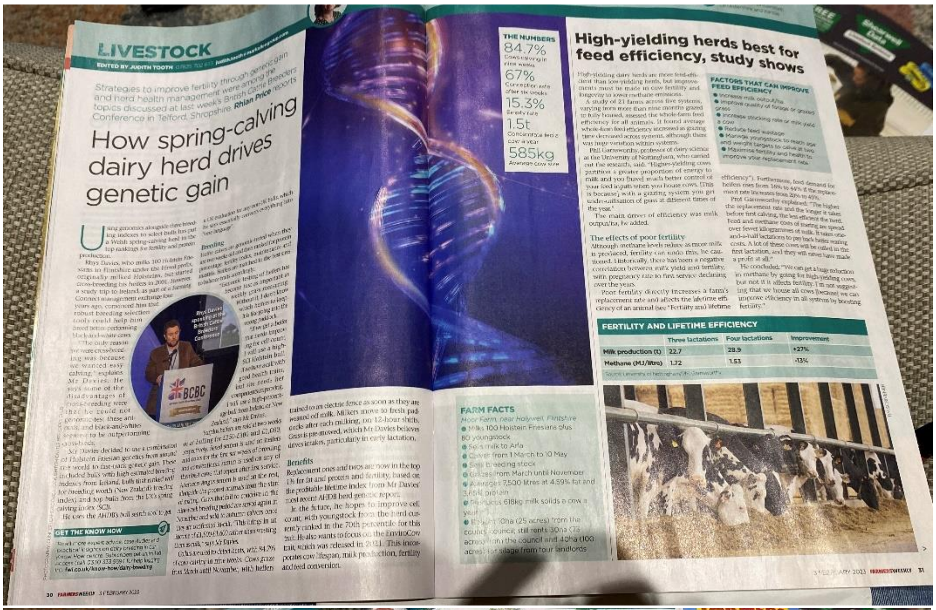
Farm facts

- 2,024-hectare (5,000-acre) ranch in Manitoba, Canada
- All ground down to perennial forage
- 550-cow suckler herd; made up of a nucleus herd of 75 pedigree, unrecorded Aberdeen-Angus females alongside 475 pure-bred Aberdeen-Angus commercial cows
- 2,000 feet above sea level
- All cattle are out-wintered, calve outside and no artificial fertiliser is used
- Average cow weight of 575kg
- Cows bred at two years to calve at three years

82 | FEBRUARY 10 2023 — FGinsight.com — FGinsight.com — FEBRUARY 10 2023 | 83

3. https://thepasturepod.libsyn.com/
4. https://ahdb.org.uk/food-farming-podcast

5.


LIVESTOCK
How spring-calving dairy herd drives genetic gain
High-yielding herds best for feed efficiency, study shows
THE NUMBERS
84.7%
67%
15.3%
1.5t
585kg
FERTILITY AND LIFETIME EFFICIENCY
FARM FACTS


LIVESTOCK BRITISH CATTLE BREEDERS
Advice to reduce assisted calvings for better fertility
Looking to...
SELL?
PROMOTE?
RECRUIT?
FIND OUT MORE TODAY
FWi.co.uk/mediacentre

6.

LIVESTOCK CONFERENCE

Test could revolutionise bTB surveillance and control

Trial to focus on ability to detect disease

A BULK milk tank surveillance test could bring a number of significant advantages to bTB (bovine tuberculosis) control, with its potential being put to the test this year via a GB-wide field trial.

Alastair Hayton, of Synergy Farm Health explained that the Enferplex bTB test detects antibodies to bTB in either blood or individual milk samples.

The test is already validated by the World Organisation for Animal Health (WOAH) for use on individual blood samples and is now being evaluated as a bulk tank test.

The validation studies are complete, but are waiting to be approved by the relevant WOAH committees this summer.

Gains

Mr Hayton said there were a number of potential gains to be made by using the bulk tank milk test.

Mr Hayton said: "Along with its potential ability to detect whether a herd is infected or not, the test potentially may also provide information about the dynamic of the disease within a herd and whether the disease status is improving or deteriorating."

He added he thought the test could 'revolutionise bTB surveillance and control'.

"Samples are easy to obtain and the test is robust, reliable and inexpensive to perform," he said.

"If it proves effective, it could reduce skin testing requirements for farms and by allowing continuous monitoring of herds, it allows more rapid detection of disease introduction, making eradication easier."

However, in order to assess the extent of its value, Mr Hayton said a field trial was now necessary.

"The difficultly in doing this is that there is a very limited time to perform such a study without risk to individual farms and the wider industry, as if the test is officially validated by WOAH this summer, the UK Government would have to place restrictions on any herd testing positive.

"Prior to this, Defra and devolved authorities have stated they will not act on any positive results and are under no obligation to do so."

A field trial, which will involve about 5,000 dairy farms from across England, Scotland and Wales, has now been set up and is due to start this month.

Enrolled farms will have their bulk tank milk tested every two to three months, with a smaller subset of milk recorded herd tested monthly.

Testing will be carried out by National Milk Laboratories and results sent to Scotland's Rural College for analysis.

Mr Hayton stressed that while the results of positive tests will, by law, be reported to Defra, there will be no repercussions for individual farms.

He said: "Specifically, they will take no statutory actions if a bulk tank milk sample shows a positive Enferplex milk test result. And the official bTB status and their normal bTB statutory testing schedule will be unaffected by the study."

PICTURE: GETTY

If it proves effective, the bulk tank milk bTB test could reduce skin testing requirements.

Detect disease

He said the trial would focus on the test's ability to detect disease in herds currently under restriction and in herds designated officially bTB-free.

"It will also look at the value of monitoring the level of bulk tank milk seropositivity as an indicator of whether a herd is moving either towards disease freedom where levels are falling, or vice versa, where the levels are rising and the current actions are failing to control disease where the herd is already under restriction, or where the herd is currently officially bTB-free, predicting that a herd will lose that status.

"We very much hope, and expect, the results will demonstrate a clear benefit of bulk tank milk testing to the industry in fighting this devastating diseases and we look forward to reporting the outcomes in the future."

"The test potentially may also provide information about the dynamic of the disease within a herd and whether the disease status is improving or deteriorating
ALASTAIR HAYTON

Change in ag is coming

WHERE the sole goal is net zero emissions, 'carbon tunnel vision' can mean the industry is ignoring other sustainable development goals said Arron Nerbas, a farmer from Angus, Canada, who follows holistic and regenerative farming principles.

Mr Nerbas said moving beyond this 'carbon tunnel vision' meant taking a more holistic approach to sustainability management.

He said: "Change is coming in agriculture like never before and it is important to be ahead of the curve.

"The answers are in front of us, if we see them, but farmers need to understand what others think of us.

"Small changes affect the way we do things, but big changes affect the way we see things."

Mr Nerbas advised farmers to look at their systems and find the cow that will work most efficiently in that system.

He said: "Soil and grass is the most important thing in farming, with cows using the grass from the soil.

"Land prices are rising, but if you can double the amount of grass you grow, it is like doubling your land for free."

FGinsight.com

76 | FEBRUARY 3 2023

LIVESTOCK

Challenging traditions and being open to new ideas was the theme of this year's British Cattle Breeders Club conference at Telford. Angela Calvert and Katie Jones report.

Unity needed to tell the true beef story

"We can demonstrate that beef should be part of a balanced diet
LUCIANNE ALLEN

Reconnecting farming and food

"It disrupted the current chain model
JAMES EVANS

CONFERENCE LIVESTOCK

Traits to boost optimisation

"Good temperament helps when collecting the cows for milking, and for the initial training onto the robots

7. 

Industry News

BCBC
British Cattle Breeders Club
75TH ANNIVERSARY

75th British Cattle Breeding Conference designed to create discussion, debate and vision

British farmers are constantly being advised to scrutinise what they do and adapt according to market demands, but is this happening when it comes to cattle breeding?

The 75th British Cattle Breeding conference will be held at Telford Hotel and Golf Resort, Shropshire, from Monday 23rd to Wednesday 25th January, and will bring together experience and science from across the industry in the UK and beyond to create discussion, debate, vision and, as always, to guide the way in putting science into practice on British cattle farms.

With increasing pressures on farmers the opening session will question is it time for change? Keynote speakers will share their insight into the latest challenges and opportunities.

Opening the Beef Day presentations Lucianne Allen, Sales and Marketing Director for Aubrey Allen, will explore how the industry is faring in the war against meat. Never one to shy away from a difficult conversation Lucianne, a former criminal barrister, will discuss the consequences of the beef industry losing and how working together could make a difference. She has been Sales Director for the national catering butcher for the past 15 years and in the past four years has won three accolades in the Women in Meat Business Awards.

John Giles from Promar International will share insight from the soft fruit industry and how lessons learned in the past 10 to 15 years could benefit livestock farmers. In his role as Divisional Director for Agri-Food, John has completed projects in the UK and some 60 countries across the world and has extensive experience in the beef, dairy, pork, poultry and horticultural sectors. Consumer developments in the UK market and export opportunities in post-Brexit post-Covid Britain will also be on the agenda.

Sustainable breeding is about more than net zero – profitability, welfare and consumer perception all need to be considered too. Our expert speakers will discuss the importance of avoiding carbon tunnel vision in our second conference session.

The role of genetics in producing a resilient, forage efficient beef animal is the focus of Arron Nerbas's presentation. Arron runs an intergenerational ranch business, Nerbas Bros Angus, in Manitoba, Canada. The forage only operation has 550 cows and has been applying regenerative principles for nearly 20 years. As well as discussing their genetic process, Arron will share how their regenerative approach has benefited the land, soil, ecosystem and economic business model.

Arron Nerbas

Prof Geoff Simm, Director of the Global Academy of Agriculture & Food Systems at the University of Edinburgh, will address the question: Where does beef fit into feeding the world? He will explore changes to production systems and technical opportunities that may help producers address growing pressures that challenge traditional approaches.

Terence Pye

In the final presentation of the beef session, Terence Pye will bring a farmer's perspective. He will share how his breeding programme resulted in dramatic improvements in calving ease and directly enhanced herd performance, profitability, sustainability and welfare of animals in his suckler herd. Together with his wife and daughter, Terence runs a herd of 70 pedigree Salers cows plus followers on their 95ha farm in North Yorkshire. Under their Rigel prefix they sell breeding stock, with customers across the UK and Europe, and have exported semen to Canada.

Producing functional cattle which perform well and thrive in our farming systems is the focus of the third conference session at this year's BCBC conference.

Improved herd health for increased fertility was the priority for a pilot project by Hybu Cig Cymru – Meat Promotion Wales (HCC). Its Red Meat Development Programme supports beef farmers to work closely with vets on proactive animal health planning. This presentation will give a vet's view on the work carried out and the take away learnings that can benefit others in the sector.

Eric Fantanillas, of IngenomiX in France, will explain how the company evaluated the calving-first heat interval (CFHI) in Limousin cattle. The company used accelerometer collars to detect first heat in Limousin females in research on 35 farms over four years. The evaluated heritability, together with the great variability of the phenotype, allowed IngenomiX to set up a genomic selection programme for CFHI on the Limousin breed.

Results from a KTIF project 'Feeding for fertility in the suckler herd' will be presented by Dr Lorna MacPherson. Lorna is Senior Dairy Consultant with SAC Consulting based in Aberdeen. She will outline how the project in eastern Scotland monitored the nutritional status of cows over the spring calving period in 2020.

How can hybrid vigour benefit the beef supply chain? Our expert speakers will explore the issues in the fourth session of the BCBC 2023 Conference.

Benefits and insights of an integrated beef supply chain is the topic of Richard Phelps's presentation opening the session. Richard is Group Agriculture Director for ABP UK and Managing Director of Blade Farming, and will outline how collaboration – particularly on genetics – can help overcome challenges and maximise opportunities currently faced by the sector.

Carmarthenshire beef farmer Aled Evans will share the story of how he and brother Iwan devised a dairy calf rearing system and beef finishing enterprise which had lifestyle and legacy targets first and foremost. Since starting the business seven years ago, they have become one of the UK's flagship grazing units expanding from 180 calves in 2015 to 650 in 2021, and were named Farmers Weekly Beef Farmer in the same year.

James Evans, Director of Farming at Grassroots Farming, will discuss how the business was established by three farmers who spotted an opportunity to supply beef from regenerative farms to a national burger chain. The business suffered some Covid-related setbacks but has now entered an agreement to provide all 45 'Honest Burger' restaurants with certified regenerative beef by 2024.

A panel of leading farmers will discuss the hot topics for British cattle breeders in the final sessions of the beef day at the BCBC 2023 conference.

Three successful beef farmers will be getting to grips with the most pressing topics for the sector in our panel discussion which will conclude the conference's Beef Day.

Bridget Borlase runs a butchery business alongside a small herd of pedigree Simmental suckler cows in Hertfordshire. Her success with 'Bridget B's Butchery' saw her named Women in Meat's Craft Butcher of the Year in 2021.

Paul Williams was Farmers Weekly Beef Farmer of the Year in 2017. He runs a suckler and dairy beef system in Snowdonia National Park. The business rears calves from 14 days old through to 20 months with an emphasis on genetics and use of technology.

Completing the beef panel is John Scott from the Scottish Highlands. John's family business produces beef and lamb from 250 Beef Shorthorn and Luing cows and 3000 ewes, alongside an arable unit producing spring barley and wheat for milling as well as biomass and wind energy projects.

In our 75th year, we have endeavoured to create a programme that highlights the importance of breeding and genetics in creating a sustainable British cattle industry across all sectors commercial and pedigree alike.

For a limited time take advantage of the early bird and group booking discounts.

The full programme and registration details are now available on our website www.cattlebreeders.org.uk or contact Heidi at heidi.bradbury@cattlebreeders.org.uk for further information.

Aled Evans

18 The National Beef Association Magazine | WINTER 2022

WINTER 2022 | The National Beef Association Magazine 19

8. 

Breeding key to improving sustainability

Challenging traditional approaches, to find ways to improve efficiency, profitability and sustainability, was the theme of this year's British Cattle Breeders Club Conference.

TEXT JAMIE GLEESON

Efficiency, fertility, emissions, and profit are all linked, University of Nottingham's Phil Garnsworthy told delegates at this year's British Cattle Breeders Club conference, held in Shropshire in January.

"Milk yield drives production efficiency, and milk yield per hectare is key to whole-farm efficiency. But any efficiency gains are partly offset by lower fertility," he said. "During the past 30 years, yields have increased, but dairy cow fertility has fallen.

"Reduced fertility and poorer oestrus detection meant that more cows were being culled because they were not in calf," added Professor Garnsworthy. "This meant that more dairy replacements were required, resulting in reduced herd efficiency."

Calving interval also plays a key role. "Fertile cows with 365-day calving intervals will complete four lactations in four year, whereas the average cow, with a longer 410-day interval, will only complete three.

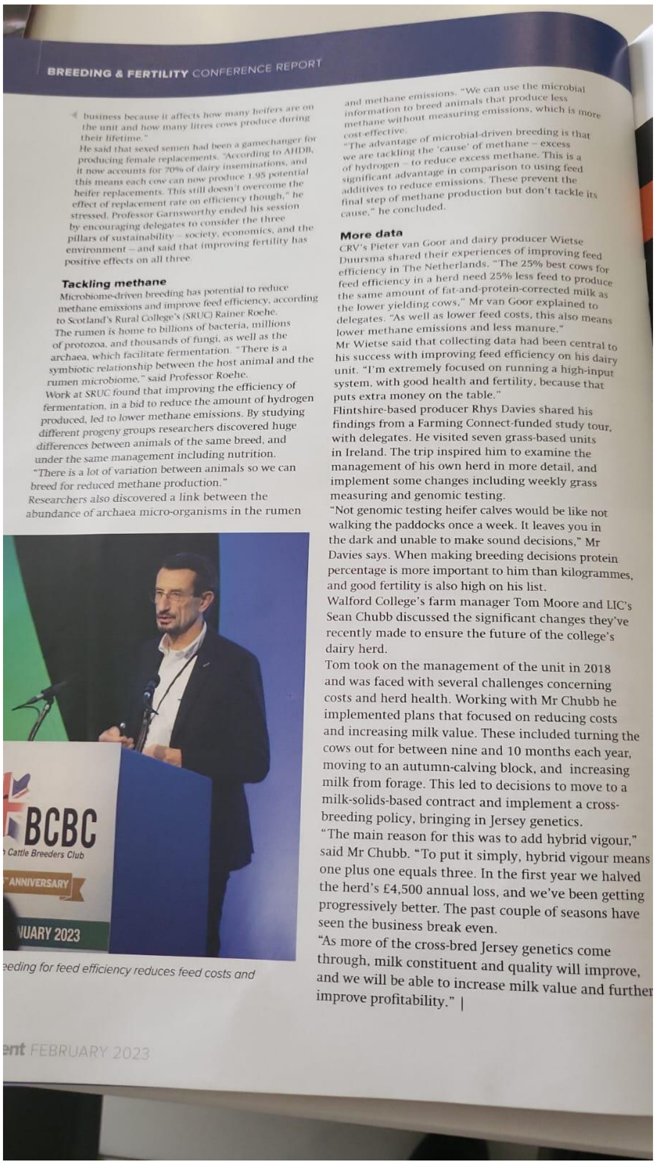
"A cow completing four lactations will produce 27% more milk during her lifetime, she will eat 12% more energy, and efficiency and net energy increases from 0.32 to 0.34 – that's up 11%." He added that feed and methane 'costs' of rearing are, therefore, spread across more kilogrammes of milk, further improving production efficiencies.

The key to improving whole-farm feed efficiency is to improve milk yield per hectare. "Improving quality and utilisation of grass and forage allows dairy businesses to increase livestock numbers and manage feed better to reduce wastage.

"Youngstock must be managed to achieve weight targets, with a focus on maximising fertility and health to reduce animal wastage and reduce replacement rates.

"Heifer losses and age at first calving also impact efficiency, but the biggest drive is fertility culls. It has a huge effect on the overall efficiency of the herd and ▸

cowmanagement FEBRUARY 2023 57



BREEDING & FERTILITY CONFERENCE REPORT

business because it affects how many heifers are on the unit and how many litres cows produce during their lifetime."

He said that sexed semen had been a gamechanger for producing female replacements. "According to AHDB, it now accounts for 70% of dairy inseminations, and this means each cow can now produce 1.95 potential heifer replacements. This still doesn't overcome the effect of replacement rate on efficiency though," he stressed. Professor Garnsworthy ended his session by encouraging delegates to consider the three pillars of sustainability – society, economics, and the environment – and said that improving fertility has positive effects on all three.

Tackling methane

Microbiome-driven breeding has potential to reduce methane emissions and improve feed efficiency, according to Scotland's Rural College's (SRUC) Rainer Roehe.

The rumen is home to billions of bacteria, millions of protozoa, and thousands of fungi, as well as the archaea, which facilitate fermentation. "There is a symbiotic relationship between the host animal and the rumen microbiome," said Professor Roehe.

Work at SRUC found that improving the efficiency of fermentation, in a bid to reduce the amount of hydrogen produced, led to lower methane emissions. By studying different progeny groups researchers discovered huge differences between animals of the same breed, and under the same management including nutrition.

"There is a lot of variation between animals so we can breed for reduced methane production."

Researchers also discovered a link between the abundance of archaea micro-organisms in the rumen and methane emissions. "We can use the microbial information to breed animals that produce less methane without measuring emissions, which is more cost-effective.

"The advantage of microbial-driven breeding is that we are tackling the 'cause' of methane – excess of hydrogen – to reduce excess methane. This is a significant advantage in comparison to using feed additives to reduce emissions. These prevent the final step of methane production but don't tackle its cause," he concluded.

More data

CRV's Pieter van Goor and dairy producer Wietse Duursma shared their experiences of improving feed efficiency in The Netherlands. "The 25% best cows for feed efficiency in a herd need 25% less feed to produce the same amount of fat-and-protein-corrected milk as the lower yielding cows," Mr van Goor explained to delegates. "As well as lower feed costs, this also means lower methane emissions and less manure."

Mr Wietse said that collecting data had been central to his success with improving feed efficiency on his dairy unit. "I'm extremely focused on running a high-input system, with good health and fertility, because that puts extra money on the table."

Flintshire-based producer Rhys Davies shared his findings from a Farming Connect-funded study tour, with delegates. He visited seven grass-based units in Ireland. The trip inspired him to examine the management of his own herd in more detail, and implement some changes including weekly grass measuring and genomic testing.

"Not genomic testing heifer calves would be like not walking the paddocks once a week. It leaves you in the dark and unable to make sound decisions," Mr Davies says. When making breeding decisions protein percentage is more important to him than kilogrammes, and good fertility is also high on his list.

Walford College's farm manager Tom Moore and LIC's Sean Chubb discussed the significant changes they've recently made to ensure the future of the college's dairy herd.

Tom took on the management of the unit in 2018 and was faced with several challenges concerning costs and herd health. Working with Mr Chubb he implemented plans that focused on reducing costs and increasing milk value. These included turning the cows out for between nine and 10 months each year, moving to an autumn-calving block, and increasing milk from forage. This led to decisions to move to a milk-solids-based contract and implement a cross-breeding policy, bringing in Jersey genetics.

"The main reason for this was to add hybrid vigour," said Mr Chubb. "To put it simply, hybrid vigour means one plus one equals three. In the first year we halved the herd's £4,500 annual loss, and we've been getting progressively better. The past couple of seasons have seen the business break even.

"As more of the cross-bred Jersey genetics come through, milk constituent and quality will improve, and we will be able to increase milk value and further improve profitability." |

eeding for feed efficiency reduces feed costs and

ent FEBRUARY 2023

9. [BBC Radio 2 audio file]
10. @allabouthecows @NerbasBrosAngus @cattlebreeders @AberdeenAngusUK @AHDB_BeefLamb
11. https://ahdb.org.uk/news/keeping-up-with-our-counterparts-in-canada
12. https://www.fwi.co.uk/news/opinion/opinion-cattle-breeders-in-upbeat-mood
13. https://www.farminguk.com/news/canadian-breeder-urges-uk-beef-farmers-to-think-outside-the-box-_62054.html
14. https://www.aberdeen-angus.co.uk/2023/canadian-aberdeen-angus-breeder-urges-farmers-to-think-outside-the-box/
15. [Event feedback]

How can we support farmers in the management of complex systems? A case study on multi-trophic rice-fish farming systems in Guinea

Lucas Fertin, Teatske Bakker

Short abstract

In some contexts, the complexity of systems occupying a socio-ecological niche is a challenge for research and advisory services, as are multi-trophic rice-fish farming systems. Using a case study of a research and development project in Guinea, we reconstructed the action research process and the role played by each actor, and conducted semi-structured interviews with the participants farmers, technicians, researchers and project managers. We describe the implemented participatory and collaborative experimentation, that allowed each farmer to identify, test and evaluate fish farming practices in their ponds, guided by a technician. All groups of stakeholders (farmers, technicians, and researchers/project executives) perceived improvements in their ability to manage or advise about multi-trophic rice-fish farming systems, and collective exchanges played a key role in the process.To support farmers in the adaptation and mangement of complex systems, the goal is not to anticipate all the situations farmers might encounter, but to equip them with knowledge and experimentation skill in order to deal with a wide range of situations. Co-learning allowed the project staff to link their knowledge about biological phenomenon with the repertoire of technical options available to farmers considering their constraints and priorities. However a change in posture from all stakeholders is a prerequisite to enable co-learning.

Extended abstract

Purpose

The transition towards sustainable agricultural and food systems requires agricultural innovations addressing global food security challenges such as hunger, malnutrition, health and poverty (Tamburino et al. 2020). However, innovations might be complex and site or context specific. Rather than the adoption of an innovation, it become more suited to talk about the adaptation of an innovation, especially in sub-saharan Africa (Glover et al. 2016).

The concept of socio-ecological niche (Ojiem et al. 2006), defined as the integration of agro-ecological, socio-cultural, economic and institutional factors at various spatial and organizational levels, allows to define which options fit best in a given context using farming system analysis (Descheemaeker et al. 2016). However, in some contexts, the complexity of the systems occupying a socio-ecological niche challenges research and advisory services.

Multi-trophic fish-farming in rice fields, or complex rice systems , are an example of complex systems combining several agricultural approaches such as mixed species, organic farming, vegetable gardening (Khumairoh et al. 2019). In rice-fish farming, farmers aim at recreating at smaller scale (dam pond) and in a shorter cycle (6 – 12 months) the same natural mechanisms at play at larger scales (rivers and oceans) and over several years, that allow to regularly harvest, near the house, fresh fish for consumption and sale. To do so, farmers mobilize biological phenomenon (Hunter & Price, 1992) based on trophic chain management (Lazzaro & Lacroix, 1995) to generate biomass in a limited space and time. A set of practices allows to anticipate, stimulate or reduce biomass in one or several primary trophic compartments. Primary organisms will in turn allow to increase or decrease biomass from secondary organisms, which are later consumed by fish (Tilapia - *Oreochromis niloticus* and Hétérotis - *Heterotis niloticus*).

Due to this complexity, farmers have to undergo several trial-and-error cycles in order to start a stable production system, with different levels of water fertilization, water management, and fish densities, with the aim of establishing references for the number of fish, desired fish size and desired cycle length (Glasser, et al. 2001). In summary, a rice-fish farmer must first discover the best way to manage water renewal in order to facilitate fertilization and thus bring the number of fish in coherence with the desired objective in the given time. Then, depending on the opportunities of cash, labour, fertiliser, fish food, equipment, structures (Bosma, et al. 2011 ; Kabir, et al. 2020), this complex farming system can be increased in its productive capacity to allow less intraspecific competition. The opposite can also be done, that is keeping the individual weight of the fish the same but increasing their number.

This contribution aims at illustrating a method that accompanies and supports farmers in the tests and adaptations of complex multi-trophic rice-fish farming systems. The goal is also to record the evolutions in the perceptions and competences of participant farmers, technicians and researcher regarding the management of complexity and variability. We discuss the issues at stake for the support of farmers in the adaptation and management of complex systems.

Design/Methodology/Approach

We present a case study of a collaborative research approach on rice-fish farming in Guinea. Guinea is a West African country with an unstable economic situation since decolonisation (Pacquement, 2020). In the forest region, where the project is located, the main agricultural activities are coffee plantations, oil palms, rubber trees, market gardening, rainfed hillside rice and flooded rice in the lowlands. The Commercial and Family Fish Farming Development Project (PisCoFam) is financed by the French Development Agency (AFD) by 10 million euros over 5 years. The Ministry of Fisheries, Aquaculture and Maritime Affairs of Guinea (MPEAM) is in charge of the project and the NGO APDRA Pisciculture Paysanne is in charge of the implementation. The Centre de Coopération International de Recherche pour le Développement (CIRAD) is coordinating the projet research activities in partnership with APDRA.

The case study is composed of two parts. First, the reconstitution of the action research process and the role played by each stakeholder, through the study of the project documents and interviews with key stakeholders. Second, we conducted semi-directive interviews with the participants: farmers (n=17), technicians (n=7), researchers (n=2) and executives of the PiscoFam projects (n=3). In addition, we used participatory observation during collective sessions.

The objective of the interviews was to collect information to understand the learning that took place on the technical practices and the results on the farm, but also on the method used. The data collected was also intended to identify whether there had been a change of attitude in each category of participant.

Findings

a) A cyclic and collaborative process based on farmers' experimentations

The first result consists of a thorough description of the collaborative research and the roles played by each stakeholder (figure 1). The research-action process allowed each participant farmer to identify, test and assess one or several fish-farming practices in their own rice ponds, paired with a technician. Each technician follows two or three fish farmers during two years.

Each technician collects data during their visits (3 visits/month) coinciding with technical operations such as fish stocking or fish harvesting. This allows to observe the evolution of the pond biomasses in addition to the discussion with farmers.

Moreover, all involved stakeholders (farmers, technicians, researchers) conduct collective work at three key-moments : at the start of the process to agree on the activities and the assessment criterias, and at the end of the first and the second production cycle to discuss their assessments of the results and of the process itself.

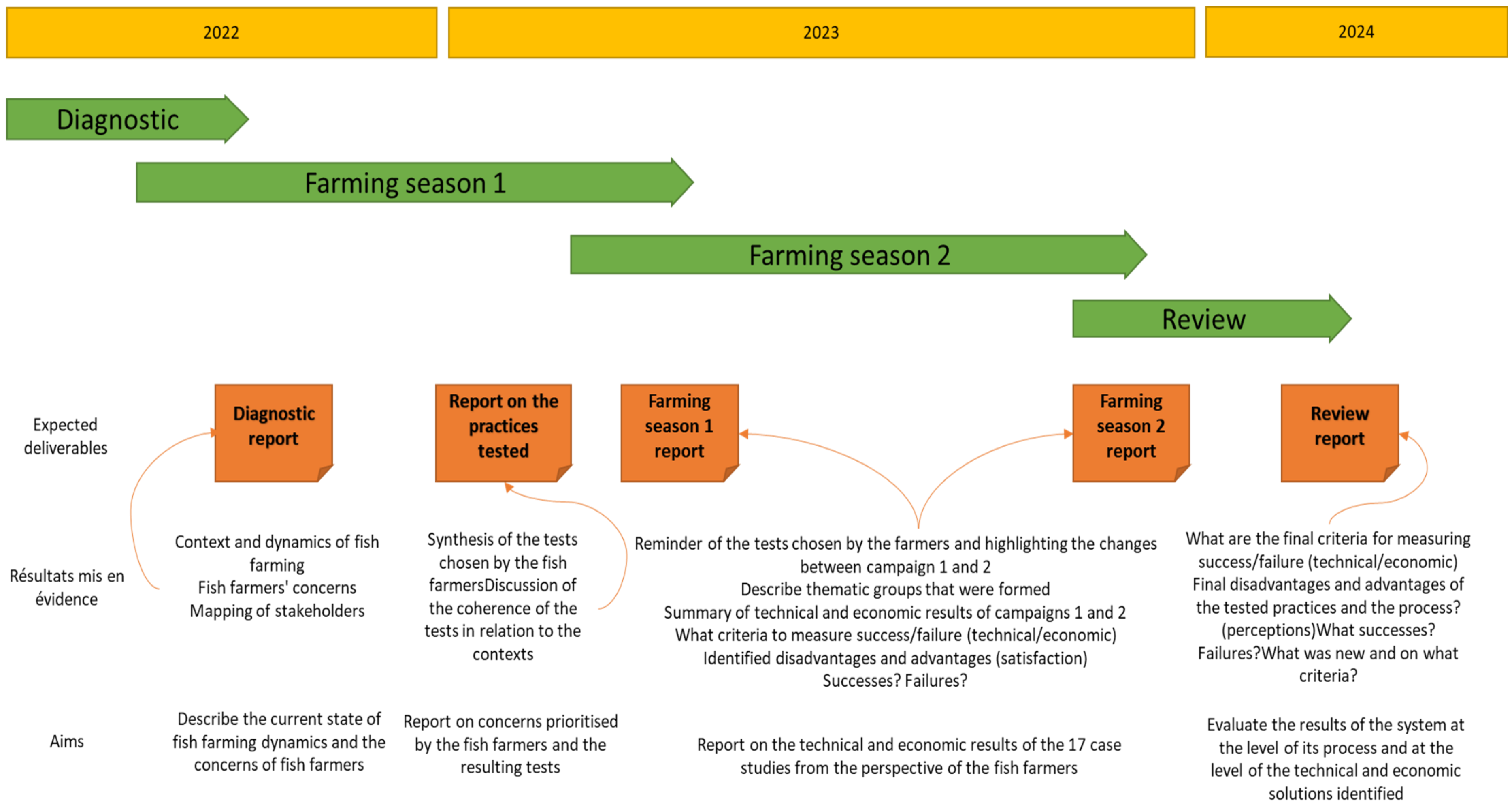


Figure 1 : Timeline of the cycle monitoring system (source : authors).

b) Co-learning among stakeholders to support the adaptation of complex rice-fish farming systems

The results of the interviews with stakeholder show that each group (farmers, technicians, and researchers/project executives) perceived improvements in their ability to manage or advise about multi-trophic rice-fish farming systems, and that collective exchanges played a key role. Farmers have had to express their concerns and priorities, which were discussed with a technician to reach the identification of a technical option to be tested in their rice-field plot(s). During the production cycle, farmers contributed to observations and data collection in the agro-ecosystem, and took part in the analysis of the data and the resulting fish, rice and vegetable yields. Another contributing event identified by farmers are the collective debates that allowed to exchange and compare experiences with other farmers, some of whom shared the same constraints or objectives. They have become able to take part at run tests and master new technical options, namely regarding fertilization and feed management. They also perceive a better understanding of the interactions between the agroecosystem components and their management practices. Farmers expressed their satisfaction about the different technical options they have learned, and show or expect better technical and economic results for production cycle.

The results show that after accompanying farmers in 2 fish production cycles, the technicians have a systemic vision of the farms and of the rice-fish plots, considering ecological and economic interactions that determine the success of a fish production cycle. Technicians perceive that they are able to estimate the monetary value of rice, fish and vegetable production on a given plot, considering its management. They consider farmers' objectives and constraints, especially in relation to non-technical objectives. They have become able to facilitate a discussion with the farmers about different technical options, and to identify farmers' criteria of satisfaction.

The main researchers involved in the process, in coordination with the remaining research team of the project, identified a better understanding of the criteria relevant to characterize fish-farms in the area, as well as indicators relevant to farmers (exceeding yield and economic indicators). This contextualized knowledge allows a better analysis of the socio-technical landscape at play for fish-farming in Guinea. The other main contribution identified is the ability to implement participatory and collaborative experimentation with farmers, which could be mobilized in the future for co-design with farmers. (Meynard et al. 2012). Capacity building for technicians (rather than knowledge acquisition) and the implication of local institutional stakeholders were the main challenges for the implementation the research-action and its perennity.

Practical Implications

On the topic on advice to support on-farm adaptation of complex rice systems, Khumairoh et al. (2019) proposed a simplified version of Farmer Field Schools. However the approach presented here differs. Indeed Khumairoh et al. (2019) consulted farmers during an initial preparation step about the rice system characterization and challenges, that allowed to anticipate the technical options answering the expressed challenges. Simplified FFS were then implemented and farmers could provide feedback. We argue that it can also be relevant to build an approach aiming at building skills for farmers through the on-farm experimentation and adaptation of the complex systems, with the help of a technician, and as a complement to collective meetings with other farmers. The aim is therefore not to anticipate all the situations farmers might encounter, but to equip them with knowledge and experimentation skill in order to deal with a wide range of situations. This appears especially relevant in the case of complex systems such as multi-trophic rice-fish farming systems.

Theoretical Implications

In some contexts, the complexity of the systems occupying a socio-ecological niche challenges research and advisory services. We discuss the importance of co-learning (Descheemaeker et al. 2016) in the process of supporting farmers in their adaptation and management of complex systems. Co-learning allowed the project staff (technicians, researchers and project executives) to link their knowledge about biological phenomenon with the repertoire of technical options available to farmers considering their constraints and priorities. However a change in posture from all stakeholders is a prerequisite to enable co-learning.

References

Bosma, R. H., & Verdegem, M. C. (2011). Sustainable aquaculture in ponds: principles, practices and limits. *Livestock science*, *139*(1-2), 58-68.

Descheemaeker K, Ronner E, Ollenburger M, et al (2016) Which options fit best? Operationalizing the socio-ecological niche concept. Experimental Agriculture 55:169–190. https://doi.org/10.1017/S001447971600048X

Glasser, F., & Oswald, M. (2001). High stocking densities reduce Oreochromis niloticus yield: model building to aid the optimisation of production. *Aquatic Living Resources*, *14*(5), 319-326.

Glover D, Sumberg J, Andersson JA (2016) The Adoption Problem; or Why We Still Understand so Little about Technological Change in African Agriculture. Outlook on Agriculture 45:3–6. https://doi.org/10.5367/oa.2016.0235

Hunter, M. D., & Price, P. W. (1992). Playing chutes and ladders: heterogeneity and the relative roles of bottom-up and top-down forces in natural communities. *Ecology*, 724-732.

Kabir, K. A., Verdegem, M. C., Verreth, J. A., Phillips, M. J., & Schrama, J. W. (2020). Effect of dietary carbohydrate to lipid ratio on performance of Nile tilapia and enhancement of natural food in pond aquaculture. *Aquaculture Research*, *51*(5), 1942-1954.

Khumairoh, U., Lantinga, E. A., Schulte, R. P., Suprayogo, D., & Groot, J. C. (2018). Complex rice systems to improve rice yield and yield stability in the face of variable weather conditions. *Scientific reports*, *8*(1), 14746.

Lazzaro, X., & Lacroix, G. (1995). Impact des poissons sur les communautés aquatiques. *Pourriot R. et Meybeck M., Limnologie générale. Coll. Ecol*, *25*, 648-686.

Meynard J-M, Dedieu B, Bos AP (Bram) (2012) Re-design and co-design of farming systems. An overview of methods and practices. In: Farming Systems Research into the 21st Century: The New Dynamic. Springer, Dordrecht, pp 405–429

Ojiem, J. O., de Ridder, N., Vanlauwe, B. and Giller, K. E. (2006). Socio-ecological niche: A conceptual framework for integration of legumes in smallholder farming systems. International Journal of Agricultural Sustainability 4:7993.

Pacquement, F. (2020). L'histoire de l'AFD en Guinée: des remous de la guerre froide aux défis du développement durable. Karthala Editions.

Souaré, Daouda et Traoré, Sékouba Gbamou. 1998. Systèmes agraires et dynamiques paysannes de la riziculture en Guinée forestière. 1998.

Tamburino L, Bravo G, Clough Y, Nicholas KA (2020) From population to production: 50 years of scientific literature on how to feed the world. Global Food Security 24:100346. https://doi.org/10.1016/j.gfs.2019.100346

Session 3E – Advisors' competences and training

Competencies for the innovation advisor in practice

Charlotte Lybaert[a], Lies Debruyne[a], Eva Kyndt[b], Fleur Marchand[a,c]
(a) Flanders Research Institute for Agriculture, Fisheries and Food (ILVO), Merelbeke, Belgium;
(b) Centre for Transformative Innovation, Swinburne University of Technology, Melbourne, Australia;
(c) Centre for Research on Environmental and Social Change and Institute of Environment and Sustainable Development, University of Antwerp, Wilrijk, Belgium;

Short abstract

Agricultural advisors are seen as key catalysts for innovation, as they are expected to take up an intermediary role and thus bring together research, industry and farmer communities. In the European funded i2connect project, a competency profile was designed for the innovation advisor. In this follow-up research, we aim to obtain a better understanding of how this competency profile for the 'innovation advisor' resonates with the current profile of the 'agricultural advisor' in Europe. To do so, 5 focus groups with teams of advisors from advisory organisations across Europe are being conducted. The competency profile for the innovation advisor was translated into a visual self-assessment tool, which forms the basis for discussion. In practice, this self-assessment tool can be used by advisors and advisory organisations to start a conversation on the competencies and skills that are present or lacking in the organisation. The results of the focus groups are expected by June 2023 and will provide insights into whether European advisors are equipped to take on the role of innovation intermediary and which aspects influence this issue. Furthermore, these insights can also lead to recommendations towards more supportive policies.

How Extension Educators' Leadership Competencies Affect the Support for Organizational Change

Suzanna Windon
The Pennsylvania State University & Mariah Awan (M.Sc), Purdue University

Short abstract

This quantitative study investigated (State) Extension educators' perceptions of support for change and its relationship with leadership competencies. The participants were 149 Extension educators with full-time employment appointments. The final data set included responses from 111 employees, providing a response rate of 74.5%. The mean summative score for intrapersonal leadership competencies was 4.12 (SD = .378). The mean summative score for interpersonal leadership competencies was 4.04 (SD = .467). Results indicated that Extension professionals mostly support change (M = 4.00, SD = .616). We found a significant positive correlation between support for change and Extension educators' interpersonal leadership competencies (r = .389, p = .001) and intrapersonal leadership competencies (r = .238, p = .013). Intrapersonal and interpersonal leadership competencies predicted a significant proportion of the total variation in overall support for change (16.2%), F (2, 104) = 10.024, p < .001. Leadership education is fundamental in advancing Extension educators' intrapersonal and interpersonal leadership competencies. A well-developed contemporary leadership education program can help to prepare Extension educators to support organizational change.

Extended abstract

Introduction and Purpose

Understanding Extension educators' orientation toward organizational change is critical as Extension works to adapt to the 21st century (Bloir & Scheer, 2017) because new opportunities and challenges present themselves in Extension work (Smith & Torppa, 2010). One of the challenges for leaders is implementing planned organizational changes toward more effective outcomes (Battilana et al., 2010). The leadership theories and models emphasize the importance of envisioning and leading change for organizational development (Zaccaro & Banks, 2004). The authors also indicated that organization innovations for change require creating an effective learning culture. Day and Dragoni (2015) differentiated two dimensions of a leader's development over time: the intrapersonal and the interpersonal dimensions. Intrapersonal leadership development includes human capital development that includes individual-based knowledge, skills, and abilities (Day, 2000). In 2019, Struckmeyer et al. conducted a study to determine factors that affect support for a new caregiving method among family and consumer sciences Extension educators. The authors found that support for change was significantly predicted by the following factors: current position, leadership self-efficacy, interoffice support, and social support. The development of leadership competencies has been an area of scholarly inquiry of county Extension educators (Benge et al. 2011; Boyd, 2004; Benge & Sowcik, 2018; Ricketts et al., 2010; Woodrum & Safrit, 2003; Stedman & Rudd, 2006) and state specialists (Radhakrishna, 2001). Leadership competencies have also been identified to guide undergraduate academic plans for future Extension professionals (Scheer et al., 2006). Argabright (2019) and colleagues conducted a review of the literature of several resources on Extension competencies. They found that management, communication, diversity, interpersonal leadership skills, and networking were critical leadership skills for the modern Extension professional. More recent studies indicated that organization leaders must know how to create change to address unpredictable situations. (Clampitt & Williams, 2005). Despite the plethora of studies examining leadership development for Extension educators, few studies in the literature were identified related to Extension professionals' level of support for organizational change. None of the identified studies examined the relationship between Extension processionals' leadership competencies and support for change. This study addresses a gap in the literature and discusses the relationship between Extension educators' perceptions of support for organizational change and Extension educators' leadership competencies.

This quantitative study seeks to assess perceptions of two dimensions of support for change among [State] Extension educators and model the relationship between support for change and intrapersonal and interpersonal leadership competencies. The knowledge gained through this work should expand current understandings regarding the nature, scope, and value of support for change within the Extension educator role. Four research objectives guided the current study:

1. Describe Extension educators' perceptions of their intrapersonal leadership competencies
2. Describe Extension educators' perceptions of their interpersonal leadership competencies
3. Describe Extension educators' perceptions of their support for change
4. Explain the relationship between Extension educators' perceptions of support for change and perceived intrapersonal and interpersonal leadership competencies

Method

The present study of support for change was completed using a survey research method. An online survey was utilized to collect data from the [State] Extension educators, administered via Qualtrics.

Participants and Data Collection

The target population for our study was [State] Extension educators. In our study, we used a census approach and followed Dillman's et al., (2014) online data collection technique. The acting director of [State] Extension sent a pre-notification email to Extension educators and asked them to participate in this study. We sent a second pre-notification email and four email reminders. The population of the study reported here was 149 [State] Extension educators with full-time employment appointments. After removing responses with missing data, the final data set included responses from 111 employees, providing a response rate of 74.5%. An online survey method was used. Data was collected using the Qualtrics software. We developed the *Self-Leadership Scale* using existing literature related to leadership, specifically self-leadership and intrapersonal leadership competencies (Benge et al., 2011; Bruce & Anderson, 2012; Day, 2000; Day & Dragoni, 2015; Goleman, 2004; Stedman & Rudd, 2006; Subramony et al., 2018; Ulvenblad et al., 2014), the Cronbach Alpha (.84) The *Job Motivation Scale (3 items)* was adapted from Vithessonthi & Schwaninger (2008), the Cronbach Alpha (.82) The instrument was measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A panel of five Extension professionals reviewed the instrument for face and content validity. The panel of experts determined that the instrument was sufficiently valid. We used a census approach and followed Dillman's et al. (2014) online data collection technique. We send one invitation and four follow-up emails to 149 [State] Extension educators with full-time employment appointments. The final data set included responses from 111 employees, providing a response rate of 74.5%. We used a survey method to address the four research objectives of this study. We used an online questionnaire administered via Qualtrics to explore Extension educators' perceptions of intrapersonal and interpersonal competencies and support for organizational change. We developed the *Intrapersonal Leadership Scale and Intrapersonal Leadership Scale* using existing literature on leadership, specifically intrapersonal and interpersonal leadership competencies (Benge et al., 2011; Bruce & Anderson, 2012). We adapted Vithessonthi and Schwaninger's (2008) three-item, *Support for Change Scale*. This scale measured the degree of behaviors that represented employees' support for change. Both scales' items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The reliability of the original scale was 0.70. The panel of experts determined that the instrument was sufficiently valid. A pilot test was conducted to determine the instrument's reliability. We used Dillman et al. (2014) method for online data collection for our pilot test. For the pilot study, we selected 35 [State] Extension educators. The response rate for individuals completing the pilot study was 68 % (n = 24). The reliability coefficient of the *Intrapersonal Leadership Scale* in this study was .839. The reliability coefficient of the *Interpersonal Leadership Scale* in this study was .916. The reliability coefficient of the overall *Support for Organizational Change Scale* in this study was .829. Caution is advised in interpreting the study findings since the study participants are not a random sample. The findings of this study will only apply to those who participated and, as such, cannot be generalized to the entire population of [State] Extension educators. We used standard Davis Conventions (1971) to describe the magnitude of the correlation between independent and dependent variables.

Findings

The mean summative score for intrapersonal leadership skills was 4.12 (SD = .378, n = 111). Lower scores indicate greater needs for intrapersonal leadership skills content areas, and higher scores indicate greater proficiency. The survey items scoring the highest mean values were (a) I have a clear set of values that I apply in the workplace; I work to achieve ethical excellence (integrity) in my Extension work. (c) I easily work independently. (M = 4.70; SD = .497). The survey items scoring with the lower scores were (a) I balance my personal and professional life. (b) I handle stress effectively. (c) I can easily manage my professional calendar. The mean summative score for the interpersonal leadership scale was 4.04 (*SD* = .467, *n* = 111). Lower scores indicate greater needs for intrapersonal leadership skills content areas, and higher scores indicate greater proficiency. The survey items scoring the highest mean values were (a) I work to establish trust with the people I work with. (b) I easily collaborate with others on projects. (c) I form internal partnerships (i.e., with other Extension professionals) to enhance my work. The survey items scoring the lowest mean values were (a) I lead organizational change within my role. (b) I delegate tasks effectively, and (c) I effectively engage in difficult conversations (i.e., negotiation with external stakeholders, ethical situations involving volunteers, etc.). The mean summative score for support for change was 4.00 (*SD* = .616, *n* = 107). Application of the Pearson correlation coefficient showed a positive, very strong association between interpersonal and intrapersonal leadership competencies (r = .777, p = .001); a moderate positive association was found between support for change and interpersonal leadership competencies (r = .389, p = .001); and a slightly positive association was found between support for change and intrapersonal leadership competencies (r = .238, p = .013). A multiple linear regression analysis was conducted to determine the relationship between overall support for organizational change (dependent variable) and independent variables such as intrapersonal leadership and intrapersonal leadership skills. The results indicated that intrapersonal and interpersonal leadership competencies predicted a significant proportion of the total variation in overall support for change, F (2, 104) = 10.024, p < .001. Multiple R^2 indicated that approximately 16.2% of the variation in support for change could be explained by the Extension of educators' intrapersonal and interpersonal leadership competencies. Within the final model, one of the predictors was statistically significant. The strongest predictor of support for change was interpersonal leadership competencies (β = .514; p-value < .001). Intrapersonal leadership skills (β = .262; p-value = 2.62) was a statistically insignificant predictor of support for change.

Discussion and Implementation

Our results indicate that [state] Extension professionals have high levels of intrapersonal leadership in values, ethics, and workplace independence. These findings align with Hayne's (2000) findings, which indicated that decision-making, assertiveness, and willingness to take the initiative are important leadership competencies for Extension educators. Extension professionals had lower scores in the following areas: work-life balance, stress management, strategic program planning, and mindfulness. Findings for work-life balance, mindfulness, and stress management align with Kroth and Peutz's (2011) study, which found that Extension professionals ranked work-life balance and burnout as highly important issues. Extension professionals scored high for levels of interpersonal leadership under the topics of trust, collaboration, and partnerships. The importance of these interpersonal skills abilities aligns with Hayne's (2000) and Benge and Sowcik's (2018) findings on the importance of collaboration and the ability to build strong relationships with others for Extension professionals. Lower scores were reported for leading change, delegation, and difficult discussions, and the importance of these competencies aligns with the literature. We found that, on average, Extension professionals mostly support change. These findings align with Bloir and Scheer's (2017) findings. Our study has implications for the future study of Extension leadership and support for organizational change, as well as implications for Extension leadership professional development practitioners. As mentioned earlier, our study indicated a lack of literature on support for change studies among Extension professionals, and existing studies contradicted some of our findings. Human resource practitioners and Extension faculty members developing leadership professional development materials for Extension professionals should focus on topics we identified as lower scoring, namely work-life balance, stress management, strategic program planning, mindfulness, leading change, delegation, and difficult discussions/conflict management. Leadership education is fundamental in advancing Extension educators' intrapersonal and interpersonal leadership competencies. A well-developed contemporary leadership education program can help to prepare Extension educators to support organizational change.

References

Benge, M., Harder, A., & Carter, H. (2011). Necessary pre-entry competencies as perceived by Florida Extension agents. *Journal of Extension*, *49*(5). https://www.joe.org/joe/2011october/a2.php

Benge, M., & Sowcik, M. (2018). Online Leadership Short Course for County Extension Directors. *Journal of Extension*, *56*(6), https://eric.ed.gov/?id=EJ1194932

Bloir, K., & Scheer, S. D. (2017). Exploring Employee Readiness for Change in a State Extension System. *Journal of Extension*, *55*(6). https://www.joe.org/joe/2017december/pdf/JOE_v55_6a3.pdf

Byrne, C. (2017). *Growing together: 4-H professional, research, knowledge and competencies 2017.* https://nifa.usda.gov/sites/default/files/resources/4-H%20PRKC%202017%20Guide.pdf

Day, D. V. (2000). Leadership development: A review in context. *The Leadership Quarterly,* 11(4). https://doi.org/10.1016/S1048-9843(00)00061-8

Day, D. V., & Dragoni, L. (2015). Leadership development: An outcome-oriented review based on time and levels of analyses. *Annual Review of Organizational Psychology and Organizational, 2*(1). https://doi.org/10.1146/annurev-orgpsych-032414-111328

Harder, A. (2019). Public value and partnerships: Critical components of extension's future. *Journal of Extension*, *57*(3). https://www.joe.org/joe/2019june/pdf/JOE_v57_3comm1.pdf

Haynes, B. R. (2000). Management skills of county Extension administrators: Are they sufficient to do the job? *Journal of Extension, 38*(2). https://www.joe.org/joe/2000april/rb2.php

Scheer, S. D., Ferrari, T. M., Earnest, G. W., & Connors, J. J. (2006). Preparing extension professionals: The Ohio State University's model of extension education. *Journal of Extension*, *44*(4), 1-12. https://www.joe.org/joe/2006august/a1.php

Smith, K. L., & Torppa, C. B. (2010). Creating the capacity for organizational change: Personnel participation and receptivity to change. *Journal of Extension*, *48*(4). https://joe.org/joe/2010august/a1.php

Stedman, N. L., & Rudd, R. (2006). Leadership styles and volunteer administration competence: Perceptions of 4-H county faculty in the United States. *Journal of Extension*, *44*(1). https://www.joe.org/joe/2006february/rb6.php

Ulvenblad, P., Hoveskog, M., Tell, J., Ulvenblad, P. O., Ståhl, J., & Barth, H. (2014). Agricultural business model innovation in Swedish food production: the influence of self-leadership and lean innovation. In DRUID Society Conference 2014 on Entrepreneurship–Organization–Innovation, Copenhagen Business School (CBS), Copenhagen, Denmark.
http://www.diva-portal.org/smash/get/diva2:746588/FULLTEXT01.pdf

Vithessonthi, C., & Schwaninger, M. (2008). Job motivation and self-confidence for learning and development as predictors of support for change. *Journal of Organizational Transformation & Social*

How do rural extension agents really learn? Evidence and proposals from Latin America

Fernando Landini

National Scientific and Technical Research Council (CONICET), and University of La Cuenca del Plata (Argentina)

Short abstract

Rural extension and advisory services are a very diverse and complex practice. In this paper I describe the various sources of knowledge and learning of rural extension agents from Argentina, Chile, Cuba, Ecuador, Guatemala and Uruguay, and present proposals to strengthen their skills based on the results. One hundred and thirty three rural extension agents were interviewed and asked about how they had learned the knowledge they use in their professional practice. Interviews were transcribed and analysed using content analysis procedures. Eight sources of knowledge and learning were identified: early rural or farming experience, vocational education, undergraduate education, experiential learning, in-service training, mentoring, exchange of experiences among peers, and graduate education. The results show that rural extension agents acquire knowledge and skills from a multiplicity of sources, some of them usually not taken into account by researchers and institutional authorities. These sources are interconnected and thus should not be analysed independently. Finally, it is apparent that contributing to the development of extension agents' knowledge and skills is not only about training them but also generating contexts that contribute to autonomous learning. In the article I also present multiple recommendations for practice.

Keywords: rural extension; advisory services; Latin America; learning, training, practice; mentoring.

Extended abstract

Introduction

Rural extension and advisory services are a very diverse and complex practice (Leeuwis, 2004; Silva et al., 2021). Depending on the context, they require knowledge in the field of agriculture, sustainable practices and marketing, as well as soft skills related to establishing relationships with people, interpersonal communication and even group work and support for organizational strengthening (Berven et al. al., 2020). Thus, the education and training of practitioners who work as rural extension agents or advisors is widely acknowledged as fundamental (Jilito & Wedajo, 2021; Namyenya et al., 2022).

In general, most academic literature on the education and training of rural extension agents is limited, for various reasons. Many articles simply point out the insufficient training of rural extension agents and highlight the need to improve it, without analysing or discussing the best strategies to do so (Diab et al., 2020; Landini & Vargas, 2020). At the same time, there are also numerous papers studying the education and training of rural extension agents. However, they often limit their attention to formal education (university degrees and vocational studies) and in-service training, which leaves out multiple sources of knowledge and experience that extension agents draw on in their practice, such as their experience or the exchange among peers (Landini, 2021).

In the academic literature, there are also some articles that study alternative or innovative strategies to train extension agents. For instance, Gorman (2019) analysed a graduate training program for extension agents based on reflection on practice and peer exchange, and Lefore (2015) described the development of skills for facilitation in the context of participatory workshops and the supervised implementation of knowledge in practice. In this paper, based on a study carried out in Argentina, Chile, Cuba, Ecuador, Guatemala and Uruguay, I systematically describe the various sources of knowledge and learning of rural extension agents and present proposals to strengthen their skills based on the results.

Methodology

To reach these objectives, we conducted a qualitative research supported by the constructivist paradigm, 133 rural extension agents (47 women and 86 men) from Argentina, Chile, Cuba, Ecuador, Guatemala and

Uruguay were interviewed, including 68 individual interviews and 18 group interviews (15 interviews per country, with the exception of Cuba where they were 11). Five researchers conducted the interviews, although the author of this article conducted most of them. An interview protocol was used to facilitate comparability, which inquired how the interviewees had acquired the knowledge and skills used in their professional practice. We also asked for proposals to improve the education and training of extension agents. Mean age and experience varied across national samples. The average age for the complete sample was 42 years old and the average experience was 12 years. Most of the research participants had university degree and worked in public rural extension or development institutions in their countries. Provinces or departments in each country were selected based on their accessibility. We transcribed the interviews and analysed them following content analysis procedures, with the support of the Atlas.ti software.

Findings and Discussion

In contrast to the vast majority of the scientific literature, which focuses on undergraduate university education and short training courses (in-service training) (Landini, 2021), the evidence of this research shows that rural extension agents and agricultural advisors develop knowledge and skills from a large and diverse set of sources. These sources are listed and described below, and the scientific articles that present the expanded research results are indicated in each case.

<u>Early rural or farming experience</u> (Landini, 2021). Numerous interviewees reported that they were born in farming families or in rural communities, which allowed them to know both the idiosyncrasies of the rural population and the agricultural practice. Although institutions usually do not value this, extension agents recognize it as a valuable complement to formal education.

<u>Vocational education</u> (Landini, 2020). In countries such as Chile and Guatemala, almost 50% of the respondents had attended only vocational education, while in other cases there were extension agents who had first received vocational education and later obtained university degrees. The interviewees highlighted that vocational education is an insufficient source of knowledge to be a proficient extension agent, but still deemed it as very valuable because vocational education allowed them to get agricultural practical experience, in contrast to universities (that are considered excessively theoretical). Therefore, research participants usually describe it as a valuable complement to university education and not as a training experience that lacks value after obtaining a university degree.

<u>Undergraduate education</u> (bachelor's degree) (Landini, 2020). From the interviewees' perspective, undergraduate education constitutes the fundamental basis for offering agricultural advice to farmers. However, respondents also highlighted that it is insufficient because it is excessively theoretical, does not offer tools to interact with people and does not offer alternatives to work in contexts with a scarcity of material resources or with non-business farmers

<u>Experiential learning</u> (Landini, 2023). It complements and helps to mature the undergraduate university education. It is usually mentioned when arguing that that undergraduate university education did not offer sufficient guidelines to face practice proficiently. Experiential learning includes from simply developing expertise over time and learning by trial and error, to reframing practice as a result of reflective processes.

<u>In-service training</u> (Landini & Villafuerte Almeida, 2022). It is one of the sources of knowledge and skills most mentioned by academic literature and valued by Latin American rural extension institutions. The interviewees highlighted that in-service training is important for updating their technical knowledge as well as for incorporating new knowledge related to rural extension and interpersonal relationships. However, most of the interviewees highlighted that in-service training is scarce, insufficient and there is no institutional strategy for staff training in their contexts. Training events that are practical, participatory and allow connecting theory and practice are particularly valued.

<u>Mentoring</u> (Landini, 2022a). Mentoring involves a diversity of practices. A significant percentage of those interviewed reported having developed their professional practice in the initial years with the support of an informal mentor (mentoring was institutionalized in no case). Mentors function as guides and provide coordinate systems in uncertain or ambiguous contexts or situations. They help the development of

professional identities and allow for the progressive and supervised exercise of the different components of the professional role. The results of the study show that mentoring is a key source of knowledge and skills for extension and advisory practice.

Exchange of experiences and communities of practice (Landini, 2022b). Most of the interviewees work in rural extension institutions as part of local teams. Although research participants are not usually aware at first glance, they are constantly exchanging knowledge and discussing problems with peers. In this way, they exchange recommendations, reflect critically on practice and innovate in the ways of dealing with problems. That is, they do not only share knowledge, but also create it. The role of institutional settings and authorities is fundamental as facilitator of horizontal dialogue.

Graduate education (Landini, 2020). We found that in several of the research countries, it is common for extension agents to undertake graduate studies, especially in the area of extension and rural development, several years after having started their professional practice. The results show that graduate studies allow connecting and synergizing different sources of knowledge: theory offered by professors, personal experience and exchange with peers who have similar problems. The interviewees argue that graduate studies have been of great value to their professional training and to the development of their skills.

Theoretical implications

Different theoretical implications derive from this study. In the first place, it is necessary to recognize that rural extension agents acquire knowledge and skills from a multiplicity of sources, many of them scarcely recognized and valued, both by the scientific literature and by institutional decision makers. At the same time, it is clear that these sources are interconnected and can strengthen each other and, in consequence, it is not appropriate to think or analyse them independently. Finally, the existence of different sources of informal learning invite us to become aware that we not only have to think about the development of the skills of extension agents and advisors in terms of teaching, but it is also necessary to recognize that there are learning processes in which no one has the formal role of teaching.

Recommendations for practice

Multiple recommendations for practice derive from these results. These recommendations were presented and analysed in detail in the articles indicated in each case, and in an additional paper that described the respondents' recommendations to strengthen their own education and skills (Landini, 2022c). Some key recommendations are presented below.

Early rural or farming experience and vocational education. Since they complement undergraduate university education, we recommend valuing them even in the case of applicants who have a university degree.

Undergraduate education. We recommend strengthening topics related to rural extension and sociology in cases in which they does not exist, increasing the instances of practice, and contributing to the understanding of reality from a complex and systemic perspective.

Experiential learning. We recommend contributing so that extension agents and advisors can develop experiences in different territorial contexts and with different types of farmers. At the same time, experimentation and trial and error should be valued in institutions as ways of learning.

In-service training. It is essential that extension institutions develop training programs based on the training needs of their staff and that they prioritize training activities that are practical, participatory, and allow for the connection between theory and practice.

Mentoring. Extension and advisory institutions should be aware of and support informal mentoring processes, allow staff to spend time in mentoring activities, and value the mentor role in performance evaluations. In some cases, it may even be advisable to institutionalize mentoring practices. Extension and advisory institutions can also offer mentoring training to local extension authorities and experienced extension agents.

Exchange of experiences and communities of practice. Although peer-to-peer exchanges are highly spontaneous, it is essential that rural extension institutions foster organizational climates and supportive environments that contribute to peer learning. This includes supporting the development of trust between peers, fostering teamwork, and creating institutional opportunities for exchanging among extension agents.

Graduate education. Master's degrees in rural extension and rural development have shown great potential to enhance the skills of extension agents. We recommend to value and support this type of education. For optimal learning, it is important that the participants already have professional experience before participating of a master's degree.

Conclusion

Extension agents and advisors develop knowledge and skills from a broad, complex and interconnected diversity of sources. It is necessary that institutional strategies aimed at developing their knowledge and skills do not focus only on one or a few sources, but rather adopt a comprehensive view.

References

Berven, B., Franck, K., & Hastings, S. (2020). Investing in extension's workforce: Assessing and developing critical competencies of new agents. *Journal of Extension, 58*(2). https://tigerprints.clemson.edu/cgi/viewcontent.cgi?article=1145&context=joe

Diab, A. M., Yacoub, M., & AbdelAal, M. (2020). An overview of the agricultural extension system in Egypt: The history, structure, modes of operation and the future directions. *Sustainable Agriculture Research, 9*, 30-42. https://doi.org/10.5539/sar.v9n4p30

Gorman, M. (2019). Becoming an agricultural advisor-the rationale, the plan and the implementation of a model of reflective practice in extension higher education. *The Journal of Agricultural Education and Extension, 25*(2), 179-191. https://doi.org/10.1080/1389224X.2018.1559742

Jilito, M., & Wedajo, D. (2021). Agricultural extension agents' education and turnover intentions in public extension services in Ethiopia. *International Journal of Agricultural Extension, 9*(2), 183-191. https://doi.org/10.33687/ijae.009.02.3294

Landini, F. (2020) Límites y potencialidades de la formación universitaria en América Latina para la práctica de la extensión rural. *Educaçao e Sociedade, 41*, e218569. https://doi.org/10.1590/ES.218569

Landini, F. (2021). How do rural extension agents learn? Argentine practitioners' sources of learning and knowledge. *The Journal of Agricultural Education and Extension, 27*(1), 35-54. https://doi.org/10.1080/1389224X.2020.1780140

Landini, F. (2022a). Formación de extensionistas rurales latinoamericanos a partir de procesos de mentoría. *Perfiles Educativos (México), 44*(117), 78-95. https://doi.org/10.22201/iisue.24486167e.2022.177.60465

Landini, F. (2022b). Intercambio de experiencias y aprendizaje horizontal entre extensionistas: fuente invisibilizada de conocimientos para la práctica. *Psicoperspectivas, 21*(3). https://dx.doi.org/10.5027/psicoperspectivas-Vol21-Issue3-fulltext-2643

Landini, F. (2022c). Propuestas de extensionistas de Argentina, Chile, Cuba, Ecuador, Guatemala y Uruguay para fortalecer su propia formación. *Revista Brasileira de Educação do Campo, 7*. e14589. https://doi.org/10.20873/uft.rbec.e14589

Landini, F. (2023). La dinámica del aprendizaje experiencial en la formación de las y los extensionistas rurales latinoamericanos. *Revista Mexicana de Investigación Educativa, 28*(96), 251-275. https://www.comie.org.mx/v5/sitio/wp-content/uploads/2023/01/RMIE_96_WEB.pdf

Landini, F. & Vargas, G. (2020). Evaluación de los problemas que limitan el impacto del servicio de extensión público en el oriente de Guatemala. *Revista de Economia e Sociologia Rural. 58*(1), e192529. https://doi.org/10.1590/1806-9479.2020.192529

Landini, F. y Villafuerte Almeida, I. (2022). Capacitación de extensionistas rurales en América Latina: Prácticas, problemas y propuestas. *Revista Electrónica Educare,* 26(2), 309-328. http://dx.doi.org/10.15359/ree.26-2.17

Leeuwis, C. (2004). *Communication for rural innovation. Rethinking agricultural extension*. Blackwell Science.

Lefore, N. (2015). Strengthening facilitation competencies in development: Processes, challenges and lessons of a learning alliance to develop facilitators for local community engagement. *Knowledge Management for Development Journal, 11*(1), 118-135. https://hdl.handle.net/10568/66447

Namyenya, A., Zeller, M., Rwamigisa, P., & Birner, R. (2022). Analysing the performance of agricultural extension managers: A case study from Uganda. *The Journal of Agricultural Education and Extension, 28*(3), 363-389. https://doi.org/10.1080/1389224X.2021.1932539

Silva, N., Silva, N., & Oliveira, M. (2021). Competências em foco: Extensionista rural, uma profissão de multifuncionalidades. *Research, Society and Development, 10*(6). https://doi.org/10.33448/rsd-v10i6.15503

Integrating lifelong learning in practice for advisors in Australia's national extension strategy for the vegetable sector: literature review and research design

Elizabeth Koech
The University of Melbourne

Short abstract

The traditional approach to education must evolve from being a concentrated period at the start of a career to one where learning is an integral lifelong process that equips individuals and communities with the skills, knowledge and confidence to meet and embrace change. Question: Skills: How are generic and specific skills for advisors, teachers and facilitators (at both individual and collective or organisational level) identified, translated into training tools and methods, and implemented? Development of frameworks to guide CPD for farmers, advisors, teachers and facilitators?There has been renewed research interest in continous professional development (CPD) and life long learning for extension practitioners in the wake of evolving extension approaches, seemingly towards a focus on innovation and resilience. In the current environment of constant change priority is stressed on innovative strategies for the upskilling and renewal of knowledge on extension as pivotal for resilience.Australia's extension system is privatised and pluralistic thus calling for a transition to frameworks of practice that offer inclusion of all organisations participating in extension delivery. This paper introduces a doctoral research project, commenced in mid-2022, that seeks to contribute knowledge to this emerging need for capacity building of extension agents and co-innovation among organizations that is pivital in a pluralistic advisory system. The research is centered around a case study of an ongoing Australian national-scale extension project for the vegetable industry – 'VegNET3.0' - which among other initiatives is investing in professional development of its advisors and seeks to build capacity on the innovation systems approach to extension. This paper presents a background of the project and the highlights some results of a systematic review of literature on capacity building and professional development and the proposed preliminary research design.

Extended abstract

Purpose

The levy-funded national research and development corporation body for Australia's horticultural industry, Hort Innovation(HI), is investing in the national vegetable industry extension program (VegNET). The project is centred around the implementation of a five-year national vegetable extension strategy in ten regions in Australia each with an agricultural advisor refeered to as a regional development officer (RDO). Among other actions, the strategy endorses the use of an innovations systems (AIS) approach in extension delivery, hence transitioning the role of advisory staff from Industry Development Officers (IDOs) whose task was a general remit around the delivery of awareness and extension activities to a Vegetable Regional Development Officer role (RDOs) focused on the development and delivery of regional and national strategies based on well-developed processes of stakeholder engagement (HI, 2021).

Informed by an industry development portfolio review which recommended providing professional development in uptake of knowledge in extension theory and practice for its advisory staff, the project is investing in their professional development plans, mentoring and coaching, training and networking opportunities. The project has commissioned this PhD research to investigate and explore the benefits of the above professional development investments to HI by observing and measuring change in capacity of advisory staff over the life of the project and attributing this to the above investments. The research will also identify other factors that support or hinder success of advisors' professional development, including those associated with the project's governance and institutional arrangements.

Design/Methodology/Approach
The research commenced with a systematic review of literature using the PRISMA method which was used to intentionally select certain work on professional development and capacity building in various fields of practice based on set out criteria. The research question guiding the search was framed as:

What **professional development** strategies can be promoted to **build the capacity** of agriculture advisors to take up new roles as facilitators in AIS approach?

The key words identified were "professional development" with synonyms being "career development", "professional networking" or "career education" and "capacity building" with synonyms being "capacity development" and "capabilities".

The databases chosen for review were Web of Science, Cabi Abstracts and Agricola in EBSCOhost and Scopus best known for publishing the disciplines of health, education and agriculture. In the end 36 articles were examined from the year 2015 to date with case studies mostly being from the global north. The field of education and health were reviewed because of their advanced habits of constant refinment of practice through continous professional development.

Findings
The framing of professional development

The review of literature established two framings of professional development, the objective and the subjective approaches (Kemmis, 2011). The subjective approach is framed as a human-centered approach which focused on the development of the individual by acknowledging and building on their pre-existing knowledge of practitioners and working on their self assesed skills gaps (Kemmis, 2011), while the objective approach was actioned as a system function, a formal engagement or management-oriented task based on human resources efforts to deliver on organizational outcomes, with resources allocated as part of organizational goals (Farazmand, 2004; Yamoah, 2014). Professional development is realised through aqusition of new knowledge, skills, attitudes and practice in a process of adult learning (Johnson & Davies, 2009) hence the study examined the various ways through which adults learn.

Continous professional development -Formal learning

Agricultural advisors initially gain knowledge through education consisting of school, vocational and college studies usually delivered in a formal setting described as consisting of a hierarchy level-grade structure, admission requirements, registration, predetermined and non flexible teaching and learning methods with a set duration and schedule (Alonderienė & Pundzienė, 2008).

Continous professional development- Non-formal learning

Once in practice advisors often learn through non formal and informal methods.Professional learning happens non-formally through intentionally organized learning events, which take place in an institutional setting. This may be implemented based on problem solving, observations, inquiry or practice (Percy, 2005). Though intentional and set in an institutional setting it is distingushed from formal learning by the lack of pre-requisite entry requirements, evaluation and awarding critera that formal learning uses (Manuti, 2015). Examples mentioned are on job training, mentoring, coaching, seminars and workshops.

Continous professional development- Informal learning

Professional learning also happens informally, Eraut (2012) describe this as a conscious or unconscious every-day process where the learner acquires competencies. This they say happens at individual as well as organizational level. They contend that informal learning methods are the main contributor to life long learning and mention it as being an unintentional and unpredictable process with no set location therefore might not be distinguished by the learner. Manuti et al. (2015) adds that due to its unstructured and at times, unintentional manner, this kind of learning and knowledge is tacit and regarded as part of experience thus practitioners find it hard to describe it in their work.They mention that it may be aquired through interaction with collegues or farmers while practicing in the field giving examples such as learning by doing, job shadowing, peer interaction, personal research, group work, and feedback from superiors.

Push vs pull initiatives in continuous professional development

A metasynthesis of literature on life long learning and continuous professional development of nurses in the UK by Mlambo et al. (2021) highlighted the push pull mechanism of CPD between the UK department of health and the nurses themselves, contending that while the government sets CPD as mandatory to nursing practice, nurses themselves intentionally seek to improve their practice through self driven initiatives. An example presented on the paper being on-site learning which they describe as utilizing existing expertise to expand knowledge in practice. They describe this as requiring discretion and willingness from management to allow time and space for making mistakes and learning .

Professional development and capacity building

The ultimate desired outcome of professional development is to build capacity of practitioners to perfom as per their job requirements (Sheppard et al., 2009). Capacity is an abstract concept with various descriptions in literature mostly boiling down to actual or potential ability to perform, yield or withstand (Brown et al., 2001). Morgan (2006) describes it as technical ability, relationships and values, while Foster-Fishman et al. (2001) describe it as skills, education, and knowledge.

Capacity is situated at either individual, organizational or network and broader systems scales (Land, 2000). So far this study has identified Bennett (1975) Knowledge, attitude, skills, aspirations and practice (KASAP) as an applicable conceptual framework for observing and measuring change in capacity. In Bennett (1975) description, knowledge refers to content, concepts, theories, and principles, skills is the ability to use and apply knowledge. They define attitudes as a set of beliefs and values, aspirations as desires for professional fulfillment and practice as the individual or collective application of acquired knowledge, attitudes, skills , and aspirations to work.

Theoretical Implications

Developing a methodology and choosing methods that answers our research question which seeks to find out to what extent professional development increases capacity for extension, demands we apply strategies of inquiry that acknowledge capacity and its abstract nature in order to understand how advisors perform their practice.

The concept of capacity as described Morgan (2006) is a continous nonlinear process of change with multiple intervention points including structural and process interventions to harness individual potential, leading to cognitive transformation observed as individual empowerment, motivation and practice change. This describes a multifaceted uniqueness and un-generalisability of the concept and demands constructing meanings and taking into account individual accounts to observing changes. This guides the methodology to human centered methods of observation and analysis of data.

The theoretical framework proposed for use in this study enables us to deconstruct the dynamics of professional practice with a view of understanding how practice is formed, changes and stays the same. The work of Schatzki et al. (2001) in *The Practice Turn In Contemporary Theory* brought back in review the significance of practice theory in explaining this. Schatzki et al. (2001) argue that materials and practices are interwoven, and that humans, artefacts, organisms and things of nature are variously but unavoidably enmeshed in social life. This perspective was refined by Shove et al. (2012) in her work examining *The dynamics of social practice*. Shove et al. (2012) frame practice as an entity and as performance. They describe practice as a performance in view of the immediacy of doing and the recurcive ‘pattern’ which settles down and stabilizes to what is then termed as practice.Shove et al. (2012) argues that practice is as an entity separate from the practitioner who is deemed as only a carrier and host of practice, a radical departure from the school of thought that understandings, know how, meaning and purpose are personal attributes of individuals.

We align with Shove et al. (2012) views which deconstructes practice as encompassing three elements; materials , meanings and competencies. They contend that these elements are linked to form practice hence observing emergence, persistence and disappearance of practice involves analysing the linkages, de-linkages and resulting configurations of these elements over time.

Practical Implications

This review took the subjectivist view of professional practice understanding practice as intentional action shaped by meanings and values at individual level and shaped by traditions and history at the social level (Kemmis, 2011). The understanding that continuous professional learning mostly happens informally - described as unstructured and at times unintentionally aquired through interaction and practice (Eraut, 2012) and non formally through deliberate intervention (Manuti et al., 2015) highlights the inherent difficulty of observing and accounting for change in capacity of practitioners hence informs the design of this research. To address this the research uses a human centered approach to focus on observing change at the individual scale. This is demonstrated in the research design.

Methods

Case study

This qualitative research proposes the use of a case study and longitudinal approach to investigate changes in capacity resulting from professional development investments in VegNET 3.0. The case study approach allows the researcher to focus on intrinsic details of the project under implementation while taking into account contextual factors in each region (Yin, 2003)

The logitudinal approach

The longitudinal approach will be used to observe change in capacity over the project period as advisory staff receive professional development initiatives and develop capacity through practice. This approach will observe change by applying continuous and repeated measures over the life of the project, which will be critical for detecting and observing patterns or changes of individual advisors. The baseline collection was done before the project commenced and the results presented in August 2022. The research aims to follow this with the first round of data collection from June 2023 and the second round from February 2024. Thereafter a culminating post project survey is proposed for June 2026.

Method of Sampling

The study proposes to use purposive sampling to select advisory staff whose change in capacity will be observed based on a critera informed by the baseline study. An initial baseline assesment of capacity of advisors in the VegNET 3.0 developed individual career profiles for each RDO which informs this study of the academic background and years experiences, stage in their career, professional developments received including skills and aspirations for professional development.This form the critical reference point when observing change in capacity and the diversity of advisors e.g their dynamic career stages may point to key factors influencing change in capacity.

Other findings from the baseline were that at the beginning of VegNET 3.0 two thirds of RDOs were new to the role with less than a year of working with the program, hence did not receive training on AIS or participate in the design of regional extension plans. These findings guide this research in the selection of

RDOs to track over the project period as we seek to observe change in capacity for those who received training vs those who learn on the job.

The psychometric study conducted during the baseline contends that the length of career has an impact on the uptake of new extension strategies. This hypothesis will be tested by purposively selecting advisors in their late career stages and comparing their responses to earlier career stages.

Types of data collected

The study proposes to use Bennett (1975) KASAP tool as a conceptual framework for measuring change in capacity. The baseline study identified data collection tools for observing each element on the framework. This is presented in Table 1 below.

Table 1: Conceptual framework for measuring change in capacity

	Description	**Data collection tools**	**Types of data collected**
KNOWLEDGE	Extension theory Grower business in project regions Technical principles of agronomy Knowledge and innovation brokering Stakeholder engagement and coordination	Borich's needs assessment survey	Visual charts (boxplots)
ATTITUDES	Beliefs and values in extension approaches	Psychometric scale (Landini and Bermadi,2019)	Visual charts (boxplots)
SKILLS	Technical know how	Starting, strengthening and mastering matrix	Visual Matrix scale
ASPIRATIONS	Inner motivations	Career aspirations scale (Gregor & O'Brien, 2016)	Visual scale
PRACTICE	Methods of working	Semi-structured interviews Observations	Inteview transcripts Observation notes
Governace and Institutional arrangement in coinnovation	Emerging issues in multi-organizational implementation of projects	Key informant interviews Observations	Inteview transcripts Observation notes

References

Alonderienė, R., & Pundzienė, A. (2008). THE SIGNIFICANCE OF FORMAL, INFORMAL AND NON-FORMAL LEARNING FOR THE ACQUISITION OF THE CHANGE MANAGEMENT COMPETENCE. *Vocational Education: Research & Reality*(15).

Bennett, C. (1975). Up the hierarchy. *Journal of extension*, *13*(2), 7-12.

Brown, L., LaFond, A., & Macintyre, K. E. (2001). *Measuring capacity building*. Carolina Population Center, University of North Carolina at Chapel Hill ….

Eraut, M. (2012). 1 Transfer of knowledge between education and workplace settings. In *Knowledge, values and educational policy* (pp. 75-94). Routledge.

Foster-Fishman, P. G., Berkowitz, S. L., Lounsbury, D. W., Jacobson, S., & Allen, N. A. (2001). Building collaborative capacity in community coalitions: A review and integrative framework. *American journal of community psychology*, *29*(2), 241-261.

HI. (2021). *National vegetable extension strategy*.

Johnson, N., & Davies, D. (2009). Continuing professional development. *Medical education and training From theory to delivery*, *157*.

Kemmis, S. (2011). *What is professional practice? Recognising and respecting diversity in understandings of practice*. Springer.

Land, T. (2000). *Implementing institutional and capacity development: conceptual and operational issues*. European Centre for Development Policy Management Maastricht (Netherlands).

Manuti, A., Pastore, S., Scardigno, A. F., Giancaspro, M. L., & Morciano, D. (2015). Formal and informal learning in the workplace: A research review. *International journal of training and development*, *19*(1), 1-17.

Mlambo, M., Silén, C., & McGrath, C. (2021). Lifelong learning and nurses' continuing professional development, a metasynthesis of the literature. *BMC Nursing*, *20*, 1-13.

Morgan, P. (2006). The concept of capacity. *European Centre for Development Policy Management*, *1*(19), 826-840.

Percy, R. (2005). The contribution of transformative learning theory to the practice of participatory research and extension: Theoretical reflections. *Agriculture and human values*, *22*, 127-136.

Schatzki, T. R., Knorr-Cetina, K., & Von Savigny, E. (2001). *The practice turn in contemporary theory* (Vol. 44). Routledge London.

Sheppard, B., Brown, J., Dibbon, D., Sheppard, B., Brown, J., & Dibbon, D. (2009). Professional development and capacity building. *School district leadership matters*, 85-100.

Shove, E., Pantzar, M., & Watson, M. (2012). *The dynamics of social practice: Everyday life and how it changes*. Sage.

Yin, R. K. (2003). Designing case studies. *Qualitative research methods*, *5*(14), 359-386.

Seeing the forest through the trees: A systematic review approach to the compilation of relevant and useful tools and learning materials in support of multi-actor project development

Evelien Cronin[1], Hanne Cooreman[1] and Elke Rogge[1]

[1] ILVO – Flanders Research Institute for Agriculture, Fisheries and Food

Short abstract

The Multi-Actor (MA) approach under the Horizon Europe (HE) programme has been posited as a promising instrument to better connect research and innovation projects to practice in agriculture, forestry and rural development sectors. However, bringing together different societal actors with complementary knowledge and skills in European projects is challenging. As part of the PREMIERE project, a MA HE project, we aim to build a database of tools and learning materials to support the first phase of multi-actor HE projects, i.e. the co-creative proposal-writing, consortium building, drafting of a MA strategy and the setting up of the project management approach. We explain how to build such a database of tools by combining a rigorous scientific methodology to implement a desktop mapping of tools, i.e., 'Systematic Review', with an iterative, user-focused and multi-actor approach. This combination is essential as this phase of MA projects has its own distinct characteristics and needs. A profound insight into which tools and learning materials are available combined with how time-consuming, complex or resource intensive they are is thus fundamental. Elaborating possible tools to include harder to reach actors can be an empowering exercise and a game-changer in terms of the inclusivity and potential of MA projects.

Extended Abstract

Purpose

The PREMIERE project aims to support prospective Horizon Europe project consortia which are expected to apply the Multi-Actor Approach (MAA) during proposal writing, project work and beyond. While the MAA is posited as a promising instrument to 'speed up innovation', in practice, making best use of complementary knowledge from different types of actors is challenging and not always straightforward. Within PREMIERE, the aim is to provide learning material and tools, and offer training and networking events for actors, policy makers and executive agencies especially to support the proposal-writing phase of multi-actor (MA) Horizon Europe projects. A part of this work consists of the compilation of a database of already available tools (such as co-innovation methodologies, webinars, guidelines, videos and toolkits) which can provide support in drafting and implementing a MA strategy, building a MA project consortium, the co-creative writing process and the management of a MA project.

Databases of tools or the development of toolkits are a popular and rather well-known characteristic and output of many MA Horizon Europe or Horizon 2020 projects, see for example, the FarmDemo training kit[7] or the SHERPA Stakeholder Engagement tools[8]. Yet, the process behind the compilation of these toolkits, guidelines, or databases often remains a black box. In this abstract, we aim to shed light on how to iteratively build a database of tools which combines a rigorous scientific methodology to implement a desktop mapping of tools, i.e., Systematic Review (Zawacki-Richter et al., 2020), with an iterative, user-focused and multi-actor approach (EIP-AGRI, 2017). The latter implies a continuous checking and consulting with the intended users of the database on their needs, current level of knowledge on and awareness of already available tools.

The fundamental reason underpinning the use of such a rigorous approach to the set-up of the PREMIERE tool database, is its specific scope. While in other examples of these toolboxes, the focus is to support actors or processes in a stage where they have secured funding. In contrast, the PREMIERE tool database aims to bring together tools which can support a multi-actor process starting in the phase where there is no funding available yet. Neither is there the certainty at that point in time that the funding for their work will be

[7] https://trainingkit.farmdemo.eu/

[8] https://rural-interfaces.eu/resources-and-tools/stakeholder-engagement-tools/

acquired, while the time and other resources needed to compile a project proposal is typically perceived as scarce. This phase of MA projects thus has its own distinct characteristics and needs in terms of support (Cronin et al., 2022). Mostly because research shows that especially under time pressure, people tend to revert to established routines, rely on shortcuts and quick fixes to solve complex problems instead of discussing and debating them (Cronin et al., 2022; Fieldsend et al., 2020; Verouden et al., 2016). This also entails that new potential proposal writing partners who are unfamiliar with the rules and routines have a disadvantage. This toolkit has the ambition to respond to the needs of these partners as well. The tools which we aim to collect and compile can thus not be too time-consuming, complex or require any large amount of resources to implement. In conclusion, using and searching this envisaged toolbox should be a straightforward and quick activity.

Approach and methodology

In order to ensure a rigorous and scientific approach to compile the PREMIERE database, we have developed a methodology that combines a systematic review approach (1) to map existing learning materials and tools, with a user-consulted approach (2). The systematic review approach is often referred to by authors implementing literature reviews in educational research (Zawacki-Richter et al., 2020). The logic behind this approach is that in order to review the existing information available on a particular topic, one needs an explicit, accountable and rigorous research method. Our research question does not comprise a collation of the scientific knowledge available on a specific topic, but rather a compilation of learning materials and tools available to and potentially useful and relevant for participants in MA project consortia. Therefore, we have adapted the linear nine step process described in Zawacki-Richter et al. (2020). We translated it into an iterative process where desktop research is complemented with user interactions. This combination should help assure that in the process of database compilation not only a complete scanning, with clearly defined boundaries, of currently available tools and learning materials is done but also that the final database includes those tools and learning materials useful and relevant to the targeted group of users. The overall process is illustrated in Figure 1 below and each step will be further specified in the following section.

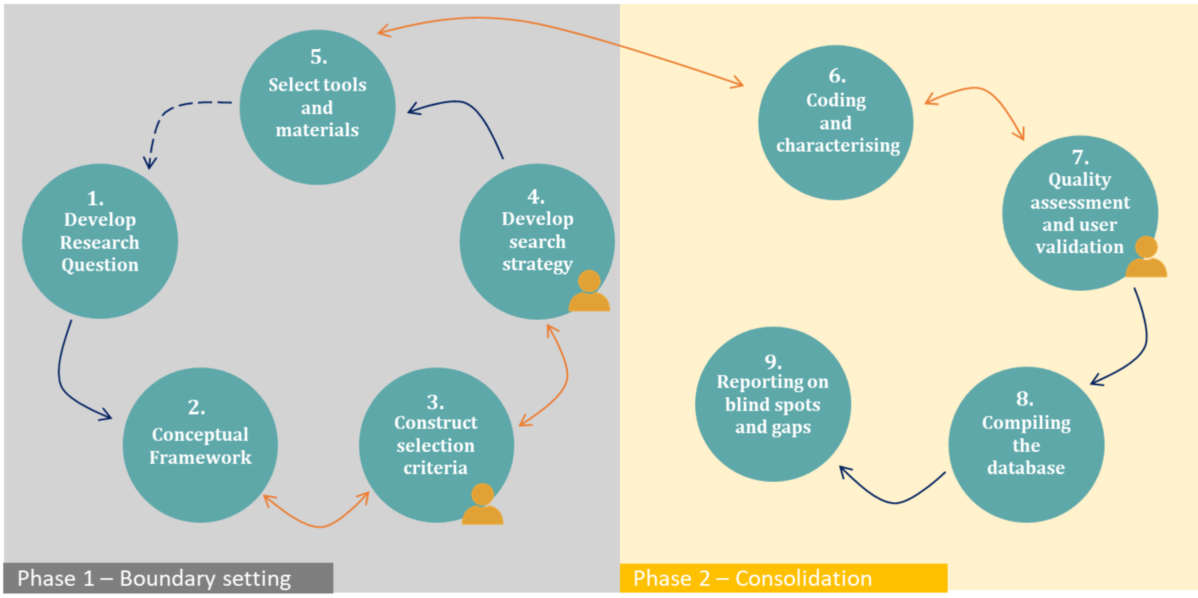


Figure 13. Systematic Review approach to database compilation with user interactions (adapted from Zawacki-Richter et al., 2020)

Setting up the systematic review approach

As an extension to the systematic review approach, we aim to complement the desktop search for learning materials and tools with user interactions in three distinct ways (indicated with a 'person' icon in the figure); a) an online survey with 'users' on what types of tools and learning materials they would envision (selection criteria) and b) this survey will also ask which tools they have used before (develop search strategy) and c) workshops to test and validate the quality, relevance and usefulness of the tools which passed the coding and characterising step of the systematic review process. In this extended abstract, we detail our approach related to each step of a systematic review approach as depicted in Figure 1. We have divided the steps of the systematic review approach into two distinct phases. In the boundary-setting phase, the iterative process aims at setting the key boundaries to the database compilation in order to ensure an effective search. In the consolidation phase, the process aims at consolidating the final database by introducing a structure to the tools and compiling them. Each of these phases include several steps which we will explain in the following paragraphs.

Phase 1 – Boundary setting

First, **the research question and user groups** need to be clearly defined. In our case, the research question consists of two parts: 1) Which tools and learning materials are currently available in support of actors engaged in MA project proposals and co-creative proposal-writing, and 2) Which tools and learning materials are useful for and relevant to actors engaged in MA project proposals and co-creative proposal-writing?

Second, **the conceptual framework** (CF) clarifying the main assumptions of the search is elaborated. This provides a baseline upon which certain types of tools or learning materials are in- and excluded. Our focus is to support the development of MA Horizon Europe projects and a better inclusion of the needed variety of relevant societal actors in a balanced way during the project preparation phase. Consequently, our conceptual framework entails on the one hand an elaboration of clusters of activities related to MA project preparation and on the other hand the development of the type of actors involved in the form of 'user personas' (Table 3). The three clusters of activities we define as a) those related to networking and consortium building, b) writing and the development of the project approach and c) the management of administrative and technical requirements.

Table 3. MA project user personas (based upon Cronin et al., 2022; Fieldsend et al., 2020, 2021)

User persona	Description
Project leaders	Actors who have been involved in multiple European projects, especially under the RI funding framework. Either they have been the coordinator of such projects before, or they aspire to coordinate these types of projects in the future.
Project followers	Actors who have been involved in a few European projects, especially under the RI funding framework. They know how these projects work, but do not have the ambition to play a large or leading role in these projects. They are often task or sometimes WP leaders.
Novices	Under the novices, we see two types : - **Self-initiators:** These are actors who have never been involved in these types of projects, but are interested in participation. They take initiative to be involved and would like to be more involved in the future. - **Invitees:** These actors have been invited by other actors to be involved in this type of European project, but would not have taken any initiative themselves. They are not interested in being more involved in the future at first sight.

Third, in the **construction of selection criteria** there is the combination of the desktop mapping and user interaction. The selection criteria will be a combination of practical (e.g., available in English, free access), theoretical (e.g., evidence-based) and user specific (e.g., quick to understand) considerations. This step involves a user-interaction to get first insights into which types of characteristics tools and learning materials should have according to users. These will be collected using an online survey with users who have been involved in MA project proposals before.

The **search strategy** builds on the selection criteria and the user input. We aim to apply a snowball sampling strategy (Parker et al., 2019). As many other MA projects have compiled tools or learning materials in support of multi-actor processes, we first explore the list of MA projects available on the EIP AGRI Service

Point website[9]. Using the reference lists of these lists of tools and toolboxes, we explore other tools, toolkits and learning materials. The themes specified under the conceptual framework are used as Google search terms. Also, the user survey will provide inputs on the direction of our search and what users consider to be relevant sources. We do not aspire to be exhaustive, rather we aim to enable the identification of relevant, useful and user-friendly tools, toolkits and learning materials in line with our research question.

This brings us to the last step of this phase, **the selection of tools, toolkits and learning materials**. At this point, the tools and other learning materials identified under the search undergo a checking or screening process. As indicated in Figure 1, in this screening process, we might want to revisit and further fine-tune or specify the research questions and the subsequent step. We aim to implement this step in two stages: in a first stage, we evaluate the relevance of the scope of the tools or learning materials at first sight (language, checking of key terms such as 'multi-actor', 'participatory') to see their likely relevance, after which a more in-depth review is done against the scope of the themes and user personas described in the CF. This selection and reviewing step is planned to be done using researcher triangulation, to strengthen the validity.

Phase 2 – Consolidation

The second phase starts by **"coding" and "characterising" the tools and learning materials**. This process includes a) for who these tools or learning materials would be interesting (cfr. the user personas), b) how they will support the MA project development, c) when and to which end can they be supportive in the MA project development and d) any other characteristics which would be relevant based upon the insights from the user surveys. This step will feed back into the selection, as it might indicate that some search paths remained underexplored.

Next, the **quality assessment and user validation** will be implemented. At this point, we double-check the quality and usability of the tools and learning materials. On the one hand, this can be done based upon a review of the original source and the clarity of the description of the tools and materials. On the other hand, the selected and coded tools and learning materials will undergo a testing and validation exercise with users. We will organise workshops bringing together different user personas to check the fit of the tools and learning materials with their own expectations and needs.

In the final steps, the **database is compiled** into a user-friendly online repository. Furthermore, using the insights gained, we will **report on whether in the wide array of tools, toolkits and learning materials available there are any blind spots and gaps** when it comes to supporting actors in their involvement in MA project proposal writing.

Practical Implications

While the 'multi-actor approach' increasingly gains attention and importance when it comes to acquiring funding under the Horizon Europe programme, the reality is that this type of approach not only requires quite some efforts in terms of time and resources, but also specific types of skills and capacities from engaged actors. In order for these projects to become more inclusive to a wide range of societal actors, such as advisors, teachers, facilitators or even farmers, there is a need to provide easy and low barrier access to tools and learning materials that fit the needs of these different types of actors. Compiling a database which explicitly considers not only the needs of organisations or actors usually involved in and highly motivated to be part of these MA projects, but also those of harder to reach groups, or groups of actors with a limited amount of time and resources available or a low or no up-front intrinsic motivation to become part of these large consortia can be empowering for different types of potential actors, and finally a game-changer.

[9] https://ec.europa.eu/eip/agriculture/en/about/multi-actor-projects-scientists-and-farmers

Theoretical Implications

The scientific and theoretical value of this abstract and our approach to the database compilation is twofold:

1) It applies the well-known methodological framework of Systematic Reviews to a new topic, i.e. the compilation of a database of tools and learning materials instead of a literature review.
2) The findings of the iterative cycles and the user interactions, will provide deeper insights into how transdisciplinary research and innovation projects, such as the MA Horizon Europe projects in the agriculture, forestry and rural development sector, gain form and what the different needs in terms of information, skills and communication are from different types of actors.

References

Cronin, E., Fieldsend, A., Rogge, E., & Block, T. (2022). Multi-actor Horizon 2020 projects in agriculture, forestry and related sectors: A Multi-level Innovation System framework (MINOS) for identifying multi-level system failures. *Agricultural Systems*, *196*(August 2021), 103349–103349. https://doi.org/10.1016/j.agsy.2021.103349

EIP-AGRI. (2017). Horizon 2020 multi-actor projects. Retrieved February 8, 2023, from https://ec.europa.eu/eip/agriculture/sites/default/files/eip-agri_brochure_multi-actor_projects_2017_en_web.pdf.

Fieldsend, A. F., Cronin, E., Varga, E., Biró, S., & Rogge, E. (2020). Organisational Innovation Systems for multi-actor co-innovation in European agriculture, forestry and related sectors: Diversity and common attributes. *NJAS - Wageningen Journal of Life Sciences*, *92*(1), 100335–100335. https://doi.org/10.1016/j.njas.2020.100335

Fieldsend, A. F., Cronin, E., Varga, E., Biró, S., & Rogge, E. (2021). 'Sharing the space' in the agricultural knowledge and innovation system: Multi-actor innovation partnerships with farmers and foresters in Europe. *The Journal of Agricultural Education and Extension*, *27*(4), 423–442. https://doi.org/10.1080/1389224x.2021.1873156

Parker, C., Scott, S., & Geddes, A. (2019). Snowball sampling. SAGE research methods foundations.

Verouden, N. W., van der Sanden, M. C. A., & Aarts, N. (2016). Silence in Interdisciplinary Research Collaboration: Not Everything Said is Relevant, Not Everything Relevant is Said. *Science as Culture*, *25*(2), 264–288. https://doi.org/10.1080/09505431.2016.1141191

Zawacki-Richter, O., Kerres, M., Bedenlier, S., Bond, M., & Buntins, K. (Eds.). (2020). *Systematic Reviews in Educational Research: Methodology, Perspectives and Application*. Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-27602-7_1

Session 3F – Extension/Advisory Issues

Learning good practices from the experiences of interactive innovation cases

Tom Kelly, Līga Cimermane, Linda Sarke, Geoffrey Hagelaar, Dora Lakner, Jos Verstegen, Alex Koutsouris, Patrizia Proietti, Simona Cristiano, András Vér, Sylvain Sturel

Short abstract

Within the Horizon 2020 i2connect project good practices in the formation and bottom up groups and networks involving farmers, advisors and other actors who need to interact and innovate together were identified and described. The activities (tasks) in this Coordination and Support Action (CSA) project involved documenting bottom up cases from different countries, sectors and organisations where advisors were providing support in brokering and facilitating innovation projects. Having documented these cases they were evaluated, a small number (nine cases) were selected and peer reviewed by advisors and farmers. The peer (field) review process led to a harvesting and description of good practices evident in these cases. There are three rounds planned for selection and peer reviews, in this paper the first round is reported. Eighteen (18) good practices were identified and described. The good practices were categorised into four categories: 1. The Network and Enabling Environment, 2. The Broker/Advisor attributes 3. Advisor/Brokers Actions and approaches 4. Farmer Roles and Actions. Following this initial analysis a good practice prompt card was developed to help advisors think about how they can improve their interactive innovation support roles.

Extended Abstract

Background

The limitations of conventional top down innovation support provided by farm advisors are evident in the way many complex and difficult challenges are unresolved. On the other hand, nowadays more farm advisors provide support services (facilitation and training) to groups of farmers and other actors to address issues and opportunities; however the predominant model is still a one to one consultancy model and as such based on individual relationships between farmers and advisors. The major policy change in innovation support arising from the European Innovation Partnership (EIP) and other local regional and national initiatives, based on multi-actor and bottom up approaches which define interactive innovation, has been to support groups and networks of actors who have common problems or opportunity to work together, co-create and implement solutions. This has changed the way innovation support is provided to a more interactive model, where there is a more balanced flow of bottom up and top down knowledge exchange and participation of actors.

Within i2connect Horizon 2020 Coordination and Support Action (CSA) an emphasis has been put on learning from practice, to narrow the gap between theory and practice in terms of innovation support through interaction of the key actors who influence and implement practice change and new technology. In the first two years of the project 118 practical cases of advisors and farmers working together on innovation projects in different countries and sectors have been collected and analysed using a co-designed framework. While each case provides interesting and valuable learnings about that case, further more detailed analysis using a peer review process was completed. A selection of nine successful cases have been reviewed in a field review process to identify good practice (i2connect, 2021a) and an initial set of 18 good practices evident in these cases were described (i2connect, 2021b). In this paper we intend to describe the process used to identify and categorise the good practices and the potential to use these good practice descriptions to improve the success of future interactive innovation projects and networks.

Methodology

Following an open call, partners in the i2connect project and beyond submitted potential successful practical cases using a co-designed template. Practical cases are examples of multi-actor projects, activities and networks which partners feel or expect could provide opportunities to analyse and learn how they were successful and in particular the role that advisors played and continue to play in supporting that particular

case. Nine successful cases were selected based on key criteria and were peer reviewed by teams of three involving one person from a project partner, one advisor and farmer from other cases. Training was provided for peers and a detailed set of questions were prepared in a logical flow chart to aid the process. The success and experience of the review was documented along with the detailed description of each case. These reports provided rich insights and evidence of good practices from these practical cases.
Frameworks and templates used in H2020 projects (FAIRshare, SKIN and agroBRIDGES) analysing good practices were identified and adapted to the needs of i2connect. A working definition of i2connect interactive innovation support good practices was agreed with project partners as "Deliberate actions where there is evidence showing a contribution to success in practical innovation cases involving advisors, farmers and other actors" This definition aligns well with two widely accepted definitions.
FAO (2013) "A good practice is not only a practice that is good, but a practice that has been proven to work well and produce good results, and is therefore recommended as a model. It is a successful experience, which has been tested and validated, in the broad sense, which has been repeated and deserves to be shared so that a greater number of people can adopt it"

ENRD (2018) "Good practice refers to strategies, programmes, projects, procedures, management and implementation practices that should be at least: Implemented with positive results; Successful, innovative, tested and validated: it contributes to the improved performance of an entrepreneurship/farm/ organisation and this contribution is recognised; Transferable: it can be adopted in and adapted to other contexts"

Each case peer review report was analysed using the framework with the main actors and their actions identified and findings of potential good practice were suggested and verified by the team. This framework along with the description and peer analysis of the cases were analysed in a series of 2 further online workshops using the MURAL workspace platform where good practices were identified and defined.

Findings

Eighteen good practices were categorised based on the need to define actions which fit better with a multi actor framework and the need to provide guidance to the actors and their actions in the context of impact on the success of interactive innovation. Good practices were categorised as being related to 1. The Network and Enabling Environment, 2. Advisor/Broker attributes, 3. Advisor/Broker actions and 4. Farmer roles and actions.

The Network and Enabling Environment
Seeking an International Perspective - An international perspective in projects enables advisors and farmers to learn from the experience of other advisors and farmers internationally. This may give both the advisors/facilitators and the farmers exposure to new ideas and new ways of doing things that may be relevant to them. There are many ways of achieving this, for example through visits/study tours, international exchange programs, and digital meetings.

Diversity among actors in projects - A diversity of actors in a group is important, it provides an added interest and improved learning environment. Diversity can include age, gender, race, educational background, experience, and attitude. It adds value to a multi-actor group by helping to provide a wider perspective on a problem or to bring new energy to group. The inclusion of a range of relevant actors in projects also supports innovation through improved ownership among the actors and their cohorts. It also brings a broader and deeper perspective, with more knowledge and potential to find solutions. This diversity amongst actors may allow for a social learning environment and may prevent cognitive, information, managerial, or system gaps within an innovation project.
Advisors having a strong network within the AKIS - Having a wide network of relationships as advisors within a project improves the innovation process. Networks are built through personal relationships of trust and friendship enabling this process. The advisor may show leadership and commitment to the needs of farmers in the project, by promptly mobilising resources from their network such as access to resources, human or financial, when a problem or opportunity arises. This wide variety of actors and stakeholders within a network allows for, and promotes social learning and the co-generation, dissemination, and the spread of innovations.

Institutional support and creating an enabling environment - Institutions may act as a support for innovation projects in the enabling, up-scaling and out-scaling of farmer or advisor led innovation projects. Assistance from institutions for the development, testing and application is important in the innovation process. It is the role of the advisor to advocate for support from institutions and to facilitate this for their farmer clients and to help create an enabling environment where good ideas grow and develop. Without the support of institutions, networks are much less able to work efficiently and creatively.
Providing opportunities for social interaction among actors and partners - A safe, trustworthy environment to share information and experiences (both successes and failures) is difficult where people are strangers.

This space to discuss and tease out issues, where all actors and partners can learn about each other, is easier where there is also a social dimension.

Advisors/Brokers attributes (their knowledge, competency and character)
Identifying and understanding farmers' needs - It is vital that time and effort is put into creating a common understanding of the real needs of farmers. Advisors and their organisations must continuously seek out the needs of farmers. They should ensure that their goals, activities and outcomes address the real short and long term needs, while recognising that the needs of farmers may differ from person to person and group to group. This practice is supported by advisors who do not assume that they know the needs already, and ask farmers to express their needs regularly. Farmers who were part of the identification of a problem, should partake in the decision making process to find a solution. The advisor should ensure that the solutions are practical and meet the real needs of the farmers for a successful uptake of the solution.
Advisors with complementary skills working together - Having multiple advisors facilitating a group of farmers may enhance the quality of service being received. Two facilitators in a discussion group allows one facilitator to support the technical knowledge and skills, while the other facilitator may have complementary soft skills and maximise the participation and learning in the group. While one facilitator communicates the technical skills to the group, the other facilitator may focus on the members of the meeting ensuring all group members participate, and communicate effectively.

Regular upskilling of advisors - Continuous Professional Development (CPD) is important within all professions as foundation training and learning is insufficient to support a long-term career due to the frequency of change whether it be in the soft or hard skills area. Advisors may not only need technological or practical skills (hard skills), but may need training in the area of soft skills such as facilitation practices, networking, problem-solving etc. It is important that advisors are up to date with new knowledge.
Advisor with a good relationship with the farmers and a real interest in the issue - An interactive innovation project's success may be built on good relationship which an advisor has with farmers. This is a leadership relationship built on trust and mutual understanding, with a common goal and effort investment of an innovation project. Though there may be a good relationship, this must not stand in the way of critique, as both advisor and farmers must learn to improve their skills, hard or soft, and not all learning opportunities are pleasant ones.

Knowledge and ability to write project proposals and access funding - Professional knowledge of administrative and procedural requirements that apply to specific supports for innovation supports schemes (e.g. Measure 16 of the CAP, Operational Groups, Rural Development Programmes, LIFE+, etc.) help actors navigate across the different opportunities for funding and complete the application proposals. The writer should have the ability to listen to the emerging needs and expectations of farmers, advisors and other partners, and to build-up a strong case around their ideas but also providing their own ideas, to design the intervention logic of the project.

Advisor/Brokers Actions and Approaches

Planning good internal and external communication - Similar to change management and strategic developments in the corporate world, effective communications both internally and externally in interactive innovation cases are vital. The good practice is that it is planned and managed throughout the project.
Having the opportunity to learn from other successful practice - Groups of advisors and/or participants in their own networks have the opportunity to learn from past experiences of successful projects. This

contributes to the knowledge, skills, experience, motivation and many other aspects of interactive innovation support, that improve the efficiency of new interactive innovation projects and networks.
Developing a communication channel between research and advice - Effective communication between research and advice is essential for research results to be put into practice. It is also important not to interpret this as a one-way process because there is a need to know the real needs of farmers in order to determine the directions of research. There is a need to support farmers in a different ways and with different expertise, the advisor may not be able to help the farmer, but needs to know who to turn to.
Create an environment to enable the advisors to create and build a wide network - Advisors play a key role in the efficient knowledge transfer and exchange. Networking of advisors is also important for farmers (as end-users of advice), because the service provided in this way is based on a broader professional basis. Advisors support for difficult problems on farms rely heavily on others, and these may be researchers, farmers, other advisors and other AKIS actors. Having a strong micro-AKIS network as an advisor is a help, it also means that advisors can interact with others and bring in new knowledge and experience.
Reflection and capitalisation during the project - Scheduled reflections at multiple stages of projects allow issues to be identified and managed early on, it also shows how different actors may develop and improve processes. Collective reflective actions help actors/partners identifying problems, sharing common understanding on causes and mitigation actions, capitalizing the knowledge gathered from the experience and increasing the ownership of the results.

Farmer Roles and Actions
Ensuring that the project is steered by the farmers and end users, not expert-driven - The direction of the project can be influenced by individuals who have the strongest interest, they are heavily vested in the day to day decisions and overall direction of the project. The expert can be seen as the natural leader and to influence the main decisions. This can lead to a lack of ownership and commitment from other participants. Where there is a shared leadership with all actors taking on and delivering leadership and direction as a group the experience and result can be much better for all involved.Upskilling of farmers - Continuous professional development of participants (farmers) is an important part of innovation support for farmers. Setting up a farmers' group helps to define farmer’s training needs. Receiving group training helps co-developing skills and knowledge on the specific topic and motivates farmers to work collaboratively.Integrating farmers in research and experimentation - The active involvement of farmers in research and experimentation is one way of giving them ownership of the innovation process and increases their interest and likelihood of adopting a solution and of influencing other farmers. This good practice puts farmers in the centre of the projects: at initial stage, involve farmers in dialogue to identify the needs at field level; base the process on the initial ideas from farmers; during implementation, include farmers in the project steering committee and decision making; build research programmes and agree protocols with the farmers (not only with the research institutes).

Implications

The identification and description of good practices relating to the success of interactive innovation projects, as evident in cases reviewed by peers, has the potential to be an effective influence on the roles of advisors, policy makers, farmers, researchers and others involved. The challenge of integrating these practices into new projects may be helped by the multi-actor framework in order to convert these good practices into targeted actions aimed at specific actors. This work is ongoing in the i2connect project.
This work may contribute to the on-going theoretical developments concerning Innovation Support Services, operating on systemic perspectives and aiming at enhancing the interaction between diverse actors. This is true especially for intermediation (facilitation and brokerage) which has yet to be thoroughly described, operationally defined, or well-evaluated.

References

FAO (2013) Good practices at FAO: Experience capitalization for continuous learning https://www.fao.org/3/ap784e/ap784e.pdf
ENRD (2018) Mara Lai - Making the most of project and good practice examples. https://enrd.ec.europa.eu/sites/default/files/w31_nrn-project-examples_capitalisation_lai.pdf
i2connect (2021a) D2.3. First series of individual reports from the field reviews of practical cases https://i2connect-h2020.eu/wp-content/uploads/2021/10/i2connect_Deliverable_2_3_final.pdf
i2connect (2021b) Harvest common best practice from the field reviews of practical cases https://i2connect-h2020.eu/wp-content/uploads/2021/10/Deliverable-2.4-tk-v5-27-05-2021.pdf

The value of actors' topical insights in a transition to a culture of interactive innovation support in advisory services

Tom Kelly, J. Kavanagh, R. Clancy, F. Birke, I. Hrovatic, L. Debruyne, S. Sturel

Short abstract

The consumption of information has changed to a more interactive and chaotic one where knowledge is shared in bites and often in a sporadic and spontaneous way. Several digital channels add to the flow of information in real time and people have become less willing to consume or produce content, which is substantive. A task in the H2020 i2connect Coordination and Support Action (CSA) project was dedicated to recording the ongoing topical information that was flowing around thirteen chosen partner organisations relating to innovation support and particularly relating to the challenge of advisors support for interactive innovation processes and actions. From 125 topical insight recorded to date, analysis shows a rich source of knowledge vignettes relating to interactive innovation support. These present a challenge and an opportunity to the i2connect project partners but also to the actors in the Agricultural Knowledge and Innovation Systems (AKIS) in the transition to more inclusive, bottom up approaches and especially the role of farm advisors in brokering and facilitating groups of farmers toward more sustainable and better solutions.

Extended abstract

Background

A huge gap exists between the conventional innovation support provided by farm advisors and the bottom up approaches that support interactive innovation. Today more farm advisors provide support services (facilitation and training) to groups of farmers and other actors to address issues and opportunities; however, the predominant model is still a one to one consultancy model and as such based on individual relationships between farmers and advisors. Meanwhile social media through various channels has become a powerful communication channel and while it often contains useful insights of the experiences of individuals, it is random and lacks structure to capture the many valuable insights shared. In the i2connect H2020 Coordination and Support Action (CSA) project (2019-2024), a specific task was included to gather topical insights from a range of project partners who represent the main actors in innovation support. The value of these insights was to capture some of the issues, conversations, thoughts, feeling and actions of advisors and others who are involved in interactive innovation support. Thirteen i2connect partners submitted brief descriptions (topical insights) of what they thought to be important and relevant issues affecting day-to-day interactive innovation support. In this paper, we present a sample of some of the relevant insights gathered and discuss the potential value of this approach in the support of an interactive innovation culture among farm advisors and other actors of AKIS within a European context.

Methodology

Topical insights were identified by the thirteen i2connect partners every 4 months and were collated and stored in a shared worksheet. Partners added their topical insights on an ongoing basis throughout the first two and a half years of the i2connect project. For each insight a descriptive narrative of approx. 100 words, and links to background information, stories, brochures and websites were provided. A selection of 10 insights was made for publication as a project deliverable at 4-month intervals. (i2connect 2020, 2021, 2022)

Box 1: Example of topical insights as submitted

1. Peer to peer - intergenerational learning (Igor Hrovatic, CAFS & SEASN, Slovenia)

Peer-to-peer learning is another trend that's been gaining traction in the learning and development world. It can take many forms and it is an effective method of knowledge transfer. Project Wise farmer is an example of intergenerational peer-to peer learning, where younger farmers pass on digitalization knowledge to older farmers. In return, older farmers pass on their knowledge, gained through many years of experience to younger ones. Together they can effectively solve specific problems in agriculture, with the help of farm advisers, who provide professional support throughout the whole learning process. This is an interactive way of connecting farm generations in the digital age. https://www.wisefarmer.eu/

2. Overcoming the digital divide (Lies Debruyne, ILVO, Belgium)

This is linked to the importance of digitalisation in advisory services. As mentioned, the current situation has led to a surge in digital approaches, also in farming and advisory contexts. It is however crucial to consider the existing digital divide, where the lack of infrastructure (e.g. broadband) is a real issue in many rural areas. As a result, Living Labs and other co-creation approaches, which also switch to online, may completely fail to include the more vulnerable end users, while their needs may in fact be the most pressing to consider in the current situation. This became clear during discussions about DESIRA Living Labs

To date, 70 topical insights were selected for publication on the report and further analysed into five broad categories -

1. Skills and Competence (n = 19)
2. Enabling Environment for Interactive Innovation (n=13)
3. Structures and Governance (n= 8)
4. Communications and Knowledge Flows (n=16)
5. Advisors activities (n=14)

While there are overlaps and duplication of insights from different sources, it is important to respect the individuality of each insight and to cluster them, so that they may be used to inform actors and to provide practice based learning and multi-actor perspectives. The challenge remains how to use these insights so that they add value to the interactive innovation learning and discovery journey of advisors who find themselves providing support to groups of actors in their role as innovation brokers.

Moreover, At the i2connect mid-term conference in November 2022, a subsample of eight topical insight themes were presented to address the predicted response of farmers or their advisors who might ask - so what? when these topics are challenged in the current models of advisory service support for innovation.

1. Profound weakness in the AKIS
2. Lack of any training in extension skills
3. Facilitated peer to peer exchange is effective
4. Evaluate to learn and do better
5. Recommendations for inclusive interactive innovation
6. Digitalisation is a means to an end, what about interactive innovation?
7. Better connections with research
8. Interactive learning with impact

These insight themes benefit from further analysis using a Multi-actor framework, which creates a response. During the i2connect mid-term conference, three insight themes 2, 5 and 8 were presented using an interactive session that was supported by Mentimeter1* to get further insights on what could be done and by who?

Findings so far
We present the results from the mid-term conference where participants were asked to provide their feedback, opinions, suggestions on each insight theme and what should happen next and who should do it to improve interactive innovation processes.

Example theme 2 - Lack of any training in extension skills (three closely related insights, selected key sentence)
"no official training program or university degree for advisors" (ILVO, Belgium)
"The lack of any training on extension/advisory/communication methodology and, in general, on soft skills (at both university level and in-service training) is profound. (AUA, Greece)
"following the privatisation of advisory services, professional training and up-to-date learning courses for providers are not always systematic or continuous across Europe" (CREA, Italy))
Using a Word Cloud, the audience was asked what should happen, there were 50 different audience suggestions which were categorised as policy changes, structural changes, potential actions and motivational incentives. The policy suggestions were mainly around better undergraduate and post graduate extension skills training, public funding of training and compulsory modules. The structural issues were to support CECRA2, an advisors academy/association, CPD models and Open University for extension. For actions the predominant suggestions were about improving peer to peer learning, needs assessment tools, advisory exchange programmes, training of trainers. The suggestions for motivational incentives were, certification, financial support, inspirational trainers and international exchange.

Example theme 5 - Recommendations for inclusive interactive innovation skills (two closely related insights, selected key sentence)
"the target audience for interactive innovation approaches should extend to farmers who are hard to reach and less engaged, they should not be forgotten in the bottom up processes which engage with well informed and active participants" (Teagasc, Ireland).

There is an enormous variety of Multi Actor (MA) co-innovation partnerships across Europe; MA cooperation for innovation works in different formats; There is more to 'interactive innovation' than just the interaction within a MA co-innovation partnership. (ILVO Belgium)

From the audience feedback on "**what should happen and who should do it?"** there were 31 different audience suggestions which were categorised into actions and persons responsible.

What should happen?	Supporting policies, widen the target group to rural dwellers and civil society, train advisors to become innovation brokers, use other channels to communicate and recruit other less engaged farmers, break it down to smaller inclusive meetings, integration of more female farmers and their perspectives, get a group of farmers who are motivated to engage others, help them stay in touch and help with technology, reward individuals or groups for being involved, invite more farmers to join throughout the project, cooperation between institutions and farm organisations.
Who should do it?	Advisors are a bridge between science and practice, farmers unions and chambers, public advisors have a key role to play, advisor or someone from their organisation should mediate or facilitate a process, policy makers and others in power, innovation advisors.

Example theme 8. Interactive learning with impact *(three closely related insights, selected key sentences)*
"Farmers identified three phases of social learning, light-bulb moments, coping with challenges and gaining successful expertise. Four types of social learning were found: (a) learning from observing actions of others, (b) sharing experiences with storytelling, (c) informal social interactions and (d) being a role model with a large social network." (HAFL, Switzerland)
"The "Safe Farm EIP" used drama in an innovative way to encourage cultural change around farmer health, wellbeing and safety". (Teagasc, Ireland)
"Participants were impressed by the storytelling method when new, innovative ideas emerged from their joint discussion … a totally different perspective" (EUFRAS, Latvia)
The figure below summarise the audience feedback on which AKIS actors can use the above methods, tools and approaches to transition into a culture of interactive innovation support in advisory services.

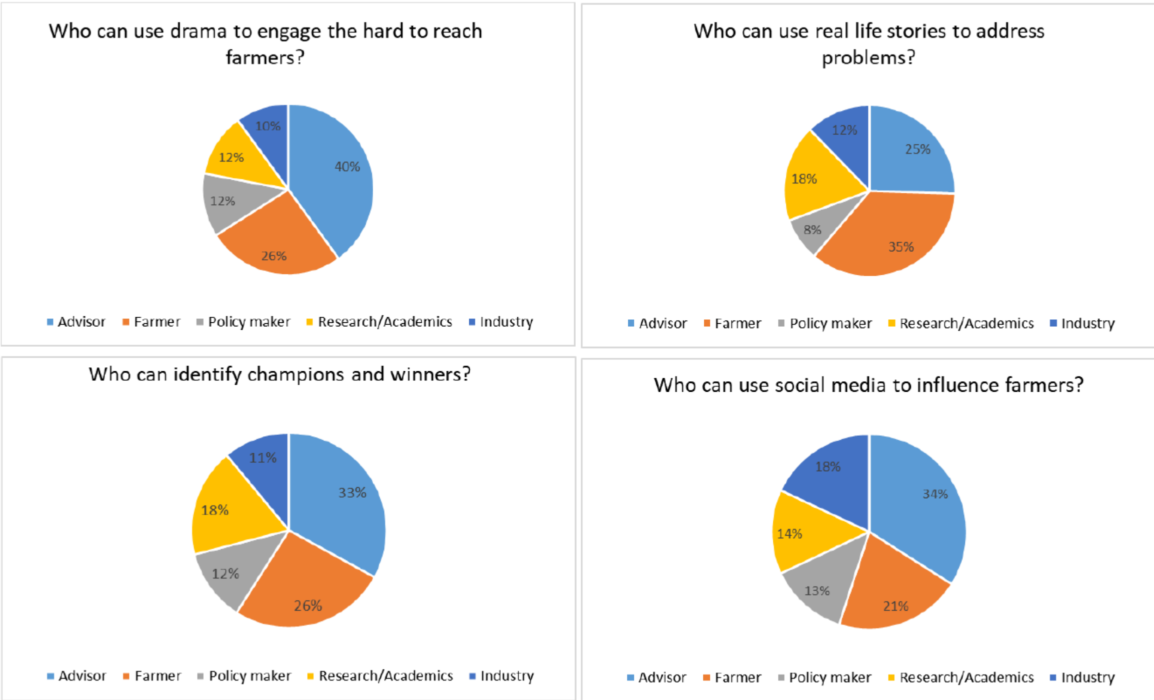


Figure 1: conference participants' assessment on who can use the methods and approaches

Implications and Conclusions

In a Multi-actor H2020 CSA project, impact depends on the actions taken by the targeted actors. There is a strong change management parallel with what happens in the corporate world where large industry attempts to innovate faster. The key to successful change management is communications, ownership and participation (By, 2005; Leeuwis, 2004). In the i2connect project one of the initiatives used has been the collection of topical insights from partners' activities within and outside the projects family of actors. These insights collected are a valuable resource in the necessary dialogue of informing actors and encouraging action. They require continuous analysis, reflection and action or responses from different actors. The challenge in this project so far has been how to integrate this resource into the ongoing support for interactive innovation. We face huge challenges with behavioural changes in how the actors interact, how information is consumed and used by advisors and farmers. There is evidence in the insights of a very slow change from conventional consultancy models of innovation support to more interactive models. While a major emphasis is placed on upskilling advisors and managers a more extensive cultural change is needed within the AKIS and the sharing of insights with key actors could play a valuable role in this culture change.

References

I2connect (2020) Deliverable 1.5a First overview of topical insights from innovation activities, services and networks https://i2connect-h2020.eu/wp-content/uploads/2021/09/Task-1.4-Deliverable-1.5-1.pdf

I2connect (2021) Deliverable 1.5b Second overview of topical insights from innovation activities, services and networks https://i2connect-h2020.eu/wp-content/uploads/2022/03/i2connect_Task-1.4_Deliverable-1.5b.pdf

I2connect (2022) Deliverable 1.5c Third overview of topical insights from innovation activities, services and networks i2connect_Task-1.4_Deliverable-1.5c_Feb-2021-draft-02.pdf (i2connect-h2020.eu)

Leeuwis, C. (2004). Communication for rural innovation: rethinking agricultural extension. John Wiley & Sons.

Rune Todnem By (2005) Organisational change management: A critical review, Journal of Change Management, 5:4, 369-380, DOI: 10.1080/14697010500359250

The life-long learning challenge in the context of multi-actor innovation: diversity across community-based approaches to sustainability

Áine Macken-Walsh

Short abstract (200 words):

This paper presents insights from 11 Sustainability Innovation Pilots (SIPs), operationalised by the Ploutos Horizon 2020 project. Each SIP, based in a different EU member state, involved a community-based multi-actor approach to pursuing a sustainability-oriented innovation project. Combined, the 11 SIPs offered a valuable opportunity for investigating learning needs in the context of community-based interactive innovation. Each of the SIPs involved a diversity of actors with various professional and disciplinary backgrounds (farmers, advisors, technology providers etc.) and results of a narrative-based storytelling approach found that neither professional/disciplinary backgrounds nor prior experience of multi-actor projects could predict diverse learning needs. As a result, the learning needs of diverse actors where the MAA challenge is concerned, can be difficult to target and address by life-long learning providers. A combined 'bottom up' and 'top down' approach is presented as an approach to reconcile established skills and competency frameworks for multi-actor/behavioural innovation and learning needs experienced on the ground by actors involved in projects. Specifically, a co-design process for the development of a user interface – to identify and address learning needs – is advocated. Learnings are applicable to other agricultural education and education contexts where life-long learning needs are unpredictable and highly diverse.

Extended abstract

Purpose

The multi-actor approach (MAA) to interactive innovation is becoming an increasingly prevalent characteristic of rural and agricultural development programmes, and for its successful implementation, particular knowledge and skills on the part of both extension agents and participants (farmers, industry and NGO actors etc.) are required. This presents challenges for life-long learning where farmers, extension agents and all actors in agriculture and rural development spheres are concerned. For a successful MAA, the learning challenge is less focused on the development of the traditional array of discrete professional and disciplinary forms of expertise, but, rather, on building capacity to work cooperatively and diversely across disciplines and professions. This presents a different type of learning challenge than heretofore, in identifying learning and educational needs beyond discrete specialisms; and targeting bespoke education/capacity building at different actors whose existing, often informal experiences and 'mindsets' relevant to the MAA are largely unknown to education providers.

This paper presents findings from the Ploutos (Data-Driven Sustainable Agri-food Chains) Horizon 2020 project, which enabled eleven Sustainability Innovation Pilots (SIPs) across the EU to pursue data-driven innovation taking a community-based multi-actor approach (MAA). Ploutos takes a systems-based approach across the value chain, seeking to activate systemic changes involving collaboration between actors in the system, often at the local level. A specific focus of the SIPs was to stimulate and support behavioural innovation within the multi-actor SIPs themselves and within their target communities of end-users, often farmers. Behavioural innovation involved identifying new/altered behaviours needed for sustainability-oriented innovation to be realised on the ground, and deploying participatory interventions to achieve these behaviours. In the context of Ploutos's systems-based approach, behavioural innovation often occurred collaboratively, requiring a MAA to coalesce interests and value systems across diverse actor cohorts for engendering collective support and pursuit of sustainability goals.

This paper presents the various challenges experienced by the SIPs in identifying, addressing and achieving behavioural innovation. It illuminates corresponding challenges for agricultural extension and education, particularly with regard to the need for identifying and targeting very different needs among clients and adults engaged in life-long learning. In the context of Ploutos's development 'Behavioural Innovation Toolbox' targeted at practitioners outside of the project EU-wide, this paper presents insights to guide how different learning needs for actors involved in MAA projects may be identified, how learning resources and tools may be targeted at different actors, and how learning may be advanced in individual and group-based learning approaches.

Design/Methodology/Approach

Eleven multi-actor Sustainability Pilots (SIPs) operating in different EU countries for the Horizon 2020 Ploutos project provided the focus for the analysis. The 11 SIPs provided valuable case-studies for identifying learning needs of SIP actors arising in the lifetime of the Ploutos project. At a late stage in the project, a story-based narrative approach was used to explore participants' experiences of pursuing a multi-actor approach to address behavioural innovation challenges in sustainability-oriented innovation in each SIP throughout the lifetime of the project. The narrative data were analysed following a qualitative descriptive case-study approach for each SIP, augmented with some biographical analysis relating to SIP actors interviewed.

The mode of analysis paid attention to diversity in actors' views and experiences of the MAA and of behavioural innovation before the Ploutos project and throughout the project itself; and their learning experiences and needs in the context of these views and experiences.

Findings

Each of the SIPs were formally integrated to the Ploutos Horizon 2020 project in a similar way, engaging with innovation work-streams in relation to: behavioural innovation; collaborative business model innovation; and technological data-driven innovation. SIP actors were also primary participants in the Ploutos Innovation Academy (PIA), in order to gain '*expertise, practical experience, business modelling and ICT… [and to] to get informed, co-create, dialogue, discuss and demonstrate new technologies in a real world environment*'. Although each SIP was different in terms of its activities, each involved different actors collaborating to achieve pre-designated economic, social and environmental sustainability goals, which were bespoke to each SIP.

The behavioural innovation challenges identified at the outset of the Ploutos project by each SIP, were, at the macro-level, oriented to achieving more sustainable behaviours. At the micro-level, the operationalisation of responses to these challenges was mostly focused on the need for actors to share knowledge and engage in more collaborative behaviours within SIPs; and for SIPs to engage with and stimulate behavioural innovation among end-users, typically farmers. In this context, the MAA could be highly instrumental in supporting collaborative behaviours within SIPs and in engaging with farmers as partners – co-creating, dialoguing, and leveraging farmers' and other actors' knowledges and values for behavioural innovation. It was necessary for SIPs to deploy interventions in response to behavioural innovation challenges – arising iteratively throughout projects - using various participatory/MAA approaches and tools in navigating their projects from beginning to completion.

The analysis of story-based narratives of each SIP revealed that there were vastly differing levels of awareness of principles and tools relating to the MAA; and of knowledge of how to first identify behavioural innovation challenges and formulate interventions to address them. Some SIPs identified a whole range of, often related, behavioural innovation challenges and, through various reflexive learning experiences, tested out different approaches to navigate and address them throughout the innovation process. Some but not all of these SIPs had, previous to Ploutos, direct exposure to projects where working collaboratively with diverse partners was a distinct feature. Other SIPs experienced difficulties in identifying and recognising behavioural innovation challenges, and some were largely unfamiliar with principles and processes of the MAA. Some had not worked in partnership with actors outside their own immediate or related disciplines, yet other SIPs others had worked previously in multi-actor projects but remained unfamiliar with key principles and processes of the MAA. All SIPs had actors who were highly skilled and had high levels of formal educational attainment in scientific and professional disciplines, which was not deterministic of effective implementation of the MAA or of identifying and addressing behavioural innovation challenges. Neither was the cohort to which an actor belonged (scientist, farmer, extension agent etc.) deterministic. It was found that no SIP or actor within a SIP could be easily categorised as having particular learning needs according to their professional profiles or experiences. Moreover, a determinant of learning needs was individual actors' awareness of participatory principles and possession of particular philosophies/'mindsets' in relation to the purpose and potential of collaboration and multi-actor partnerships.

Practical Implications

The requirement for a demonstrably rigorous MAA to be pursued in an increasing range of rural and agricultural development programmes; and for projects to identify and address behavioural innovation problems poses challenges for extension and education providers to identify and meet life-long learning needs of participants in such programmes. Formally recognised skills and capacities – for meeting the considerable challenge of putting into practice effective MAA principles and processes; and for addressing behavioural innovation - are currently nascent at EU level. Actors in both older and younger age cohorts must become familiar with and effectively operationalise MAA and behavioural innovation processes not only to benefit from participating in interactive innovation programmes currently and henceforth but so that their valuable knowledges inform and enrich such programmes. This is the main hypothesis underpinning the MAA to meeting Grand Societal Challenges such as climate change – that we need a diversity of knowledges and inputs to innovation processes.

The 'starting point' for agricultural extension and education efforts where offering life-long learning supports to diverse actors is highly variable. The results of the analysis of 11 SIPs presented in this paper – all of which were engaged in the same Horizon 2020 project – indicate that learning needs cannot be predicted according to actors' educational or professional profiles; nor on the nature of their life experiences.

In this context, necessary for the development of the 'Ploutos Behavioural Innovation Toolbox', is significant investment in the co-design of a user interface that allows users to interactively assess their own learning needs based on the navigation and interpretation of key principles of the MAA and, relatedly, behavioural innovation. Through such a navigational and interpretive process, learners may identify learning needs and guide the identification/formulation of what education and extension supports are most appropriate. Alongside the co-design of such a user-interface, crucial learning mechanism will be tools such as storyboards that provide end-users with access to 'real life innovation stories', drawing learners' attention to and encouraging learning around key MAA principles and processes; and key considerations and insights for problem identification where behavioural innovation is concerned. The propositions presented in the paper, informed by the analysis of learning needs of 11 SIPs, are suitable for integration for education and extension modules such as those offered by CECRA.

Theoretical Implications

There is an increasing literature focused on identifying key competencies for those facilitating and engaging multi-actor innovation (Wielinga and Robijn, 22020; Lybaert et al., 2022); as well as an increasing range of tools and approaches that assist in achieving behavioural innovation in the context of multi-actor innovation projects (van der Weerdt et al. 2022). A combined 'top down' and 'bottom up' approach (Crescenzi et al., 2011) is proposed to bridge the gap between theoretical constructs of what competencies and tools are identified as prospectively meeting learning needs of actors involved in multi-actor innovation and their actual needs, which are illustrated by the nuanced and varied experiences of Ploutos SIP actors on the ground. Led by principles of 'knowledge ordering' and employing design thinking, the value of a dialogical process to reconcile and address misalignment between top-down competency/skills frameworks and learning needs experienced in the field is explained. The results of this dialogical process, operationalised through co-design workshops between formal knowledge providers (i.e. educators) and actors implementing interactive innovation (multi-actor community-based groups) produce a 'learning dashboard' that provides a navigational tool for advisors, educators and end-users to identify and access learning needs. The approach offers insights for other agricultural extension and education challenges, where there is a need to detect and address diverse learning needs of clients/end-users.

References

Crescenzi, Riccardo and Rodríguez-Pose, Andrés (2011) Reconciling top-down and bottom-up development policies. Environment and planning A, 43 (4). pp. 773-780. ISSN 0308-518X

Ploutos H2020 – A Sustainable Innovation Framework to rebalance agri-food value chains (ploutos-h2020.eu)

Weerdt, Caroline, Hemert, Dianne, Vliet, Tony, Gutierrez D., Jose (2022) Ploutos Project D2.2: Behavioural innovation for Sustainable Oriented Innovations WP2 -Behaviour Innovation and Ecosystem Engagement

Wielinga, E., Robijn, S. Energising Networks: Tools for co-creation, Wageningen University Press.

Organisational Capacity Assessment for Innovation Support: approach and results from tool applications in Cameroon and Madagascar

Hycenth Tim Ndah[1,9], Andrea Knierim[1], Sarah Audouin[2,10,11], Nestor Ngouambe[3], Sarah Crestin-Billet[1], Narilala Randrianarison[4], Aurélie Toillier[5], Ousmane Traoré[6], Guillaume Fongang[7], Syndhia Mathé[8]

[1] University of Hohenheim, Stuttgart, Germany,
[2] CIRAD, UMR INNOVATION, Antsirabe, Madagascar
[3]African Forum for Agricultural Advisory Services, Uganda
[4]University of Antananarivo, Madagascar
[5]Food and Agriculture Organization of the United Nations (FAO), Rome, Italy
[6]University of Ouga 2, Ouagadougou, Burkina
[7]University of Dschang, Dschang, Cameroon
[8]CIRAD - UMR Innovation, CSIR-STEPRI Ghana
[9]Leibniz Centre for Agriculture Landscape (ZALF), Müncherberg, Germany
[10]INNOVATION, Univ Montpellier, CIRAD, INRAE, Montpellier SupAgro, Montpellier, France
[11]Centre National de Recherche Appliquée au Développement Rural (FOFIFA), SRR, Antsirabe, Madagascar

Short abstract

In order to ensure sustainable support for innovations in agriculture, innovation support service (ISS) providers must intervene in timely and efficient manner, hence the need for emphasis on their capacity for providing these services. In the last decade, many donor-funded resources have been channelled into developing and applying capacity frameworks, especially within the context of north-south collaboration. While most of these frameworks have focused on public bodies, strengthening capacities of private and third sector organisations for supporting innovations in agriculture and agri-food sector have been limited. Impelled by this knowledge gap, the EU-Africa research project (SERVInnov) has developed the 'Organisational Capacity Assessment approach for Innovation' (OCATI). in this contribution, we introduce this approach and present findings from its application in Cameroon and Madagascar. Results reveal that, while some capacity components appear as well-developed, e.g. the capacity to deliver ISS services) others scored less, signalling entry points for improvement (e.g. the capacity to relate with other actors). The application has created space for reflection within these organisations, revealing i) opportunity for reflexive thinking about own position in supporting innovations, ii) the value of raising awareness for ISS, and iii) how support to innovation in agriculture and agro-food sector matter and can be enhanced.

Extended abstract

Purpose

Based on a combination of structural and functional views of the Agricultural Innovation System (AIS) (Lamprinopoulou et al., 2014; Ndah et al., 2020; Spielman and Kelemework, 2009; TAP, 2016, Audouin et al. 2018), a distinctive widening of roles for agricultural advisory services towards supporting innovations has been observed. In practice, new, and diverse service providers have emerged and have broadened service approaches, tools, and related functions. The increasing needs by innovators to receive support from service providers for innovation processes, raises attention on the management of their capacity to provide support. This calls for continuous assessment, evaluation, and strengthening of these capacities to remain competitive.

In the context of north-south, and south-south collaboration within the last decade, a lot of donor-funded resources have been channelled into capacity development frameworks for institutional governance and learning (OECD, 2006), for boosting food and nutrition security (FAO, 2010, 2012a, b, 2013), for enhancing and strengthening environmental conservation (GEF, 2010) and recently, for strengthening agricultural innovation systems (TAP, 2016). While a major part of these efforts has addressed capacity issues at national, and sectorial levels strongly linked with public bodies (or organisations) (e.g government Ministries) (FAO, 2010, 2012a, b), efforts towards assessing and developing organisational capacity to innovate or specifically enhancing their role in offering innovation support services (ISS) (Mathé et al., 2016a; Ndah et al., 2020) have been limited (Allebone-Webb et al., 2016; FAO, 2013). To ensure effective, efficient, relevant, and sustainable support for innovations in agriculture, and most importantly to meet the diverse and increasing demand of innovators (or of adopters), there is an urgent need for timely interventions in evaluating and monitoring organisational capabilities to deliver ISS. To meet this challenge, designing robust self-assessment frameworks and tools is imperative for diagnosing as well as monitoring capacity needs related to ISS provision.

Based on the above background and knowledge gaps, the EU-Africa collaborative research project (SERVInnov) as one of its objectives, has developed an Organisational Capacity Assessment Tool for Innovation support (OCATI). The OCATI approach offers a scheme/tool for self-evaluation of organisational capacities for supporting and accompanying innovations in the agriculture and agri-food sector. This contribution, i) introduces the OCATI approach, and 2) presents findings from its application in Cameroon and Madagascar.

Design/Methodology/Approach

Objectives and origin of OCATI approach.

The OCATI approach aims at a self-evaluation of innovation support service providers (organizations) revealing their weaknesses and strengths with specific reference to 1) organisational, technical, functional capacities and skill needs, as well as 2) influencing structural conditions (enabling environment), towards providing Innovation Support Services (ISS). As a holistic approach, it systematically combines qualitative action research methods with quantitative scoring to determine the level of organisations' performance towards enhancing innovation support services. The tool is based, firstly on an extensive literature review, and secondly on a series of bilateral talks with selected members from innovation support organisations, conducted within the context of the EU-Africa SERVInnov project (https://servinnov.cirad.fr/). Further inspiration for designing this approach has come from similar assessment tools as; the Qualitative Expert based Assessment Tool for innovations (QAToCA (Ndah et al. 2015) and CDAIS organizational capacity assessment tool (FAO 2019).

Theoretical basis for the OCATI approach

The term capacity is widely understood as the ability of achieving to realise a targeted state or process. Particularly, in the context of development cooperation, capacity has been referred to as “the ability of people, organizations and society as a whole to manage their affairs successfully” (OECD, 2006). The OECD defines capacity as the process whereby people, organizations and society unleash, strengthen, create, adapt, and maintain capacity over time, while the UNDP links capacity to the ability of individuals, institutions, and societies to perform functions, solve problems and set and achieve objectives in a sustainable manner (UNDP, 2006). Linking “capacity” to “innovation”, Allebone-Webb et al. (2016) state that actors can produce and sustain innovation processes in a dynamic systems environment by continuously identifying constraints and opportunities, and mobilising capabilities and resources in response.

Studies on capacity development distinguish three interdependent levels or dimensions of intervention i.e the individual, the organizational, and the systemic level (FAO, 2010, 2012a, b; GEF, 2010). While looking at capacity to adapt and respond towards promoting innovations, the Tropical innovate’ (C2I) as an emerging concept, have outlined four core capacities areas, the capacity i) to envision and create new ways of doing things, ii) to connect with others to access and understand new information and resources, iii) to experiment, test, assess, and adapt, and, iv) to work with others to achieve action and change. The authors conclude that the capacity to innovate (C2I) concept puts a spotlight on process-driven approaches to innovation that have previously been undervalued.

In a related light the Capacity Development for Agricultural Innovation Systems (CDAIS) project has proposed a similar framework for strengthening organisational capacity (FAO and Agrinatura, 2019). As a guideline for capacity coaching and development process, it has been used for building the capacity of organisations that provide innovation support services (ISS) in the food and agriculture sector (Toillier and Kola, 2018; Wopereis-Pura et al., 2019). The CDAIS framework bases its capacity analysis on three main pillars 1) Capacity to organise - which deals with the organisation’s internal operation relating to its identity, capital, and formal and informal arrangements; 2) Capacity to relate – which deals with organisation’s relationships with the outside world and; 3) Capacity to deliver – which addresses organisation's services and products – i.e., the technical know-how, and the relevance, effectiveness and sustainability of the ISS developed by the organisation.

The above frameworks are observed to have predominantly focused on public institutions and/or organisations operating at national, regional, and sectorial levels. On the other hand, holistic capacity assessment frameworks and/or tools with attention on enhancing private, farmer-based organisations (FBOs) and non-governmental organisations' capacities for enhancing innovation processes in the agriculture and agro-food sector have been limited. It is for this reason that the Organizational Assessment Tool for Innovation (OCATI) approach has been developed.

Steps and procedure for OCATI approach application

Drawing from the methodology used in literature as well as lessons derived from bilateral talks with project partner organisations, the OCATI approach makes use of six participative iterative steps for its implementation as outlined in Figure 1.

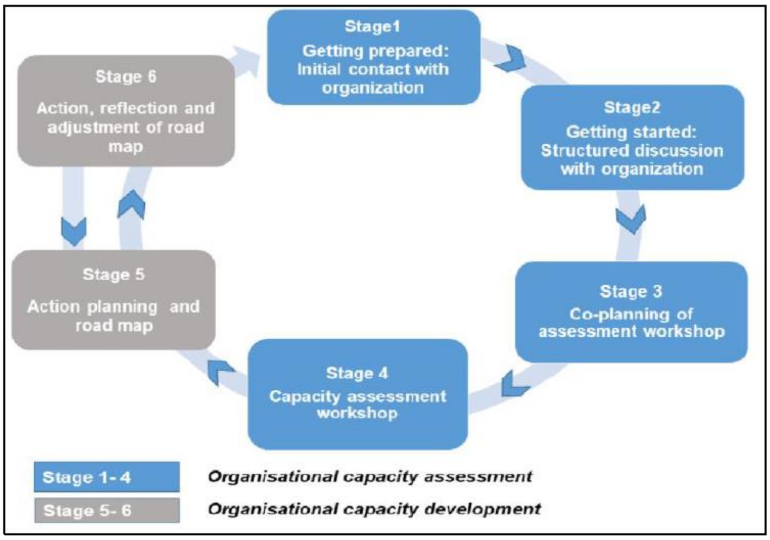


Figure 1: Steps and procedure of OCATI Approach

In an OCATI implementation process, while steps 1 - 4 refers to the capacity assessment process, steps 5 and 6 refers to capacity development processes. In the application cases where data is generated for this contribution, we limited activities to capacity assessment (1 - 4). Nevertheless, provision is made within the tool guide (ndah et al. 2021) for organisations to always finalise steps 5-6. Besides, the approach function on the assumption that partner organisations once successfully completed steps 1-4, become self-motivated in using generated results for further drafting internal action plans or constructing a joint vision for the organisation towards strengthening capacities (5-6) for supporting innovation processes.

Technical scoring tool associated with OCATI approach.

Besides, the participative action methods embedded in steps 1, 2, 3 of the "OCATI" approach, it makes use of a MS-excel based quantitative scoring tool for assessing innovation support capacities. As a decision support tool, it is comprised of five thematic components: 1) Organisational positioning, 2) Capacity to internally organise, 3) Capacity to deliver ISS, 4) Capacity to relate, and 5) enabling environment (Figure 2).

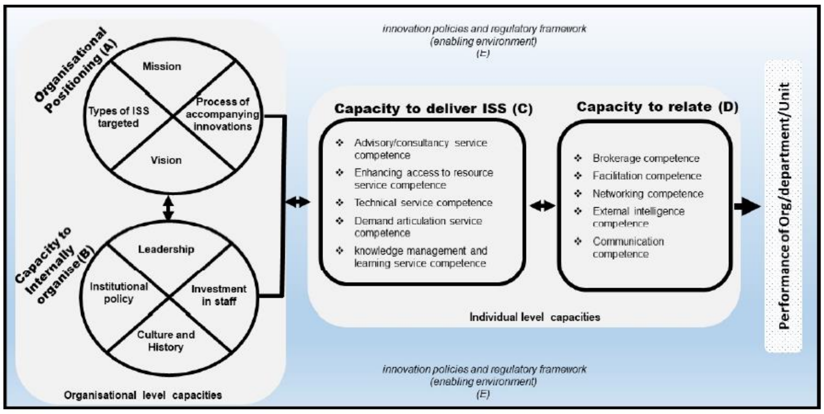


Figure 2: Structure and components of OCATI technical scoring tool (Own design with adapted elements from Wopereis-Pura et al. (2019), Toillier and Kola (2018), FAO (2013))

The assessment of these thematic components and their successful interplay of the mentioned capacities feeds into a general results part indicating the performance of an innovation support organisation, department, or sector under assessment (Figure 2). Each of these components has been designed to comprise a list of indicators (49 in total), all linked to operational statements, which in turn are connected to an assessment scale.

Based on this scale, responses from scoring are aggregated and results are quantitatively visualised in form of tables, graphs and or bar charts. When processing the recorded scoring data, scores from the different statements are averaged per component and weights are applied. This weighting is especially important as the total number of statements across the components varies. The technical tool is used in guiding discussions during the assessment workshop in step 4 (Figure 1).

Application of OCATI approach

Case studies

Organisations that support innovations face several challenges in carrying out their mission. For instance, they must respond to the specific needs of innovation communities by offering training, coaching, support, and capacity-building services that will enable innovation project leaders to progress. Moreso, they must position themselves in relation to other organisations operating in the area, and lastly, they must act in a changing economic and political context.

Table 2: Characteristics of case study organisations

Organisation/Country	**Organisation X1 (Cameroon)**	**Organisation X2 (Madagascar)**
Type of organisation	Civil Society Organisation	Farmer Based Organisation (FBO)
Year of creation	1987	1989
Spatial coverage of organisation (districts/regions)	Centre region (Mfoundi Lekie)	National coverage
Number of farmers reached	>5000	300,000
Number of staff dedicated to supporting innovations	more than 54 permanent employees and the rest are consultants	51 employees (with 25 for accompanying innovations)
Types of innovations supported (social, organisational, technical, etc.)	Social innovation, Organisational, Marketing, and technical innovations	technical, organisational, service, and institutional innovations

It is on this basis, that the OCATI tool was applied to one civil-society organisation in Cameroon (X1) and in one farmer-based organisation in Madagascar (X2) with the main objectives of examining and best understanding how these organisations are positioned to meet the challenges of innovation support. The results of the tool's application provide an image of a certain situation at a time "t". They can be used to change the way the organisations organise themselves internally and/or to compare changes and progress made in the pursuit of accompanying innovations across subsequent years.

Findings

Overall and thematic capacity performance across components

The findings reveal an overall average capacity performance for both organisations (Org) with 57.1% for organisation X1 (Cameroon) and 57.4% for organisation X2 (Madagascar).
With regards to capacity performance per thematic components, it is for both organisations largely similar but for a few variations (Figure 3). Firstly, the capacity to deliver ISS services (C) emerged as the main strength of both organisations with an overall score of 100%. This is closely followed by organisational positioning (A) with a score of 73% for organisation X1 and 70% for organisation X2, while the capacity to internally Organise (B) emerged from the 3rd position with a 62% score for org. X1, and 59% for org. X2. (Figure 3). On the other hand, Capacity to relate (D) linked mainly to networking facilitation and brokerage and enabling environment (E) linked mainly with policy context and programs for innovation, emerged as the most limiting capacity components across both organisations - all scoring less than 50% (Figure 3).

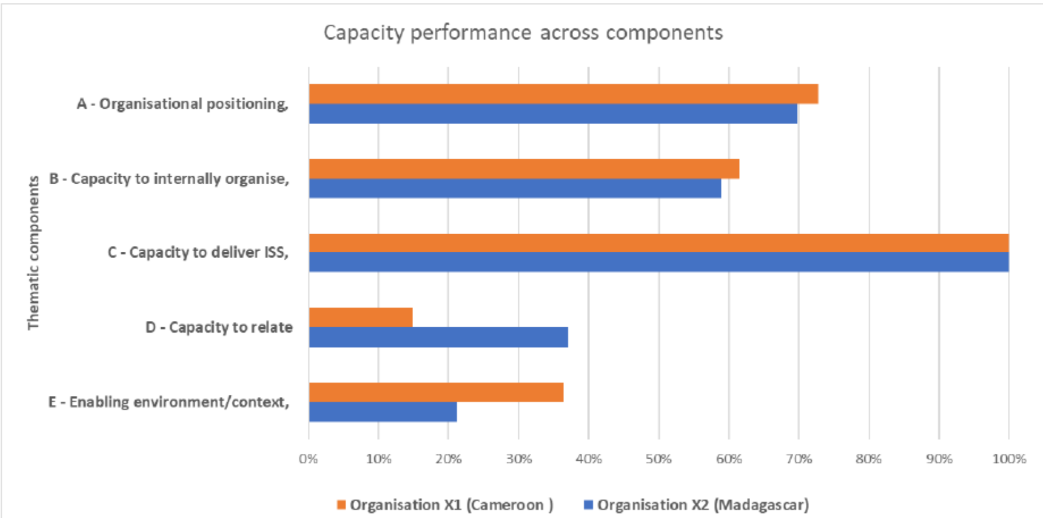


Figure 3: Organisational capacity performance across components for Organisation X1 and X2

Critically limiting competencies within capacity components

For organisation X1, the assessment revealed i) feedback mechanisms (D7), ii) communication channels (D8), iii) economic factors (E4), iv) policy frame conditions (E2), and v) the percentage of the national budget for innovations (E11) as areas with critically limiting competences for its overall performance. In contrast, organisational risk management (B9), organisational history (A11), clear services and products (A7) and the organisational mission (A1) are assessed as areas with critically limiting competencies for the overall performance of organisation X2 (Table 1).

Table 1: Key limiting capacities across the two organisations.

Organisation X1 (Cameroon)			Organisation X2 (Madagascar)		
ID	Indicators	Evaluation	ID	Indicators	Evaluation
A7	*Clear Services and products*	1	A1	*Organisational mission*	0
A9	*Status of employed staff for accompanying innovations*	1	A3	*Process of accompanying/supporting innovations*	1
A11	*Organisational history*	1	A4	*Diversity in portfolio of ISS provided*	0
B2	*Consultative decision making*	1	A5	*Network with other actors*	1
B3	*Incentive structures*	1	A6	*Responsiveness to changing clients' needs*	1
B5	*Conflict management*	1	A7	*Clear Services and products*	0
B6	*Staff ownership and responsibility on decisions*	1	A8	*Percentage of human resources dedicated for accompanying innovations*	1
D2	*Facilitation competence*	1	A10	*Methodological approach for accompanying innovations*	1
D3	*Exploring complementarity and synergies*	1	A11	*Organisational history*	0
D4	*Tools and networking platforms*	1	B2	*Consultative decision making*	1
D6	*Knowledge of other actors and their influence*	1	B6	*Staff ownership and responsibility on decisions*	1
D7	*Existing feedback mechanism*	0	B9	*Risk management*	0
D8	*Communication channels defined and used*	0	C5	*Capacity building - technical training competence*	1
D9	*Communication strategy planed and resources allocated*	1	E9	*Plans, and programmes for innovations*	1
E1	*Political frame conditions*	1			
E2	*Policy frame conditions*	0			
E3	*Administrative setup*	1			
E4	*Economic factors*	0			
E9	*Plans, and programmes for innovations*	1			
E10	*Appropriateness and effectiveness of innovation policies*	1			
E11	*Percentage of national budgets for innovations*	0			

Key	
0	Critically limiting capacities
1	Limiting capacities

Practical Implications

The above presented results signal that in their endeavours towards enhancing the process of accompanying and supporting innovations in agriculture, both organisations must pay careful attention to improving capacity for components E (i.e., enabling environment) and D (i.e., capacity to relate - linked with networking activities with external actors).

Specifically, the highlighted critical limiting competences under component E (enabling environment) call for policy lobbying and institutionalisation, while those linked with component D (capacity to relate) beckons for specific actions related with planning and organising feedback mechanism with beneficiary of services (D7), as well as defining, and putting in place clear communication channels (D8). This tallies with other studies where inter-organizational capacities have been highlighted as the main shortcomings to support local-led innovations in Madagascar (Audouin et al 2021). Besides, there is a strong need for improving the organisational risk management strategy by relying on regular employee feedback (B9); defining clear services and products offered by the organisation (A7); revising the organisational statement of purpose to include the promotion of innovation as one of its intended goals (A1) - especially for the case of organisation B (Madagascar). Especially the need for regular feedback and definition of clear services, tally with the call for gender and more inclusive approaches proven to be critical for efficient service provision (Crestin-Billet et al. 2022).

Moreso, the results call for a general need to raise awareness of the support agents about their effective role towards supporting innovation guided by the 07 types of ISS emphasised in recent innovation support-related studies (Mathé et al. 2016, Ndah et al. 2018 and Faure et al. 2019) and embedded in the OCATI approach as well (i.e., knowledge awareness, technical advice, market access, network facilitation and brokerage, capacity building, enhancing access to resources and institutional support). For instance, most of the participants highlighted during discussions that until the workshop, they had not realised that they were effectively involved in supporting innovation. Gaining awareness and even redrawing their formal mission including supporting innovation activities, would strengthen the capacity of these organisations to monitor their ISS. The OCATI approach, therefore, helps to support organisations to extract and develop their core competence of innovation support, to develop a strategy for further strengthening this, and to become more professionalised and recognised.

In sum, by making use of both qualitative and quantitative action research methods within a single approach, resulting in in-situ results, the OCATI has provided a chance for reflections within the same assessment workshop, therefore, bringing to the doorsteps of targeted partner organisations, i) the opportunity for reflexive thinking about their position with regards to supporting innovations, ii) the added value of raising awareness for innovation support services, and iii) an opportunity for revealing how support to innovation processes within agriculture and agro-food systems matter and can be enhanced directly or indirectly by development organizations.

Theoretical Implications

While the OCATI approach follows a similar pattern as used in other approaches in the literature, its holistic and comprehensive strategy makes it robust and unique. Especially, its focus on (new) cutting-edge topics of organisational capacity for innovation support in agriculture and agri-food systems makes it novel. It further boosts the experiential learning approaches and is a timely add-on to the widely used monitoring and evaluation (M&E) tools for extension and advisory Service (EAS) organisations.

References

Allebone-Webb et al. (2016). What is the capacity to innovate and how can it be assessed? A review of the literature. In "Proceedings of the 12th European International Farming Systems Association (IFSA) Symposium", pp. 1-18.
Audouin et al. (2018). Territory matters: Exploring the functioning of an innovation system through the filter of local territorial practices - the example of the adoption of cashew trees in Burkina Faso. Journal of Rural Studies 63, 130–140. https://doi.org/10.1016/j.jrurstud.2018.08.007
Audouin et al. (2021). To what extent can local-led innovation platforms tackle complex agricultural development challenges? Insights from Madagascar. The Journal of Agricultural Education and Extension. https://doi.org/10.1080/1389224X.2021.1997769
Crestin-Billet et al. (2022). Accompagner les innovations agricoles et agroalimentaires au Cameroun: comment soutenir l'inclusion à travers la fourniture de services? Projet SERVInnov.
Faure et al. (2019). "How to strengthen innovation support services in agriculture with regard to multi-
Extended Abstract for the 26th ESEE conference
stakeholder approaches." Journal of Innovation Economics Management (1): 145-169.
FAO (2010). FAO capacity Development learning module 1: Enhancing FAO's practices for supporting capacity development of member countries ". Food and agriculture Organisation of the United Nations Rome
FAO (2012a). FAO Capacity development learning module 2: FAO approaches to capacity development in programming: processes and tools." Food and Agriculture Organization of the United Nations, Rome
FAO (2012b). FAO Capacity Development learning module 3: Good learning practices for effective capacity development." Food and Agriculture Organization of the United Nations, Rome.
FAO (2013). Capacity Development learning module 4: Organisation analysis and development. Food and Agriculture Organization of the United Nations, Rome
FAO and Agrinatura (2019). Organisational Strengthening – A guide to the coaching process." Agrinatura, FAO, Paris, Rome.
GEF (2010). Monitoring Guidelines of Capacity Development in GEF Operations. Global Environment Facility, Washington DC.
Kidd et al. (2000). Privatising agricultural extension: caveat emptor. Journal of Rural Studies 16, 95–102.

Lamprinopoulou et al. (2014). Application of an integrated systemic framework for analysing agricultural innovation systems and informing innovation policies: Comparing the Dutch and Scottish agrifood sectors. Agricultural Systems 129, 40-54.

Mathé et al. (2016). Typology of innovation support services, WP1 AgriSpin, deliverable 1.4. ." CIRAD, Montpellier, France.

Ndah et al. (2018). Diversity of innovation support services and influence on innovation processes in Europe - Lessons from the AgriSpin project. In "13th European IFSA Symposium: Farming systems: facing uncertainties and enhancing opportunities", Chania (Greece).

Ndah et al. (2020). Co-designed Methodological Framework and Guidelines for in-depth Case Study Analysis, SERVInnov project, Deliverable 1.3., Universität Hohenheim, Stuttgart, Germany.

Ndah et al. (2015). Adoption Potential for Conservation Agriculture in Africa: A Newly Developed Assessment Approach (QAToCA) Applied in Kenya and Tanzania. Land Degradation & Development 26, 133-141.

OECD (2006). The chalenge for capacity Development, Working towards good practices ". Organisation for Economic Co-operation and Development, Paris, France.

Spielman and Kelemework (2009). Measuring agricultural innovation system properties and performance: Illustrations from Ethiopia and Vietnam, Intl Food Policy Res Inst.

TAP (2016). Common Framework on Capacity Development for Agricultural Innovation Systems: Conceptual Background. CAB International, Wallingford, UK.

Toillier and Kola (2018). Renforcer les capacités des organisations fournissant des services support à l'innovation. CDAIS, Montpellier, France.

Wopereis-Pura et al. (2019). Organisational strengthening - A guide to the coaching process, Agrinatura, Paris, France.

Improving farm advisory services to stimulate transitions for sustainable agriculture: towards a farmer-centric advice paradigm

Ellen Bulten[1], Boelie Elzen[1], Jaroslav Prazan[2]
[1]Wageningen Universiry and Research (WUR), [2]UZEI

Short abstract (200 words):

Transitions towards more sustainable European agriculture are influenced advisory organisations that support farmer decision-making. However, there is a large bias in both policy and research in starting from the side of advice provision while having little or no attention for farmers' advice needs. This paper describes results based on 26 case studies in 13 European countries that was analysed based on a 'multiple level approach', addressing the micro-level of individual farmers, the meso-level of national (or regional) AKIS and the EU macro-level. Results show a variety of shortcomings in advisors meeting farmers' need for advice which cannot easily be addressed in a coherent way in current thinking on farming advice. For that reason, we propose using a new overall perspective on farming advice which we call a 'farmer centred advice paradigm'.The main features of this new paradigm need to address the following topics: 1) farmers' advice needs; 2) what is meant by 'farming advice'; 3) who is an 'advisor'; 4) advice setting and methods; 5) the gap between AKIS and microAKIS; 5) training and AKIS coordination; 6) maturity of innovation; 7) the macro perspective: contribute to sustainable development; and 8) role of policy.

Extended abstract

Purpose

European agriculture increasingly faces a variety of sustainability challenges. Sustainable innovation by farmers has been suggested as a means to overcome these challenges and work towards a sustainable European agriculture. To address all three pillars of sustainability effectively, agricultural innovation should be environmentally sound, economically viable and societally beneficial (e.g. Purvis et al., 2019, Rasul & Thapa, 2004). The problem is that concrete innovations often do not satisfy all three of these requirements, at least not at first sight, making farmers hesitant to change their practices. The challenge then becomes to stimulate farmers yet to make steps forward in adopting more sustainable innovations.

In the Horizon 2020 AgriLink project,[10] that ran from 2017-2021, we focused on the role that advisors play to help farmers to adopt more sustainable farming practices and equipment. The general objective of AgriLink (Agricultural Knowledge: Linking farmers, advisors and researchers to boost innovation) was to stimulate transitions towards more sustainable European agriculture by furthering the understanding of the roles played by a wide range of advisory organisations in farmer decision-making and to enhance their contribution to learning and innovation.

One of the key initial findings in our research was that there is a large bias in both policy and research in starting from the side of advice provision while having little or no attention for farmers' advice needs. We therefore started by taking a closer look at these needs at the micro level and tried to connect them to the meso level advice provision in various AKIS environments and the macro level overall ambition of making European agriculture more sustainable. To be able to do this, we adopted a multiple level approach and used a variety of methods to collect data to facilitate integrating findings from these three levels.

Design/Methodology/Approach

Our research was built on 26 case studies that were carried out in 13 project partner countries: Belgium, Czech Republic, Spain, France, Greece, Italy, Latvia, The Netherlands, Norway, Poland, Portugal, Romania and the UK. The cases covered four categories of innovation types: technological, farming practices, marketing & financing, and social & organisational innovations.

AgriLink studied both the demand for advice from farmers and the provision of advice by various types of advisors. The table below summarises the various data sources used.

[10] More information about the project and its results can be found on the project website: https://www.agrilink2020.eu/

Data source	Description
32 case studies	Case studies about the role of advice in the innovation clusters • >1000 farmer interviews • 75 advice narratives • 26 regional multi-actor seminars to validate case study results (~500 participants total)
6 Living labs	Living labs to develop innovative new advisory services • 12 Living Lab monitoring reports
Evaluation national advisory regimes	To assess the governance of national farm advisory systems • 13 EU-FAS assessment reports • 7 in-depth national advisory assessment reports • >200 interviews with advisors
13 Socio-technical scenario workshops	To explore potential pathways for future evolution of advisory services • 13 socio-technical scenario reports

We used a 'multiple level approach' in the data analysis, addressing the micro-level of individual farmers, the meso-level of national (or regional) AKIS and the EU macro-level. This approach presents an innovative combination of different levels of innovation and advice, including an analysis of how the levels influence each other. Data processing used a combination of quantitative and qualitative approaches.

Findings

Using the concept of microAKIS, one of the key findings was that, from the perspective of a farmer, advice provision and advice providers are much more varied than is assumed in common advisory perspectives in both policy and research. The microAKIS indicates the micro knowledge-system that each individual farmer personally assembles, including the range of individuals and organisations from whom farmers seek advice and exchange knowledge with the processes involved, and how they translate this into innovative activities (or not) (Sutherland and Labarthe, 2022). A microAKIS includes various sources of advice that may be biased (e.g. provided by input suppliers) or that lack professional underpinning. Acknowledging this, independent advice providers should take farmers' reliance on such potentially biased sources as a starting point and help farmers to assess the validity of this type of advice and help them to place their advice needs in a broader context which also includes policy and societal objectives for sustainable development.

In AgriLink, we identified a variety of shortcomings in advisors meeting farmers' need for advice which cannot easily be addressed in a coherent way in current thinking on farming advice. For that reason, we propose using a new overall perspective on farming advice which we call a 'farmer-centric advice paradigm'. Based on the findings from our empirical study we identified a set of nine aspects that should be part of this paradigm that will be further elaborated in the paper.

Practical Implications

The main features of this new paradigm need to address the following aspects:

- **Farmers' advice needs**: a farmer-centric approach in which the farming advice system better address the variety of topics that farmers need advice on.
- **Various forms of 'farming advice'**: To acknowledge the heterogeneity of farmers' microAKIS, it is necessary to broaden the conception of farming advice to include all sources of information a farmer uses, i.e. the whole microAKIS.
- **Variety of types of 'advisor'**: We propose to use the term advisor for a person who provides advice as a profession, i.e. someone who uses a specific set of skills to transfer or (co-)produce certain types of knowledge for farmers. Two types of advisors can be distinguished: independent and 'linked' advisors (linked to business interests).
- **Advice setting and methods**: To characterise the relationship between farmer and advisor, a distinction is made between the 'advise setting' and the 'form of advice', or advice methods.
- **The gap between AKIS and microAKIS**: Although a regional AKIS can be quite varied, a farmers' microAKIS is usually quite small, i.e. individual farmers tend to use only a small subset of sources of advice.
- **Training and AKIS coordination**: advice often does not fit the needs of innovative farmers. To address this at the level of the individual advisor, it is important that advisors receive frequent

training to keep up-to-date with new developments. In close interaction with other advisors, advisors can create more encompassing knowledge and competence pools. Coordination is also required for the activities between back office and front office.

- **Maturity of an innovation**: Farming advice needs to take into account that innovations in different stages of development entail different advice needs from farmers.
- **The macro perspective: contribute to sustainable development**: There is not an automatic, systemic and positive relationship between agricultural innovation and sustainable development. There is therefore a need for a change at the meso level, facilitated by policy at the macro level, where advisors take sustainable farming as an explicit goal in their advice provision.

Role of policy: The impact of these macro level advisory policies to make farming more sustainable is relatively minor, partly because member states face a range of implementation problems and partly because the advice regulations are weakly connected to the overall farming regulations and policies.

Based on the identified weaknesses in current advisory systems, we propose four policy recommendations, acknowledging the current CAP policy context (see also Labarthe et al., 2021 for more detail):

- Invest in **independent advice** to avoid bias in the content of farming advice from varied sources and ensure reaching sustainability goals and enable transparency and robustness of advice content;
- Focus advisors' **education and training** around a farmer-centric approach and make them acquainted with social science perspectives and concepts such as the Triggering Change Model (Sutherland et al., 2012) and microAKIS. Also target missing competences leading to gaps in advice provision (such as collective actions in direct marketing);
- Ensure **inclusivity of advice** by including 'hard-to-reach' populations such as small-scale farms but also salaried workers, contractors, etc. to also meet their needs in realising sustainable agricultural practices;
- Facilitate **integrated advice** approaches that enable advisors (within the wider AKIS context) to offer broader, systemic advice provision that places a single issue in the broader context of sustainable development, thereby increasing impact towards making agriculture more sustainable.

Implications for future research

Each aspect of the proposed farmer-centric advice paradigm needs further elaboration to specify details of the paradigm and develop targeted recommendations to create a robust client oriented system for farming advice. For example, the following research questions need to be addressed:

- How to encourage farmers to use a wider and 'validated' set or sources of advice, beyond their small micro-AKIS?
- How to facilitate provision of more integrated forms of advice rather than advice on single issues?
- How can advisors integrate macro sustainability aspects into advice addressing the micro-level needs of farmers?
- How can policies best stimulate all of the above? Th general suggestions in the previous section will need further elaboration.

These research questions provide a sub-set of issues for further research and it should be noted that such studies should be seen a part of an overarching paradigm that covers all three levels and their interactions. Findings from various studies addressing the issues above should therefore be related to each other, implying that also further meta-analysis is required to connect findings from such studies. This should be aimed at developing a system for farming advice that covers farmers' advice needs at the micro-level as well as the macro-level objective of making European agriculture more sustainable.

Acknowledgements

Thanks to all our AgriLink colleagues who's work we have build on in this paper. The AgriLink project was funded from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No. 727577.

References

Labarthe P., Prager, P., Leloup, H., Elzen, B., Collins, K., Laurent, C., Redman, M., Schoorlemmer, H., Sutherland, L., Micheloni, C., Bulten, E., Potters, J., Townsend, L., Koutsouris A., Prazan, J., Adamsone-Fiskovica, A., Madureira, L., Maïz, D., Tisenkopfs, T., Van Raaij, M. (2021). *Deliverable 5.7 Policy Recommendations Report. Strengthening farm advice for innovation and Sustainability.*

Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: in search of conceptual origins. *Sustainability science*, *14*(3), 681-695.

Rasul, G., & Thapa, G. B. (2004). Sustainability of ecological and conventional agricultural systems in Bangladesh: an assessment based on environmental, economic and social perspectives. *Agricultural systems*, *79*(3), 327-351.

Sutherland, L. A., & Labarthe, P. (2022). Introducing 'microAKIS': a farmer-centric approach to understanding the contribution of advice to agricultural innovation. *The Journal of Agricultural Education and Extension*, *28*(5), 525-547.

Learning from the world: Using a global review of innovative extension approaches to support the red-meat knowledge and innovation system in Australia

Ruth Nettle[1], Nicole Reichelt[2], Jana-Axinja Paschen[2], Helen McGregor[2], Basil Doonan[3], Ashley Evans[3] and Leanne Sherriff[4]

[1] Rural Innovation Research Group, University of Melbourne, Australia
[2]Redefining Agriculture, Australia
[3]Pinion advisory, Australia

Short abstract

This paper describes a participatory review of innovative approaches to agricultural extension internationally. It was conducted for, and with, representatives of the Australian red-meat sector responsible for its adoption strategy. A stakeholder reference group (SRG) interacted with program leaders and practitioners implementing innovative approaches reflective of three emergent design concepts: 1. Understanding target audiences and contextual factors in adoption; 2. Supporting producer peer-to-peer learning and producer leadership in adoption design, and 3. Strengthening the capacity of the advisory sector. Interactions were held with the Agriculture and Horticulture Board (UK) (Service Design Teams); The Young Farmer Business Program, NSW (Australia); Remote service provision (Resource Consulting Services (Australia); Red Meat Profit Partnership-farmer action groups (New Zealand); Extension 350 (New Zealand); AgriLink/Living Labs (EU); Dairy Australia's national program approaches. Implementation plans for 4 new extension activities were developed. Findings from the project suggest that changes to existing extension approaches must acknowledge and engage with the ways that innovativeness in extension is framed and contested. Further, the aspiration of novelty and innovation cannot replace the proven benefits from good extension project design and management. Greater attention to the governance of the Agricultural Knowledge and Innovation system (AKIS) with respect to innovating extension approaches is recommended.

Extended abstract

Purpose

Innovation in agricultural extension approaches is an 'ideal' often expressed by investors in extension programs who seek greater engagement or greater adoption of specific practices or technologies amongst a farming population. However, what counts as 'innovative' is contested and how to change from 'routine' approaches to those considered to be 'new or novel' is rarely factored-in to extension design. It is often assumed that novel extension approaches can be adopted 'off the shelf'. A key question is how to decide on, and implement, novel extension approaches? This paper describes a participatory review of innovative approaches to agricultural extension in different countries that was conducted for, and with, representatives of the Australian red-meat sector responsible for the adoption strategy. This paper describes the participatory and iterative methods applied in the review with stakeholders to enhance collective learning, including how the contested nature of innovative extension approaches was negotiated. Outlining the review findings and the actions emerging from the project, we discuss the implications for policy makers, extension program leaders and extension practitioners who may be seeking to innovate their extension approaches.

Design/Methodology/Approach

The 'Global Review of Adoption' (GAR) project was conducted by the authors over 15 months in 2021-2022. The project aimed to identify successful novel strategies, programs, and practices that could be implemented by the Australian red meat sector to support the continuous improvement of approaches for adoption. The project was initiated by Meat and Livestock Australia (MLA) through their Producer Adoption Reference Group (PARG) (MLA, 2020; 2022).

The participatory and iterative review of innovative extension approaches involved:

a) **Formation of a stakeholder reference group (SRG)**: involving 12 representatives purposefully selected from: MLA program managers; leading producers from the northern, southern and western Australian red-meat research advisory councils, MLA extension delivery partners (including government and private sector); farm advisors and farming groups. In addition to geographical representation, members had experience in either the sheep (wool and/or meat) or beef sectors. The SRG represented the needs of key sectors and production systems across the red meat industry in terms of adoption approaches and their role was to: advise the research team on the scope for the selection of extension and adoption programs, projects, and practices to be reviewed; identify, and assist the research team in connecting with international contacts or in other sectors; participate in co-designing new approaches to adoption via online meetings and discussions; and provide feedback on preliminary findings reports and recommendations. The work of the SRG was designed to increase the chances that ideas would be implemented as a result of the project. All members shared an interest in 'adoption' and participated collectively in informal learning and reflection.
b) **A rapid appraisal of Australian and international published literature:** targeting approaches in behavioural and practice change from the agricultural, business, environmental, educational, health and natural resource management sectors, 245 articles were reviewed. Web of Science and Scopus databases were examined with search terms generated by the project team and refined in consultation with the SRG. Key questions for the review included: What are the innovative approaches used by extension providers to engage with different groups of producers/end-users? 2. How are approaches assessed for effectiveness in meeting learning needs? 3. How are programs involving multiple service providers administered and evaluated? 4. What novel ideas are creating breakthroughs in areas of historically low adoption? 5. To what extent has remote location been addressed in extension approaches? 6. How are people incentivized and what are effective awareness raising activities that increase producers' interest in change/adopting practice change? Thematic analysis of the articles involved the identification of critical success factors in the design and delivery of projects and programs.
c) **Telephone interviews with 22 Australian and international adoption program/project informants** (five continents): Interview respondents were identified from the list of key countries, programs, projects, and international informants known to the authors and the SRG. The interviews compiled accounts and important details of novel extension and engagement approaches, including observations from practice, knowledge and application of monitoring and evaluation methodologies, and reflections on the 'novelty' of approaches. Interviewees were also asked to identify key programs or projects that offered practical examples of program approaches they deemed as successful, innovative or generating high levels of engagement and/or adoption. Thematic analysis of the interviews was compared with findings from b).
d) **Synthesis of results from phases b) and c):** A summary document from the synthesis was used as a basis of interactive activities with the SRG to identify critical success factors that resonated most with the context of the red-meat sector and enabled a shortlisting of 'innovative' options to pursue (i.e. from approximately 22 approaches down to 6).
e) **On-line 'zoom' interactive sessions** (6 sessions): National and international leaders of the identified innovative approaches interacted with the SRG and MLA program managers to provide opportunity for exchange of information, knowledge and insights with practitioners of the innovative approaches and enable detailed examination of success factors and practicalities of implementation. Each session was designed to capture the innovative aspects of initiatives, their critical success factors and reported impacts, and allow time for SRG members to reflect on the novelty and applicability of the examples in Australia's red meat contexts. The authors used these sessions to support the co-design of 4 innovative activities for the Australian red-meat context that could be implemented by MLA
f) **Implementation plans:** developed for 4 activities which were reviewed and endorsed by the SRG.

Findings

The literature review established six key themes related to innovative and successful adoption approaches:

1. **Understand target audiences** (e.g. Fielke et al., 2018).
2. **Participatory approaches to program design and extension** (e.g. Nettle et al., 2022; Cordoba, 2018; Brown et al., 2021; Calliera et al., 2021; Stitzlein et al., 2020; Zavratnik et al., 2019).
3. **Catering to different learning styles** (e.g. Weaver et al. 2016; Cordoba et al., 2018; Knook et al., 2018; Taylor et al., 2017; Sarage et al., 2021).
4. **Multimedia, e-extension, and engagement** (e.g. Son et al., 2019; Ivey & Myer, 2019; Cliffe et al., 2021; Gilchrist et al., 2021; Thorn et al., 2017).
5. **Hybrid (online/face-to-face) models** (e.g. Bamka et al.,2020; Brannan et al., 2019; Rolfe, 2017; Thorn et al., 2017; Uribe& Santamaria, 2017).
6. **Monitoring and Evaluation (M+E) methods** (e.g. Ivey & Myer, 2019; Gilchrist et al., 2021).

The analysis of the key informant interviews aligned with the findings from the literature and together, key practice insights on success factors in supporting adoption were distilled and were applied to develop design concepts for innovative approaches.

Reflections and decisions of the SRG – design concepts for innovative approaches
Based on the combined insights, three 'design concepts' were selected by the SRG for further development and contextualisation:

- **Understanding target audiences and contextual factors in adoption** (farmer segmentation and tailoring of approaches): Agriculture and Horticulture Board (UK) *Service Design Teams; Young Farmer Business Program, NSW (Australia); Resource Consulting Services – Australia).*
- **Supporting producer peer-to-peer learning and producer leadership in adoption design** (co-design/co-innovation/farmer action groups e.g. *Red Meat Profit Partnership – New Zealand*, *Extension 350 – New Zealand, AgriLink and Living Labs - EU*).
- **Strengthening the capacity of the advisory sector** (advisor mentoring, training e.g. *Dairy Australia national programs - AUS*).

The conclusion was that innovative programs do not have to be pioneering. In consolidating all the findings, four innovative activities were proposed, and implementation plans developed for application in the Australian red-meat sector, and endorsed by the SRG: 1. Engaging with southern rangeland producers; 2. Designing a collaborative program to support wide adoption of pain relief in animal management; 3. Applying a 'Living Labs' approach in R&D regional consultation processes, and; 4. Supporting producer-driven 'Farmer Action Groups' as part of strategic partnerships.

The main challenge for MLA now is how to govern the innovation. This includes making decisions on an appropriate strategic and operational governance model to progress the implementation, how to identify and build the capacity to implement, evaluate the innovative approaches, and resource investments in innovation.

Practical Implications
For policy makers, extension program leaders and extension practitioners who may be seeking to innovate their extension approaches, there are several considerations:

- Any change to existing extension approaches must acknowledge and engage with the ways that innovation in extension is contested and framed, such as: the experience people have with particular approaches influences how 'innovation' is judged, there are expected routines of extension (extension 'cultures') in different sectors and places.
- Interactive learning between the 'innovators' in extension and those 'interested' in innovation has greater impact than reading about innovative approaches. It helps stakeholders' picture what innovative extension looks and feels like.
- New or innovative approaches cannot replace the fundamentals of good project management and design.

- Any change to routines in extension requires funding, time to learn, and expertise to aid implementation. Innovative approaches cannot be applied directly/'off-the shelf'.

Theoretical Implications

While agricultural knowledge and innovation systems (AKIS) are encouraged to be adaptive, innovating approaches within the system and the potential vulnerabilities in doing innovation in agricultural extension have not been adequately addressed. There is a need for deeper consideration of the change management processes needed for such innovation. Further, shared ownership and the championing of new approaches requires appropriate models of adaptive governance.

Acknowledgements: *This project was funded by Meat and Livestock Australia: L.ADP.2110 - A review of global adoption practices and outcomes, and recommendations for implementation within the Australian Red Meat Industry*

6. References

Bamka, W., Komar, S., Melendez, M., & Infante-Casella, M. (2020). "Ask the Ag Agent" Weekly Webinar Series: Agriculture-Focused Response to the COVID-19 Pandemic. In JOURNAL OF EXTENSION (Vol. 58, Issue 4). UNIV OF WISCONSIN EXTENSION JOURNAL INC.

Brannan, M., Bernardotto, M., Clarke, N., & Varney, J. (2019). Moving healthcare professionals—A whole system approach to embed physical activity in clinical practice. In BMC MEDICAL EDUCATION (Vol. 19). BMC. https://doi.org/10.1186/s12909-019-1517-y

Brown, P. R., M. Anwar, M. S. Hossain, R. Islam, M. N.-E. A. Siddquie, M. M. Rashid, R. Datt, R. Kumar, S. Kumar, K. Pradhan, K. K. Das, T. Dhar, P. M. Bhattacharya, B. Sapkota, D. B. Thapa Magar, S. P. Adhikari, M. F. Rola-Rubzen, R. Murray-Prior, J. Cummins, S. Maharjan, M. K. Gathala, B. Brown and T. P. Tiwari (2021). "Application of innovation platforms to catalyse adoption of conservation agriculture practices in South Asia." International Journal of Agricultural Sustainability: 1-24.

Calliera M, Capri E, Zambito Marsala R, Russo E, Bisagni M, Colla R, Marchis A, Suciu N. Multi-actor approach and engagement strategy to promote the adoption of best management practices and a sustainable use of pesticides for groundwater quality improvement in hilly vineyards. Sci Total Environ. 2021 Jan 15;752:142251. doi: 10.1016/j.scitotenv.2020.142251. Epub 2020 Sep 7. PMID: 33207509.

Cliffe, M., Di Battista, E., & Bishop, S. (2021). Can you see me? Participant experience of accessing a weight management programme via group videoconference to overcome barriers to engagement. In HEALTH EXPECTATIONS (Vol. 24, Issue 1, pp. 66–76). WILEY. https://doi.org/10.1111/hex.13148

Cordoba, M. C., Ruegg, P. L., Shaver, R. D., Weigel, K. A., Carvalho, P. D., Fricke, P. M., & Cabrera, V. E. (2018). Repro Money: An Extension Program to Improve Dairy Farm Reproductive Performance. Journal of Extension, 56(2), 11.

Fielke, S. J., Botha, N., Reid, J., Gray, D., Blackett, P., Park, N., Williams, T. (2018). Lessons for co-innovation in agricultural innovation systems: A multiple case study analysis and a conceptual model. The Journal of Agricultural Education and Extension, 24(1), 9–27.

Gilchrist, E., Johnson, A., McMurran, M., Stephens-Lewis, D., Kirkpatrick, S., Gardner, B., Easton, C., & Gilchrist, G. (2021). Using the Behaviour Change Wheel to design an intervention for partner abusive men in drug and alcohol treatment. In PILOT AND FEASIBILITY STUDIES (Vol. 7, Issue 1). BMC. https://doi.org/10.1186/s40814-021-00911-2

Ivey, J. L., & Myer, P. R. (2019). Use of a timely topics web tool to enhance research-based extension program impact. Journal of Extension, 57(3), 3.

Knook, J., Eory, V., Brander, M., & Moran, D. (2018). Evaluation of farmer participatory extension programmes. In JOURNAL OF AGRICULTURAL EDUCATION & EXTENSION (Vol. 24, Issue 4, pp. 309–325). ROUTLEDGE JOURNALS, TAYLOR & FRANCIS LTD. https://doi.org/10.1080/1389224X.2018.1466717

Meat and Livestock Australia (2022) Producer Adoption Outcomes Report 2020-2021. Meat Livestock Australia, accessed April 16, 2022: <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.mla.com.au/globalassets/mla-corporate/research-and-development/final-reports/adoption-outcomes-report-2020-21-web.pdf>

Meat and Livestock Australia (2020) Strategic Plan 2025. Meat Livestock Australia, accessed April 16, 2022: <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.beefcentral.com/wp-content/uploads/2020/06/MLA-Strategic-Plan-2025.pdf>

Nettle R., Major, J., Turner, L, Harris, J. (2022) Selecting methods of agricultural extension to support diverse adoption pathways: a review and case studies. Animal Production Science doi:10.1071/AN22329

Rolfe, J., Perry, L., Long, P., Frazer, C., Beutel, T., Tincknell, J., & Phelps, D. (2021). GrazingFutures: Learnings from a contemporary collaborative extension program in rangeland communities of western Queensland, Australia. In RANGELAND JOURNAL (Vol. 43, Issue 3, pp. 173–183). CSIRO PUBLISHING. https://doi.org/10.1071/RJ20078

Sarage, D., O'Neill, B. J., & Eaton, C. M. (2021). There is no I in Escape: Using an Escape Room Simulation to Enhance Teamwork and Medication Safety Behaviors in Nursing Students. Simulation and Gaming, 52(1), 40–53. https://doi.org/10.1177/1046878120976706

Son, J., Niehm, L. S., Russell, D. W., & Lee, J. (2019). Assessing the social media use and needs of small rural retailers: Implications for extension program support. Journal of Extension, 57(2). https://www.scopus.com/inward/record.uri?eid=2-s2.0-85064526412&partnerID=40&md5=d67d5781adf8dff875d3dec2bf76259c

Stitzlein, C., Fielke, S., Fleming, A., Jakku, E., & Mooij, M. (2020). Participatory design of digital agriculture technologies: Bridging gaps between science and practice. In RURAL EXTENSION AND INNOVATION SYSTEMS JOURNAL (Vol. 16, Issue 1, pp. 14–23). AUSTRALASIA PACIFIC EXTENSION NETWORK-APEN.

Taylor, J., Namey, E., Carrington Johnson, A., & Guest, G. (2017). Beyond the Page: A Process Review of Using Ethnodrama to Disseminate Research Findings. *Journal of Health Communication*, *22*(6), 532–544. https://doi.org/10.1080/10810730.2017.1317303

Thorn, K., Tobin, D., Radhakrishna, R., Chatrchyan, A., Chan, J., & Allred, S. (2017). Usefulness of Delivery Methods for Climate Change Programming: Perspectives of Extension and Research Faculty. In JOURNAL OF EXTENSION (Vol. 55, Issue 5). UNIV OF WISCONSIN EXTENSION JOURNAL INC.

Uribe, G., & Santamaria, L. (2017). Exploring Hybrid Teaching Methods for Hispanic Agricultural Workers. In HORTTECHNOLOGY (Vol. 27, Issue 5, pp. 695–699). AMER SOC HORTICULTURAL SCIENCE. https://doi.org/10.21273/HORTTECH03700-17

Weaver, R. (2016). Capacity building and community resilience: A pilot analysis of education and employment indicators before and after an extension intervention. Journal of Extension, 54(2). https://www.scopus.com/inward/record.uri?eid=2-s2.0-84964989295&partnerID=40&md5=f8c631101966faf983fb56b414409809

Zavratnik, V., Superina, A., & Duh, E. S. (2019). Living Labs for rural areas: Contextualization of Living Lab frameworks, concepts and practices. Sustainability (Switzerland), 11(14). https://doi.org/10.3390/su11143797

Session 3G – Innovation related issues

Leverage points in farmer, advisor and researcher interactions

Lisa Blix Germundsson, Magnus Ljung

Department of People and Society, National Competence Centre for Advisory Services, Swedish University of Agricultural Sciences.

Short abstract

The aim of this study is to investigate how agricultural firms can use innovation support services to develop new knowledge and innovation, for their sustainable business development and growth. The methods comprise a qualitative case study with a comparative process ethnography approach, employing two cases of long-term collaborations between multiple actors in Sweden. The findings suggest that the processes of social learning, the forming of collective agency, enhancing of resource access and the operationalizing of results, were leverage points creating the ability to maintain and develop the collaboration over time. The practical implications include how agricultural firms can gain innovative strength and find leverage by forming collective agency with key individuals in order to access complementary competences and resources of others. The theoretical implications include the value of collective agency for multi-actor collaborations, and that a composition of smaller leverage points were found to enable larger change.

Extended abstract

Purpose

The aim of this study is to investigate how agricultural firms can use the innovation support system to develop new knowledge and innovation and create sustainable business development and growth. The results relate to the development of approaches and tools used for collaborative, participative and transdisciplinary learning, found in topic 3 of the ESEE 2023 conference.

Investigations into the functions of innovation support services (ISS) have revealed a number of functions being carried out by advisory organisations and other actors, these include problem identification, network brokering, and the provision of resources (Faure et al. 2019; Proietti and Cristiano 2022). The role of ISS is to support farmers and other stakeholders with by providing adequate responses to their need for new knowledge and innovation (Kilelu et al. 2014). Such functions within the AKIS can become leverage points for development and change (Leeuwis and van den Ban 2004). Leverage points are places within a complex system in which a small shift in one function can produce changes across the whole system (Meadows 1999). As a conceptual framework, the leverage point perspective can be applied as guidance to identify where local actors, engaged in social learning, can jointly and successfully intervene in a system (Lam et al. 2020). In agricultural knowledge and innovation systems (AKIS), there is always the potential to re-design interactions by changing the structure of information flows between stakeholders and increasing their power to change or self-organise (EU SCAR 2012). In this way, new forms of stakeholder interactions, implemented as small steps, can form the basis of significant change. According to Senge (2006), the bottom line of systems thinking is finding leverage, the key element from which small actions can be taken and can lead to substantial improvements.

An important driver of innovation identified in previous literature is knowing what you want to achieve, or the art of demand articulation (e.g., Klerkx and Leeuwis 2008; Kilelu et al. 2014). This step requires an analysis of what is already known and a will to push forward in a specific matter. Pelenc et al. (2015:227), denote this as *agency*, defining it as "the ability of a person to pursue goals and act in order to reach them". Similarly, Giddens (1984:14) defines agency as an individual's ability to "make a difference" with regard to the current state of affairs. Individual agency can go beyond narrow self-interest to encompass altruistic motives in a wider sense and can contribute to the creation of collective agency (Pelec et al. 2015). Collective agency emerges through a social learning process, where individual agency is shared with others; it cannot be imposed on anyone unwillingly (Pahl-Wostl 2006). Such a set of more or less shared ideas facilitates communication in the group and can lead to the adoption of joint goals for action. In this way, collective agency is a social structure, which guides the members' communication and decision-making. Such social structures can contain social rules and mobilise resources (Giddens 1984). The concept of collective agency has been used to denote, for example, social innovation promoting alternative food systems (Fernandez-Wulff 2019), and in multi-actor approaches to environmental conflict (Pahl-Wostl 2006; Pelenc et al. 2015). Faure et al. (2019) found the expression of agency, as demand articulation, to be present in all stages of the innovation process. Demand articulation has also been found to be a dynamic process, unfolding with the learning processes of the involved actors (Kilelu et al. 2014).

Design/Methodology/Approach

A qualitative case study approach was used as it allows for the capture of the evolving and dynamic nature of social events over time. Following Leeuwis and van den Ban (2004:373), a comparative process ethnography approach was used, in this case meaning "the close following (or ex-post reconstruction) of events and interactions in and around a particular innovation trajectory, as well as the gathering of the participants' reflections and rationalisations in connection with these". Retrospective studies enable a recognition of overall patterns in innovation processes, and aid the understanding of cause and effect (Leonard-Barton 1990).

Through searches in the databases of four applied research funders, two cases of long-term collaboration, exceeding 10 years and involving multiple stakeholders, were identified. The first case started in the early 2000's with the aim of dealing with the problem of weed control in organic farming. A working group was formed, consisting of two researchers, four farmers, an advisor, an advisory support expert, and a group facilitator. The set-up was to have a participatory approach with field trials carried out by the farmers at their farms. Between 2006-2014, the collaboration developed into a series of project proposals, resulting in ten projects being performed, three being related to the main project idea of weed control, and seven being spin-off ideas which sprung from the main project. An additional six projects addressed follow-up questions.

The second case included a producer organisation with warehouse facilities for the storing of fresh produce. In order to deliver better quality all year round to customers and consumers, they needed to understand how post-harvest treatment and storage of the fresh produce should be carried out. A dialogue was started between the producer organisation and university researchers, resulting in a research project. From 1999 to 2018, the collaboration developed into a series of emerging ideas and project proposals. The data collection included written sources and semi-structured interviews with the involved individuals, the latter are presented in table 1.

Case	Type of organisation	Representative
Case 1. Weed control in organic farming	Farms	Farmer 1
		Employee of Farmer 1
		Farmer 2
	Advisory services	Advisor 1
		Advisor 2, facilitator expert
	National agricultural authority	Advisory support expert
	University	Researcher 1
		Researcher 2
Case 2. Storing of fresh produce	Producers' cooperative	Former CEO
		Former advisor, current CEO
	University	Researcher 3
		Researcher 4
Related to both cases	Farmers' organisation	CEO
		Expert

Table 1. The respondents (n=14) and their roles in the respective cases.

The documents and interviews complemented each other and offered a means of comparing and triangulating data. Using a grounded theory approach, we searched for patterns in the material (Charmaz 2006). With the aim of unpacking the development of the case studies over time, the project funding of the two cases was mapped along timeline illustrations.

Findings

A wide variety of actions and processes were present in the two multi-actor cases. Some of these appeared to be particularly important for creating and developing the collaboration process, and reach the desired outcomes. As will be further detailed below, we found the most prominent of these to be the forming of collective agency, social learning, enhancing resource access and the operationalization of results.

The forming of collective agency

The start of the two cases reflects a similar pattern: someone recognising a problem and deciding to act on it, i.e., having the agency to deal with a perceived problem or opportunity (Giddens 1984). Thinking that their problems could best be dealt with in cooperation with others, they made contact with researchers they knew themselves or through others. By inviting others to join forces in dealing with the problem, their individual agency was transformed into a collective agency; a social structure guiding the communication and decision-making of the involved individuals (Pelenc et al. 2015). This happened through a social learning process and led to the forming of concrete ideas around project set-up and funding proposals. While the concept of collective agency in Fernandez-Wulff (2019) and Pelenc et al. (2015) refers to larger groups of people in public contexts, in this paper, the notion of collective agency is used in the context of a small group of individuals sharing specific agency within agricultural innovation.

While in both the cases, researchers were invited to share the original agency, over time the sharing of the agency went both ways. For example, in case 1, there was a need for a joint understanding of the field trials and to settle a trial plan agreed upon by all parties. The researchers expressed how they would argue for their needs in the field trials, building interest and understanding from the farmers. Hence, the farmers would share that part of the researcher's agency in a collective agency based around the trial plans performed at their farms.

Social learning

The collaboration in the two cases developed into a series of emerging ideas related to the original question, for example, seedbed preparation and fertilizer placement. Reflecting on how the new ideas were born, the respondents would refer to their dialogue with others, in which new ways of seeing things were elaborated. It often started with someone voicing an idea, allowing others to comment and contribute with their views, adding new perspectives and knowledge to the original idea, with new angles on the issue becoming visible (cf. Isaacs 1999). This relates to the findings of Millar and Curtis (1997) and Šūmane et al. (2018), who found that most learning occurs when expert and local knowledge meet. In this way, dialogues and joint learning created new ideas and motivation for further work.

In the interview excerpts concerning emerging ideas, references were made to relationships with others, suggesting this was an important element in the creation of new ideas. A researcher commented appreciatively on the sense of the "joy of discovery" when working with farmers and advisors, and a representative of a producer organisation pointed to "the long-term, close relationships and easy contact paths", reflecting a sincere appreciation of the relationships they had. This indicates that the quality of their relationships with other actors was a key element in the generation of new ideas, allowing for 'thinking together' (Isaacs 1999, p 6).

Enhancing resource access and operationalizing of results

Both cases were successful in finding further funding to continue the project and to deal with any emerging ideas in several spin-off projects. Project funding enabled field trials and lab experiments to be performed, which provided input for experiential learning in the groups. The feedback from the monitoring and evaluation of the trials contributed to a higher quality of social learning in the groups (Guijt and Proost 2002) and enabled new thoughts and ideas to emerge in dialogue. The ability to test emerging ideas deepened the learning dialogue between the parties around the issues.

One of the farmers reflected on the value of being involved in the field trials; the monetary compensation for the work was positive, but the real value lay in the use which the results could be put to. A representative for a producer organisation reflected on how the research findings were operationalized into a practical booklet for the organisation and its growers. In this way, the new learnings were operationalized into practical change.

Practical Implications

The cases illustrate how individual agency was shared with others through social learning, creating collective agency, a social structure that formed the basis for the further collaboration. From this, project set-up and applications could be formed, creating resources for experiential learning and monitoring and, in turn, enabling further learning, the creation of new ideas, and the operationalizing of results. This is to say that agricultural firms can gain innovative strength and find leverage through innovation support services by forming collective agency with key individuals in order to access the competence and resources of others. It also indicates how the development and maintenance of networks is a worthwhile pursuit for agricultural firms, even when time and resources may be scarce. For policymakers, the results suggest that funding is needed for services supporting the identified leverage points, e.g., providing network facilitation, guidance for social learning processes, and to enhance resources access and operationalization through project funding. This is related to several of the identified functions of ISS (Faure et al. 2019; Proietti and Cristiano 2022).

Theoretical Implications

The results of this study indicate that social learning, the forming of collective agency, the enhancement of resource access and the operationalizing of results enabled further learning and the creation of new ideas. These processes created the ability to maintain and develop the collaboration over time. The results suggest that a composition of leverage points (Meadows 1999) can provide deep potential impacts. It was the smaller but qualitatively important differences in how things were done that were found to alter behaviour and trajectories, in turn enabling larger change (Senge 2006).

This paper uses the notion of collective agency in a small group of individuals related to a specific agricultural innovation. While researchers were invited to share the original agency, over time, the sharing of agency became a reciprocal development. The results from the monitoring of trials also influenced and altered the collective agency, as the new findings were integrated and brought new goals and actions. This illustrates how the collective agency evolved together with the joint learning in the groups. This links with findings of how continuous learning contributes to a dynamic process of demand articulation (Kilelu et al. 2014), present in all stages of the innovation process (Faure et al. 2019).

Acknowledgements

The authors would like to thank the respondents for sharing their insights, and the Royal Swedish Agricultural Academy for supporting the participation at the ESEE conference.

References

Charmaz, K. (2006). *Constructing grounded theory,* London, Sage.

EU SCAR (2012). *Agricultural knowledge and innovation systems in transition - a reflection paper*. Brussels, European Commission.

Faure, G., Knierim, A., Koutsouris, A., Ndah, H. T., Audouin, S., Zarokosta, E., Wielinga, E., Triomphe, B., Mathé, S., Temple, L., et al. (2019). How to Strengthen Innovation Support Services in Agriculture with Regard to Multi-Stakeholder Approaches. *Journal of Innovation Economics,* 28**,** 145.

Fernandez-Wulff, P. (2019). Collective agency in the making: How social innovations in the food system practice democracy beyond consumption. *Politics and governance,* 7**,** 81-93.

Giddens, A. (1984). *The constitution of society: outline of the theory of structuration. ,* Cambridge, Polity Press.

Guijt, I. & Proost, J. (2002). Monitoring for social learning. In: Leeuwis, C. & Pyburn, R. (eds.) *Wheelbarrows full of frogs. Social learning in rural resource management.* Assen, Koninklijke Van Gorcum.

Isaacs, W. (1999). *Dialogue and the art of thinking together: a pioneering approach to communicating in business and in life.* New York, Currency.

Kilelu, C. W., Klerkx, L. & Leeuwis, C. (2014). How Dynamics of Learning are Linked to Innovation Support Services: Insights from a Smallholder Commercialization Project in Kenya. *The journal of agricultural education and extension,* 20**,** 213-232.

Klerkx, L. & Leeuwis, C. (2008). Matching demand and supply in the agricultural knowledge infrastructure: Experiences with innovation intermediaries. *Food Policy,* 33**,** 260-276.

Lam, D. P. M., Martín-López, B., Horcea-Milcu, A. I. & Lang, D. J. (2021). A leverage points perspective on social networks to understand sustainability transformations: evidence from Southern Transylvania. *Sustainability science,* 16**,** 809-826.

Leeuwis, C. & van den Ban, A. (2004). *Communication for Rural Innovation. Rethinking agricultural extension.* Blackwell Science.

Leonard-Barton, D. (1990). A Dual Methodology for Case Studies: Synergistic Use of a Longitudinal Single Site with Replicated Multiple Sites. *Organization Science,* 1**,** 248-266.

Meadows, D. (1999). *Leverage Points Places to Intervene in a System*. Hartland VT, USA, Sustainability Institute.

Millar, J. & Curtis, A. (1997). Moving farmer knowledge beyond the farm gate: An Australian study of farmer knowledge in group learning. *European Journal of Agricultural Education and Extension,* 4**,** 133-142.

Pahl-Wostl, C. (2006). The Importance of Social Learning in Restoring the Multifunctionality of Rivers and Floodplains. *Ecology and society,* 11**,** 10.

Pelenc, J., Bazile, D. & Ceruti, C. (2015). Collective capability and collective agency for sustainability: A case study. *Ecological economics,* 118**,** 226-239.

Proietti, P. & Cristiano, S. (2022). Innovation support services: an evidence-based exploration of their strategic roles in the Italian AKIS. *The journal of agricultural education and extension,* ahead-of-print**,** 1-21.

Senge, P. M. (2006). *The fifth discipline. The art and practice of the learning organisation.* New York, Crown Business.

Šūmane, S., Kunda, I., Knickel, K., Strauss, A., Tisenkopfs, T., Rios, I. D. I., Rivera, M., Chebach, T. & Ashkenazy, A. (2018). Local and farmers' knowledge matters! How integrating informal and formal knowledge enhances sustainable and resilient agriculture. *Journal of Rural Studies,* 59**,** 232-241.

Tailoring technical options: case studies of intangible and tangible supports in advisory approaches in West Africa

T. Bakker[1], T. Cheriere[2], A. Ganeme[3], H. Sawadogo[4], M. Adam[2], K. Descheemaeker[5]

[1]CIRAD, UMR Innovation, Montpellier, France
[2]CIRAD, UMR AGAP, Montpellier, France
[3]Université Joseph Ki-Zerbo, Laboratoire de Biologie et Ecologie Végétales (LaBEV, UFR/SVT), Ouagadougou, Burkina Faso
[4]Institut de l'Environnement et de Recherches Agricoles, Département Gestion des Ressources naturelles et Système de Production, Ouagadougou Burkina Faso
[5]Wageningen University, Plant Production Systems, Wageningen, The Netherlands

Short abstract

Purpose To support the sustainable development of smallholder farms, bridging the gap between generic scientific knowledge and local knowledge relevant to farmers' socio-ecological niches represents a challenge for advisory services. We explore two approaches supporting farmers in the tailoring of technical options to their own farm systems.

Design/Methodology/Approach We present two case studies in which farmers are supported in the adaptation of sustainable cropping practices and describe the mechanisms at play for the tailoring of technical options using the concept of tailoring effort.

Findings In the case of Farmer Field Schools (FFS), the tailoring occurs during discussions with the farmers, when the facilitator contextualizes technical options to suit farmers' expressed priorities and constraints. Each farmer can then choose what is relevant to their situation. In the case of crop models (CM), the tailoring happens when researchers parametrize the model as closely as possible to farmers' environments and practices, and then use simulation results in discussions with farmers.

Practical implications Possible complementarity between FFS and CM could be explored for advisory services. Advisors need to acquire the skills for collaboration with farmers and facilitation approaches that support the tailoring of generic knowledge to farmers' priorities and constraints.

Theoretical implications We highlight the importance of considering what is required from the different stakeholders to make the tailoring process to a socio-ecological niche effective, when supporting farmers in transition towards sustainable agricultural systems.

Extended abstract

Purpose

The transition of agricultural systems is tied to many issues related to environmental, social and economic sustainability, especially in sub-Saharan Africa (Côte et al. 2022). Several authors stressed the need for adaptation to local circumstances (Descheemaeker et al. 2019) in paradigms such as agroecology (Altieri 2002) or ecological and sustainable intensification (Doré et al. 2011). Indeed, diverse cropping and farming systems ask for site-, space- and time-specific management to increase ecosystem services delivery. However, uncertainties associated with the performances of agroecological practices may hinder their use by farmers. This calls for new ways to accompany locally relevant agricultural innovations (Duru et al. 2015). For farmers, the idea of an agroecological transition translates to the localized adaptation of agroecological principles to their own pedo-climatic and socio-economic constraints (Duru et al. 2015). Farmers should be at the centre of their transition process (Altieri 2002). Accompanying farmers in local adaptation of knowledge and practices is expected to generate credible, salient and legitimate results (Cash et al. 2003).
Moreover, especially in sub-Saharan Africa, smallholder farming is characterized by a large diversity of individual situations created by a multi-dimensional and multi-level socio-ecological context. In a reflection about the tailoring of options to local conditions, Descheemaeker et al. (2019) identified socioecological niches (Ojiem et al. 2006) as a concept incorporating the agro-ecological, socio-cultural, economic and institutional factors at various spatial and organizational levels.
However, within the agricultural innovation systems (Klerkx et al. 2012) in West Africa, advisory services face challenges linked to the quality of human resources delivering advice and the characteristics of the

advisory methods (Faure et al. 2011). In this context, which approaches are relevant to support farmers in the tailoring of technical options to their own farm systems?

Depending on the approach chosen by farmers and advisors, the efforts necessary for locally adapting generic knowledge may rely mostly on farmers or on advisors. Through "tailoring effort", we refer to the mental and communication efforts required for the clarification of the objectives and assessment criteria, the translation of generic scientific knowledge into relevant technical options, and the extraction of information, allowing the "customization" to individual needs and constraints.

We present two case studies of approaches aiming at accompanying farmers in the adaptation of their practices towards more sustainable cropping practices. We hypothesize that both case studies, relying on different processes for scientific knowledge contextualization, require different implication and tailoring efforts from farmers and advisors.

Design/Methodology/Approach

We use the distinction between advisory approaches based on tangible support objects (a plot, for example) and approaches based on intangible objects such as models or videos. We selected two case studies located in the cotton production area of West Africa, and conducted interviews with key stakeholders of the project and with participant farmers.

In northern Togo, we studied the use of Farmer Field Schools (FFS) from a project focusing on the degradation of arable land and the promotion of farm resilience through agroecological practices. The implementation of collaborative FFS, as described in Bakker et al. (2021), constitutes a tangible support for the advisory approach.

In Burkina Faso, the CLEMATIS project (2022-2023) aims at using models in co-learning approaches with farmers to assess the contribution of crop diversification to ecosystem services. A first step of the project explored the use of crop models as a tool to discuss changes that could be expected from practice changes in a given cropping system (Cheriere et al, in prep.). This approach based on a crop model (CM) constitutes the second case study.

Findings

a. Tangible support: collaborative Farmer Field Schools in northern Togo

Farmer Field Schools (FFS) are a participatory field-based extension approach that seek to support farmers' competences. FFS are best described as intensive, season-long programs in which farmers collectively experiment, observe and learn with a facilitator about a crop or topic of their choice (Davis 2006). The FFS field, with its different sub-plots each dedicated to a technical option, constitutes the tangible support on which groups of farmers meet routinely with a trained facilitator (technician or farmer) discuss and undergo experiential learning.

The case study in Togo focused on three FFS. By means of a description of the FFS implementation process, we identified that the tailoring occurs in the discussion with the FFS group, when the facilitator contextualizes technical options to suit the particular pedo-climatic condition of the FFS's field location and farmers' expressed priorities. Each farmer can then retain what is relevant for their own situation.

Two mechanisms for contextualizing generic knowledge are at play. First, farmers can choose the most suitable option for their own situation through examples from the FFS sub-plots, which harbors testing of a variety of technical options. Farmers are exposed to the technical options during activities (field visits, soil profile description…) occurring during the cropping season. The fact that the field is collective allows to test and take more risks than on farmers' own fields. Second, opportunities to contextualize knowledge stems from the facilitation during the FFS cycle, as the discussions taking place during the activities can give farmers information on what options might be the most suitable in their context. The facilitator's role is therefore to include all farmers (including women, poorer farmers etc) and discuss farmers' criteria on the technical options (e.g.: regarding labor or cash requirements at different cropping stages).

b. Intangible support: crop modeling with farmers in central Burkina Faso

The potential for the use of crop models (CM) for extension and education with smallholder farmers has been explored (Carberry et al. 2004). The CLEMATIS project was guided by the idea that crop models could be used to simulate a number of scenarios of change, contextualized to farmers' field environment and crop management practices, from which each farmer can select and discuss with the facilitator specific simulations that are relevant to them.

The first mechanism for contextualizing generic knowledge relied on crop models' intrinsic characteristics. They are built around generic scientific principles and offer the opportunity to define the environment and management of the virtual crop. CM parametrization aimed at being as close as possible to farmers' environments and practices; a group of farmers described 4 soil types they encountered in their fields, an average sorghum crop management and technical options to explore (3 organic amendments x 5 application rates).
The second mechanism relied on using simulation results to support discussions around the effects of technical options with farmers. Matching a simulated situation to the farmer's actual situation aimed at anchoring the discussion within the farmer's reality. From there, farmers were offered to explore the technical options of their choice. The facilitator's role was to present the effects of the technical option considered within the chosen context, commenting on relevant processes associated with practice's change effects and answering the farmer's questions.

Practical Implications

Despite the differences in mechanisms allowing the tailoring of generic scientific knowledge to farmers' context, FFS and CM approaches aim at generating a change in agricultural practices through the comprehension by farmers of agronomic interactions and mechanisms occurring within specific socio-ecological niches. FFS can touch on subjects ranging from crop management and cropping system scale all the way to farm level, and sometimes more integrative topics (Bakker et al. 2020). Whilst the CM used in Clematis was centered on the cropping scale, whether a modelling-based approach is adapted to various scales relies on appropriate model availability.
The differences between FFS and CM echo the tangible and intangible aspects of the two approaches. The physical nature of FFS means that the approach is constrained by the pedo-climatic characteristics of the FFS field and the duration of the project. The technical options (at the scale of practice in crop management and/or cropping system) that are displayed in the FFS field are however a true and tangible representation of a considered option. On the other hand, the abstract nature of CM outputs is reinforced by the virtual representation of processes in CM which are not an exact representation of reality. Nonetheless, CM offer the possibility to develop scenarios encompassing a wide variety of environment and management settings. These differences reveal the possible complementarity of FFS and CM that could be explored for advisory services. For example, CM approach could be used preliminarily to FFS in order to facilitate the selection of the technical options to be tested in the FFS field, or CM could be used to illustrate scenarios without increasing the number of plots implemented in the FFS field.
Additionally, we argue that FFS are more appropriate for the exploration of locally innovative practices or risky options for farmers because most results are palpable and can be directly assessed by farmers themselves, while CM outputs of an innovative practice that cannot be tied down to farmers' own experience may meet more mistrust. This last hypothesis may be challenged by the facilitator's ability to build trust in CM outputs and by mobilizing other complementary sources, notably using digital communication tools.
Both in FFS and CM, facilitation and participatory diagnostic phases are cornerstones of the tailoring process. Assisting farmers from the formulation of the problem to the interpretation and discussion of the results while letting farmers chose the main orientations of the project, aims at insuring legitimacy and saliency of the results. The practical implication is that advisors need to acquire the necessary skills (such as interpersonal communication skills, discussion and collaboration with farmers, pedagogy) for collaborative facilitation approaches that support the tailoring of generic knowledge to farmers' priorities and constraints.

Theoretical Implications

Our comparison of approaches highlights the importance of considering the different steps in the tailoring process and what is required from the different stakeholders to make this tailoring process effective. It asks the question of whether a disproportionate tailoring effort expected from farmers affects their adaptation of a practice. FFS's field environment may not correspond to farmers' fields environments, thus extra tailoring efforts remain for farmers in adapting FFS's learnings to their context. CM's outputs were designed to match as much as possible farmers' own system and reducing the number of extra steps necessary to tune the technical option to farmers' context, but using CM requires building trust. Ultimately, farmers remain the ones in charge and bear the risks when trying a new practice. Nonetheless, the nature of the information (tangible and intangible) may affect the remaining efforts for the adaptation of the technical option, especially considering the fact that farmers tend to experiment and validate in their fields a technical option before using them at large scale (Hansson S. 2019; Catalogna et al. 2018). A research perspective would be to investigate how considering the tailoring effort in the design of advisory services can help support farmers in the transition toward more sustainable farming systems, and how combined use of tangible and intangible support objects can be explored for this purpose.

References

Altieri MA (2002) Agroecology: the science of natural resource management for poor farmers in marginal environments. Agriculture, Ecosystems & Environment 93:1–24. https://doi.org/10.1016/S0167-8809(02)00085-3

Bakker T, Blundo Canto G, Dugué P, de Tourdonnet S (2020) To what extent is the diversity of farmer field Schools reflected in their assessment? A literature review. The Journal of Agricultural Education and Extension 1–21. https://doi.org/10.1080/1389224X.2020.1858890

Bakker T, Dugué P, de Tourdonnet S (2021) Assessing the effects of Farmer Field Schools on farmers' trajectories of change in practices. Agron Sustain Dev 15. https://doi.org/10.1007/s13593-021-00667-2

Carberry P, Gladwin C, Twomlow S (2004) Linking Simulation Modelling to Participatory Research in Smallholder Farming Systems. ACIAR PROCEEDINGS 32-46.

Cash D, Clark W, Alcock F, et al (2003) Knowledge systems for sustainable development. Proceedings of the National Academy of Sciences 14:8086-8091. https://doi.org/10.1073/pnas.1231332100.

Catalogna M, Dubois M, Navarrete M (2018) Diversity of experimentation by farmers engaged in agroecology. Agron Sustain Dev 38:50. https://doi.org/10.1007/s13593-018-0526-2

Cheriere T, Ganeme A, Lairez J, et al (in prep) Lessons from the use of a crop model in participatory approaches with farmers.

Côte FX, Rapidel B, Sourisseau JM, et al (2022) Levers for the agroecological transition of tropical agriculture. Agron Sustain Dev 42:67. https://doi.org/10.1007/s13593-022-00799-z

Davis K (2006) Farmer Field Schools: A Boon or Bust for Extension in Africa? Journal of International Agricultural and Extension Education 13:. https://doi.org/10.5191/jiaee.2006.13109

Descheemaeker K, Ronner E, Ollenburger M, et al (2019) Which options fit best? Operationalizing the socio-ecological niche concept. Experimental Agriculture 55:169–190. https://doi.org/10.1017/S001447971600048X

Doré T, Makowski D, Malézieux E, et al (2011) Facing up to the paradigm of ecological intensification in agronomy: Revisiting methods, concepts and knowledge. European Journal of Agronomy 34:197–210. https://doi.org/10.1016/j.eja.2011.02.006

Duru M, Therond O, Fares M (2015) Designing agroecological transitions; A review. Agronomy for Sustainable Development 35:1237–1257. https://doi.org/10.1007/s13593-015-0318-x

Faure G, Rebuffel P, Violas D (2011) Systemic Evaluation of Advisory Services to Family Farms in West Africa. The Journal of Agricultural Education and Extension 17:325–339. https://doi.org/10.1080/1389224X.2011.576821

Hansson S (2019) Farmers' experiments and scientific methodology. European Journal for Philosophy of Science 9: 32. https://doi.org/10.1007/s13194-019-0255-7

Klerkx L, van Mierlo B, Leeuwis C (2012) Evolution of systems approaches to agricultural innovation: concepts, analysis and interventions. In: Darnhofer I, Gibbon D, Dedieu B (eds) Farming Systems Research into the 21st Century: The New Dynamic. Springer Netherlands, Dordrecht, pp 457–483

From practice-based evidence to evidence-based practice: how to close the loop?

Nicolas Giraud[1], Hélène Brives[2], Laurent Hazard[3]
[1] Chambre d'agriculture de l'Aude, 11878 Trèbes, France
[2] ISARA-Lyon, 69364 Lyon, France
[3] UMR AGIR, Univ Toulouse, INRAE, 31320 Castanet-Tolosan, France

Short abstract

Agroecology not only requires changes in practice but also for the redesign of agricultural extension and innovation pathways. Farmer's experience and innovative farming groups are placed at the foreground to produce inspiring evidence. Identifying or developing innovative practices experienced by farmers, capitalizing on this experience, and promoting the deployment of these innovations by relying on farmer groups is a strategy currently being implemented in France to develop agroecology. For extension and advisory services, basing advice to farmers on situated evidence entail challenging tasks in examining and evaluating evidence. In this paper, we examine how EAS implement this new approach through an analysis of the changes in the professional activities, postures, and skills of advisors/facilitators. To address these questions, a generative experiment started officially in October 2022 in a dialogical way between a pragmatic inquiry and NG's professional activity. An action-research project was designed based on what was asked to NG by its employer, i.e. to capitalize practice-based evidence to support evidence-based practices. We argue that capitalizing on-farm innovations is a new encompassing narrative leading to professional uncertainty. It seems to be a way for advisors/facilitators and their institutions to be accountable. Finally, the implementation of horizontal learning challenges advisors/facilitators professionalism through the need to better combine technical expertise with facilitation skills.

Extended abstract

Purpose

The industrial model of agricultural modernization is now considered unsustainable (Altieri 1998; Gomiero et al 2011). Agroecology is proposed as an alternative to develop a sustainable agriculture (Altieri 1989; Gliessman 1998). Such a transition is complex for farmers since agroecology calls for the reintegration of natural elements within production systems and leads to an increase in uncertainty (Meynard et al 2012; Duru et al 2015). The challenge is to shift from an input-intensive to a knowledge-intensive agriculture that values local ecological potential (Röling and Jiggins 1994; Duru et al 2015; Thomas 2018; Hazard et al 2019). Sustainable production systems must be adapted to each specific context (Hazard et al 2019). These new goals call for the redesign of agricultural extension and innovation pathways (Compagnone et al 2018; Coquil et al 2018). Local expertise and farmers' experience are required to promote grassroot innovation (Faure et al 2018; Salembier et al 2021). If the way of producing evidence on farm is at stake (Hazard et al 2019), how this evidence can fuel agroecological transition is the other side of the same coin (Caniglia et al 2017).

For extension and advisory services (EAS), basing advice to farmers on evidence entail challenging tasks in examining and evaluating evidence. Historically, agricultural advisors have used in their work evidence built on scientific studies (Brunier, 2018). The success of such evidence based on generic knowledge has been possible thanks to the artificialization and standardization of production environments that favor the expression of the expected effects. Agroecology, by enhancing the singularity of production environments, poses the double problem of de- and re-contextualisation when evidence is produced in a singular context and used in another singular context (Ansell and Bartenberger, 2016). This problem leads to an epistemological questioning on the nature of knowledge (Nygren 1999; Girard 2014). Indeed, the evidence-based approach fits well with an epistemology of possession (Cook and Brown 1999): knowledge can be made explicit, written down and thus propagated and reused independently of those who produce it. This operation of capitalization is less obvious with evidence built on practice. According to the epistemology of practice, knowledge is experiential, constructed and transmitted in action (Cook and Brown 1999).

Capitalization, in this case, operates through experience exchanges, social learning and collective action. As experienced in medicine, policy and education (Biesta 2007, 2010; Laurent et al 2009), building an evidence-based practice strategy based on practices that work in the farm calls for a disruptive epistemological shift from possession to practice for advisory practice. In this article, we question how practice-based evidence for evidence-based practice (Hazard et al 2019) can be implemented and updated by agricultural advisors to help farmers make their own transition path.

Identifying or developing innovative practices experienced by farmers, capitalizing on this experience, and promoting the deployment of these innovations by relying on farmer groups is a strategy currently being implemented in France to develop agroecology (MAAF 2016; Thomas 2018). How spotlighting farming groups and capitalizing their experience can constitute the required paradigm shift to foster agroecology is yet to be explored. In this paper, we examine how EAS implement this new approach through an analysis of the changes in the professional activities, postures, and skills of advisors/facilitators. We aim at describing how this new political context may entail power relationships within the AKIS through an attempt to identify transformations occurring on the professionalism of advisors/facilitators.

Design/Methodology/Approach

The work and reflection tracks presented in this article emerged from a problematic professional situation. This situation came up as one of the authors (NG) got hired as a project manager in charge of innovation, research and development (IRD) in the agricultural chamber of Aude in the South of France, one of the 13 counties of the Occitanie region. He integrated a larger group of 13 agents which are called IRD referents. This group is coordinated by a regional facilitator of the regional agricultural chamber of Occitanie (CRAO) in charge of implementing national guidelines and priorities operationally. Oriented by the Agroecological Project for France (MAAF 2016) and framed by the National Program for Agricultural and Rural Development (PNDAR), NG's job is to facilitate the identification/detection, the capitalization and the transfer of on-farm innovations. Wherein, the logic of valorizing professional knowledge is quite strong. He rapidly faced difficulties and realized that the capitalization on farmers' experience was not self-evident. Interacting primarily with advisors facilitating innovative farming groups (who we are calling advisors/facilitators here), he did not know what nor how to do to support the capitalization of local experiences.

Looking for scientific support, NG approached his current supervisors (L. Hazard and H. Brives). Together, they designed an action-research project based on what was asked to NG by its employer (Dulcire et al 2018), i.e. to capitalize practice-based evidences to support evidence-based practices. A generative experiment started officially in October 2022 in a dialogical way between a pragmatic inquiry and a professional activity (Ansell and Bartenberger 2016). This double stance contributes to an original project which is process-oriented and making place to actor's reflexivity and learning (Miller 2013; Dulcire et al 2018). We believe it can lead to the (re)building of locally-adapted solutions for identifying and capitalizing experiential knowledge. Ultimately, the goal is to better accompany change towards agroecology through the implementation of practice-based evidence as part of an evidence-based approach.

The research inquiry is build in three phases : problem exploration, participatory observation and intervention. Yet, these phases are conducted in a dialogical way allowing the researcher to pursuing his professional activity while fueling the research project with relevant material. The overall purpose of the problem exploration is to better understand the device philosophy (how it was conceptualized and equipped) and its relation with the reality of the tools (what it makes the advisors do). The second phase aim at following the pathway and the different events that leads to an evidence and how this evidence returns to action. Finally, the intervention phase has more practical implications and calls for a reflexive and practical dialogue, i.e. a trial and error approach until it works, between the utilization of capitalization tools and their concrete effects on advisors professional activities and farmers' change of practice toward agroecology. In this article, we present preliminary results of the investigation phase making good use of ethnographic methods such as participatory observation (since October 2021 until now), exploratory interviews (n=9) and focus groups (n=4).

Findings

Capitalizing on-farm innovation, a new encompassing narrative leading to professional uncertainty

The main trigger of this inquiry constitutes a result in itself. We found that the capitalization of farmer's successes as practice-based evidence to produce proven knowledge is not clearly documented. For various actors involved in the agroecological transition such as advisors/facilitators, their managers and regional coordinators directly or indirectly related to policy making, definitions of capitalization overlap in many ways. Innovation – whatever it may be, i.e. an information, a data, a practice, an experience – has to be identified, capitalized and then transferred. The process of transforming a result into useful and actionable knowledge is called capitalization. It should inspire

Capitalizing on-farm innovation for advisers/facilitators and their institutions to be accountable

The command of capitalizing practice-based evidence to produce evidence-based practices is at first sight political. We argue that the capitalization device aims first and foremost to justify field work done by advisors/facilitators. Influenced by policy goals where quantifiable indicators predominate, this device creates tools that facilitate the uprise of field data by advisors/facilitators. Rather than being oriented towards local actors and especially farmers, capitalization is oriented towards the top. If this new narrative brings to light field innovation by farmers, it may also make advisors/facilitators work invisible. This is probably why new jobs/professions (transversal project facilitators), as NG's position, are being offered within EAS organizations such as the agricultural chambers. Indeed, for managers of advisors/facilitators, capitalizing on advisors/facilitators on-farm projects is a way to valorise their work and expertise. That being said, we believe that this may also be a strategy to face the decrease in public funding and seek for always more competitive money.

Capitalizing on-farm innovation challenges professional norms

A necessity to find the balance between extraction and inputs?

Identifying/tracking innovation from farmers that are called "pioneers", "innovative", "early adopters" - which are often the ones taking part in innovative farming groups - is therefore at the forefront of the capitalization device. It is a prerequisite to capitalize something. The logic of capitalization can thus be understood as an extraction and appropriation of farmer's knowledge by the advisors/facilitators leading to ethical issues. Moreover, advisors/facilitators are still in the logic of "bringing something" to the farmers based on their own expertise. Here, instead of bringing something to farmers, they are rather compelled to taking something from them. Hence, some advisors/facilitators may lose meaning and the sense of their work.

"What am I?" Combining technical expertise and facilitation/capitalization skills is challenging

This new expectation to capitalize as many as possible field experiences put both transversal project managers and field advisors/facilitators in an uncomfortable position. We hypothesise that it has it has more to do with what they want to do (goal/value-related, in what they find meaning) than with what they can do, although their skills are also clearly at stake. With this injunction to capitalize on their local experience, they now more than ever have to show/bring to light their achievements. Their professional norms are questioned: the definition of a job well done, making sense of this work, etc. In fact, it seems to redefine their jobs and professional identities. For many advisors/facilitators but also for transversal project managers, being on the field with farmers makes more sense and brings more recognition than staying behind a desk (and being held accountable). Willing to become advisors with a certain level of technique (a niche expertise), they also need to become capitalizing facilitators. If the promotion of collective approaches enables the implementation of horizontal learning, it challenges advisors/facilitators professionalism because they need to better combine technical expertise with facilitation and capitalization skills.

"It's not my job!" The gap between political expectations and the reality of what is intended by advisors/facilitators

The tension may be found there where a majority is fed up with filling Excel sheets and where a lot of advisors/facilitators believe it is not their job to do this, especially because it pulls them far from the field and reduce their proximity to farmers. Indeed, capitalization is often understood as being communication, i.e. public relations or marketing. As a result, advisors/facilitators wishing to develop

a technical expertise that contributes to their recognition is jeopardized by the time devoted to this imposed activity of group facilitation while meeting the capitalization requirements. The capitalization device is hence equipped with new human resources - i.e. transversal project managers - whose primary mission is to capitalize to promote the skills development of advisors/facilitators. Procedures, tutorials and guides/manual are objects taking inventory of ways to facilitate farming groups and capitalizing on their experiences. Thereby, the creation of facilitation and capitalization tool boxes constitutes a way to accumulate actionable knowledge, i.e. capitalization/facilitation know-hows for advisors/facilitators.

From capitalization to capacity building for agroecology?

In search for meaning, advisors/facilitators discussed the next step: what comes after experiential knowledge is capitalized? Is this capitalisation enough for agroecology scaling out? For many, capitalizing of farming groups experiences is important but this should not be done at the expense of more personalized advice that allows for more concrete support for change. Yet, individual advicing – also considered prescriptive and vertical - tends to lose legitimacy by policy-making spheres but also organizations seen as alternatives from the Chambers. But if the individual support constitutes the final push to get farmers to take the plunge, it argues for a better articulation of collective and individual approaches.

Theoretical and Practical Implications

Our project has related theoretical and practical implications. We have to deal with the multidimensional reality of local knowledge and the heterogeneous ways of knowing "in which diverse cultural, environmental, economic and socio-political factors intersect" (Nygren 1999: p. 282). Is it possible and how to extract and transpose knowledge from one situation to another? How to articulate an epistemology of possession to an epistemology of practice? How does this paradigm shift, in which advisors are now asked to build evidence on farmers' experience in order to advise and accompany them, redefine their profession?

References

Altieri, M. A. (1989). Agroecology: A new research and development paradigm for world agriculture. Agriculture, Ecosystems & Environment, 27(1-4), 37-46.

Altieri, M. A. (1998). Ecological impacts of industrial agriculture and the possibilities for truly sustainable farming. Monthly Review, 50(3), 60.

Ansell, C. K., & Bartenberger, M. (2016). Varieties of experimentalism. Ecological Economics, 130, 64-73.

Biesta, G. (2007). Why "what works" won't work: Evidence-based practice and the democratic deficit in educational research. Educational theory, 57(1), 1-22.

Biesta, G. J. (2010). Why 'what works' still won't work: From evidence-based education to value-based education. Studies in philosophy and education, 29, 491-503.

Brunier, S. (2018). Le bonheur dans la modernité: Conseillers agricoles et agriculteurs (1945-1985). ENS éditions.

Caniglia, G., Schäpke, N., Lang, D. J., Abson, D. J., Luederitz, C., Wiek, A., ... & von Wehrden, H. (2017). Experiments and evidence in sustainability science: A typology. Journal of Cleaner Production, 169, 39-47.

Compagnone, C., Lamine, C., & Dupré, L. (2018). La production et la circulation des connaissances en agriculture interrogées par l'agro-écologie. De l'ancien et du nouveau. Revue d'anthropologie des connaissances, 12(12-2).

Cook, S. D., & Brown, J. S. (1999). Bridging epistemologies: The generative dance between organizational knowledge and organizational knowing. Organization science, 10(4), 381-400.

Coquil, X., Cerf, M., Auricoste, C., Joannon, A., Barcellini, F., Cayre, P., ... & Prost, L. (2018). Questioning the work of farmers, advisors, teachers and researchers in agro-ecological transition. A review. Agronomy for Sustainable Development, 38, 1-12.

Dulcire, M., Chia, E., Sibelet, N., Sierra, Z., Sito, L., & Paturel, D. (2018). Recherche-action en partenariat et innovation émancipatrice. Innovation et développement dans les systèmes agricoles et alimentaires. Versailles: Quae, 139-150.

Duru, M., Therond, O., Martin, G., Martin-Clouaire, R., Magne, M. A., Justes, E., ... & Sarthou, J. P. (2015). How to implement biodiversity-based agriculture to enhance ecosystem services: a review. Agronomy for sustainable development, 35, 1259-1281.

Faure, G., Chiffoleau, Y., Goulet, F., Temple, L., & Touzard, J. M. (2018). Innovation et développement dans les systèmes agricoles et alimentaires (p. 260). éditions Quae.

Girard, N. (2014). Quels sont les nouveaux enjeux de gestion des connaissances. L'exemple de la. Gliessman, S. R., Engles, E., & Krieger, R. (1998). Agroecology: ecological processes in sustainable agriculture. CRC press.

Gomiero, T., Pimentel, D., & Paoletti, M. G. (2011). Environmental impact of different agricultural management practices: conventional vs. organic agriculture. Critical reviews in plant sciences, 30(1-2), 95-124.

Hazard, L., Couix, N., & Lacombe, C. (2022). From evidence to value-based transition: the agroecological redesign of farming systems. Agriculture and Human Values, 39(1), 405-416.

Laurent 1, C., Baudry 2, J., Berriet-Solliec 3, M., Kirsch 4, M., Perraud 5, D., Tinel 6, B., ... & Ricroch 13, A. (2009). Pourquoi s' intéresser à la notion d'«evidence-based policy»?. Revue Tiers Monde, (4), 853-873.
Extended Abstract for the 26th ESEE conference

Luederitz, C., Schäpke, N., Wiek, A., Lang, D. J., Bergmann, M., Bos, J. J., ... & Westley, F. R. (2017). Learning through evaluation–A tentative evaluative scheme for sustainability transition experiments. Journal of Cleaner Production, 169, 61-76.

MAAF (French ministry of agriculture, agrifood and forestry) (2016) The agroecology project in France. https://agriculture.gouv. fr/sites/minagri/files/1604-aec-aeenfrance-dep-gb-bd1.pdf. Accessed 24 Apr 2022

Meynard, J. M. J. (2012). La reconception est en marche! Conclusion au Colloque «Vers des systèmes de culture innovants et performants: De la théorie à la pratique pour concevoir, piloter, évaluer, conseiller et former». Innovations agronomiques, 20, 143-153.

Miller, T. R. (2013). Constructing sustainability science: emerging perspectives and research trajectories. Sustainability science, 8, 279-293.

Nygren, A. (1999). Local knowledge in the environment–development discourse: From dichotomies to situated knowledges. Critique of anthropology, 19(3), 267-288.

Röling, N. G., & Jiggins, J. L. S. (1994). Policy paradigm for sustainable farming. European Journal of Agricultural Education and Extension, 1(1), 23-43.

Salembier, C., Segrestin, B., Weil, B., Jeuffroy, M. H., Cadoux, S., Cros, C., ... & Meynard, J. M. (2021). A theoretical framework for tracking farmers' innovations to support farming system design. Agronomy for Sustainable Development, 41(5), 61.

Thomas, J. (2018). Reconnaissance politique des savoirs professionnels. Expérimentation, légitimation, réflexivité et organisation d'un groupe d'agriculteurs autour des connaissances professionnelles. Revue d'anthropologie des connaissances, 12(12-2).

Thomas, J. (2018). Discourses on sustainability in the French farming sector: The redefinition of a consensual and knowledge-intensive 'agroecology'. In Contested Sustainability Discourses in the Agrifood System (pp. 146-162). Routledge.

Understanding anchoring processes in crop diversification initiatives: A middle-range conceptual model

Lenn Gorissen[a,b], Margot Leclère[c], Mirjam Schoonhoven-Speijer[c], Walter A.H. Rossing[b]

[a] University of Twente, Section of Knowledge, Transformation & Society (KiTeS), Netherlands
[b] Wageningen University and Research, Farming Systems Ecology Group (FSE), Netherlands
[c] Université Paris-Saclay, INRAE, AgroParisTech, Paris, France

Short abstract

The Horizon 2020 DiverIMPACTS project contributed for five years (2017-2022) to the ongoing process of crop diversification in European agriculture through 25 Case Studies (CSs). The project aimed to develop the technological and institutional conditions for crop diversification by using a structured governance approach to innovation management. This study evaluated the anchoring of crop diversification novelties by the CSs and the means and mechanisms by which this was achieved, arriving at a middle-range theory of anchoring processes. Anchoring is the process in which a novelty becomes newly connected or connected more firmly to a niche or a regime. The authors collected learning histories of six representative CSs and analysed them in terms of three forms of anchoring by qualitative case study methodology, drawing on concepts from realist evaluation. From each learning history, context-mechanism-anchoring outcome sequences were derived by tracing the activities reported by the CSs. Network anchoring was the most frequently occurring form of anchoring, followed by technological anchoring, while institutional anchoring occurred least often. The results highlight the importance of social capital and social learning as key mechanisms in the anchoring process of crop diversification novelties in European agriculture.

Extended abstract

Purpose

Sustainability transitions are urgently needed to fundamentally redress the negative impact of human activities on the social and biophysical environment. Ecological intensification of agricultural production systems has been proposed as a key component of sustainability transitions in food systems (e.g. Tittonell et al., 2016). The concept emphasises the use of natural functionalities of ecosystems to support the provision of a variety of ecosystem services by agricultural production systems. These technological changes are associated with systemic reorientation of the socio-technical systems in which agricultural production takes place. Increasingly, scientists become engaged in initiatives in which such transformative change is aspired, and questions arise about the way in which scientific knowledge can be combined with knowledge of societal actors through activities that effectuate change 'on the ground'.

Middle-range theories are conceptual frameworks that abstract from practical experiences to arrive at theoretical concepts that are sufficiently generic to be applied in other contexts while catering to day to day concerns of practitioners. By developing middle-range theories, researchers can provide practical insights for change-project managers into how sustainability transitions can be achieved in practice.

Elzen et al.'s (2012) anchoring concept is a useful conceptual lens that can be used to start building a practical theory of change for sustainability transitions. The anchoring concept refers to the process in which a novelty becomes newly connected, connected in a new way, or more firmly connected to the niche or the regime. Developing such a middle-range theory on crop diversification is the aim of this paper.

Design/Methodology/Approach

The research is based on critical realist approaches to social research and program evaluation research (Maxwell, 2012; Pawson & Tilley, 1997). The study focuses on how a particular CS brought about institutional, organisational, and/or technical innovations in agricultural systems, using realist evaluation to disentangle complex causality patterns. Realist evaluation is a subfield of evaluation research that traces its roots to critical realism and is concerned with causal questions in complex systems. Causal mechanisms play a central role in critical realism and realist evaluation, as they interact with the context to produce outcomes that can be directly experienced and empirically measured (Astbury & Leeuw, 2010; Hoffecker, 2021). Identifying mechanisms helps to understand how program features bring about consistent types of changes, and these C (Context) – M (Mechanism) - O (Outcome) configurations can be analysed based on the actions and assessments of actors in a change-oriented research program such as DiverIMPACTS.

We employed a cross-case analysis (Yin, 2018) of six DiverIMPACTS CSs. The approach involved studying individual cases and comparing them to develop a middle-range of innovation processes, which is more detailed than the high-level theories on societal transitions. By analysing each CS holistically rather than focusing on specific activities or methods, we aimed to maintain the internal logic of each CS and connect it to outcomes.

To collect data, we used the Learning History tool, which enabled CS teams to describe the most significant events (MSEs) in their CSs over time and categorise them into one or more of 11 innovation activity categories. Next, the CSs were asked to attribute effects to each MSE, and the strength of the effect was expressed in a score between 1 and 5.

To analyse the data, we began by closely reading the Learning History accounts and classifying each MSE and its effects using the Context-Mechanism-Outcome (CMO) analytical framework. We then identified the three anchoring mechanisms (social learning, empowerment, and social capital) that were most frequently associated with the MSEs and represented these patterns using Sankey diagrams. Finally, we compared the CSs in terms of the relative shares of these three major mechanisms using a ternary diagram.
Throughout the analysis, results were discussed between the researchers to ensure consistency. By employing this comparative approach, we were able to develop a more detailed understanding of the innovation processes at work in each CS and to identify patterns that may be relevant to other innovation projects. Figure 1 gives a comprehensive overview of the methodological steps followed in the research.

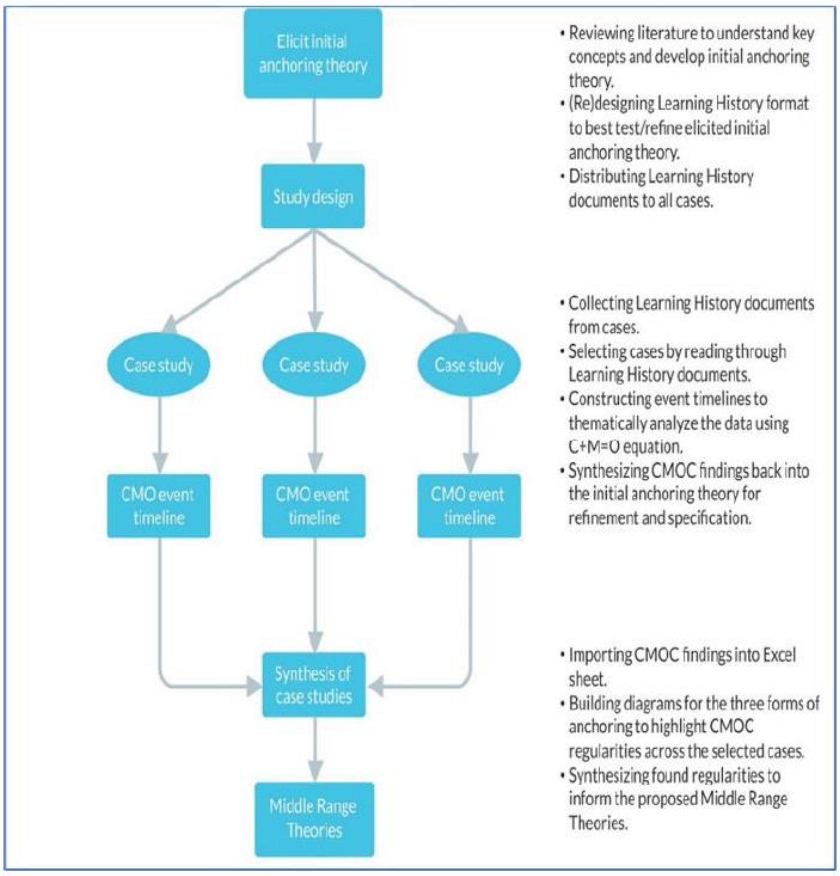


Fig. 1. Methodological steps followed in the research.

Findings

Our research findings indicate that network anchoring was the predominant form of anchoring in the CSs, followed by technological and, to a lesser extent, institutional anchoring. This suggests that, at this stage of development, building a network capable of supporting crop diversification was crucial.

Our analysis identified several instances of technological anchoring. These findings suggest that crop diversification had already reached a degree of maturity that enabled CS actors to develop networks around the novelty.

Interestingly, institutional anchoring remained scarce and primarily limited to cognitive institutional anchoring, with minor evidence of economic or normative institutional anchoring. Future developments in the CSs will show whether institutional anchoring will become more prominent in subsequent phases.

Among the three anchoring mechanisms, social learning, empowerment, and social capital, we found that social capital was the dominant mechanism associated with network anchoring, while social learning stood out for technological anchoring. Surprisingly, we found that empowerment was triggered significantly less than the other two mechanisms, potentially due to the Covid-19 pandemic's two-year lockdown of CS activities, hindering direct and informal interactions among actors in the CSs. Other factors, such as a lack of project entrepreneurship, may have also contributed to this result.

In conclusion, our research highlights the importance of network anchoring in crop diversification within the DiverIMPACTS project context, with social capital playing a critical role. While technological anchoring was also prevalent, institutional anchoring remained limited. Our findings underscore the need for future research into the role of empowerment in anchoring.

Practical Implications

The practical implications of this research are several. Firstly, the findings suggest that building networks is crucial for successfully implementing crop diversification. Attention to networking activities in projects and the selection of networks for engagement in projects are thus called for. Secondly, the study highlights the importance of social capital and social learning as mechanisms for anchoring crop diversification. In projects where researchers and societal actors join forces to bring about change, attention for triggering these mechanisms goes beyond classical project designs where actors are considered as data providers for scientists. Thirdly, the limited evidence of institutional anchoring implies that there may be a need to prioritise institutionalisation efforts to support the long-term permanence of crop diversification initiatives.

Finally, the results emphasise the need for project leaders and CS leaders to engage in the acquisition of extra resources or leverage support from institutions to promote empowerment and support the development of sustainable agricultural practices.

Theoretical Implications

Firstly, the study provides empirical evidence for the usefulness of Elzen et al.'s (2012) framework on anchoring in the analysis of sustainability initiatives and highlights the importance of distinguishing between different forms of anchoring. Secondly, the mechanisms of social learning and social capital constituted important factors in anchoring crop diversification, which may have broader implications for understanding the process of sustainable agricultural innovation and diffusion. Questions arose around the role of empowerment, with lack of social contact due to Covid-19 as a confounding factor. Thirdly, the study highlights the need to consider the role of networks in promoting sustainability transitions and suggests that network-building activities may be key to the successful implementation of sustainable innovations. Finally, the research emphasises the need to consider the institutional context in promoting sustainability transitions.

References

Astbury, B., Leeuw, F.L., 2010. Unpacking Black Boxes: Mechanisms and Theory Building in Evaluation. Am. J. Eval. 31, 363–381. https://doi.org/10.1177/1098214010371972

Elzen, B., Van Mierlo, B., Leeuwis, C., 2012. Anchoring of innovations: Assessing Dutch efforts to harvest energy from glasshouses. Environ. Innov. Soc. Transitions 5, 1–18. https://doi.org/10.1016/j.eist.2012.10.006

Hoffecker, E., 2021. Understanding inclusive innovation processes in agricultural systems: A middle-range conceptual model. World Dev. 140, 105382. https://doi.org/10.1016/j.worlddev.2020.105382

Maxwell, J., 2012. A realist approach for qualitative research. Sage, Thousand Oaks.

Pawson, Tilley, N., 1997. Realist evaluation. Sage, London.

Tittonell, P., Klerkx, L., Baudron, F., Félix, G. F., Ruggia, A., Apeldoorn, D. Van, Dogliotti, S., Mapfumo, P., Rossing, W. A. H. 2016. Ecological Intensification: Local Innovation to Address Global Challenges. In: Lichtfouse, E. (eds) Sustainable Agriculture Reviews. Sustainable Agriculture Reviews, vol 19. Springer, Cham. https://doi.org/10.1007/978-3-319-26777-7_1

Yin, R.K., 2018. Case study research and applications: design and methods (6th edition). Sage, Thousand Oaks.

Evaluating co-innovation as complexity-aware project governance: creating space for agricultural transformation within Horizon 2020 project DiverIMPACTS

Mirjam Schoonhoven-Speijer[a*], Walter A.H. Rossing[a], Elizabeth Hoffecker[c], Julie Ingram[d], Boru Douthwaite[e], Antoine Messéan[b], Margot Leclère[a,b]

[a] Farming Systems Ecology Group, Wageningen University and Research, Wageningen, The Netherlands
[b] Université Paris-Saclay, INRAE, AgroParisTech, Paris, France
[c] Sociotechnical Systems Research Center, Massachusetts Institute of Technology, Cambridge, United States
[d] Countryside and Community Research Institute, University of Gloucestershire, United Kingdom
[e] Selkie Consulting Ltd., Cushalogurt, Kilmeena, Westport, Co. Mayo, Ireland
* Corresponding author

Short abstract

How can transformative knowledge available at research institutes find its way to actors in the food system? Co-innovation – jointly identifying systemic problems and co-creating potential solutions through collective learning processes – is an often applied set-up in research projects to foster transformation. These projects form 'multi-actor' environments where actors across research institutes and disciplines cooperate to bring about change. Studies evaluating co-innovation mainly focus on the influence of multi-actor partnerships on the outcomes of co-innovation processes. However, how co-innovation is carried out in practice is little evaluated. In this paper, we address this gap by evaluating co-innovation as a form of multi-actor project governance. We developed an evaluation framework drawing on realist evaluation and taking 'creating transformative space' as outcome of co-innovative project governance. Realist evaluation is in line with 'complexity-aware' evaluation approaches, necessary in evaluating a project addressing change in complex adaptive systems. We tested and adjusted our framework using the Horizon 2020 project DiverIMPACTS on crop diversification as a case study. The study lays emphasis on the importance of evaluating complexity-aware project governance and provides a framework to build upon in future evaluations. Results have lessons for appropriate tools and methodologies of co-innovation for collaborative, participative and transdisciplinary learning.

Extended abstract

Purpose

Agricultural systems are facing large challenges around sustainability, climate change and biodiversity, requiring transformative changes. How can transformative knowledge available at research institutes find its way to actors in the food system? Over the last decades, there have been several shifts in this respect. First, a linear approach of knowledge transfers has made way for co-innovative approaches, where researchers and actors in food systems cooperate in participatory and transdisciplinary ways to foster transitions (Leeuwis & Aarts, 2011). Co-innovation implies jointly identifying systemic problems and co-creating potential solutions through collective learning processes (Dogliotti et al., 2014), and currently dominates agricultural innovation policy discourse (Fieldsend et al., 2020). The goal of these approaches is to produce 'actionable knowledge', which is the translation of scientific knowledge to context-specific knowledge, usable in sustainability transitions (Rossing et al., 2021). Second, the so-called 'projectification' of research. During the last 20 years, the 'project' has become a key form of contemporary governance and policy implementation (Fieldsend et al., 2020). In this way, a project functions as an intermediary between research institutes and actors in the agricultural system, and as main vehicle for the implementation of co-innovation approaches. Projects form a 'multi-actor' environment where actors across several research institutes and disciplines are cooperating to bring about change. Notably, being 'multi-actor' has become a requirement for EU funded projects (Cronin et al., 2022).

Given the widespread occurrence of the term co-innovation, and multi-actor collaborations being made a prerequisite under European funding programs (i.e. Horizon 2020 and Horizon Europe), it is notable that *how co-innovation is carried out in practice* has been little evaluated. There is a growing body of literature reviewing the functioning of multi-actor collaborations for co-innovation (e.g. Cronin et al., 2022; Feo et al., 2022; Fieldsend et al., 2020), using large datasets, with a strong focus on the functioning of partnerships and how these enhance or constrain the outcomes of co-innovation processes. However, there is less attention for how co-innovation is used as methodology for producing actionable knowledge (Ingram et al., 2020; Rossing et al., 2021). In other words, how is co-innovation enacted in practice? And what factors determine whether co-innovation as project governance can contribute to agricultural transformation? With this paper, we address this gap by evaluating co-innovation as a form of multi-actor project governance, and defining the outcome of co-innovation as 'creating space for agricultural transformation'. The aim of the paper is two-fold: to develop an evaluation framework, and to test this using the Horizon 2020 project DiverIMPACTS (2017-2022) on crop diversification as a case study.

Design/Methodology/Approach

Based on exploring existing literature concerning how co-innovation works in practice and iterative discussions on the Horizon 2020 project in case, we defined the *outcome* of co-innovation processes as 'creating space for transformation'. Space is - literally and figuratively speaking - needed in which actors can negotiate how co-innovation is implemented in practice over time and in specific cases (Coutts et al., 2017; Leeuwis & Aarts, 2011). We operationalised this idea of 'creating space' from several angles found in the literature (see Table 1): how to define space, what is needed to build space, and how to manage space.

Co-innovation as project governance is meant to be reflexive of how innovation takes place within complex systems (Hoffecker, 2021; Ingram et al., 2020; Rossing et al., 2021), and therefore its evaluation should be 'complexity-aware'. Complexity-aware implies an emphasis on the non-linear and unpredictable dynamics of the systems a project tries to influence (Douthwaite & Hoffecker, 2017; Hoffecker, 2021; Moore et al., 2018), as well as the continuous adaptations and readjustments made in the project to deal with changes in the context and project dynamics (Ingram et al., 2020). Realist evaluation (Pawson & Tilley, 2004) is an approach fit for complexity-aware evaluation. Central to realist evaluation is testing the 'program theory' - how the program is supposed to work - with the following question: what works, for whom, in what circumstances, in what respects, and how? To answer this question, Pawson & Tilley (2004) propose the following three key components: mechanisms, context, and outcomes. *Mechanisms* are the process of how subjects interpret and act upon an intervention: what it is about a program and interventions that brings about effects. Second, the *context* explicates the conditions, or particular circumstances, under which programs are introduced and mechanisms are active. Certain contexts will be more supportive to the program theory than others and can both enable and constrain (Klerkx et al., 2017). Lastly, realist evaluation takes into account that a program is liable to have mixed *outcome-patterns* due to the variations in context and activated mechanisms.

Table 1: operationalising 'creating space'

Defining space (Pereira et al., 2018)	'A safe-enough environment where actors invested in transformation can experiment with new mental models, ideas, and practices that can help shift social-ecological systems onto alternative pathways'
Building blocks for space (Ingram et al., 2020)	1. Research design and management should be flexible and adaptive 2. Facilitation of the co-innovation process should enable joint exploration of knowledge 3. Awareness of contingency of co-innovation upon the context and existing knowledge systems

Managing space (Clark et al., 2016; Moore et al., 2018)	1. What researchers should know: - knowledge on different types of systems and how they influence co-production of knowledge: innovation systems, complex systems, adaptive systems, and political systems 2. What researchers should do: - Stakeholder collaborations for jointly addressing transformation - Social learning to deal with uncertainty and surprise - Knowledge governance to address formal and norm-based rules - Training to increase skills and capacity for navigating emergence - awareness of constraints and leverage points – and reflexivity - reflect on the interpretation of one's own frames, and those of others

Combining the operationalisation of 'creating space' with realist evaluation and its key components, we developed the framework presented in Table 2 to evaluate co-innovation as complexity-aware project governance. We test the framework using the following research questions :

a. Project design: How was space for co-innovation initially conceived in the project?
b. Project management / roll out: how was space for co-innovation managed over time?
c. Which were enabling capacities or constraining factors in creating space?

The questions are in line with the realist evaluation steps for data collection and analysis explicated by Pawson & Tilley (2004):

1) Positing the potential processes through which a program may have worked in CMO terms, including the decisions made in drawing up and implementing interventions
2) Data collection based on the hypotheses based under 1, taking into account that the data should be able to explain variations in C's, M's and O's
3) Assessment and interpretation of the analysis: are the theories about how the program worked being supported or refuted by the proceeding analysis?

Table 2: framework for evaluating co-innovation as complexity-aware project governance

Context	**Mechanisms**	**Outcome**
Constraints and enablers for using space: - Personal - I - Project - We - Professional community - They - Resources etc. - It	*Trust*: growing or failing, perception of the other *Social Capital*: joint resources and building on these *Social Learning*: learning to be flexible and adaptive; jointly identifying problems and solutions, knowledge governance *Empowerment*: to do things differently, implement adaptations	Space created and used: A safe enough… …collaborative environment… …where actors invested in transformation… …can experiment with new mental models, ideas and practices

We apply our framework to the following case study. The EU Horizon 2020 funded DiverIMPACTS project (Diversification through rotation, Intercropping, Multiple Cropping, Promoted with Actors and VCs Towards Sustainability) was a five-year (2017-2022), 11M euros, European project that aimed 'to achieve the full potential of diversification of cropping systems for improved productivity, delivery of ecosystem services and resource-efficient and sustainable value chains (www.diverimpacts.net). At the beginning of the project, a network of 25 change-oriented Case Studies (CSs), consisting of existing and newly elaborated initiatives on crop diversification spread across 10 European countries, was set up. DiverIMPACTS had 8 work packages (WPs), one of which (WP2) was entirely dedicated to the co-innovation process. WP2 facilitated co-innovation workshop series in which the CSs were guided to come to action perspectives regarding their own process of change, as well as facilitating interactions between the WPs and the CSs, and the other WPs themselves.

Data collection was done using the following methods. Answering research question 1 included desk research of official project documents, and (informal) discussions with WP2 researchers and the project coordinator to come to the 'formal program theory'. Answering question 2 included making a timeline to show the roll out of co-innovation in DiverIMPACTS over time. Adaptations made to the original planning showed whether the project was able to be flexible and adaptive to changes in the context, adaptation being an important 'building block' of transformative spaces. Data used for the timeline were dates when events took place, minutes of several types of meetings, powerpoints, and semi-structured interviews. For answering research question 3 we drew upon so-called Learning Histories, filled in by the CSs and WPs. The purpose of the Learning History was to invite reflexivity by looking back on activities and the responses to these by the socio-technical system. These reflections on the interventions and governance elements enabling co-innovation aided in making CMO-configurations explicit. In terms of mechanisms, we tested whether the list of mechanisms explicated in the framework above were workable or needed adjustments.

Findings

We started out by examining the official 'program theory' in terms of 'creating space for transformative change'. In DiverIMPACTS, there was a theoretical and pragmatic need to tackle the EU multi-actor approach in a different way. Co-innovation was chosen to have a prominent place in the project, based on earlier experiences of researchers in earlier projects, and to develop the co-innovation approach coined by Rossing et al. (2021) further. A specific structure was designed to create space for co-innovation in the following two ways: through meetings and interactions at several governance levels, and with specific tools.

The governance set-up of the program was to enable interactions at several levels, thereby creating spaces for transformation. Each CS had a CS leader and a CS monitor, the latter intended to be an independent researcher enabling reflections on the case study processes. Additionally, the CSs were clustered into *5 clusters*, which all had a cluster leader. Cluster leaders would regularly interact with CS leaders and monitors, but also with the *learning-for-innovation platform*, which included the WP2 coordinators and task leaders. Three *co-innovation workshop series* were key in facilitating the co-innovation process, enabling CS actors to reflect on their course of action and steering for change. Sessions at the *annual meetings* functioned as follow-ups to the co-innovation workshops. Annual meetings were a space for *interactions between the CSs and the other WPs,* to adapt research done by the WPs to the needs of CSs. Specific WPs were also invited to the second and third round of the co-innovation workshop series. The formal governance set-up of the program relied on mechanisms of these interactions being safe enough, on connecting and combining actors, and joint social learning.

In addition, the following tools were provided as a way to create space for the CSs to work on changing practices. *Seed money* was provided for CS teams to go 'beyond business as usual' and implement those innovations that would result from the co-innovation process. This was an example of the mechanism 'doing things differently'. *Adaptive monitoring* in terms of quarterly reports, CS biographies and Learning Histories enabled to monitor the efficacy of the approach, but also to provide tools to the CSs to formalize their learnings and progress. Lastly, monthly *webinars* were initiated after the first annual meeting, as a response to critique that there was not sufficient exchange on what concerned CSs on a daily basis, and addressed a wide array of topics. These last two elements show mechanisms of being flexible and adaptive, knowledge governance and social learning.

These are first results of analysing the formal set-up of the program. The analysis of questions 2 and 3 of the project was still ongoing at time of submission of this abstract. In the Learning Histories, CSs were asked to rate the innovative elements of project governance described above, and these rankings will guide our search for the functioning of mechanisms and the influence of context. The co-innovation workshops, monitoring and the CS management (i.e. functioning of the CS leader and CS monitor) were valued highest on average, whereas seed money and sustainability indicators (a specific tool of one of the WPs) were valued lowest. The next step will be to qualitatively assess the explanation the CSs gave for their scores, which will enable us to dive deeper into the mechanisms initiated by these interventions, as well as enabling or constraining contextual factors. One strongly influencing factor for instance was the Covid-19 pandemic.

Practical and theoretical implications

Practical implications of the research are the following. Employing a realist evaluation framework helped to define precise, contextualised learnings about how to execute co-innovation in practice. This could enhance competences of researchers and actors in agricultural systems, supporting the creation of spaces for transformation. Lessons learned could be taken up in the design and governance of future research projects. We also aim for our framework to aid in reflecting on project governance and how to carry out co-innovation in practice. In this way, we contribute to shaping future projects in such a way as to enhance science-society interactions for agricultural transformation.

In terms of theoretical implications, the framework developed adds to the growing body of literature concerning complexity-aware evaluations. We especially aim to contribute to theorizing on the evaluation of project governance, which seems to be an overlooked field of study, while it is especially important in this age of 'projectification'. The research also enables further operationalisation of the concept of 'transformative space', the research being an iteration between the pre-defined categories based on the literature, and insights from this project. It also emphasizes the importance of the adaptive nature of project governance, which is relevant for both theory and practice.

References

Clark, W. C., van Kerkhoff, L., Lebel, L., & Gallopin, G. C. (2016). Crafting Usable Knowledge for Sustainable Development. *Proceedings of the National Academy of Sciences (PNAS)*, *113*(17), 4570–4578. Coutts, J., White, T., Blackett, P., Rijswijk, K., Bewsell, D., Park, N., Turner, J. A., & Botha, N. (2017). Evaluating a space for co-innovation: Practical application of nine principles for co-innovation in five innovation projects. *Outlook on Agriculture*, *46*(2), 99–107.

Cronin, E., Fieldsend, A., Rogge, E., & Block, T. (2022). Multi-actor Horizon 2020 projects in agriculture, forestry and related sectors: A Multi-level Innovation System framework (MINOS) for identifying multi-level system failures. *Agricultural Systems*, *196*.

Dogliotti, S., García, M. C., Peluffo, S., Dieste, J. P., Pedemonte, A. J., Bacigalupe, G. F., Scarlato, M., Alliaume, F., Alvarez, J., Chiappe, M., & Rossing, W. A. H. (2014). Co-innovation of family farm systems: A systems approach to sustainable agriculture. *Agricultural Systems*, *126*, 76–86.

Douthwaite, B., & Hoffecker, E. (2017). Towards a complexity-aware theory of change for participatory research programs working within agricultural innovation systems. *Agricultural Systems*, *155*, 88–102.

Feo, E., Spanoghe, P., Berckmoes, E., Pascal, E., Mosquera-Losada, R., Opdebeeck, A., & Burssens, S. (2022). The multi-actor approach in thematic networks for agriculture and forestry innovation. *Agricultural and Food Economics*, *10*(1).

Fieldsend, A. F., Cronin, E., Varga, E., Biró, S., & Rogge, E. (2020). Organisational Innovation Systems for multi-actor co-innovation in European agriculture, forestry and related sectors: Diversity and common attributes. *NJAS - Wageningen Journal of Life Sciences*, *92*.

Hoffecker, E. (2021). Understanding inclusive innovation processes in agricultural systems: A middle-range conceptual model. *World Development*, *140*.

Ingram, J., Gaskell, P., Mills, J., & Dwyer, J. (2020). How do we enact co-innovation with stakeholders in agricultural research projects? Managing the complex interplay between contextual and facilitation processes. *Journal of Rural Studies*, *78*, 65–77.

Klerkx, L., Seuneke, P., de Wolf, P., & Rossing, W. A. H. (2017). Replication and translation of co-innovation: The influence of institutional context in large international participatory research projects. *Land Use Policy*, *61*, 276–292.

Leeuwis, C., & Aarts, N. (2011). Rethinking communication in innovation processes: Creating space for change in complex systems. *Journal of Agricultural Education and Extension*, *17*(1), 21–36.

Moore, M.-L., Olsson, P., Nilsson, W., Rose, L., & Westley, F. R. (2018). Navigating emergence and system reflexivity as key transformative capacities: experiences from a Global Fellowship program. *Ecology and Society*, *23*(2).

Pawson, R., & Tilley, N. (2004). *Realist Evaluation*.

Pereira, L. M., Karpouzoglou, T., Frantzeskaki, N., & Olsson, P. (2018). Designing transformative spaces for sustainability in social-ecological systems. In *Ecology and Society* (Vol. 23, Issue 4). Resilience Alliance.

Rossing, W. A. H., Albicette, M. M., Aguerre, V., Leoni, C., Ruggia, A., & Dogliotti, S. (2021). Crafting actionable knowledge on ecological intensification: Lessons from co-innovation approaches in Uruguay and Europe. *Agricultural Systems*, *190*.

Implementing the Knowledge and Innovation System for Bioeconomy (KISB): a new vision from the BIObec project

Giacomo Maria Rinaldi
University of Bologna

Short abstract

The bioeconomy (BE) represents a convergence of traditional and innovative sectors and industries toward a new bio-based paradigm. However, to date, the convergence is still incomplete in several domains, like Bioeconomy Education and Training (BET). The issue is strictly connected with a missed development of a coherent and holistic Knowledge and Innovation System (KIS). In this vein, the traditional KIS, like the Agricultural one (AKIS), can be seen as a starting point to switch from a strictly sectorial perspective to a system open to all the other sectors involved in BE: the Knowledge and Innovation System for Bioeconomy (KISB).The BIObec project aims, through its various activities, to contribute to boosting the KISB, and developing a holistic framework for multi-level Bio-Based Education Centres (BBECs) that can act as a knowledge hub for all the stakeholders interested in bioeconomy. The convergence of these different actors from different KIS toward one educational entity can help to develop one unified KISB. Anyhow, it needs a guided integration process, rather than a "forced coexistence". Only in this way, do the generated synergies allow that " the whole is greater than the sum of the parts."

Extended abstract

Purpose

The concept of Bioeconomy (BE) rose in the 1990s and originally it was referring to the management of natural resources that grow naturally and are harvested by human activities, e.g. forestry (Viaggi, 2018b). Afterwards, at the beginning of the 21st century, the interest in bioeconomy increased politically thanks to the search for answers to grand challenges (Bugge et al., 2016) like ensuring food, resources maintenance, climate change, growing population, etc. (Egea et al., 2021).

Nevertheless, despite it is more than twenty years that the concept of BE appeared in academic literature and in strategic documents of many countries, still there is no unified definition (Bioeconomy Summit, 2015; Lewandowski, 2018). In other words, a common agreement on what BE implies (sectors and disciplines) and to which goals it aims (Growth? Sustainability? Circularity?) is missed (Holmgren et al., 2020). However, in the last decade, the definitions provided by some international organizations, like OECD and EU, helped to delineate at least the boundaries of BE (Lewandowski, 2018). In particular, in the European context, a milestone for the definition of the concept was the strategic document "Innovating for Sustainable Growth – A Bioeconomy for Europe", which was launched by the European Commission (EC) in 2012.

In this document, BE is defined as "the production of renewable biological resources and the conversion of these resources and waste streams into value-added products, such as food, feed, bio-based products and bioenergy" (EC, 2012). Hence, the EC's definition stressed the focus on raw materials rather than the conversion process (Hausknost et al., 2017).

However, this definition was not related directly to the concepts of sustainability or circularity. The integration was part of the revised BE strategy (EC, 2018).
The new definition is the following: "The bioeconomy covers all sectors and systems that rely on biological resources (animals, plants, micro-organisms and derived biomass, including organic waste), their functions and principles. It includes and interlinks: land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services."(EC, 2018, p. 4). Moreover, the document expressly states that: "To be successful, the European bioeconomy needs to have sustainability and circularity at its heart" (EC, 2018, p. 4).

This fundamental step highlights the strategical role of BE to face the grand challenges mentioned and the awareness that these challenges, which are highly complex, and characterized by uncertainty in the way of addressing and solve them (Bugge et al., 2016), need new strategies and system-thinking to be won.
BE, with its complexity and its multi- and trans-disciplinarity (Egea et al., 2021; Ryymin et al., 2020) is regarded as crucial to understanding the complex nature of ecological sustainability problems (Ryymin et al., 2020). Furthermore, the European Strategy gives BE not only a passive role of "analyst of the reality" but also – and mostly – a proactive role to identify innovative solutions for the production of new and sustainable bio-based products and the substitution of fossil raw materials (EC, 2018). More in general, the final aim is to promote a change of paradigm toward an integral human development, which harmoniously combines the connection between the economy, society, and the environment(Andersson & Grundel, 2021; Biber-Freudenberger et al., 2020; Hafner et al., 2020).

Nevertheless, we are still far from a full application of the BE potential and a general knowledge of the concept and the vision remains poor (Viaggi, 2018b). Indeed, in the literature, we can find requests for deeper analysis in the Market (Gatto & Re, 2021), Entrepreneurship (Kuckertz et al., 2020), Interactions between actors (Masiero et al., 2020), Policy (Viaggi, 2018a), Ethics (Tei et al., 2018) just to cite some.
One of the key issues still not explored is human resources education and training (Viaggi, 2018b). Indeed, although it is expressly defined Knowledge-Based Bioeconomy (KBBE) by the EC (Aguilar et al., 2009; EC, 2002, 2005), a precise framework boosting the development of the Bioeconomy Education and Training (BET) seems lacking or insufficient.

A framework is suggested by (Viaggi, 2018b), who identifies at least two levels of action: 1. Improving general education, from primary school to PhD; and 2. Reinforce – or sometimes create – vocational training and lifelong learning.

Anyhow, the issue is strictly connected with a missed development of a coherent and holistic Knowledge and Innovation System (KIS). In this vein, the traditional KISs, like the Agricultural one (AKIS), can be seen as a starting point to switch from a strictly sectorial perspective to a system open to all the other sectors involved in BE: the Knowledge and Innovation System for Bioeconomy (KISB) (Kurtsal, 2022).
Moving from this point of view, the BIObec project, a BBI-JU project, aims to develop a holistic framework for six multi-level Bio-Based Education Centers (BBECs) in six different contexts. In particular, the main objective of the project is to be compliant with the requests of the industry and of the surrounding ecosystem at local, regional and/or national levels.

Design/Methodology/Approach
The BIObec project aims to contribute to boosting the KISB, developing a multi-actor approach in which the processes of coordination, dialogue, and decision-making are set among all the stakeholders involved in a particular context – directly and indirectly – in BET. In the scope of the project, a four-stage methodology was adapted (Fig. 1).

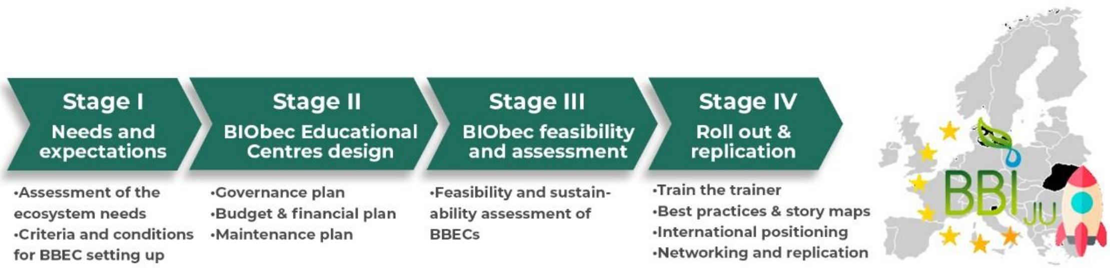


Figure 14. The BIObec project methodology

In the first stage, an analysis of the stakeholders' needs and expectations about the BET was made, assessing the ecosystem needs and collecting criteria and conditions to set up the BBECs. The first step of this stage was desk research to get information from scientific literature, grey literature, official documents and previous projects' outcomes about BET.

After that, several focus groups have been held in order to directly ask different stakeholders all around Europe their expectations, requests and needs about a possible BBEC. This step allowed us to map these stakeholders and their indications in terms of possible actors to involve in the project. Hence, as a consequence of this process, a stakeholder map for each context was developed.

Furthermore, Stage I concluded with a survey of all the stakeholders interested in being involved in the creation of the Centres. The survey concluded the preliminary part of the project, allowing the transition to Stage II, of which the core was the design of the Centres identified. In particular, Stage II started with the co-creation of a Business Model Canvas (BMC - one for each of the six BBECs). The BMC draft helped to point out the main dimensions of the Centres: i) governance; ii) economic and financial requirements; iii) plans and programs for Education and Training. Moreover, the activity made clear the strong connection among the different aforementioned dimensions and the importance of developing them in parallel to guarantee their consistency. And this is the objective of Stage III, which aims to express the feasibility and the assessment of each of the six pilot BBECs.

Finally, the fourth and last Stage is intended to provide a plan for the roll-out and replication of BBECs. Also, in this case, the underlying approach is co-design together with project partners and different stakeholders. Furthermore, the identification of a potential certification scheme is planned in order to ensure quality and good practices in replication.
The first two stages have been completed, while the third and fourth stages are still ongoing.

However, it is valuable to underline that the concept underlying the BBECs tries to merge the traditional idea of an education centre – such as a university or a vocational education and training centre – with that of a *knowledge hub* (fig. 2).

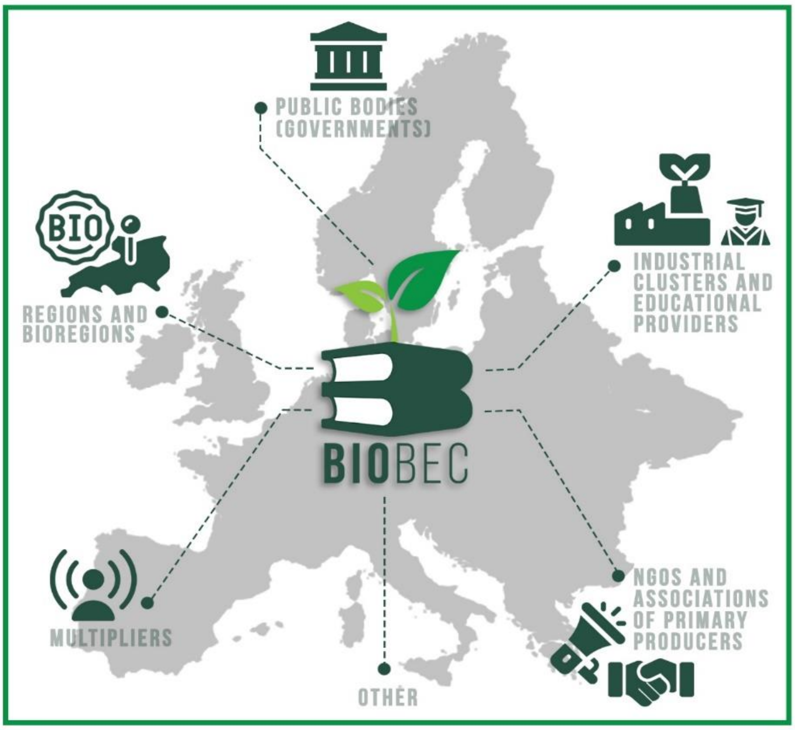


Figure 15. The concept of Knowledge Hub for the Bio-Based Education Centres (BBECs).

Findings

Focusing on one specific context, the Italian one, every stage provided several outcomes. More in detail, during the exploration of needs and expectations about the BBEC, the Italian stakeholders expressed the need for a higher degree of embedding of each bio-based sector with the other sectors of the bioeconomy. More in general, it appears that the actors from the different value chains are still far and not interconnected with each other. In this sense, connecting actors to co-create a Bioeconomy Education Centre can represent a starting point to bring the sectors together. And, generally speaking, the topic is perceived as transversal: indeed, for many stakeholders, the bioeconomy education is missed for all educational levels (i.e. pre-university, university, vocational education, lifelong learning) and, thinking of the job world, it is missed both for the private sector (industry) and for public administration.

Moreover, it was not mentioned directly the AKIS but both during the selection of stakeholders for activities and during the drafting of the stakeholder map the framework emerged indirectly. Indeed, the actors involved are the same or similar to the ones in the BIObec stakeholder map: it can be seen as an enlargement of the AKIS in reference to the Italian bioeconomy.

Furthermore, the co-creation of the BMC allowed us to point out some important preliminary elements in each of the aforementioned three main dimensions. In particular, focusing on the educational part, some key elements for the Centre emerged:

- While it is clear the main objective of the Centre – i.e. fulfilling the skill, competencies and training gaps -, it was also remarked the importance of exploiting synergies between education, innovation processes, communication, and awareness raising through a wide collaboration among actors. On the topic of public awareness, it is clear that with no public awareness, there is no demand for Bioeconomy Education and Training, but, on the other hand, only through education, communication and dissemination the public awareness can increase;
- Matching the demand and supply of Education and Training in Bioeconomy in the selected area is a missed or at least underrepresented service. About that point, the concept of a *knowledge hub* is seen more as a connector that should not overlap with other training institutions rather than an educational institution;
- The identification of priorities, skill profiles, education and training needs for bioeconomy is a fundamental continuous activity that the Centre should perform;
- The creation of new teaching materials should be done only after the valorisation of existing ones coming from projects, portals, online materials, etc.

Practical Implications

The overall process, characterized by the co-creation and co-design approach, has the peculiarity of providing results that are more compliant with the requests of different stakeholders, in particular, the ones coming from the job world. In other words, the co-design increases the possibility of a correspondence between the industry and firms needs and the skills, competencies and knowledge provided by the so-defined educational pathways.

However, this process can be seen also as strongly context-based. That is true also for a Bioeconomy Education Centre, although in Europe there is a common strategy on Bioeconomy (EC, 2018) and the connections among bioeconomy value chains are spread to all the Member States (Avitabile et al., 2023). Nevertheless, as the project shown, the scope of the Centre can change according to several issues, namely: the main network involved (i.e., local, national, European, international); the knowledge area chosen (i.e. pre-university, university, VET, lifelong learning); and the main value chain of the selected area (e.g. food and food waste in Italy and the Mediterranean area).

These aspects were chosen to allow a smooth convergence of different actors from different KIS toward one unified KISB, allowing, at the same time, a real integration process, rather than a "forced coexistence".

Theoretical Implications

Following Fig. 3, innovation and its diffusion among firms is part of a wider process. In particular, the diffusion can increase the Scientific and Technical knowledge of one sector, creating an impact on Education. In this sense, many examples can be cited from the agricultural sector. One from the last years is provided by Precision Agriculture (Bournaris et al., 2022). Following an important change in the sector (in our case, the introduction of drones, satellites, IoT and other technologies in agriculture) so that it requires new specific skills and competencies, the educational system tries to provide a reaction with new specific educational pathways (e.g. Masters in Precision Agriculture).

In the case of bioeconomy, it does not represent a change in a specific sector rather than it represents a new common vision of all the bio-based sectors (Viaggi, 2018b). Indeed, the concept itself of bioeconomy pushes to bring close together sectors that already exist *per se*. Hence, the BIObec project has identified the concept of a *knowledge hub* more suitable for the purpose of providing students with a bioeconomy vision rather than *formal education*. This happened because, as it can be seen in Fig.3, a *knowledge hub* represents a "transversal activity" that tries to bridge the business environment and education, an element that is focal for bioeconomy development. Moreover, the *knowledge hub* provides specific educational elements that conform with the needs and requests of the students compared with formal education in which the possibility of choosing your own path is lower. In other words, it allows greater flexibility, and this aspect represents an advantage for the bio-based industries, as emerged during the project's phases.

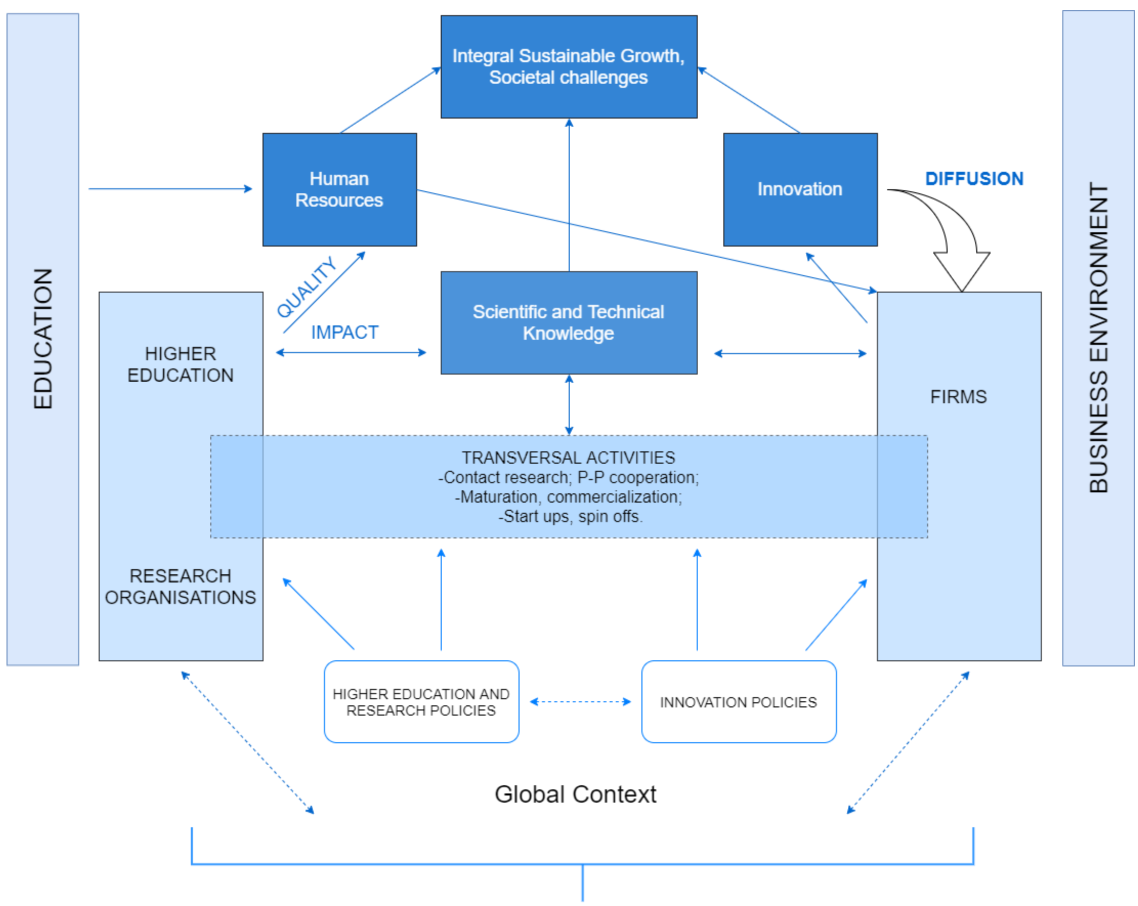


Figure 16 Impact of the quality of knowledge and education on innovation and its diffusion between firms. Source: readapted from RISE group report (RISE group, 2017)

Furthermore, another theoretical implication concerns the relationship between the AKIS and the KISB. At this stage of the project, the outcomes are still far from a comprehensive vision. However, some elements can be already reported. Indeed, with reference to the Italian context, an element that emerged is the importance of actors that act as a link among sectors. An example is represented by Clusters, which are consortiums of firms that can play the role of brokers among different sectors and different stakeholders (e.g. public administration and firms).

Another element to bring the two knowledge and innovation systems closer together is represented by the education and training system itself. Indeed, as mentioned in the findings, public awareness passes through education but, on the other hand, the demand for bioeconomy education requires a strong public awareness.

However, many are the limitation of the present study, such as the low number of stakeholders involved, the absence of a validation of the stakeholder map (for example, asking other stakeholders) or the different scope between the stakeholder map (thought for the project's purposes) and the AKIS framework (thought for policy indications). Nevertheless, the Authors aim to structure a study that overcomes these limitations before the end of the BIObec project. Indeed, on the topic of BET further research is required, especially in the field of the integration of this branch of education with the other branches of the "old" sectors. Moreover, the integration of various forms of education (e.g. formal vs non-formal, as well as the relationship between the different levels of formal education) will require a deeper understanding.

References

Aguilar, A., Bochereau, L., & Matthiessen, L. (2009). Biotechnology as the engine for the Knowledge-Based Bio-Economy. *Biotechnology and Genetic Engineering Reviews*, *26*(1), 371–388. https://doi.org/10.5661/bger-26-371

Andersson, I., & Grundel, I. (2021). Regional policy mobilities: Shaping and reshaping bioeconomy policies in Värmland and Västerbotten, Sweden. *Geoforum*, *121*, 142–151. https://doi.org/10.1016/j.geoforum.2021.02.005

Avitabile, V., et al. (2023). Biomass production, supply, uses and flows in the European Union. In S. MUBAREKA, M. MIGLIAVACCA, & J. SANCHEZ LOPEZ (Eds.), *ISBN978-92-79-77237-5. https://doi* …. Publications Office of the European Union. https://doi.org/10.2760/484748

Biber-Freudenberger, L., Ergeneman, C., Förster, J. J., Dietz, T., & Börner, J. (2020). Bioeconomy futures: Expectation patterns of scientists and practitioners on the sustainability of bio-based transformation. *Sustainable Development*, *28*(5), 1220–1235. https://doi.org/10.1002/sd.2072

Bioeconomy Summit. (2015). *Communique´ of the global bioeconomy summit 2015: making bioeconomy work for sustainable development*.

Bournaris, T., et al. (2022). Current Skills of Students and Their Expected Future Training Needs on Precision Agriculture: Evidence from Euro-Mediterranean Higher Education Institutes. *Agronomy*, *12*(2). https://doi.org/10.3390/agronomy12020269

Bugge, M., Hansen, T., & Klitkou, A. (2016). What Is the Bioeconomy? A Review of the Literature. *Sustainability*, *8*(7), 691. https://doi.org/10.3390/su8070691

EC. (2002). *Life Sciences and Biotechnology—A Strategy for Europe: Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions*. Office for Official Publications of the European Communities.

EC. (2005). *New Perspectives on the Knowledge-Based Bio-Economy: Transforming Life Sciences Knowledge into New, Sustainable, Eco-Efficient and Competitive Products*. Office for Official Publications of the European Communities.

EC. (2012). *Innovating for Sustainable Growth - A Bioeconomy for Europe*. Publications Office of the European

Union. https://doi.org/10.2777/6462

EC. (2018). *A sustainable bioeconomy for Europe: strengthening the connection between economy, society and the environment*. Publications Office of the European Union. https://op.europa.eu/s/oTox

Egea, F. J., López-Rodríguez, M. D., Oña-Burgos, P., Castro, A. J., & Glass, C. R. (2021). Bioeconomy as a transforming driver of intensive greenhouse horticulture in SE Spain. *New Biotechnology*, *61*, 50–56. https://doi.org/10.1016/j.nbt.2020.11.010

Gatto, F., & Re, I. (2021). Circular Bioeconomy Business Models to Overcome the Valley of Death. A Systematic Statistical Analysis of Studies and Projects in Emerging Bio-Based Technologies and Trends Linked to the SME Instrument Support. *Sustainability*, *13*(4), 1899. https://doi.org/10.3390/su13041899

Hafner, M., Fehr, L., Springorum, J., Petkau, A., & Johler, R. (2020). Perceptions of Bioeconomy and the Desire for Governmental Action: Regional Actors' Connotations of Wood-Based Bioeconomy in Germany. *Sustainability*, *12*(23), 9792. https://doi.org/10.3390/su12239792

Hausknost, D., Schriefl, E., Lauk, C., & Kalt, G. (2017). A Transition to Which Bioeconomy? An Exploration of Diverging Techno-Political Choices. *Sustainability*, *9*(4), 669. https://doi.org/10.3390/su9040669

Holmgren, S., D'Amato, D., & Giurca, A. (2020). Bioeconomy imaginaries: A review of forest-related social science literature. *Ambio*, *49*(12), 1860–1877. https://doi.org/10.1007/s13280-020-01398-6

Kuckertz, A., Berger, E. S. C., & Brändle, L. (2020). Entrepreneurship and the sustainable bioeconomy transformation. *Environmental Innovation and Societal Transitions*, *37*, 332–344. https://doi.org/10.1016/j.eist.2020.10.003

Kurtsal., Y., Rinaldi, G. M., Grande, M. M., Viaggi, D. (2022). "Education and Training in Agriculture and the Bioeconomy: Learning from each other." In *Agricultural Bioeconomy: Innovation and Foresight in the Post COVID Era*. Pages 287-313. London: Academic Press

Lewandowski, I. (2018). *Bioeconomy* (I. Lewandowski (ed.)). Springer International Publishing. https://doi.org/10.1007/978-3-319-68152-8

Masiero, M., et al. (2020). Bioeconomy perception by future stakeholders: Hearing from European forestry students. *Ambio*, *49*(12), 1925–1942. https://doi.org/10.1007/s13280-020-01376-y

RISE group. (2017). *Europe's Future: Open Innovation, Open Science, Open to the World*. https://doi.org/10.2777/380389

Ryymin, E., Lamberg, L., & Pakarinen, A. (2020). How to Digitally Enhance Bioeconomy Collaboration: Multidisciplinary Research Team Ideation for Technology Innovation. *Technology Innovation Management Review*, *10*(11), 31–39. https://doi.org/10.22215/timreview/1401

Tei, Y., Chung, U.-I., & Săvoiu, G. (2018). From bioeconomics to bioeconopysis in the context of (Bio)diversity and modern morality. *Amfiteatru Economic*, *20*(49), 754–770. https://doi.org/10.24818/EA/2018/49/754

Viaggi, D. (2018a). Bioeconomy and the common agricultural policy: Will a strategy in search of policies meet a policy in search of strategies? *Bio-Based and Applied Economics*, *7*(2), 179–190. https://doi.org/10.13128/bae-7674

Viaggi, D. (2018b). *The bioeconomy: delivering sustainable green growth* (D. Hemming (ed.)). CABI.

TOPIC 4 - Public policies for innovation and the governance of AKIS: how to embed advice & education into strategies of AKIS

Session 4A – New perspectives on AKIS

AKIS as a concept: from history to future

Eelke Wielinga[1], Sylvia Burssen[2]
[1]LINK Consult, The Netherlands
[2]Ghent University, Belgium

What is AKIS? And does it matter?

Since the European Commission launched the agricultural European Innovation Partnership (EIP-AGRI) in 2014, AKIS (Agricultural Knowledge Innovation Systems) has become a buzzword in the community of advisory work and innovation support. In the strategic EC documents of the Green Deal and the Farm-to-Fork Strategy[11] knowledge and innovation systems are mentioned as crucial instruments, and for the new period of the Common Agricultural Policy[12], all the Member States had to indicate in their strategic plans what they are going to do to improve the quality of their AKIS.

It is however questionable in how far the concept is commonly understood and considered to be useful. Is it a descriptive or a normative concept? Is it a way to study the complex reality, or an approach for governance, enhancing the knowledge flow between actors? Can you choose not to implement an AKIS? Meanwhile, different abbreviations pop up, adding to the confusion: AIS (Worldbank, FAO), AFKIS, FOKIS, DAIS, MAIS, DAC's. How do these concepts relate to each other?

In this contribution, we intend to provide some clarity on what is meant by AKIS and related terms. For their relevance, we go back to the first period in which AKIS was introduced, and the problems for which the concept offered an answer. We follow the changes over time, along with the subsequent views on the nature of knowledge. We will conclude with some observations and suggestions for the current discourse.

History

AKIS as a response to the Transfer-of-Technology (ToT) model

AKIS as a concept was coined by Niels Röling (1988). He criticized the adoption curve, introduced by Everett Rogers (1962), for understanding the diffusion of innovations. The model suggested that innovations would trickle down from innovators and early adopters to the majority of farmers. Following this theory, the most effective approach to change would be to convince the frontrunners first. Röling observed that this approach could lead to more inequality of power and access to knowledge. Furthermore, farmers who were slow to adopt, 'laggards' in the terminology of the adoption curve, could have good reasons to be reluctant. In the (ToT) approach, the quality of the innovation was beyond suspicion, while in the reality for many the message was not in their interest or not applicable under their circumstances. (Röling et al, 1976). Earlier, Anne van den Ban (1970) already stressed the importance of two-way communication in extension and separated knowledge from decision making. Extension agents should assist their clients but leave the decision of what to do to the clients themselves. Röling shifted the focus from the quality of communication about innovations towards the quality of interactions between the key actors in an innovation process, such as farmers, researchers, change agents, policymakers, and others. The systems approach, with Peter Checkland (1981) as a pioneer, took all the interactions between actors into account. He distinguished cold systems (hard science) from soft systems (complex human behaviour). The Farming Systems movement became popular among rural sociologists and beyond, studying the entire context of a

[11] resource.html (europa.eu)
[12] CAP 2023-27 (europa.eu)

farm, rather than only the techniques being used. Burton Swanson (1987) applied it to knowledge: Agricultural Knowledge Systems (AKS).

The quality of innovations depends on the capacity of a system to generate knowledge that is accepted by the key players as a ground for collective action. Such *accepted knowledge* can only be acquired through a social learning process. In order to take each other seriously, it should be acknowledged that all actors construct their own knowledge with the information they acquire. Information can be transferred, in contrast to knowledge which is something individual ('between the ears'). Therefore, Röling added the I of *information* in what became the concept of AKIS.

Knowledge as a product: AIS

Around the same period, the end of the eighties and in the nineties, a worldwide trend came up putting the market first. According to the *New Government Movement*, the public sector was supposed to become more efficient and effective by behaving like successful companies. Research and extension, or advisory services, were no longer public facilities but producers and traders of knowledge as a commodity. The knowledge market should become client driven. Many public extension services were privatised, and public funds were channelled through projects in which public agencies acted as clients on behalf of the community for issues that were not sufficiently taken up by the market. In low-income countries The World Bank stimulated innovation through the Training and Visit System (Daniel Benor, 1987), focussing on contacting farmers who were to convey the message to their communities. In this top-down approach, the distinction between knowledge and information was not made, and AKIS became AIS: Agricultural Innovation Systems.

Missing intermediaries: free actors and knowledge brokers

After the privatisation of the Dutch public extension service in 1990, there was a growing concern about the capacity of the agricultural sector to innovate. The Dutch sector had been extremely innovative in the years after WO2, which had given the farming community a strong position in the World market. But now the AKIS had scattered. Eelke Wielinga (2001) searched for key success factors that might have been overlooked in the new delivery oriented AKIS. He had observed that in the former system there were close links between well organised farmers, researchers, policymakers, and key actors in the food chain which was dominated by farmers cooperatives. Experts of the public extension service acted as "free actors", doing all that was necessary to maintain these *networks avant á lettre*. He concluded that new ways had to be found to revive networks for innovation, including the free actor position. He also pointed at the confusing views on knowledge: as uncontested truth, as a product, and as accepted knowledge. Social learning process, necessary for creating accepted knowledge, appear to be easily obstructed by actors who want to win and play it hard. Taking human networks as living systems extends the range of possible interventions beyond communication ('warm interventions') and brings the use of power ('cold interventions') into account as well for restoring healthy interactions in human ecosystems (Wielinga, 2001, 2018).

Laurens Klerkx (2008) came to similar observations in his study on the Dutch AKIS: essential links between key actors in an AKIS are not sufficiently maintained by the market. Just like Winch et al (2007) he stressed the need for *'knowledge brokers'*, which fitted better in the dominant market paradigm.

In a large-scale experiment (2004-2007), facilitating innovation networks proved to be effective. Networks, based on initiatives from Dutch farmers in animal production, were facilitated by experts in a supportive role (Wielinga et al, 2007, 2008). After 3½ years and 120 networks, the network approach for stimulating innovation became part of the Dutch AKIS policy.

Interactive innovation as part of EU policies in agriculture

Research cannot do it alone: Horizon 2020 and EIP-AGri

During an informal council in Austria in 2006, the European ministers of agriculture concluded that the knowledge systems in their countries were unable to cope with the challenges society was facing. In 2008, the Standing Committee on Agricultural Research (SCAR) stated that the still dominant ToT approach was outdated. For real impact, it should be replaced by interactive networking systems, with active involvement of all relevant actors. The concept of AKIS was revitalised in order to bring the relationships between relevant actors into the picture, but now the "I" stood for *innovation.* A Strategic Working Group, SWG SCAR-AKIS[13] was formed with the mission to build an EU-wide knowledge and innovation network focusing specifically on working with and for farmers.

In 2010, also the European Commission declared that research alone would not solve all problems, and partnerships should be promoted (COM2010). In 2012 the EIP-AGRI[14] was launched to contribute to the '2020 Europe Strategy' for smart, inclusive, and sustainable growth. The Horizon 2020 programme and the European Rural Development policy. It offered a range of funding opportunities for the implementation of the EIP-AGRI through interactive innovation projects. Between 2014 and 2020 about 3200 Operational Groups were supported, as well as 190 Muli Actor Projects (MAP), 41 transnational Thematic Networks, and a network of Living Labs. In preparation for the CAP 2023-2027 all Member States have recently submitted a national AKIS plan, including the set up of an AKIS coordination body and with attention for digitalisation, education, and training. Recently the EIP-AGRI has merged with the European CAP Network[15] which will also encourage the exchange of knowledge, support the uptake of innovations, and strengthen AKIS approaches.

Diversity and digitalisation

An inventory by the i2connect project[16] of the state of AKIS in the EU Member States showed big differences in quality and governance structures (i2connect, 2022). Digitalisation has fundamentally changed the way people acquire and develop knowledge. Limited access to knowledge has turned into an overflow of information, and the selection of relevant and reliable facts has become a major issue. This requires new forms of education and training. In subsequent EU Horizon funded projects, EURAKNOS[17] , EUREKA[18] and EU-Farmbook[19], an EU wide knowledge repository is being created. Such a knowledge reservoir should be regarded as a user-friendly living structure, constantly renewing itself. This requires the reflexivity of actors, which should be stimulated by DAIS: Digital Agricultural Innovation Systems (Fielke et al: 2020). The agro-food sector and forestry are often two different worlds, and in efforts to stimulate connection and exchange of ideas, sometimes the F of Forestry is added to AKIS: AFKIS.

Mission oriented innovation systems (MIS)

The ambitions of the EU Green Deal put emphasis on the orientation of innovation towards sustainability. This has been concretized in EU missions[20] in the Horizon Europe programme, which goes beyond the interests of farmers alone. Mission Oriented Innovation systems (MIS) need to tackle grand societal and planetary challenges. More actors are involved, such as the civil society. Klerkx and Begeman (2020) speak of MAIS: Mission oriented Agricultural Innovation systems. This marks a shift from technology- and client-oriented innovation towards society-oriented innovation. Such innovations should be embedded in a strong and well-connected system which includes education and training.

Discussion and conclusions

The meaning of AKIS follows different ideas about knowledge.

In the transfer of technology approach, knowledge is the uncontested truth or the best way, validated by research. In the client-oriented approach, knowledge is a product, and its value is determined by the client. Interactive innovation values the knowledge of each partner and stresses the need for social learning processes in order to develop accepted knowledge as a basis for concerted action.

[13] Documents (scar-europe.org)
[14] About EIP-AGRI | EIP-AGRI (europa.eu)
[15] About the European CAP Network | European CAP Network (europa.eu)
[16] i2connect - Home - i2connect (i2connect-h2020.eu) Grant Agreement number: 863039 — i2connect — H2020-RUR-2018-2020/H2020-RUR-2019-1.
[17] Home - euraknos
[18] Home - en (h2020eureka.eu)
[19] Welcome to EU-FarmBook (eufarmbook.eu)
[20] EU Missions in Horizon Europe (europa.eu)

In its original form, AKIS was meant to shift the attention from transferring the message towards the quality of relations between interdependent actors. During the period of privatizations and the shrinking role of the public sector it was assumed that the knowledge market would optimize the innovation system by itself, but that assumption turned out to be wrong: the commercial market does not pay for intermediaries who lubricate the system and care for the commons.

The shift in focus on towards networks and interactive innovation marks a revival of the idea that social learning processes are needed to create innovations that serve a sustainable future.

Awareness is one thing, creating new practices is another. In spite of all efforts to promote interactive innovation, it appears hard to find real co-creative innovation cases among Operational Groups and networks alike, based on farmers initiatives (i2connect). It would be worthwhile to further explore why. Probably, researchers need to get adjusted to a supportive role instead of leading the way, acknowledging that their expertise is only one of the knowledge components adding to a co-creative innovation process. Funding agencies need to adopt different ways to monitor progress in uncertain innovation processes, instead of expecting well defined products as they are used to in their role as client in the knowledge market. It would be useful to pay renewed attention to the confusing views on the nature of knowledge which is behind these attitudes.

Is AKIS a descriptive or a normative concept?

In itself, a system is descriptive: it is a way to single out components which are in some kind of relation to each other. It becomes a system when this interaction gives properties to the system that cannot be understood by studying each component separately. In his original definition Röling (1988) stresses this synergy: "AKIS is *a set of agricultural organizations and/or persons, and the links and interactions between them, engaged in such processes as the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilization of knowledge and information, with the purpose of a synergistic work to support decision making, problem-solving and innovation in a given country's agriculture or domain thereof*" (Röling, 1989).

The normative aspect comes in while promoting AKIS as a framework for improving connections and synergies. An AKIS exists, regardless of its quality, just like an ecosystem. Looking at interactions between researchers, farmers, and other key actors as part of an AKIS allows for identifying possible interventions for improvement that go beyond conveying the message in a more effective way.

But here, a pitfall is looming. It is tempting to say that the AKIS perspective should replace the outdated ToT approach. Literally, this is impossible, and furthermore, it reveals a top-down attitude: "Thou shall co-create!" which is rather in line with the ToT approach.

Taking AKIS as a descriptive concept offers the interactive approach as a possibility, rather than as the best way. This creates space for opening the dialogue about which kinds of cases are likely to be more successful using methods for co-creation, and what mechanisms or instruments are helpful for making it possible (enabling environment, capacity building such a training.

Collective action for the commons

The current challenge is to take AKIS wider towards MAIS, involving civil society and embracing social innovation aspects. In this period of information overflow, disinformation, and disrespect for science, and the need to integrate tacit knowledge, it is more urgent than ever to find ways to overcome conflicts and create conditions under which social learning processes have a chance to become successful.

References

Ban, A. W. Van den. (1970). "Interpersonal Communication and the Diffusion of Innovations." *Sociologica Ruralis*, pp199-21.

Benor, D. (1987). "Training and Visit Extension: Back to Basics." In *Agricultural Extension Worldwide*, edited by Rivera and Schram, 137–49. New York: Croom Helm.

Checkland, P. (1981). "Systems Thinking, Systems Practice." *Chistester: John Wily.*

European Commission. (2014). "Guidelines on Programming for Innovation and the Implementation of the EIP for Agricultural Productivity and Sustainability." *European Commission*, no. 1698: 1–21..

Fielke et al: (2020). "Digitalisation of agricultural knowledge and advice networks: A state-of-the-art review". *Elsevier*

Klerkx, L.W.A. (2008). "Matching Demand and Supply in the Dutch Agricultural Knowledge Infrastructure : The Emergence and Embedding of New Intermediaries in an Agricultural Innovation System in Transition." *Wageningen University.*

Klerkx . L.W.A., Begeman, S. (2020). Supporting food systems transformation: The what, why, who, where and how of mission-oriented agricultural innovation systems. *Elsevier.*

Rogers, E.M. (1962). Diffusion of Innovations. New York: Free Press of Glencoe.

Rogers, E.M. (1983). Diffusion of Innovations Third Edition. https://doi.org/citeulike-article-id:126680.

Röling, N. G., Ascroft, J., Chege. F.W.. (1976). "The Diffusion of Innovations and the Issue of Equity in Rural Development." *Communication Research* 3 (2): 155–70. https://doi.org/10.1177/009365027600300204.

Röling, N.G. (1988). "Extension Science: Information Systems in Agricultural Development." Extension Science: Information Systems in Agricultural Development, 233. https://doi.org/10.2307/1242055.

Röling, N.G. (1996). "Towards an Interactive Agricultural Science." European Journal of Agricultural Education and Extension 2 (4): 35–48. https://doi.org/10.1080/13892249685300061.

Röling, N.G., Wagemakers, M.A. (1998). "A New Practice: Facilitating Sustainable Agriculture." In Facilitating Sustainable Agriculture. Participatory Learning and Adaptive Management in Times of Environmental Uncertainty, edited by N. Röling, N.G., Wagermakers, M.A., 3–22. *Cambridge: Cambridge University Press.*

Röling, N.G. (1989). "The Agricultural Research-Technology Transfer Interface: A Knowledge Systems Perspective". Edited by International Service for National Agricultural Research *(ISNAR). The Hague.*

Swanson, B.E. (1987). "Analyzing Agricultural Technology Systems: A Research Report." *Annual Meeting of the Association for International Agricultural Education (3rd, Chevy Chase, MD, April 24-26, 1987).*

Wielinga, H.E.. (2001). "Networks as Living Tissue. A Study on Knowledge, Leadership and the Role of Government in Dutch Agriculture since 1945". *Wageningen University*

Wielinga, H.E., Vrolijk, M. (2009). "Language and Tools for Networkers." *The Journal of Agricultural Education and Extension* 15 (2): 205–17. https://doi.org/10.1080/13892240902909148.

Wielinga, H.E., Zaalmink, B.W., Bergevoet, R.H.M., Geerling-Eiff, F.A., Holster, H, Hoogerwerf, L., Vrolijk, M. (2008): Networks with free actors: encouraging sustainable innovations in animal husbandry by using the FAN approach. *Wageningen University and Research.*

Winch, G. M., Courtney, R.. 2007. "The Organization of Innovation Brokers: An International Review." *Technology Analysis and Strategic Management* 19 (6): 747–63. https://doi.org/10.1080/09537320701711223.

Abbreviations

AKIS and related terms

AKS: Agricultural Knowledge Systems
AKIS (1): Agricultural Knowledge and Information Systems
AIS: Agricultural Knowledge and Innovation Systems
AKIS (2): Agricultural Knowledge and Innovation Systems
AFKIS: Agriculture and Forestry Knowledge and Innovation Systems
DAIS: Digital Agricultural Knowledge and Innovation Systems
MAIS: Mission oriented Agricultural Innovation systems.
MIS: Mission oriented Innovation systems.

Others

CAP: Common Agricultural Policy (EU)
EC: European Commission
EIP: European Innovation Partnerships
FAO: Food and Agriculture Organisation (United Nations)
i2c: Innovate to connect (EU/EIP project, 2019-2024)
MAP: Multi Actor Project
OG: Operational Group
SCAR: Standing Committee on Agricultural Research
SWOT: Strengths, Weaknesses, Opportunities, Threats (analysis)
ToT: Transfer of Technology
WO2: Second World War (1939-1945)

Strengthen the AKIS through the Transformative AKIS Journeys

Patrizia Proietti, Simona Cristiano
Patrizia Proietti (CREA-PB) patrizia.proietti@crea.gov.it
Simona Cristiano (CREA-PB) simona.cristiano@crea.gov.it

Short abstract

The aim of the paper is to illustrate a logical and methodological framework for the strengthening of Agricultural Knowledge and Innovation Systems (AKISs). The political dignity gained by the AKIS and the definition of relating strategies within the CAP strategic plans is a challenge for their actors and mainly for the public governance authorities that, indeed, have to lead a transformative change in agricultural and rural systems innovation. The reinforcement of the AKISs and their better functioning across EU imply a "shifting of existing systems onto alternative development pathways" that must be based on a shift in mind-sets towards a meaningful system thinking and collective action. The Transformative AKIS Journey aims at bringing through a process of learning which transforms meaning schemes of individuals and organizations into new thoughts, feelings, and behaviours.

Extended abstract

Purpose

The aim of the paper is to illustrate a logical and methodological framework for the strengthening of Agricultural Knowledge and Innovation Systems (AKISs).

The new CAP Regulation (EU) 2021/2115 requires EU Member States (MS) to strongly pursue the AKISs reinforcement towards the overarching goal of modernizing the agricultural sector across EU and achieving the CAP 9 specific objectives.

This is why, the various regions and Member States are required to define an AKIS strategy aimed at building, also by means of an effective combination of different CAP interventions, better Agricultural Knowledge and Innovation Systems (AKIS), inclusively covering all people and organisations that generate, share, and use knowledge and innovation for agriculture and interrelated fields (value chains, environment, society, consumers, etc.) (EU SCAR AKIS, 2019). Moreover, the increasing importance of the AKIS approach for agricultural policies and the sector's sustainability performance has put the new actors 'AKIS coordination bodies (AKIS CB)' on the forefront. In principle, these latter should enable the environment for a well-functioning AKIS, through fostering cooperation, well-combining the interventions of the CAP Strategic Plans and satisfying the need for a quicker, more qualitative and more inclusive AKIS.

However, the AKIS concept itself and its working principles are not yet widely known and embraced, and the capacity of decision makers to use and to contribute to the AKIS governance is underdeveloped (Knierim et al. 2015). Agricultural decision makers, at all levels, are often not aware that, beyond their tasks within their organization, they have a role and impact within the AKIS. In addition, they have limited resources to explore new systemic perspectives. In addition, AKIS systems in the EU MS are marked by their diversity at national, regional and even local level, which affect effective flows of knowledge and the creation of synergies. Trends such as decentralization and privatization, for instance of advisory services and education and training activities, have contributed to an increasing pluralism of AKIS actors, which leaves some potential clients insufficiently or completely unserved (Knierim et al., 2017).

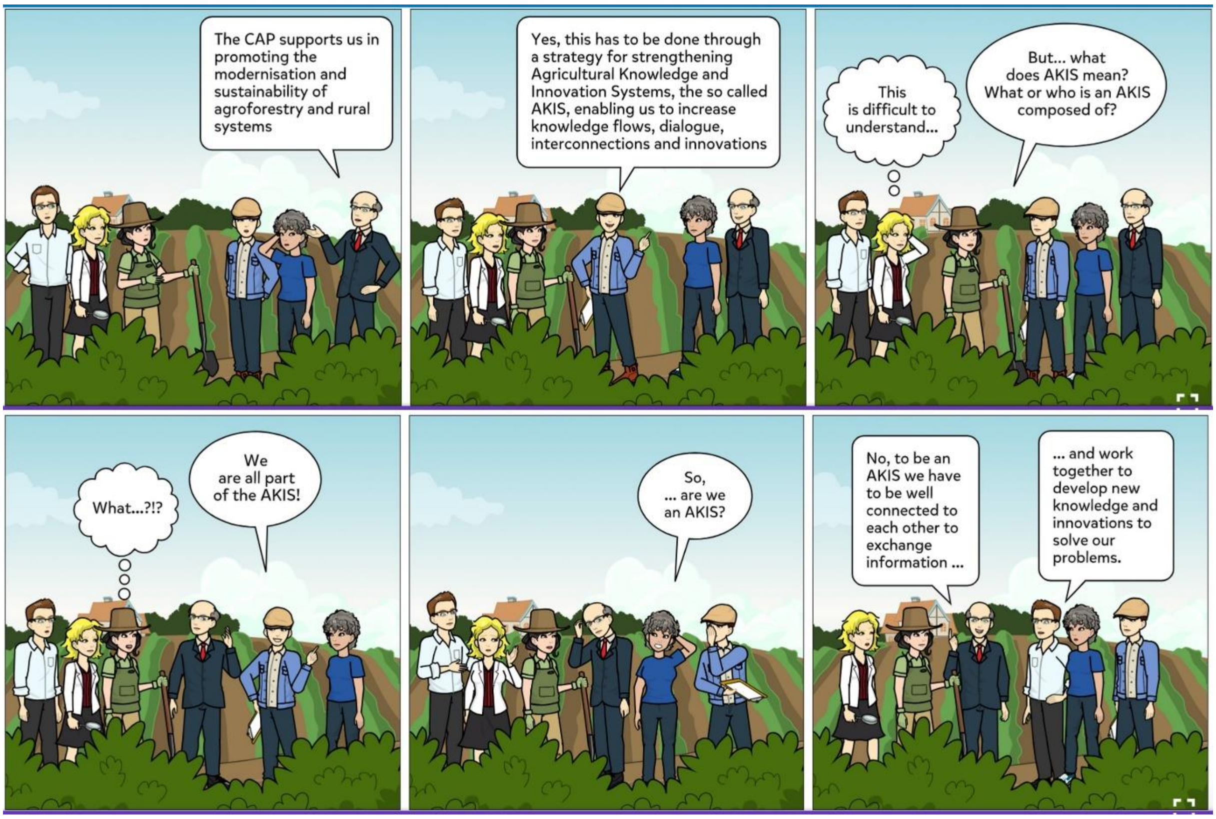
The ModernAKIS project aims to facilitate this transformation by strengthening the capacities of AKIS coordination bodies and other AKIS actors to develop systemic thinking and action that will foster greater integration of the AKIS and the development of policies and interventions that effectively support the transition to a more sustainable management and use of natural resources in agriculture and forestry. To this aim, the project will build and promote a European network of key AKIS actors from all EU Member States, includig the AKIS coordination bodies, who will be involved in networking and capacity development actions, to later act as pivots in the transformation of stronger and more effective AKISs.

The logical framework of the project

The political dignity gained by the AKIS and the definition of relating strategies within the CAP strategic plans is certainly a challenge for their actors and mainly for the public governance authorities that, indeed, have to lead a transformative change in agricultural and rural systems innovation.

The reinforcement of the AKISs and their better functioning across EU imply a rethinking of activities, relationships and tools that make them better functioning and performant, entailing a transformative change able to "shift existing systems (and their component structures, institutions and actor positions) onto alternative development pathways" that must be based on a shift in mind-sets towards a meaningful system thinking and collective action (Pelling et al., 2015).

The literature describes transformative change as the outcome of interactions between actors at different levels (Kemp et al.,1998; Schot and Geels, 2008), taking place in complex and dynamic systems that continuously evolve over time (Vallacher, Read, & Nowak, 2002). Therefore, change is a process concerning systems, not just individual developments, and involves multiple actors at multiple levels in a collaborative analytical process (Rotmans and Loorbach, 2009; Geels, 2012; Mersmann et al., 2014; NAMA Facility, 2014; Westphal and Thwaites, 2016) that concern various aspects, including changing actors' objectives, knowledge, professional norms, values and motivations, and integrating resources into agricultural systems (Martin et al., 2018).



Due to the complex structure of the interactions between actors, transformative change is not a linear process, but a pathway that is formulated upon exploration of possible pathways and co-evolves in response to a changing environment and continuous evaluation (Haasnoot et al., 2013; Van Bruggen et al., 2019).

Drawing on this, in modernAKIS, the process of strengthening AKIS takes the characteristics of a discovery journey, namely a Transformative AKIS Journey (TAJ). The TAJ aims at bringing through a process of learning which transforms meaning schemes of individuals and organizations into new thoughts, feelings, and behaviours (Mezirow, 1997; 1985).

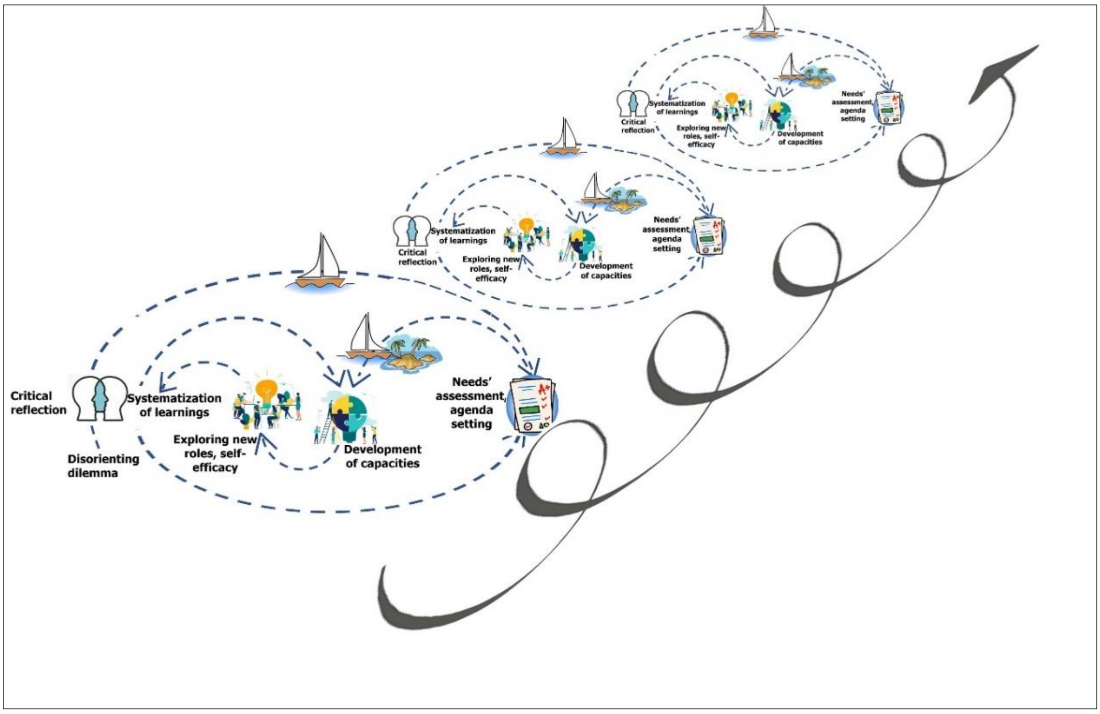
Because AKISs differ from each other, and their circumstances, capabilities, and goals differ as well, the TAJs will be multiple and differentiated, through co-designed and implemented with modularity by the same

AKIS actors, according to the context in different MSs and the specific needs for strengthening the interconnections, the capacities and skills of implementing actors. Indeed, TAJs are intended to affect the way AKIS actors perceive their roles, responsibilities, and relationships. Particularly, they aim to: 1) change actors' perspective on their own role as a part of a system: change the way of perceiving, thinking, reflecting, and making meaning about themselves and the system 2) allow a clearer view on each own place within the system: shifting relationships and connectedness to and within the system and how actors show up 3) allow more consistent and congruent actions with actors' role and place in the system 4) increase AKIS actors' capacity for responsiveness and ability to access resources within themselves as well as within system.

This change will occur through cycles of systematic learning that develop in a spiraling, ever-deepening journey that, inspired by Mezirow (1990; 1991), will iteratively accompany AKIS actors across 6 stages of transformative learning:

- Disorienting dilemma: This is the first part of transformational change. It aims at de-structuring current mindsets and prepare actors for moving away from the current and comfortable situation.
- Critical reflection: This is the key to Transformative Learning. It helps AKIS actors reconsidering and challenging their own current core beliefs, values, attitudes, and behaviours, and start thinking differently about their position within the respective AKIS.
- Capacity Needs' assessments and agenda setting for the capacity development: AKIS actors realize that they need to gain new capacities related to the functions they have to perform Development of capacities: This is the starting of collaborative learning towards the development of new meaning perspectives and their integration into new models of action.
- Exploring new roles, building relationships and self-efficacy in new roles: Actors experience the new capacities doing their work within their respective AKIS, continuing to practice the transformative cycle as they move forward.
- Systematization of learnings: day-to-day experiences within the respective AKISs will offer new insights to critically reflect leading to new advancement in the effects of the capacity development being applied during the TAJs and to new capacity development needs.

In a nutshell, the TAJs will develop through an iterative process of co-definition, co-development, co-review and co-decision for further developments, tailoring and improvements whose direction will be defined by the AKIS actors engaged within the modernAKIS network.



The transformative change will involve all AKIS actors, not only those (AKIS coordination bodies and managing authorities) playing a key role in strengthening AKISs. In fact, within the AKIS, different groups of individuals may be affected by the strengthening of the system, in different ways. To address this issue, ModernAKIS will engage, in each EU MS, a variety of key AKIS actors of change, to be part of the transformative process and facilitate other actors, within the respective AKIS, in understanding the need for change. These actors have a twofold key function: (1) immediate end-users and responsible for co-designing, co-experiencing and co-revising grounding TAJs; (2) multipliers of further transformative change within the respective AKISs, where TAJs can be replicated to help intrinsic change and resilience towards modernized AKIS ecosystems. Key actors of change are represented by actors that currently actively participate in AKIS dynamics through helping knowledge flows and innovations.

Methodological framework

Transformative pathways of change fostered by the TAJs are supported by capacity development and multi-actor approaches. Moreover, the development paths of the TAJs will embed a reflexive assessment process aimed at supporting key AKIS actors of change in the on-going analysis of how they are contributing to shape a new AKIS, thus feeding evolutionary loops of learning and adjustment of action in their respective systems.

The Capacity Development (CD) approach well fit the purpose of TAJs of triggering a broad process of change in the ways of thinking and behaviours of AKISs' actors, enabling them to catalyse iterative shifts in individual and system level culture. In fact, it allows to link individuals and the enabling environment to address, in addition to individual capacities, broad questions of institutional change, empowerment and participation.

The TAJs should empower individuals on three knowledge areas: (a) system thinking and AKIS, (b) knowledge exchange and networking, (c) AKIS as a key for the modernization of the CAP. To this aim four capacities, already identified and described by the Tropical Agricultural Platform (2016), namely the Capacity to Navigate Complexity, Capacity to Collaborate, Capacity to Reflect and Learn, Capacity to Engage in Strategic and Political Processes (including the AKIS strategies within the CAP SPs), need to be develop plus the overarching Capacity to adapt and respond or “Capacity to innovate”.

These five capacities will be strengthened through (i) upgrading skills, expertise, competencies and confidence of individual actors; (ii) improving the organization, processes and incentives within organizations, businesses and actor groups to be involved; (iii) creating an environment in which actors actively interact, exchange new ideas and expertise, and collaborate.

CD pathways will be co-developed, as an integrated part of TAJs, through an iterative design-application/learning-reflection/ learning-adjustment process applying multi-actor approach.

Multi-actor approach (MAA) is an important part of any capacity development intervention, since it allows building the combined as well as the individual, organizational and institutional capacities and may enhance the quality of interventions that influence their interrelationships through effective mobilization of actors at different levels (Rocchigiani and Herbel, 2013). Moreover, MAA is considered an effective form of CD in its own right, since interaction between actors allow effective capacities to grow rather than from training or organisational development (Acquaye-Baddoo et al., 2010).

To ensure a fully implementation of MA the capacity development will be implemented through participatory methodologies and tools (e.g., CoPs, European awareness scenario, gamification, and innovation boot camps) enabling common understanding and visioning, teambuilding, collaboration, building bridges and breaking silos between actors and sectors. These methodologies and tools will meet the following criteria:

- Empowerment: empowering the plurality of potential end-users to provide feedbacks on the on-going project activities and results and to propose further developments.
- Peer-to-Peer: ensuring processes of peer-to-peer discussion about the on-going projects’ activities and results for systematic co-creation of project developments.
- Common visioning: ensuring processes of sharing of views, debate, common visioning and prioritization about the further developments of the project.

- immediate take-up and benefits from the plurality of potential end-users.

As a integrate part of CD and MAA approaches, the use of a reflexive assessment process in ModernAKIS meets a twofold goal: 1) to serve the implementation of a real MAA, through accompanying AKIS actors along a learning and critical mirroring path that will enhance the capacity development and transformative change; 2) to allow embedding critical reflection and evaluative analysis into the logic of actions for change that the key AKIS actors will undertake within respective systems during the development paths of the TAJs. Indeed, a reflexive process will support these actors in the on-going collection of empirical evidence that will feed evolutionary loops of reflexive exercises, learning and adjustment of action in their respective systems.

The reflexive assessment process will be applied along the TAJs and will take the form of systematic assessment exercises with the key actors of change. This process will contribute to solve systemic problems and to create enabling environments for innovation system's functions, by stimulating and organizing actors' participation, creating space for capabilities development and promoting interactions among heterogeneous actors (Patton, 2008; Wieczorek and Hekkert 2012).

Indeed, the needs' assessments will serve grounding capacity development to carry out along the TAJs to identify and prioritize current and emerging necessities of the key actors of change in relation to the system and strategic capacities that are crucial to play roles and activities within the respective AKISs.

The purposes of the capacity needs' assessment is to: 1) identify the capacity needs and to engage them in setting the agenda for the TAJs and the specific capacity development activities; 2) design on-demand capacity development activities based on the paths of individual and collective learning process; 3) empower the key actors of change to better understand and deal with the complex systems and dynamics behind an AKIS functioning; 4) review the capacity development activities (methods and topics) in view to align policy developments and capacities to manage and govern the CAP at MS level.

Discussion

This framework will be implemented through the different activities of the ModernAKIS project, starting in 2022 and ending in 2029. The added value of the project lies in the involvement of the key AKIS actors of change, the extensive use of the multi-actor approach and the reiterated application of reflexive assessment. Therefore, its effectiveness will surely rely on the extent to which the project will be able to engage the key AKIS actors, as well as on the willingness of these last to "float" among the waves of the Transformative AKIS Journey.

In this respect, motivating people according to the rules of a research project (achievement of deliverables and milestones, resources and goals that are already defined and hardly changeable) is certainly a challenge. Moreover, designing capacity development pathways with dynamic groups of people is a complex activity that requires time and effective methods that guarantee the sustainability of change. These do not necessarily lead to an immediate sense of satisfaction. It is therefore crucial not to fall into the trap of celebrating 'quick wins'.

References

Acquaye-Baddoo N-A, Ekong J., Mwesige D., Nass L., Neefjes R., Ubels J., Visser P., Wangdi K., Were T., Brouwers J., (2010). Multi-actor systems as entry points to capacity development. Capacity.Org journal No. 41

EU SCAR AKIS (2019). Preparing for Future AKIS in Europe. Brussels, European Commission.

Geels, F. W. (2012). A socio-technical analysis of lowcarbon transitions: introducing the multi-level perspective into transport studies. Journal of Transport Geography, vol. 24, pp. 471–482.

Haasnoot, M.; Kwakkel, J.H.;Walker,W.E.; ter Maat, J. (2013). Dynamic adaptive policy pathways: A method for crafting robust decisions for a deeply uncertain world. Glob. Environ. Chang., 23, 485–498.

Kemp, R., Schot, J., & Hoogma, R. (1998). Regime shifts to sustainability through processes of niche formation: The approach of strategic niche management. Technology Analysis and Strategic Management, 10(2), 175–198. https://doi.org/10.1080/09537329808524310

Knierim, A., P. Labarthe, C. Laurent, K. Prager, J. Kania, L. Madureira, H.T. Ndah (2017). "Pluralism of agricultural advisory service providers – Facts and insights from Europe". Journal of Rural Studies 55 :45-58. doi: https://doi.org/10.1016/j.jrurstud.2017.07.018.

Knierim, A., Boenning, K., Caggiano, M., Cristóvão, A., Dirimanova, V., Koehnen, T., Labarthe, P., & Prager, K. (2015). The AKIS concept and its relevance in selected EU member states. Outlook on Agriculture, 44(1), 29–36. https://doi.org/10.5367/oa.2015.0194

Martin, G.; Allain, S.; Bergez, J.-E.; Burger-Leenhardt, D.; Constantin, J.; Duru, M.; Hazard, L.; Lacombe, C.; Magda, D.; Magne, M.-A.; et al. (2018). How to Address the Sustainability Transition of Farming Systems? A Conceptual Framework to Organize Research. *Sustainability 10*, 2083. https://doi.org/10.3390/su10062083

Mersmann, Florian, and others (2014). Shifting Paradigms: Unpacking Transformation for Climate Action – a Guidebook for Climate Finance and Development Practitioners. Berlin: Wuppertal Institute for Climate, Environment and Energy. Available at https://epub.wupperinst.org/frontdoor/index/index/docId/5518.

Mezirow, J. (1997). Transformative Learning: Theory to Practice Transformative Learning Theory. In Transformative Learning (Mezirow); Jossey-Bass: San Francisco, CA, USA; pp. 5–12.

Mezirow, J. (1990). How Critical Reflection Triggers Transformative Learning. In Fostering Critical Reflection in Adulthood: A Guide to Transformative and Emancipatory Learning; Jossey-Bass: San Francisco, CA, USA; pp. 1–18.

Mezirow, J. (1991). Transformative Dimensions of Adult Learning. San Francisco: Jossey-Bass

Mezirow, J. (1985) A critical theory of self-directed learning. New Dir. Cont. Educ., 1985, 17–30.

NAMA Facility (2014). Potential for Transformational Change. Berlin: German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety; London: UK Department for Energy and Climate Change. Available at www.nama-facility.org/fileadmin/user_upload/publications/factsheets/2014-08_factsheet_namafacility_potential-for-transformational-change.pdf

Patton, M. Q. (2008). Sup wit eval ext? New Directions for Evaluation, 2008(120), 101–115. https://doi.org/10.1002/ev.279

Pelling, M.; O'Brien, K.; Matyas, D. Adaptation and transformation. Climate Change, 2015, 133, 113–127.

Rocchigiani, M., & Herbel, D. (2013). OrganizatiOn analysis and develOpment learning mOdUle 4 4 OrganizatiOn analysis and development, FAO, Rome.

Rotmans, Jan, and Derk Loorbach (2009). Complexity and transition management. Journal of Industrial Ecology, vol. 13, No. 2, pp. 184–196.

Schot, Johan & Geels, Frank. (2008). Strategic niche management and sustainable innovation journeys: Theory, findings, research agenda, and policy. Technology Analysis & Strategic Management. 20. 537-554. 10.1080/09537320802292651.

Vallacher, R. R., Read, S. J., & Nowak, A. (2002). The dynamical perspective in personality and social psychology. Personality and Social Psychology Review, 6(4), 264–273. https://doi.org/10.1207/S15327957PSPR0604_01

Van Bruggen, A., Nikolic, I., Kwakkel, J.H. (2019). Modeling with stakeholders for transformative change. Sustainability, 11 (3). http://resolver.tudelft.nl/uuid:4d57b0a7-fcde-4f0a-818b-0d1ca8060c19 https://doi.org/10.3390/su11030825

Westphal, Michael I., and Joe Thwaites (2016). Transformational Climate Finance: an Exploration of Low-Carbon Energy. Washington D.C.: World Resources Institute. Available at www.wri.org/publication/transformational-climate-finance

Wieczorek, A. J., & Hekkert, M. P. (2012). Systemic instruments for systemic innovation problems: A framework for policy makers and innovation scholars. Science and Public Policy, 39(1), 74–87. https://doi.org/10.1093/scipol/scr008

Climate change and innovation: the role of public policies in a multi-stakeholder approach.

Jose Luis Cruz, A. Barrutieta, I. González, V. Bermejo, JP. Zamorano

Short abstract

Climate change (CC) is a challenge for rainfed cereal cultivation in southern Europe. Innovations are needed to adapt to and mitigate the effects of CC. In this process, farmers need information and support. Input companies are of great importance in terms of information and advice to farmers. In the specific case of CC, political, technical and industry discourse present complementary visions of CC. However there relevant differences in terms of the time frame and the perception of risk.

Waiting for CC to become a reality could overwhelm the sector's capacity to react, so it is necessary for the transition to begin to be promoted by bodies that have the necessary competencies and data. Although public policies also respond to evidence and not to possible scenarios, the margin for initiating actions is greater insofar as the range of actions covers from research and studies to provide updated information, through dissemination and awareness-raising to progressive accompaniment towards mitigation and adaptation practices.

Extended abstract

Purpose

Climate change (CC) is a challenge for rainfed cereal cultivation in southern Europe. Innovations are needed to adapt to and mitigate the effects of CC. In this process, farmers need information and support. This study shows what the sources of information are and what the role of public policies is in this innovation process.

Design/Methodology/Approach

Mapping the farmers' information sources is an essential first step in order to design an advisory system that is as agile and operational as possible (Cruz et al, 2021). To identity thes sources and the perceptions of the different stakeholders in the cereal sector, interviews have been conducted with farmers (n=27), cereal experts (n=19), researchers (n=7) and policy makers (n=2). Additionally, this study maps the main sources of information for cereal farmers in the region of Madrid (RM). It focuses especially on CC as one of the major challenges for rainfed crops in Southern Europe.

Research funded by IMIDRA (Project FP21-CONAGRO). A.B. received a fellowhisp funded by IMIDRA.

Findings

Findings answer a twofold question: What are the main information sources of farmers? What are the approahc of the different stakeholders to addres climate change? The combination of both questions highlights what the role of public policies can be, in order to promote the innovation process.

According to AKIS (SCAR AKIS, 2019), mapping the knowledge of a crop is essential for disseminating information and accelerating the innovation process. In the case of the RM cereal crop, the knowledge map is highly centralised. Information sharing and peer learning makes farmers themselves a central node in circulating knowledge (Figure 17).

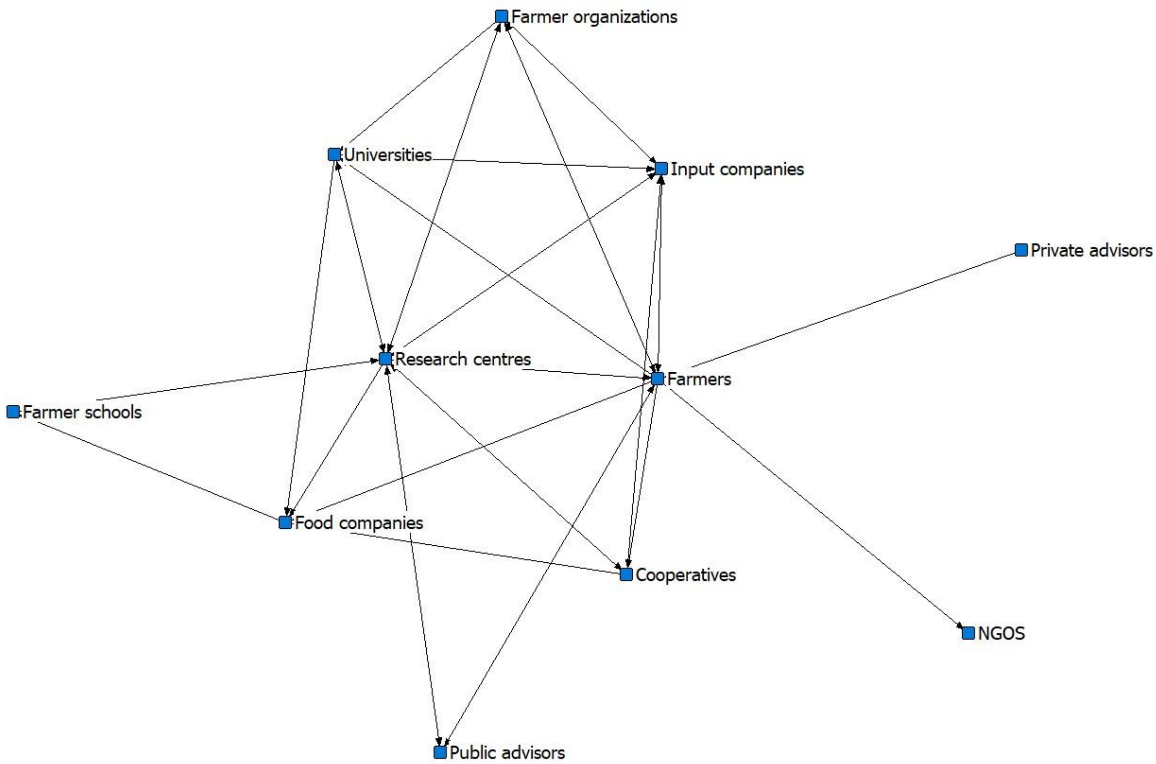


Figure 17. Map of knowledge of cereals in the region of Madrid.

Input companies are of great importance in terms of information and advice to farmers. Forty-six percent of cereal farmers acknowledge that they are the main source of information in their daily work. Presence in the field, accessibility and accompaniment is highly valued by farmers. In the case of cereals, the seed salesmen are there to support the campaigns year after year. Likewise, fertiliser and pesticide dealers are increasingly present in cereal cultivation, either because the varieties used require more support from this type of product or because the environmental conditions in which the crops are now grown require more inputs. Either way, input companies are a relevant node in cereal cultivation (Figure 18).

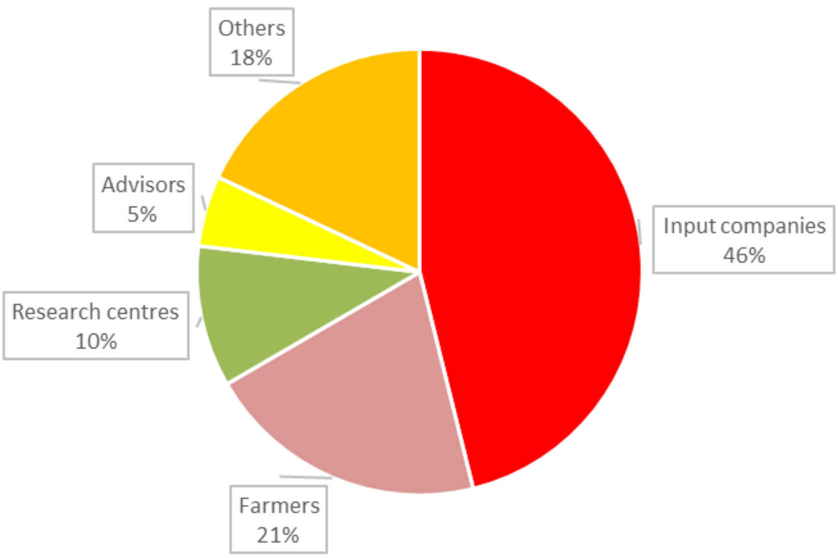


Figure 18. Farmers' information sources in the region of Madrid.

At this point, it should be noted that the EU indications and the proposals of the AKIS model point towards advisory models that are free from commercial interests in order to ensure maximum objectivity in making assessments and recommendations to the farmer (SCAR AKIS, 2019).

Research centres that carry out variety trials also have an important role to play. In the case of the RM, this work is carried out by IMIDRA. Agricultural associations are particularly valued for their contribution to more administrative and aid processing issues, but not so much as key players in technical advice on cereal cultivation.

The universities play a more specific role insofar as some of the work they carry out is not immediately applicable to the sector and, therefore, on occasions they do not have such direct contact with farmers.

Public advisory services, as indicated above, play a very residual role in the process of knowledge circulation. With the added limitation that they carry out both control of compliance with aid requirements and advice. This dual role conditions the terms of farmers' trust in them. They fear that their presence in the field may result in an inspection or sanction, so they prefer to channel their doubts and advice needs through other agents.

Regarding the second question, the dependence on weather conditions in the case of rainfed arable crops makes them particularly sensitive to changes in rainfall and temperature patterns, but farmers seem to consider this as an intrinsic element of their profession. In other words, they consider that each year the climate is different, with warmer, drier or rainier cycles. Therefore, in general terms, they do not consider long-term weather patterns, but work with a specific time frame of 1 or 2 harvests and do not consider possible scenarios but concrete realities.

Farmers are incorporating adaptive practices year by year. These are practices that do not require large investments and are almost imposed by weather conditions, such as changes in the calendar, variety selection or changes in soil management towards less tillage or even direct sowing. To a large extent, all the agents interviewed for this study agree that these are the main adaptations made. If the price of inputs rises, strategies are sought to reduce these costs. In terms of adaptation, the main stimulus is to cover costs and obtain the highest possible profitability from each year's crop.

It is noteworthy that farmers coincide with the other agents in considering the weather as the main conditioning factor of the sowing calendar, which shows that these crops are particularly dependent on temperatures and rainfall. In this line, it is shared by the different profiles interviewed (farmers, technicians, researchers) that environmental problems are affecting the cereal crop, showing their concern especially in the change of temperatures, rainfall and pests.

In the specific case of CC, political, technical and industry discourse present complementary visions of CC. Approaches vary according to the time frame and the perception of risk. Short-term and economic risks are a priority for a production sector that is already making changes to adapt to ever-decreasing profitability. The medium-term risks to food security, rural development and the environment on the part of political decision-makers complement the sector's vision.

From the point of view of the technicians who have to accompany the adaptation and mitigation process, the issue of CC is seen from a long-term perspective, although they are aware that changes are already needed. Finally, the scientific work identifies scenarios and explores options for long-term mitigation and adaptation.

Farmers' time frame of reference does not consider medium- and long-term scenarios, and the focus is on getting the harvest year by year. They also do not react to potential scenarios but react on evidence. At present, the evidence is not sufficient and waiting for a tipping point to be reached where yield and productivity losses are repeated would mean that the change towards more adapted practices would have to be made without interruption and with very tight time frames.

In other words, waiting for CC to become a reality could overwhelm the sector's capacity to react, so it is necessary for the transition to begin to be promoted by bodies that have the necessary competencies and data.

Although public policies also respond to evidence and not to possible scenarios, it is no less true that the margin for initiating actions is greater insofar as the range of actions covers from research and studies to provide updated information, through dissemination and awareness-raising to progressive accompaniment towards mitigation and adaptation practices.

Practical Implications

In the case of cereals, public policies play a key role in the transition of farming practices. Farmers work with short-term time scenarios and adapt their practices towards immediate and safe problems and solutions. Scientists work with different scenarios and risks, as well as with wide time horizons. In the face of uncertain future challenges, such as climate change, the beginning of the transition to more sustainable systems must be supported and driven by public policies.

Theoretical Implications

The assessment and monitoring of knowledge flows between stakeholders in the agricultural sector should be territorialised and crop-specific. Knowledge maps can be a useful tool to carry out these assessments and monitoring.

References

Cruz et al., (2021) AKIS: Del conocimiento a la innovación en el sector agroalimentario. Edit INIA. Madrid. http://libros.inia.es/libros/product_info.php?products_id=1507.

SCAR AKIS (2019) Preparing for future AKIS in Europe. Standing Committee on Agricultural Research (SCAR) - 4th Report of the Strategic Working Group on Agricultural Knowledge and Innovation Systems (AKIS)

Towards a Capacity Development framework for the EIP-AGRI concept

Susanne von Münchhausen, Mark Redman, Mikelis Grivins, Lisa van Dijk

Short abstract:

Agriculture, forestry and rural areas are facing manifold challenges related to climate change, biodiversity decline and other sustainability issues. The EIP-AGRI with its underlying 'interactive innovation approach' is a policy concept that aims to speed-up innovation. This paper aims to highlight the needs for capacity development for co-innovation on all governance levels – within the European Commission and the EU Member States. Moreover, the engagement with the ESEE community aims to refine the five principles deduced, and to move towards a European Capacity Development (CD) framework for the EIP-AGRI and co-innovation in farming and forestry.

Extended abstract

Purpose

A mix of policy programmes and measures is in place aiming to realise the overarching policy objectives in practice such as Green Deal and the Farm-to-Fork strategy. The European Innovation Partnership for agricultural productivity and sustainability (EIP-AGRI) with its underlying concept of 'interactive innovation' (also called 'interactive innovation', or 'co-creation' and 'collaboration for innovation') is one of the policy approaches that aims to enhance the development of innovative solution for sustainable land use and rural business (EIP-AGRI SP 2017). Since 2012, the systematic implementation of co-innovation is underway because it is seen as a promising way towards sustainable futures. In principle, the implementation of the co-innovation approach is expected to cover and span across all governance levels. However, the implementation of such a multi-level and multi-actor innovation concept is not trivial for policy, administration and practice (Fieldsend et al. 2020). In order to find ways for improvement in the upcoming funding period, policy makers were asking for advice on how to contribute to speeding-up innovation in agriculture, forestry and rural business. The EC funded multi-actor project LIAISON[21] worked on these questions (2018–2022). The team developed recommendations for policy and practice for the optimisation or 'levelling up' of the co-innovation approach. The identification of enabling and hampering factors for co-innovation within a mixed group of actors revealed that the actors involved needed a set of skills, knowledge and experiences in order to deliver well-targeted and effective solution for problems of farms, foresters and other rural business (Fieldsend et al. 2020).

The purpose of this paper is to identify and cluster the needs identified for capacity development for co-innovation. Moreover, the engagement with the ESEE community aims to refine the five principles deduced, and to more towards a European capacity development framework for the EIP-AGRI.

Methodology

A literature review on co-innovation concepts within Europe and internationally laid the foundation for the case-study selection and analysis (Cronin et al. 2021)). Since this paper focuses on capacities needed for the implementation of the co-innovation approach in the agri-food sector, the Capacity Development (CD) framework of the Tropical Agricultural Platform (TAP) was a key source for in-depth analysis. In LIAISON, this TAP framework served as starting point for understanding the capacities to co-innovate. Based on this, a case study methodology was used to gain more insights from the EIP-AGRI programme. Three case studies were selected because of their particular insights into 1) the use of the TAP framework for CE, 2) self-learning structures of the policy unit and supporting agencies (Project Group 'EIP-AGRI' Hessen, DE), and 3) learning structures for farmers and foresters provided by an innovation support network (Rural Innovation Support Service, UK). The investigation of the case studies referred to a common analytical framework (Cronin et al. 2021).

[21] The project 'LIAISON – Better Rural Innovation. Linking Networks, Actors, and Instruments' received funding from the EU's Horizon 2020 Research and Innovation Programme under grant agreement No 773418.

Findings

The analytical framework for LIAISON case studies provided guidance for the case study work. The work resulted in a) a description of its national/international context and its objectives, and b) specific lessons learnt for an improved implementation of the EIP-AGRI.

Case Study 'TAP CD Framework in practice': Developing countries, of which 90 percent are located in the tropics, often lack the resources and capacities to develop their AKIS. To address this gap, in 2012 the Agriculture Ministers of the G20 in 2012 called for the creation of the TAP. It is a multilateral dynamic facilitation mechanism, which fosters better coherence and greater impact of CD for agricultural innovation. The TAP framework proposes a practical approach to CD for agricultural innovation that aims at harmonising the diversity of existing strategies. It provides methodologies and tools to better understand the architecture of local knowledge and innovation systems, to assess needs and to plan, implement, monitor and evaluate relevant interventions. It emphasises the crucial role of facilitation, knowledge management as well as reflection and learning. In the eight pilot countries, relevant actors built new and existing partnerships to address commonly identified challenges and opportunities. CD interventions were implemented at multiple levels and interventions including tracking, monitoring and evaluation of outcomes in a participatory manner. A key finding was the importance of creating opportunities to reflect upon and reassess interventions.

Case Study 'RISS': Rural Innovation Support Scotland provided facilitated support for co-innovation between actors of the food and drink value chain in Scotland. This programme was implemented at the national level and funded though Scottish RDP funding. RISS filled a gap in the innovation landscape by strategically requiring supply chain collaboration in the initial development stage, rather than supporting projects with only producers and/or land managers aiming to create innovations in isolation. RISS creates the space for multi-actor groups including farmers, value chain actors, researchers, government representatives and cooperatives with expertise, experience, skills or a financial stake in innovative outcomes to interact and jointly develop social, organisational, commercial and/or technological innovations. The RISS programme was in itself innovative as it provided the catalyst for innovation. A key finding was that a programme-funded facilitator with certain competences and tasks was one of the success factors within the RISS group process. Enabled by the facilitator's support, actors explored iteratively their topics without following strict rules.

Case study 'Project Group of the Managing Authority': The Ministry for the Environment (the Managing Authority for the RDP in Hessen, DE) developed a strategy for the continuous learning within the multi-level governance system of EIP-AGRI implementation. It analysed the framework provided by the EC and set up a self-learning system, which consisted of institutes and procedures. The aim was a) to provide support to local EIP-AGRI project applicants, and b) to allow for an ongoing revision of Directives coming from the EC. In 2014, the teams of the managing authority, the granting authority, the external innovation support service, and the public farm advisory service formed the so-called 'Project Group'. This group coordinated and monitored their own implementation processes of the EIP-AGRI concept. External evaluators also provided feedback to this continuous learning process within programme administration.

The in-depth analysis of the case studies and the clustering of emerging functional capacities, which are needed for the co-innovation processes, resulted in five key principles. These emerged as essential drivers to 'level up' the implementation of the EIP-AGRI co-innovation approach: 1. Enhance networking and collaboration, 2. Work with diversity, 3. Create space and ability to act, 4. Foster reflection and learning, and 5. Promote fair governance on multiple levels. Moreover, the work resulted in the identification of five principles and the associated core capacities, which are essential to enhance co-innovation on the different governance levels. The findings from LIAISON indicate that if CD for co-innovation will be neglected, it might be difficult to reach a higher level of 'readiness' of co-innovation realised by policy teams and project groups across Europe.

Practical implications

The case study analyses show that the capacity to innovate can be supported by well-targeted measures such as the establishment of support organisations, structures and processes – publically or privately funded. For that reason, the EC and its policy programmes will need a CD framework, which will become an additional cross-cutting element in current innovation support programmes. Although private actors need to improve their capacity to innovate and to apply for or engage in publically funded innovation projects, they will not be able to set up and pay for such a supportive environment privately or by their professional organisations (farmers union, cooperatives, breeding associations etc.). These findings fuelled the discussion with policy makers and administrators for EIP-AGRI implementation from 2023 onwards for both the EIP-AGRI funding under the RDP and the EC's Research and Innovation Programme Horizon Europe. Currently, the funding logic is based on the financial funding of divers types of multi-actor projects, AKIS organising bodies, managing and paying authorities and associated innovation support services, as well as European level agencies. The complementation of the EIP-AGRI policy concept by the additional element of a CD framework for co-innovation is challenging for all levels involved, and therefore, it will take time.

Theoretical implications

This paper builds on the CD framework of the TAP, and other insights from the literature review. Moreover, a set of case studies sheds light on the needs and approaches realised in the EIP-AGRI context. However, the design and the implementation of a solid policy concept for the development of functional capacities for co-innovation will require further theoretical foundation. This work is expected to continue as part of the PREMIERE project[22], which receives funding from the European programme Horizon Europe (2023-2028). The expected discussion with the ESEE community at the conference in July 2023 will contribute to this further grounding and conceptualisation of the theoretical CD framework for European RDPs and research and innovation policies.

References

EIP-AGRI Service Point, 2017. Horizon 2020 multi-actor projects. Retrieved from: https://ec.europa.eu/eip/

Fieldsend, A. F., Cronin, E., Varga, E., Biró, S., & Rogge, E. (2020). Organisational Innovation Systems for multi-actor co-innovation in EU agriculture, forestry and related sectors: Diversity and common attributes. NJAS: Wageningen Journal of Life Sciences, 92(1), 1-11.

Cronin, E., Fosselle, s., Rogge, E., & Home, R. (2021): "An Analytical Framework to Study Multi-Actor Partnerships Engaged in Interactive Innovation Processes in the Agriculture, Forestry, and Rural Development Sectors", in: Sustainability 13(11), 6428; 19Thttps://doi.org/10.3390/su1311642819T

[22] The project PREMIERE – Preparing Multi-Actor Projects in a Co-creative Way receives funding from the EU's Horizon Europe Research and Innovation Programme under grant agreement No 101086531.

Evaluation of Italian Food Districts: preliminary data

Francesco del Puente[1]; Concetta Menna[2]; Marcello De Rosa[3]; Giuseppina Olivieri[4]; Piermichele La Sala[5]; Ferdinando Gandolfi[6]; Irene Paola Borrelli[7]; Teresa del Giudice[4]; Alessandro Sapio[8]

[1] University of Naples -Parthenope (IT), francesco.delpuente@unina.it
[2] CREA – Center of Political and Bioeconomy, Naples (IT), concetta.menna@crea.gov.it
[3] University of Cassino and Southern Lazio (IT), mderosa@unicas.it
[4] University of Naples - Federico II (IT), giuseppina.olivieri@unina.it
[5] University of Foggia (IT), piermichele.lasala@unifg.it
[6] Campania Region – Department of Agriculture, Naples (IT), ferdinando.gandolfi@regione.campania.it
[7] Upfront Advisory srl, Naples, (IT)), irenepaolaborrelli@gmail.com
[4] University of Naples - Federico II, (IT), teresa.delgiudice@unina.it
[8] University of Naples -Parthenope (IT), alessandro.sapio@uniparthenope.it

Short abstract:

The study describes data about 19 Strategic Plans of Food Districts, from 4 Italian Regions, it aims also at investigating the perception of Food Districts about the implementation of AKIS. In Italy, Food Districts have been instituted in 2019, based on the framework of multi-actor-arrangements. As theoretical framework, the Grounded Theory is used. To collect information, documents are analysed with an open-coding process. Findings show that the main codes are: Network-building; Territory-valorisation; Product-valorisation; Environmental-impact. These codes fit with the legislator's perception. The relevance for Integration of value-chain and for Stimulate innovation process, indicates that Food Districts horizons are in coherence with European policies. Considering the proximity plot, the targeted AKIS have the same relevance to Improve Firms Structure. Thus, in the Districts' perceptions, it could not be possible to build AKISs without improving firms' structures and vice versa. However, distant from the legislator view, Districts do not relate the construction of AKISs with Digitalization. Results are of relevant impact for the public policies and to orientate education and training in the Regions improving knowledge and investments to stimulate innovation. In addition, it is the first study that explores 'Food Districts' nationally, encouraging further research in this field.

Extended abstract

Purpose

The new economic paradigm, characterized by the emergence of knowledge as a key factor for economic growth, implies that conventional policy approaches were ineffective to support the economic development and thus new forms of intervention have become desirable (Arenal et al., 2021). In this sense, it is necessary to establish new governance mechanisms based on diverse multi-actor arrangements that can address long-term strategies (Casula, 2022). These can play a fundamental role in rural areas worldwide in order to support territories empowerment and stimulate local development. Multi-actor arrangements, stressing the importance of knowledge-sharing among parties, are thus powerful tools in improving innovation within the agricultural sector (Garcia-Alvarez-Coque et al., 2021). Therefore, investment in knowledge sharing is recognised as a primary driver in the creation and growth of innovation (Cristóvão et al.; 2012) and thus in the implementation of several multi-actor arrangements.

During this century the theoretical framework of multi-actor arrangements has led to the constitution of districts models. This operational model, according to Mantino, (2005), has spread to many sectors such as the agricultural ones in which, particularly in Italy, a pivotal role has been taken by the relation with products and territory identity. Therefore, in Italy, the so called 'Food Districts' have been recognized in 2019 in order to support interactions among actors and to increase local development avoiding quality dispersion (of products and processes) in the agri-food sector (Touzard et al., 2015; Mirra et al., 2020). In Italy, each one of the 21 Regions has competence in the regulation of the agricultural sector. Thus, the recognition of 'Food

District' takes place through the Regions to which they belong. They provide notification to Ministry of Agriculture, which has established the 'National Register of Food Districts'.
The present study aims at exploring the 'Strategic Plans' presented in order to achieve the recognition of 'Food Districts' within several Italian Regions. As theoretical framework, the Grounded Theory is used to analyse District's perspective in order to categorize the main topics expressed in the Plans. In addition, a specific attention is pointed to the perception of 'Food Districts' Plans about the implementation of AKIS (Agricultural Knowledge and Innovation Systems) within the National territory as networks capable of stimulating innovation processes.

Design/Methodology/Approach

The research question of this study calls for a qualitative approach. The Grounded Theory (Glaser & Strauss, 1967) has been followed to analyse the documents that 'Food Districts' have presented to the Regions to be formally recognized. According to Glaser (1967), Grounded Theory refers to a specific methodology able to produce a multivariate conceptual theory from systematically collected data. This method consists of several inductive strategies for analysing data and not of a preconceived concept or hypothesis. It is an emergent process that involves several non-sequential steps in which the researcher continuously moves between them. To achieve information, documents are being analysed with an open coding process: coding refers to the process of conceptualising data. It is a form of content analysis that is used to find and conceptualise the underlying issue amongst the documents (G. Allan, 2003).

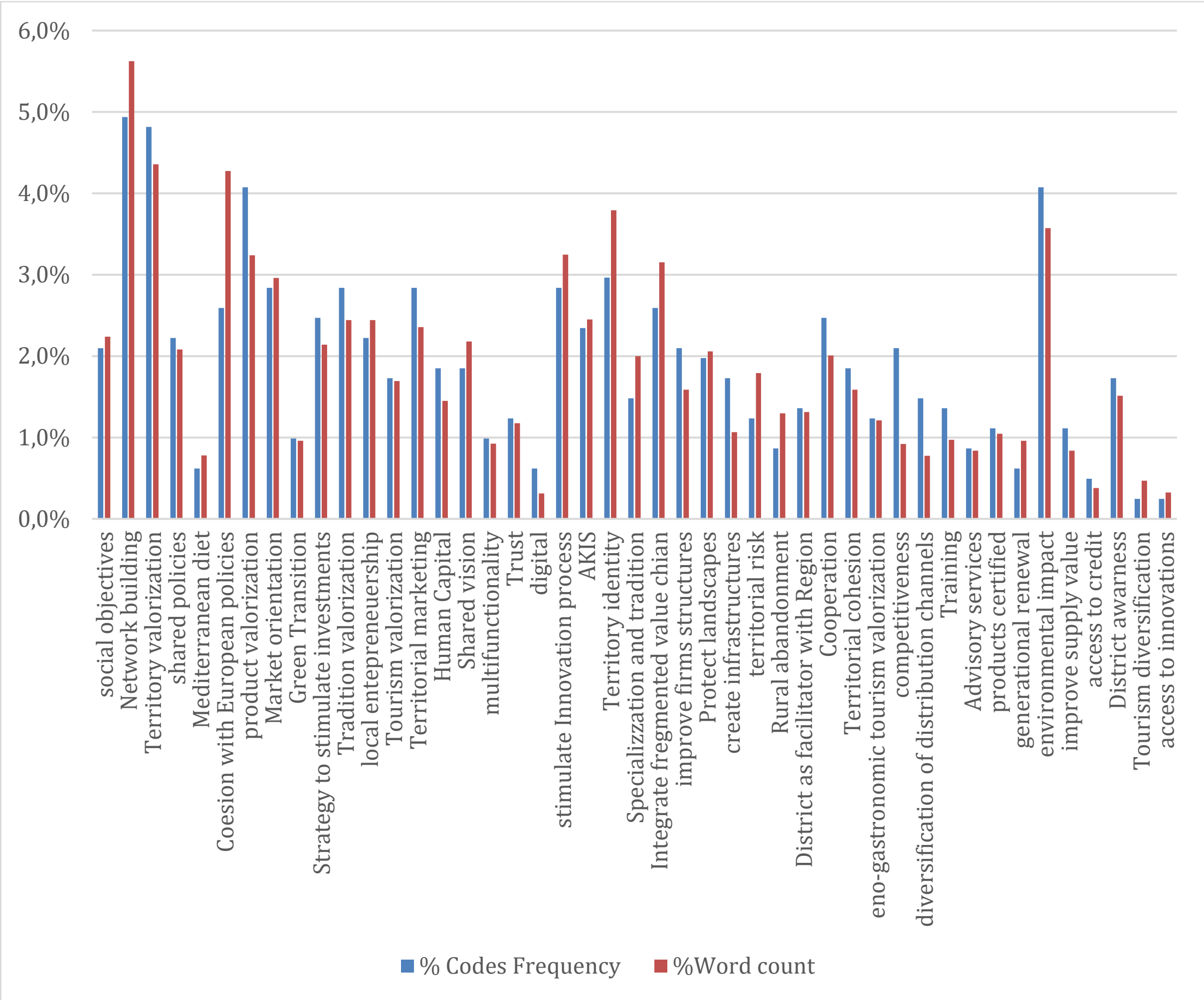
The data collection is based on a convenience sample as used, according to Hull (2013), at the beginning of a project to identify the scope, components and trajectory of the overall process. Data are selected on the basis of their accessibility, considering that these documents must be required to Regions or Ministry and are difficult to obtain. Thereafter, the researcher may request further data to saturate the theoretical sampling to develop the study. The researchers have contacted several Italian Regions' Departments to request the Documents of the 'Food Districts': 28 have been collected. According to Bengtsson (2016), if the aim of the investigation is too broad, the risk of touching upon too many aspects may preclude the researcher reaching the desired depth of the studied phenomenon. Therefore, the 6 "Biological Districts" (a specified form of 'Food Districts') have been excluded from the analysis; in addition, 3 other Documents have been excluded because their reporting was not compatible with this kind of analysis or due to different form of the documents required. Accordingly, the 19 remaining documents represent the convenience sample of the research. They are formally named: 'Scheme for the submission of the District Plan' (7 documents); 'Final District proposal' (2); 'Territorial Economic Plan' (9) and 'Food District Plan' (1). The documents were mandatory to achieve the recognition by a Regional Law, unfortunately they are not structured in a homogeneous scheme. Therefore, only the sections concerning the strategy have been analysed. Sections considered are comparable also in terms of length, in fact they stay in a range between 3000-5000 characters.

The analysis process is carried out by coding the 19 Strategic Plans of 'Food Districts' with an open coding method. It has drawn down the analysis in several parts. Firstly, the data are being open coded to create items, in parallel all the analysis has been supported with memo-writings, written by researchers in order to specify and elaborate codes and aspects of the process. This allows to conceptualize or to note important process facets of the analysis. Researchers have taken into consideration, in all stages, the validity and reliability of the research in order to maintain the quality of the analysis. Thus, to increase reliability, the approach employs a continual to-and-fro between data collection, coding, memo-writing, from which analysis emerges. At the same time, to increase validity, the process of coding has started randomly (with the 'Penisola Sorrentina e costa d'Amalfi' one) in order to minimize any bias (of order or chronological) and to facilitate a process of distancing from the text. The sections have been coded in English to avoid any translation bias at a later time, and to facilitate the process of analysis. Then, they have been re-analysed repeating the process several times by several researchers, re-evaluating codes, splitting existing ones and creating new until the saturation. The overall codes reflect maximum a paragraph and minimum a sentence of the section. Sometimes sentences are coded with more than one code due to the aim of the documents. In fact, it is fundamental to remind that the sections have been written in order to achieve the recognition of the 'Food District' by the Region, according to a Regional Law. Therefore, the text is written as an open-ended question, but it is already summarized avoiding any form of spontaneous flow of words. Hence, concepts are already synthesized in a concise form to present it to the Region. Bearing in mind all that, and considering the validity and reliability of the research, from 11 codes in the first stage, the analysis has developed 58 codes at the end, highlighting the relevant topics in the perception of 'Food Districts'.

Findings

Findings point out the amount of words involved by each code per Document. Globally, 17.193 words have been coded in the Documents. This allows to evaluate the percentage of word count utilized per code. In this sense, the weight of each code can be summarized comparing the percentage of word count with the code frequency in the overall view, within the 19 Documents analysed. Stating the number of Documents in which the code is present, it demonstrates the importance given by 'Food Districts' to each single item, displaying the different preferences among the institutions through the territory. Comparing the percentage of word counts with the frequencies of each code, it is possible to evaluate the labels more used as compared with those less present in the Documents. The chart (Figure 1) shows the comparison among both.

Figure 1: Comparison between percentage of Codes Frequency and Word count

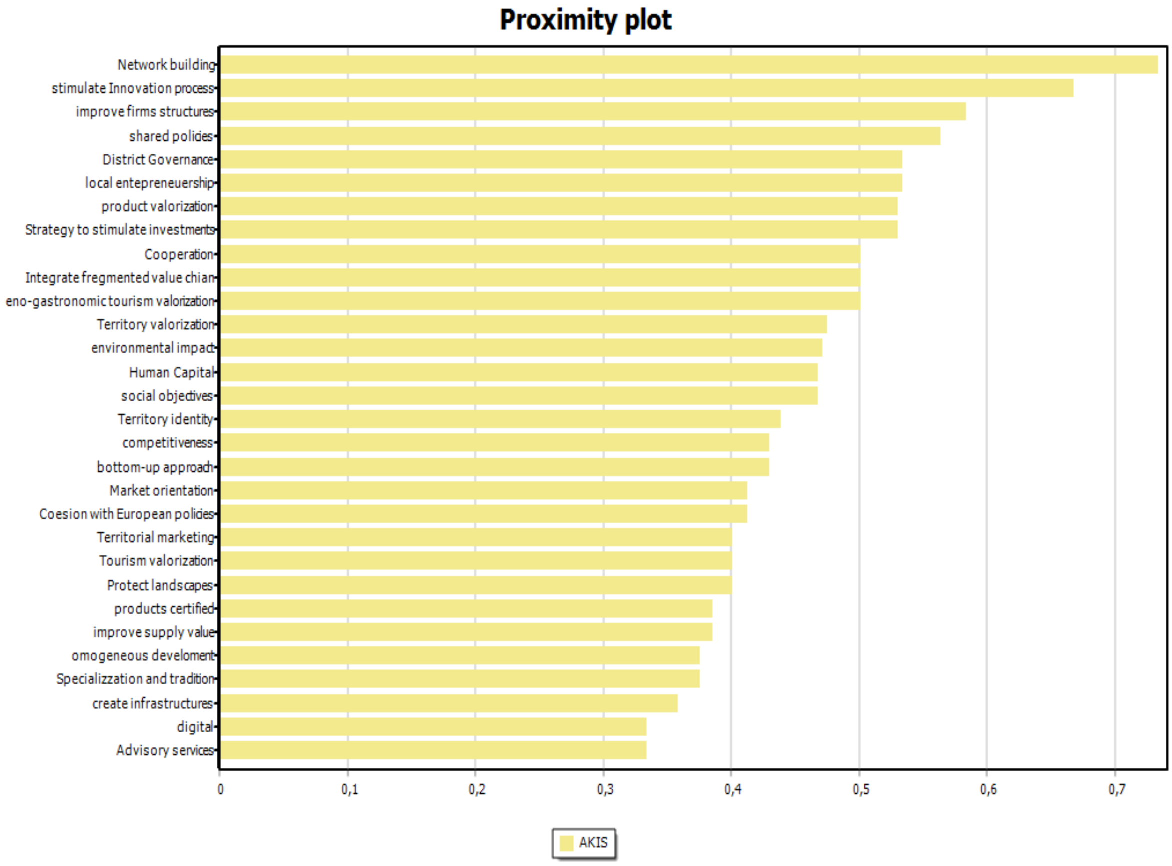


Source : Our Elaboration ; Items with a low presence in Strategic Plans are hided

Within the range between 4% and 5%, Network building and Territory valorisation are present. Under the level of 4%, two more codes are identified such as: Product valorisation; and Environmental impact. Evaluating only the percentage of word counts, Cohesion with European policies; Stimulate innovation process; Territory identity and Integrate fragmented value-chains are identified in this range. Thus, in terms of number of words labelled, the Network building involves the highest number, while in terms of appearance in the text, the Network building and the Territory valorisation are more present in Documents. This indicates the weight of Districts aimed to revitalize rural areas in the analysis. In contrast, less present codes, in terms of percentage of number of words and code frequency, are distributed as follows. Less than

1% are: Mediterranean Diet; Digital; Citizen as promoter of strategies; Access to credit; Tourism diversification; and Access to innovations. Among them, it is remarkable that 'Food Districts' devote little attention to "Digital" aspects in their strategies. In line with this perspective, a Proximity analysis is added to the description of the codes (Armborst, 2017). Drawing down a Proximity plot allows to grasp the relationships between codes and a target one. The relevance in the European Policies Agendas of the Agriculture Knowledge and Innovation Systems (AKIS) has led researchers to plot a proximity analysis targeting codes with the AKIS one. This analysis is formulated to question the perception of 'Food Districts' about the implementation of AKIS within the territories. As shown in Figure 2, the Proximity plot evaluates the co-occurrences of the single code with the targeted, using a similarity index. The software defines by default co-occurrences to happen every time two codes appear in the same Document. To evaluate co-occurrences there are several indexes, the Jaccard Index is estimated in this analysis. It compares codes from Documents to evaluate which codes are shared and which are distinct. It's a measure of similarity with a range from 0% to 100%. The higher the percentage, the more similar are the two codes. The formula in notation is: $J(X, Y) = |X \cap Y| / |X \cup Y|$.

Figure 2 : 'Proximity plot' targeting AKIS item



Source : Our Elaboration

The Proximity Plot is not a data reduction technique, but a visualization tool to help extract information from the huge amount of data stored in the distance matrix at the origin of the dendrogram and the multidimensional scaling plots. In this plot, all measured distances are represented by the distance from the 0 point. The zero point represents absence of similarity or co-occurrences. As shown in Figure 2, the AKIS code is targeted with each code in order to estimate co-occurrences of them within case. AKIS code in this way has strong relationship with Network building; Improve firms' structures; Stimulate innovation process and Shared policies (more than 55%). Minor interaction is shared with the Human Capital and Social objectives that would actually be more appropriate for the AKIS linkages. Unexpectedly, the data show that Digital and Advisory services do not share relation with the AKIS code; it demonstrates a low perception by Districts' plans about the relationships with those issues.

Practical Implications

The present analysis explores preliminary data from the Italian 'Food Districts'. It is the first study that evaluates 'Food Districts' analysing their strategies in line with the Grounded Theory framework. This allows to indicate the relevance of perception of 'Food Districts' objectives and motivations in the Italian territory. It highlights also the potential divergences between policy makers and organizations' perceptions. This analysis points out several aspects that the policy makers should follow in order to let the 'Food Districts' strategies and Legislator's objectives converge, in line with the bottom-up approach needed by the European legislator. The definition of 'Food District' by the law, indicates itself the relevance of the objectives and of the motivations that the organizations must consider. In line with that, results show that codes as Network building; Territory valorisation; Product valorisation; and Environmental impact fit with the perception of the legislator. At the same time, the importance given to the Integration of fragmented value-chains and to Stimulate innovation process, indicates the horizons and mission of these organizations in coherence with European policies, particularly the 2022-2027 programming of the Common Agricultural Policy. The analysis evaluates also the codes less appreciated in the documents. In this view, the proximity plot points out the perception of Districts highlighting the relation of each code with the AKIS one. Data show that the presence of AKIS has the same relevance of the Improve Firms Structure one. Thus, in the Districts' perception, it could not be possible to improve or to build AKISs without improving firms' structures and vice versa. Otherwise, Districts do not relate the construction of AKIS with the digitalization of firms, demonstrating a different vision between policymakers and the agricultural institutions. De facto, Digital, considering the legislator view, must be related with the construction of AKIS. Thus, the low frequency of co-occurrences between AKIS and Digital, indicates a link that has not been already perceived nationally responding to the question of how these organizations perceive the implementation of AKIS in the territory.

Theoretical Implications

The data collected report the main motivations and strategies of Districts for the formal recognition regionally. Memo-writings noted in parallel with the coding process, represent an important tool to describe differences, or gaps in the evaluation of the analysis. In particular, this methodology is crucial to pinpoint the motivations of discrepancy in views between Legislator and 'Food Districts', above all in the awareness of digitalization related to AKIS in the Strategic Plans. This is surely of relevant impact for further studies to evaluate and individuate factors that obstacle digitalization in rural areas from the perspective of 'Food Districts'. Hence, the present approach is appropriate to help policymakers to perceive which weight 'Foods Districts' attribute to the different policy measures.

References

Arenal, A., Feijoo, C., Moreno, A., Ramos, S., & Armuña, C. (2021). Entrepreneurship Policy Agenda in the European Union : A Text Mining Perspective. *Review of Policy Research*, *38*(2), 10. https://doi.org/10.1111/ropr.12416

Armborst, A. (2017). Thematic Proximity in Content Analysis. *SAGE Open*, *7*(2). https://doi.org/10.1177/2158244017707797

Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis. *NursingPlus Open*, *2*, 8–14. https://doi.org/10.1016/J.NPLS.2016.01.001

Caputo N., Del Giudice T., Marotta G., Menna C. (2020). Dai Distretti del Cibo occasione di sviluppo. Tecnica e Tecnologia pp. 56-58.

Casula, M. (2022). How different multilevel and multi-actor arrangements impact policy implementation: evidence from EU regional policy. *Territory, Politics, Governance*, 1–25. https://doi.org/10.1080/21622671.2022.2061590

Cristóvão, A., Koutsouris, A., & Kügler, M. (2012). Extension systems and change facilitation for agricultural and rural development. In *Farming Systems Research into the 21st Century : The New Dynamic* (pp. 201–227). Springer Netherlands. https://doi.org/10.1007/978-94-007-4503-2_10

G. Allan. (2003). A critique of using grounded theory as a research method. *Electronic Journal of Business Research*, *2(1)*, 1–10. https://academic-publishing.org/index.php/ejbrm/article/view/1168

Garcia-Alvarez-Coque, J. M., Martinez-Gomez, V., & Tudela-Marco, L. (2021). Multi-actor arrangements for farmland management in Eastern Spain. *Land Use Policy*, *111*. https://doi.org/10.1016/j.landusepol.2021.105738

Glaser, B. G., & Strauss, A. L. (1967). The Discovery of Grounded Theory. In *New York, Aldine*.

Hull, S. (2013). *Doing Grounded Theory*. https://doi.org/10.13140/RG.2.1.4659.3127

Mantino, F. (2005). New Approaches to Rural Policy. In *New Approaches to Rural Policy: Lessons From Around the World* (Vol. 9789264010). OECD. https://doi.org/10.1787/9789264010130-en

Mirra, L., Caputo, N., Gandolfi, F., & Menna, C. (2020). The Agricultural Knowledge and Innovation System (AKIS) in Campania Region: the challenges facing the first implementation of experimental model. Journal of Agricultural Policy, 3(2), 35-44.

Touzard, J.-M., Temple, L., Faure, G., Triomphe, B., & Boeck Supérieur, D. (2015). *INNOVATION SYSTEMS AND KNOWLEDGE COMMUNITIES IN THE AGRICULTURE AND AGRIFOOD SECTOR : A LITERATURE REVIEW*. https://www.cairn.info/revue-journal-of-innovation-economics-2015-2-page-117.htm

A Global Foresight Framework for the transformation of national agricultural extension systems: contribution for renewing AKIS

P. Djamen[1,2,3], S. Audouin[2,4,5], N. Alexandrova[6], P. Van Doren[7], Z. Mroczek[6]

[1]Cirad, UMR INNOVATION, Ouagadougou, Burkina Faso

[2] INNOVATION, Univ Montpellier, CIRAD, INRAE, Montpellier SupAgro, Montpellier, France

[3]Université Thomas Sankara (UTS)/ Centre d'Études, de Documentation et de Recherche économiques et sociales (CEDRES), Ouagadougou, Burkina Faso

[4]Cirad, UMR INNOVATION, Antsirabe, Madagascar

[5]Centre National de Recherche Appliquée au Développement Rural (FOFIFA), SRR, Antsirabe, Madagascar

[6]FAO, Rome, Italie

[7]Institut Destrée, Belgique

Short abstract:

This communication presents the first-ever global Foresight Framework co-designed to support the transformation of extension and advisory systems (EAS). The Framework includes global EAS scenarios meant to guide EAS actors to think beyond usual trends, explore alternatives and integrate global drivers that they would not have considered otherwise. It has practical implications for the reform of EAS systems. This framework was tested in Madagascar, Azerbaijan and Liberia. Theoretical implications on the interest of foresight and the place and role of EAS in AKIS/AIS[23] were identified. Potential evolutions of EAS in the AKIS/AIS configuration and operation were explored.

Key words: extension, reforms, foresight, policy

Extended abstract

Purpose

In the context of unprecedented agrifood challenges, agricultural extension and advisory services (EAS[24]) must rapidly adapt and be rethought to remain relevant and effective. Due to the low predictability of the agrifood systems, the great diversity of the EAS clientele, the multiactor composition of EAS systems with actors with different interests, capacities and drivers, the design of an effective and transformative EAS system policy and institutional strategies becomes a very challenging endeavour. Traditional approaches to renewing EAS, generally rooted on deductive approaches based on major trends, have shown their limits. To address those limitations, FAO embarked on a Global EAS foresight to mobilise a wealth of knowledge and vast expertise to exploring global trends- manifesting or silent, regional and country specificities and allow a transformative and analytical policy making in absence of experiential facts. FAO engaged with CIRAD to address the lack of methods and knowledge on foresight applied to EAS reform processes. This communication presents the characteristics, implementation modalities, and practical and theoretical

[23] There are two terms with identical content: Agricultural Innovation System (AIS) "is a network of actors (individuals, organizations and enterprises), together with supporting institutions and policies in the agricultural and related sectors that bring existing or new products, processes, and forms of organization into social and economic use. Policies and institutions (formal and informal) shape the way that these actors interact, generate, share and use knowledge as well as jointly learn" (TAP, 2016).

Agricultural Knowledge and Innovation System (AKIS) refers to "a set of agricultural organizations and/or persons, and the links and interactions between them, engaged in the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilization of knowledge and information, with the purpose of working synergistically to support decision making, problem solving and innovation in agriculture" (Röling and Engel,1991).

[24] EAS are defined as all the different activities that provide the information and services needed and demanded by farmers and other actors in rural settings to assist them in developing their own technical, organizational, and management skills and practices so as to improve their livelihoods and well-being. In: Five Key Areas for Mobilising the Potential of Rural Advisory Services, (GFRAS 2016).

implications of a global foresight methodological framework developed in a participatory manner to accompany the reform processes of national EAS systems in the perspective of future post-Agenda 2030 agrifood systems. This effort is part of a broader foresight FAO initiative related to emerging technologies and innovations and the innovation policy lab initiative.

Methodological approach

The EAS foresight framework was developed following a participatory and iterative approach including six steps (figure 1). Based on global foresight methods applied to agri-food systems (FAO, 2018 and 2022; Le Mouël et al., 2018), we selected drivers from the future agrifood scenarios (FAO, 2022) as a basis to be enriched and extended towards EAS issues. Through a literature review, we screened drivers that affect food systems and more specifically EAS at global scale, and select them through a DELPHI consultation (Toillier et al., 2021), based on 2 rounds with more than 80 international experts at global level but capturing regional perspectives (step 2). Then we built the morphological table of the drivers (a set of plausible, relevant and contrasted hypothesis of the future) (Bourgeois et al., 2017) and synopsis of EAS scenarios during 2 webinars with international EAS experts (24 participants). In order to ensure that contrasted visions of the future to be elaborated will be well contrasted, we adopted Inayatullah approach (2008) which mobilized a projected, desirable, undesirable, disruptive matrix to build the set of hypothesis of the future for each drivers.

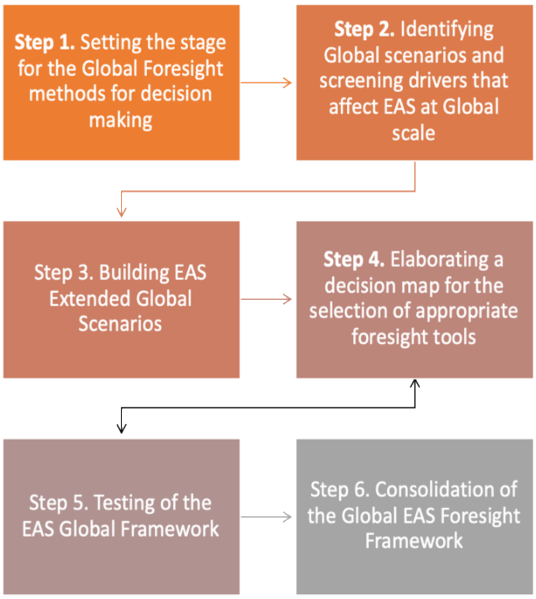


Figure 19. Different steps for the designing of the EAS Foresight Framework

Then, 7 EAS scenarios were built iteratively during back-office sessions with the co-authors of this communication, with a specific attention to the features of future EAS (step 3). Finally, the EAS Foresight framework have been tested in Madagascar, Liberia and Azerbaijan in December 2022 (step 5), following the purpose to explore future pathways for EAS transformation in a context of EAS national policy revision. The testing provided relevant feedback to be considered to consolidate the final EAS foresight framework.

Findings

a. ***Features of the framework***

The EAS foresight Framework is composed of 5 steps (fig 1), that shape activities to support a 2-3 days participatory workshop with actors involved into EAS policy, academic and practical experiences. The fifth step encloses a toolbox designed according to the purpose assigned to the foresight approach.

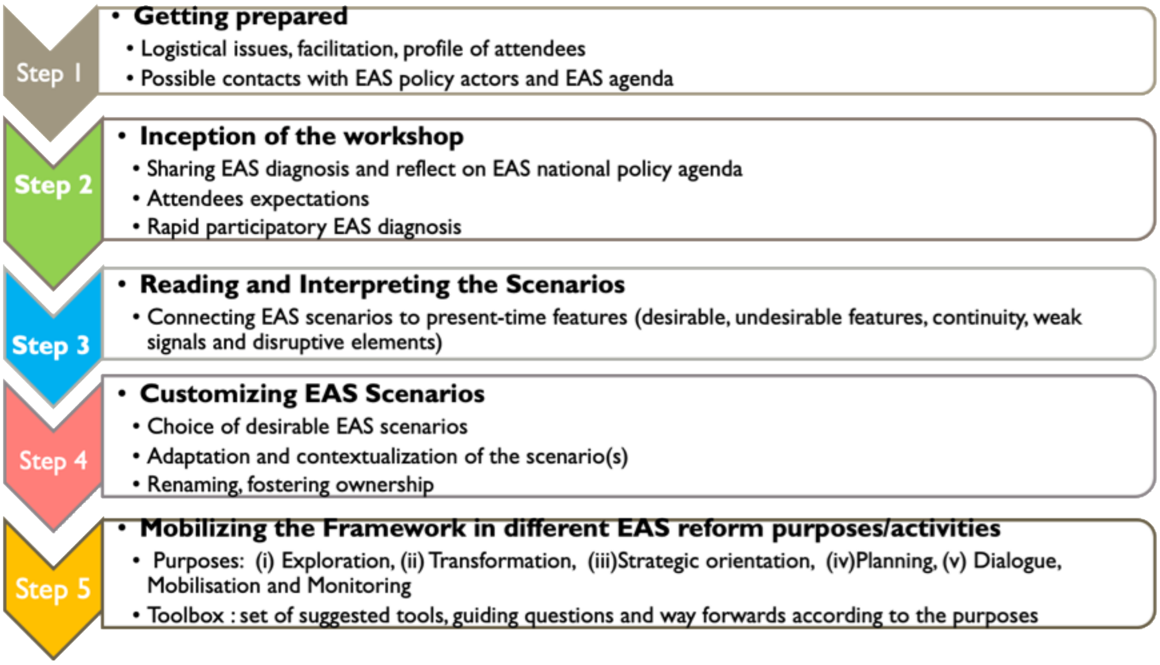


Figure 20: EAS Foresight Framework

b. Seven futures for EAS

Seven EAS scenarios of the future have been identified. They are quite contrasted and highlight different plausible evolutions of national EAS systems.

S1. Dinosaur. EAS have disappeared, because it has become obsolete and absorbed by weak signal dynamics that it did not manage to consider a few years or decades earlier. Knowledge became accessible to all, particularly through online platforms and open data. Due to the agrifood and farmer egalitarism, the role of intermediaries has severely shrunk. Extensionists are replaced by other actors not specialized in the agricultural sector or not specialized in advice. AIS/AKIS are very fragmented and weak. Urban and rural actors manage their part-time interest in food production autonomously and peer-to-peer, enabled by policies, focusing on capacity development. Person-to-person advisors, if they exist, will have a "boutique" function – as traditionally-romantic food producers' gurus.

S2. Total Agony of EAS. Lingering issues of EAS during past decades have not been addressed. Cosmetic measures have been taken but have not solved the fundamental problems. Some reforms of the EAS system have been initiated, but have not been carried through to the end. The added-value of EAS is no more recognized. EAS is underfunded, poorly coordinated though pluralistic. Digitalization is used as panacea but has left many farmers by the wayside and led to a big digital divide.

S3. Archipelago. EAS is a lever for community and equitable development. EAS systems are fully decentralized, dominated by NGOs and in service of an endogenous development and a circular economy that give priority to small-holder producers. Co-creation is the main innovation pathway. However, only the regions with strong potential are developing into archipelagos, while the rest of the world faces a more negative scenario. Decentralization that tends towards autonomy.

S4. Greenverse. The process of reforming the agricultural advisory system and correcting its shortcomings (the subject of scenario 5 below) has been completed, and has made the system more efficient and proactive. Nature positive agrifood systems are prevailing. EAS are pluralistic, responsive to producer and consumer demands, use co-creative, open, inclusive and innovative approaches. EAS systems are results-oriented and accountable to societal challenges. EAS cover all latent or clearly expressed demands of users, whether technical, social, community, environmental, organizational or related to One health issues.

S5. Business Class (pay-as-you-go). EAS are seen as a means of supporting the most affluent producers to improve their business development (productivity, financial profitability). Access to services is fee-based and structured around agribusinesses and large commodity chains. Family farming and substance farming are seen as a dead-end model, budget-wasting and to be discouraged in favour of large commercial farms. EAS highly use of technology and digital-based methods and tools.

S6. Wake-up. This scenario corresponds to a transitional or transformational situation where after awareness of the level of decay of the EAS system, decision-makers and other relevant EAS actors have taken and are implementing adequate measures to correct the structural and historical deficiencies and improve performance and impact of EAS systems. It is characterized by a series of promising reforms of the entire EAS system, including components such as governance, methods and tools, funding, accountability, and the inclusiveness of the service offer. EAS are more and more recognized as a major lever for the development of agrifood systems, there is a trend of increasing political and financial support.

S7. Recovery and Resilience. In a world plagued by frequent natural, social, health and economic crises and disasters, the role of EAS is increasingly geared towards recovery and resilience. EAS systems are integrated with social /civil and health services to mobilize resources and capacities. Unlike in the Greenverse scenario (S4) where EAS are focussed on sustainability broadly speaking, in this Recovery and resilience (S7) the main function of EAS is to support the management of risks and disasters. The functions of direct support to agricultural production and the development of value chains are becoming a minority, as they are being supplanted by the functions of raising awareness among producers and supporting their communities in the development and implementation of risk and disaster management strategies.

These scenarios raise issues, challenges, and disruptions that can be considered in the process of reforming agricultural EAS systems. The testing of the EAS Foresight framework in Madagascar, Liberia and Azerbaijan for example, has shown that these different scenarios are not necessarily exclusive; several of them can co-exist, depending on the diversity of EAS issues in different regions.

c. Evolution of EAS and potential implications for AIS/AKIS

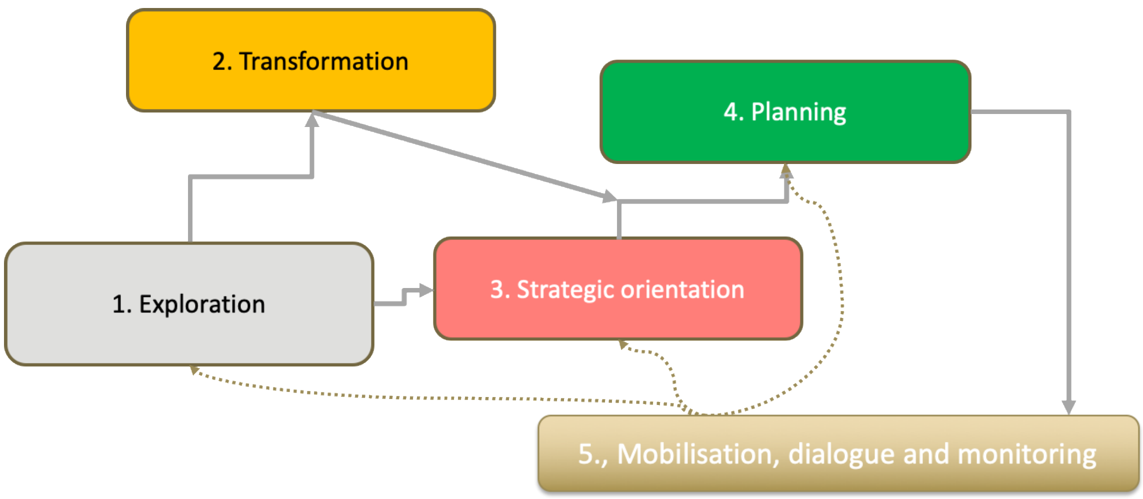
In the seven highlighted scenarios, the role of EAS in AIS/AKIS varies greatly, so do the corresponding agrifood systems and AIS/AKIS themselves. There is a gradient from a situation where EAS have completely disappeared and are no longer part of AIS/AKIS (scenario S1) to cases where EAS play a crucial role in the structure, functioning and performance of AIS/AKIS. Overall, three main profiles of situations can be identified:

- The first profile is where the EAS play a central role in the AIS/ AKIS system, not only participating in the brokering of knowledge, but also in the process of knowledge and innovation co-creation, building the capacity of producers to participate in knowledge production. This multifaceted role is particularly relevant in contexts where AIS/AKIS must contribute to addressing sustainability or systemic issues. In these contexts, the EAS system is also pluralistic and coordinated. This is for example the case with the Greenverse (S4) and Recovery and Resilience (S7) scenarios.
- The second profile is that of a situation with low pluralism of EAS and also weak and undiversified roles in agricultural knowledge and innovation systems. This is somewhat the situation where EAS provided mostly by public organisations or big agro-industrial companies are very much oriented towards technical extension on a few themes or commodities, with increasing productivity as the main objective. The Total agony of EAS (S2) and Business class (pay-s-you-go) (S5) scenarios are representative of this situation. Scenario 1 (Dinosaur) is an extreme case that shows the disappearance of EAS and consequently of AIS/AKIS that would function without EAS. This extreme situation is plausible contexts where demand for services is unified due to the extreme convergence of the agrifood systems into one global system, in which artificial food prevails. EAS therefore does not need to be personalized and can be automated. However, it may also happen if challenges of EAS described in the Total Agony scenario (S2) are not managed, and the emerging trend of EAS as a product linked to other services develops and becomes the rule.
- The third profile: few EAS providers exist but are multifunctional. In this situation, EAS organizations are not very diversified, but have enough complementary skills to play a plurality of roles in knowledge management. This situation can be found in highly centralized systems, with EAS organisations that are very territorially anchored and benefit from substantial means (human and material resources) to meet the diversity of demands. There is a heavy dominance of public or private EAS that managed to put barriers (disincentivise) other EAS so at the end big EAS organisations provide all the services

Practical Implications

The EAS foresight framework (EAS 2F) has several practical implications for national EAS system reform processes. These implications can be classified into five broad categories of purposes: (i) exploration, (ii) transformation, (iii) strategic orientation, (iv) strategic planning and, (v) dialogue, mobilisation and monitoring (Figure 21). Boundaries between these five categories of purposes is not watertight. Results from the implementation of the framework following one purpose can be considered as input, or implementation instrument, for another purpose, as it is the case of strategic orientation and planning.

Figure 21. Main potential usages of EAS Foresight Framework in the framework of EAS transformation



Exploration. The use of EAS 2F in an exploratory perspective is understood both as the study of future developments, trends, breaks and weak signals. It can also be used to identify and understand what could possibly happen - the possible, probable, plausible futures - given the imperfect knowledge of the present. The function of exploration is thus plural. Probable and plausible scenarios for EAS system can be explored is done through the selection and customization of the scenarios presented in the EAS 2F. Such exercise enables the identification of potential outcomes or consequences of upheavals EAS, and more generally consequences (positive or negative externalities) of a given strategic choice (scenario, major change). Exploration translates into a comparison of the different potential scenarios, their added value and limitations, and their consistency with the objectives of the desired reform. Foresight tools such as the Future Wheels can be used to identify potential direct effects of the 1st, 2nd or 3rd order that may result from the choices that are made. Lastly, exploration can help to highlight major elements, or those with strong potential, that are likely to have a positive or negative impact on the transformation of agricultural advisory systems. These may include weak signals, disruptive innovations, pitfalls or mistakes to be avoided, etc. The scenarios enclosed in the EAS include issues, challenges, opportunities, but also avenues for reform or, technical or organizational innovations that may be of interest to stakeholders. The approach includes identification of challenges, opportunities, and possible pockets of the future that already exist in the present and that could be mobilized to achieve the desired future (new EAS system).

Strategic orientation. Here, the EAS Foresight Framework can be used with two modalities. The first modality is to use EAS 2F as an instrument to facilitate the definition of a common vision for the future among actors and stakeholders of the agricultural advisory system. This vision should then serve as a general framework, a reference, for implementing change at one or several levels or components of the EAS system. The second modality it to mobilize the result obtained from the normative use of the EAS 2F to conduct strategic steering. It is then used at any time during the process of setting up or reforming the EAS system to check whether activities undertaken are coherent or whether their design or implementation approach must be reviewed to effectively contribute to the realization of the vision that has been developed. The of of EAS 2F for strategic orientation use produces broad strategic directions. It highlights the ends rather than the means, the objective being to guide the introduction of change (reform) in the structuring, functioning or practices within the EAS system. The result (i.e., strategic vision) of this use serves as a basis for planning, which in turn will focus exclusively on objectives and means.

Planning refers to defining the necessary measures for the design or reconfiguration of the national EAS system based on the new strategic vision that has been set. This strategic vision is built on selected desirable EAS scenario after possible customization, especially by adding other elements of the local or regional context, and/or other features from other EAS scenarios enclosed in the foresight methodological framework. The use of this tool help to think planning in a different way. It is no longer a matter of starting with the present to identify the successive actions required to achieve the strategic vision. Instead, participants start with the desired EAS scenario and describe the successive changes required and the actors involved. Foresight tools such as backcasting are particularly suitable for this exercise. The analysis and thematic grouping of the various successive changes needed to achieve the new vision of the EAS can help identifying the strategic axes. In the Madagascar for instance, the use of the framework to explore potential pathways for renewing EAS in the framework of the producers' services strategy under development enable the identification of the following potential strategic axes were identified: (i) coordination and regulation; (ii) professionalization of EAS; (iii) innovative financing; (iv) renewal of EAS methods and tools; (v) decentralization, inclusion and accountability

Transformation. The use of the EAS 2F for transformation purpose aims to identify the relevant and adapted levers to manage the possible tensions generated by the gap or even the total or partial incompatibility between the characteristics of the present system and those of the system that one would like to bring about. These gaps may be linked, among other things, to the constraints of the agricultural advisory system that we want to change, and on the other hand to the dynamics and changes associated with the new vision and agricultural advisory system that we want to implement in the future.

Mobilisation, dialogue and monitoring. The EAS 2F can serve to mobilize and engage actors and stakeholders of the EAS system in an ad hoc or continuous process of consultation, collective intelligence, debate or public dialogue around the current progress of the EAS system. The objective can be multiple, it can be to strengthen the inclusive and citizen governance of the EAS system, but also to identify possible updates, inflections or incremental improvements to the system and the strategic plan of EAS. The use of participation and dialogue is not limited to the implementation of the strategic plan, but can also be implicit in the exploration, policy and strategy development phases. Mobilisation, dialogue and monitoring purpose of the EAS 2F should be one of the main activities of the country forum or network of EAS actors in countries where they exist.

Awareness raising and consensus-building. The deployment of foresight is also an opportunity for the various stakeholders to discuss the current state of the agricultural advisory system, the determinants of this situation, the perspectives and/or approaches to solutions. Conducting this exercise makes it possible to compare different perspectives, facilitate exchanges and build consensus around the diagnosis, but also and above all on the new configuration of the agricultural advisory system and the strategic levers to be used to achieve it.

Further to the five-implication presented above, the deployment of EAS 2F can also contribute implicitly to strengthening actors' knowledge on foresight approach and their national EAS system. In several countries, the level of mastery of anticipatory approaches by EAS actors is still low. The active and effective participation of stakeholders in a foresight process for EAS reform often requires a reminder or sensitization of the participants on foresight concept and the tools that will be used. In fact, the mobilization of foresight tools for the different purposes presented above should mobilize appropriate andragogical approaches that facilitate empowerment and mastery. In addition, the foresight exercise should include a session dedicated to diagnosis that allows for an assessment of the EAS system, highlighting the internal and external factors that determine its current state, but also the elements that are likely to influence the transformation. This activity allows actors to have a common and better knowledge of their EAS system and also of the factors of change that should be considered in the transformation process.

Theoretical Implications

This research highlights a paradoxical contrast between the potential of anticipatory approaches to facilitate disruptions and creativity in strategic thinking (called "future literacy" (Miller, 2018)), and the tendency of actors to remain into their routine and classic orientations that are ultimately not very innovative. To counteract this misleading point, it appears necessary to ensure actors effectively develop awareness toward future thinking, thanks to their effective participation in the entire process, from prospective diagnosis to the elaboration of scenarios or even trajectories of the future. A similar observation was made by Jahel et al (2020).

References

Bourgeois, R., Penunia, E., Bisht, S., Boruk, D., 2017. Foresight for all: Co-elaborative scenario building and empowerment. *Technological Forecasting and Social Change* 124, 178–188. https://doi.org/10.1016/j.techfore.2017.04.018

FAO, 2018. Transforming food and agriculture to achieve the SDGs, 20 interconnected actions to guide decision-makers. Rome, Italy.

FAO, 2022. The future of food and agriculture – Drivers and triggers for transformation. The Future of Food and Agriculture, no. 3. Rome. https://doi.org/10.4060/cc0959en

Hichert, T., Biggs, R., Vos, A. de, 2021. Futures analysis, in: The Routledge Handbook of Research Methods for Social-Ecological Systems. Routledge, pp. 148–162.

Inayatullah, S., 2008. Six pillars: futures thinking for transforming. *Foresight* 10, 4–21. https://doi.org/10.1108/14636680810855991

Jahel, C., Bourgeois, R., Pesche, D., de Lattre-Gasquet, M., Delay, E., 2021. Has the COVID-19 crisis changed our relationship to the future? *Futures & Foresight Science* 3, e75. https://doi.org/10.1002/ffo2.75

Le Mouël, C., De Lattre-Gasquet, M., Mora, O., 2018. Land Use and Food Security in 2050: a Narrow Road, Agrimonde-Terra, QUAE. ed.

Miller, R., 2018. Transforming the Future: Anticipation in the 21st Century, Routledge. ed. London. 300p.

Röling, N. G., & Engel, P. G. H., 1991. The development of the concept of agricultural knowledge and information systems (AKIS): implications for extension. In W. Rivera, & D. Gustafson (Eds.), Agricultural extension: worldwide institutional evolution and forces for change (pp. 125-139). Elsevier.

Tropical Agriculture Platform (TAP)., 2016. Common Framework on Capacity Development for Agricultural Innovation Systems: Guidance Note on Operationalization. CAB International, Wallingford, UK.

Toillier, A., Mathé, S., Saley Moussa, A., Faure, G., 2021. How to assess agricultural innovation systems in a transformation perspective: a Delphi consensus study. *The Journal of Agricultural Education and Extension* 0, 1–23. https://doi.org/10.1080/1389224X.2021.1953548

Session 4B – Integration of innovation support service in the AKIS

Towards a framework to assess quality of innovation support services in AKIS: match and mismatch between farmers and providers' perceptions in Madagascar

Sarah Audouin[1,2,3], Salomé Valisoa Ranaivomanana[4], Narilala Randrianarison[4], Mandranto Nantenaina Andriamanantsoa[4], Hycenth Tim Ndah[5,6], Harilala Andriamaniraka[4], Syndhia Mathé[2,7,8]

[1] CIRAD, UMR INNOVATION, Antsirabe, Madagascar
[2] INNOVATION, Univ Montpellier, CIRAD, INRAE, Montpellier SupAgro, Montpellier, France
[3] Centre National de Recherche Appliquée au Développement Rural (FOFIFA), SRR, Antsirabe, Madagascar
[4] ESSA, University of Antananarivo, Madagascar
[5] University of Hohenheim, Stuttgart, Germany,
[6] Leibniz Centre for Agriculture Landscape (ZALF), Müncherberg, Germany
[7] CIRAD, UMR Innovation, Accra, Ghana
[8] Science & Technology Policy Research Institute, CSIR-STEPRI, Ghana

Short abstract

It is now widely recognized that innovators in rural areas (farmers, rural entrepreneurs, farmers' organisations) need diversified, efficient, phased and timely support services to help them during their innovation journey. We build on the recent concept of innovation support services (ISS) to cover the diversified nature of ISS. However, the quality of ISS has been poorly explored, apart from usual evaluation criteria commonly used for R&D project evaluation. To make sure ISS meet innovators and practitioners' expectations, we state that the diversity and matching of quality criteria formulated by these 2 types of actors should be better acknowledged and aligned. We used 6 innovation case studies in Madagascar to screen the ISS provided and quality criteria expressed by farmers and ISS providers. Our results show that farmers have a multifaceted perception about the quality of ISS. We highlight areas of mismatching about the quality of services, which most of the time reveals spaces of negotiation between them. Finally, we propose a new framework to assess the quality of ISS provision. Such comprehensive assessment advocates for more professionalized services provision toward innovation and to better connect ISS providers in order to address possible gaps in ISS provision at AKIS level.

Extended abstract

Purpose

In the EU, as well as in the Global South, strengthening agricultural innovation has become one of the main directions explicitly assigned to national agricultural policies. However, refereeing to the AKIS (Agricultural Knowledge and Innovation Systems) concept, as a way to identifying actors and institutions able to produce new knowledge and to support agricultural innovations, is not equally mobilized among Southern countries, and even within EU where CAP (Common Agricultural Policy 2023-2027) has been recently developed. For instance, in Madagascar no specific strategy has been drawn so far towards agricultural innovation. However, a reform of the national strategy for extension and advisory services is underway and will set up new policy instruments called "guichets agricoles" (farming desks) where a diversity of services will be delivered to farmers "on demand" and positioned in each communal area (provision of inputs, technical or soft skills trainings, technical advices, land certifications, etc.). While not focusing exclusively on supporting agricultural innovation, those "guichets agricoles" will indeed include activities to support farmers in their innovative journey. However, there is little knowledge about how to monitor and assess a set of innovations support services (ISS), and make sure their quality meet innovators' needs and also meet service providers' capacity to deliver services.

Our communication investigates how innovators and service providers perceived the quality of ISS in Madagascar, where AKIS actors and their role are not well identified yet and where governance among them is still under construction. Our communication also highlights several gaps within ISS provision from a qualitative and multi-actors perception, and how it should be included into the future AKIS strategy.

Design/Methodology/Approach

Our study makes use of the ISS concept, defined as a set of "on-demand" activities provided to innovation communities, under a service relationship, in order to help them in their innovation project (Faure et al., 2019; Kilelu et al., 2013; Mathé et al., 2019; Proietti and Cristiano, 2022). The concept is rooted into the AIS and AKIS literature (Knierim et al., 2015) and the economy of services applied to extension services (Labarthe and Laurent, 2011). Faure et al (2019) demonstrate that along an innovation process, innovators benefit from a diversity of ISS, according to the phases of the innovation process. Scholars elaborated and discussed (Proietti and Cristiano, 2022) several typologies of ISS, and we will make use of the one developed and discussed with our project partners: i. knowledge diffusion and dissemination, ii. advisory, consultancy and backstopping, iii. demand articulation, iv. networking, facilitation and brokerage, v. capacity building, vii. enhancing access to resource, and vii. institutional support for niche innovation and scaling mechanisms (Faure et al., 2019; Mathé et al., 2019; Ndah et al., 2021).

Respect to the service evaluation, there is abundant literature about service evaluation particularly applied to health, marketing, educational and e-administrative sectors, but little is devoted to innovation services applied to the agricultural sector. The latter mostly deals with the assessment of rural advisory services (Dhiab et al., 2020; Landini, 2020; Sulaiman et al., 2022), and even here, there is often a strong bias on economic rationality as basis for farmers and providers behavioural processes. Besides, indicators of assessment commonly used referred to the effectiveness, economic efficiency, accuracy, or profitability, but limited coverage of the multidimensional nature of service provision (Coombs and Miles, 2000). We thus opted for a more subjective and qualitative assessment of the quality of ISS provided within innovation case studies. Within these situations, we revealed a set of criteria mentioned by farmers mainly linked with their expected quality of an ideal service and a set of criteria mentioned by ISS providers mainly linked to the quality of service delivered. According to the literature (Lien et al., 2017), two levels of quality are observed: a) the structural quality, related to the inputs and resources used to provide the service such as staff or facilities, and b) the process quality, related to the fluency of the operations leading to the service's delivery. Based on the literature, we pre-identified 6 quality domains: 2 structural ones: characteristics of the service, the accessibility of the service; and 4 process ones: the provider's attitude and behaviour, the providers' expertise, the comprehensiveness of the supply of service, the relevance of the service.

Our methodology is based on a multi-case study design. We selected 6 innovations cases located in the Central Highlands of Madagascar (tableau 1) that fulfilled most of the following criteria: illustrative nature of the case to explore ISS provision (at least 3 different ISS mobilized, innovation trajectory long enough to screen ISS, diversity of types of innovation and of sub-systems (staple food, cash crop, organic farming, digital farming and animal health)), data accessibility and interest shown by the service providers to get new insight on their activities in order to improve them.

For each case study we followed a process analysis, by building the innovation trajectory in a participatory manner (several interviews with innovation stakeholders, then a focus group to validate the trajectory). An average number of 30 farmers and 10 service providers per case study were interviewed. We identified the set of ISS effectively provided (214 in total) and asked participants to select the 3 to 4 ISS per site that they considered as most important in their innovation journey (49 ISS in total, see table 1).

Table 1 : Distribution of ISS per innovation case studies

Innovation supported	Type and number of ISS provided selected for quality assessment					
	KNOW	ADV	DEM	NET	CAP	RES	INST
Organic pineapple and papaya certification		2	2			1	1
Multi-actor organic pink berries		5	1	1	1	2	
Chicken farmer-led vaccination		3	1			2	
Collective potatoes post-harvest and seeds storage		4	2		1	5	
Digital market information system for vegetable		2	2	1	3		
Multi-actor platform of bean production and transformation		3	2			2	

Caption: KNOW. knowledge diffusion and dissemination ADV. advisory, consultancy and backstopping DEM. demand articulation NET. networking, facilitation and brokerage CAP. capacity building RES. enhancing access to resource INST. institutional support for niche innovation and scaling mechanisms.

Then we conducted individual interviews with farmers and with ISS providers to screen the set of quality descriptors for each ISS that we reformulated as quality criteria during back-office sessions. The questions targeted particular service situations in order to get farmers or ISS provider's perception regarding a specific service delivery. A second focus group was then held with farmers to validate and select collectively the 5 quality criteria that were considered as most important for each ISS, along with detailed justifications collected. Farmers and ISS providers were interviewed separately in order to reduce bias in data collection.

Findings

The multidimensional nature of quality criteria applied to innovation support services

A total number of 529 criteria were described through all case studies, that we gathered under 37 quality criteria, each of them classified under 10 domains of quality criteria (fig 1).
Our results show that both structural and process quality domains are mentioned as most important for beneficiaries and for ISS providers, with process domain under provider's expertise considered as the most important.

Respect to structural quality criteria, ISS characteristics is positioned as the second quality domain and accessibility domain arrives on 3rd rank.

Respect to procedural quality domains, provider's expertise (pedagogical and technical competencies) is the most prominent one, the relevance of the service arrives at 5th rank, the comprehensiveness of the supply arrives at 6th rank. The latter includes a prominent quality criteria which is the existence of a follow-up after the service provision, the other criteria encompass concerns about including additional activities to the service (transportation, marketing, administrative support, even financial support). The provider's attitude and behaviour quality domain encompasses criteria such as confidence and reliability, social proximity and the provider's attitude (mindset, willingness to exchange with farmers in a comprehensive posture, reliability).

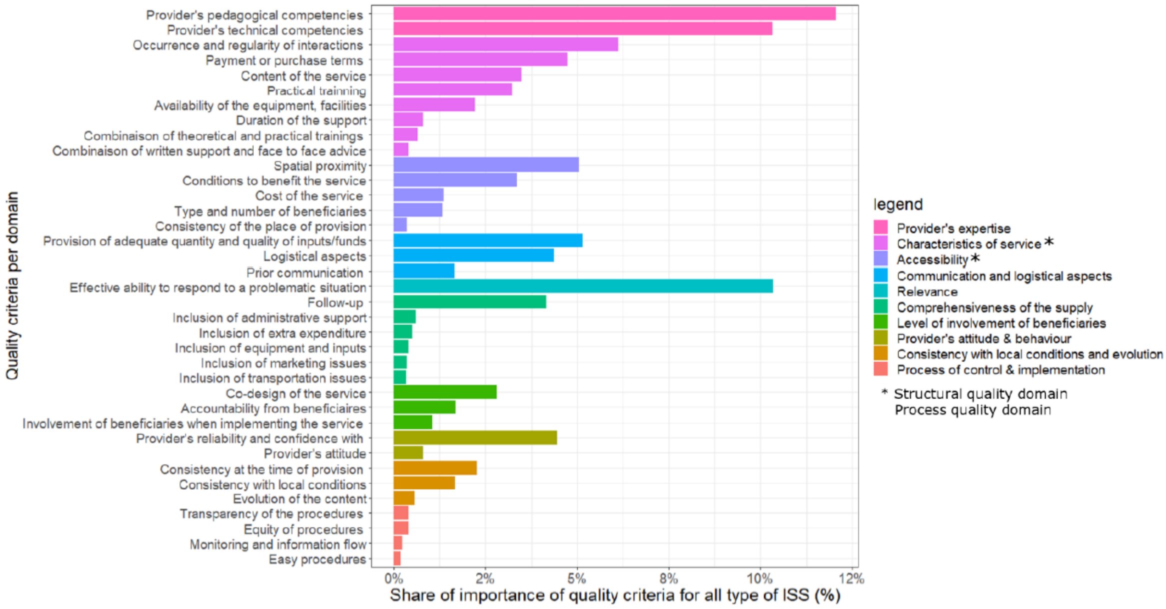
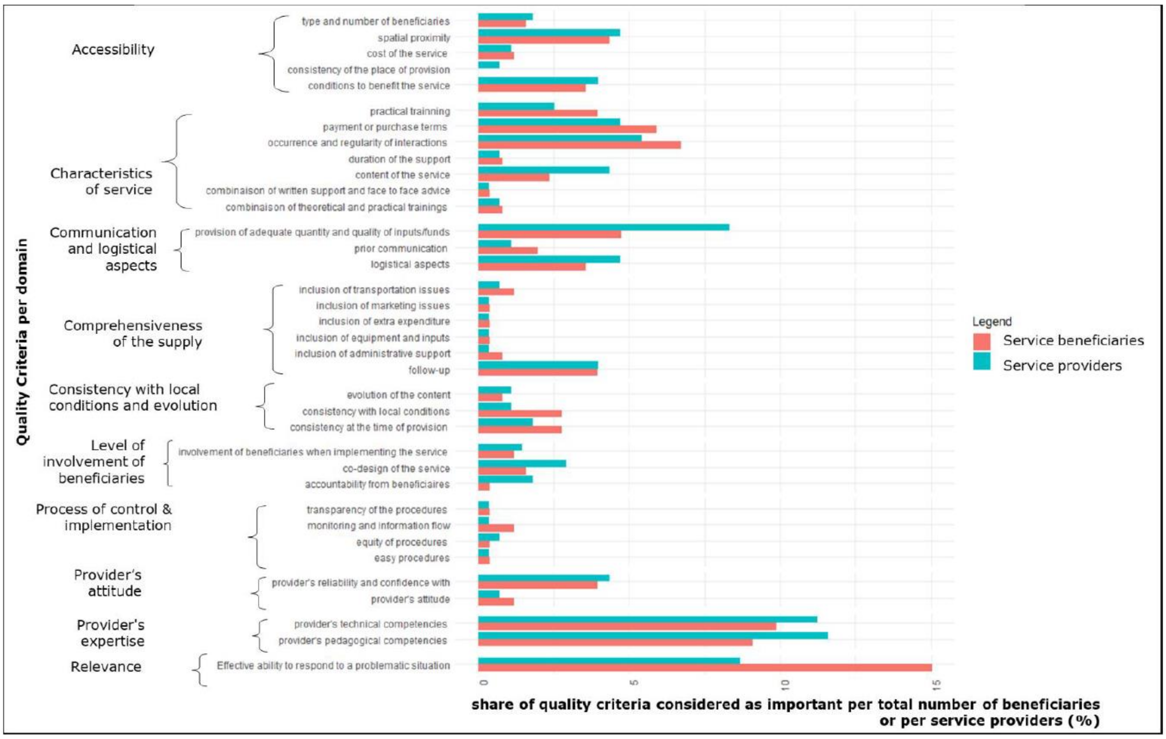


Figure 1: Importance of quality criteria mentioned by ISS beneficiaries and by ISS providers, for all type of ISS, according to their domain of quality

We also noted that 4 additional quality domain emerged which are well positioned: (i) the communication and logistical aspects of the service provision (like the communication with beneficiaries prior to the service supply, the provision of adequate, quantity and of quality inputs and the way the service is organized and prepared), (ii) the level of involvement of beneficiaries which encompasses different type and intensity of beneficiaries' participation: when co-designing the service, or when implementing the service (share of tasks and responsibilities for the monitoring, communication among beneficiaries, etc.). It also encompasses the requested counterparts expected from beneficiaries (committing to sell the production to a specific buyer, respecting organic regulations, disseminating new technical knowledge to surroundings farmers, etc.); (iii) the consistency with local conditions and the evolution of the service includes criteria such as consistency at the time of provision (ei. according to the cropping seasons), with local conditions (adequate inputs, or advices), the usefulness of the information provided with regard to local conditions, and the evolution of the content of the service (like adaptive advice according to climate conditions, or according to the maturity and strategy pursued by individuals or by the farmer's groups supported), (iv). the process of control and implementation set up to ensure that the service is well managed appeared as important, respect to the transparency and equity of the procedures (all beneficiaries are well informed about the conditions to benefit the service and rules), the way information is monitored and evolve, and the easiness of the procedures.

Match and mismatch among ISS providers and beneficiaries



With respect to ISS providers and beneficiaries' perception of the quality of ISS (fig 2.), we observed some common interest (like provider's expertise and the relevance of the service), but also mismatch about what they considered as important to ensure ISS quality. For instance, beneficiaries are much more concerned about the direct effects of the services to solve their problem, as well as about several characteristics of the service such as the service regularity, the terms for payment or purchase of inputs or products, and the practical trainings. They also request strong consistency with local conditions and at the time of provision, and also prior communication to ensure that they will be ready and available to receive the service. These mismatch reveals spaces of negotiation between farmers and ISS providers to broaden the scope or the content of ISS (raise the frequency of the service delivery, add more practical trainings, include insurance and transportation issues, etc.). Respect to the providers, they are more concerned about logistical aspects to ensure that they can deliver the adequate quantity and quality of inputs, the consistency with the place of provision, and that the service is well prepared and managed. Surprisingly, providers are more concerned about the level of involvement of beneficiaries to co-design the service, during the implementation and relying also on counterparts from beneficiaries, possibly because they know how much important it is to match with beneficiaries' expectations and raise their motivation.

Practical Implications

Our results bring out practical insights on the service relationship between farmers and service providers, based on their perception and expectation about the quality of the service provision. The set of quality criteria show the multidimensional perception of service quality. It also demonstrates that both front and back-office activities are perceived not only by ISS providers but also by farmers (ei. communication and logistical aspects, pedagogical skills of the ISS provider), which complement previous study carried out in Europe (Labarthe and Laurent, 2013) and in Africa (Faure et al., 2013). Respect to ISS providers, it advocates for a comprehensive design of ISS, in order to collect prior expectations of all type of future beneficiaries, including phases of co-design of the services; and involve beneficiaries into the monitoring of the services. Our result also demonstrates that farmers expect more integrated services, such as packages of services able to cover different issues farmers are facing (marketing issues, transportation, technical, soft skills capacity building and organisational issues). This raises the question of the capacity of ISS providers to provide generic but performant innovation services. As showed about advisory services to support innovation in Madagascar (Audouin et al., 2021a), specialization can be held at the level of a given organisation (deploying advisors with complementary skills and postures) or at the level of an innovation ecosystem where organisations support innovation in a coordinated and complementary way.

With respect to Madagascar' AKIS agenda, our results provide useful insight to inform the future "guichets agricoles" design in Madagascar: complementarities between the services will be mostly expected by farmers through integrated service provision: from advisory service to the facilitation to access new market and institutional support. It also addresses the need for more professionalization towards supporting agricultural innovations and reflect on organisational capacities to support innovation (Audouin et al., 2021b).

Theoretical Implications

With respect to methodological perspective, our results explore a more comprehensive assessment of ISS quality. It enriches the set of indicators commonly used when evaluating services, and paves the way for a new framework to assess ISS applied to agricultural sector and for supporting innovation. It underlines the need to consider 4 additional domains of quality criteria: the communication and logistical aspects of the service provision, the level of involvement of beneficiaries, the consistency with local conditions and the evolution of the service, and to a lesser extend the process of control and implementation of the services.

At the AKIS level, our results provide new insights on the way ISS might be connected to each other, especially when farmers rely on low diversity of ISS. In line with Dhiab et al (2020), our results call for a better understanding of the ISS provision at national and regional scale, in line with the rational each ISS provider elaborate. This would avoid spatial gaps and service fragmentation and foster integrated services, relying on collaboration among ISS providers and their capacity to work based on networking and partnership (Klerkx and Proctor, 2013). Such results call for drawing on evidence-based AKIS policies, based on ISS organisational mapping and their quality assessment in order to strengthen AKIS governance and counterbalance any blind-spot or antagonist private ISS provision strategy (Dhiab et al., 2020) and finally ensure that ISS are of good quality.

References

Audouin, S., Dugué, P., Randrianarisona, N., Ndah, H.T., Ratsimbazafy, T., Andriamaniraka, H., Noharinjanaharya, E.S., Ralisoa, N., Mathé, S., 2021a. Quelle place du conseil agricole dans les services support à l'innovation à Madagascar ? Cah. Agric. 30, 29. https://doi.org/10.1051/cagri/2021017

Audouin, S., Raharison, T., Rabesoa, J., Noharinjanahary, E.S., Ranaivoson, R., Triomphe, B., 2021b. To what extent can local-led innovation platforms tackle complex agricultural development challenges? Insights from Madagascar. The Journal of Agricultural Education and Extension. https://doi.org/10.1080/1389224X.2021.1997769

Coombs, R., Miles, I., 2000. Innovation, Measurement and Services: The New Problematique, in: Metcalfe, J.S., Miles, I. (Eds.), Innovation Systems in the Service Economy: Measurement and Case Study Analysis, Economics of Science, Technology and Innovation. Springer US, Boston, MA, pp. 85–103. https://doi.org/10.1007/978-1-4615-4425-8_5

Dhiab, H., Labarthe, P., Laurent, C., 2020. How the performance rationales of organisations providing farm advice explain persistent difficulties in addressing societal goals in agriculture. Food Policy 95, 101914. https://doi.org/10.1016/j.foodpol.2020.101914

Faure, G., Knierim, A., Koutsouris, A., Ndah, H.T., Audouin, S., Zarokosta, E., Wielinga, E., Triomphe, B., Mathé, S., Temple, L., Heanue, K., 2019. How to Strengthen Innovation Support Services in Agriculture with Regard to Multi-Stakeholder Approaches. Journal of Innovation Economics & Management 28, 145–169.

Faure, G., Penot, E., Rakotondravelo, J.C., Ramahatoraka, H.A., Dugué, P., Toillier, A., 2013. Which Advisory System to Support Innovation in Conservation Agriculture? The Case of Madagascar's Lake Alaotra. The Journal of Agricultural Education and Extension 19, 257–270. https://doi.org/10.1080/1389224X.2013.782169

Kilelu, C.W., Klerkx, L., Leeuwis, C., 2013. How Dynamics of Learning are Linked to Innovation Support Services: Insights from a Smallholder Commercialization Project in Kenya. The Journal of Agricultural Education and Extension 1–20. https://doi.org/10.1080/1389224X.2013.823876

Klerkx, L., Proctor, A., 2013. Beyond fragmentation and disconnect: Networks for knowledge exchange in the English land management advisory system. Land Use Policy 30, 13–24. https://doi.org/10.1016/j.landusepol.2012.02.003

Knierim, A., Boenning, K., Caggiano, M., Cristóvão, A., Dirimanova, V., Koehnen, T., Labarthe, P., Prager, K., 2015. The AKIS concept and its relevance in selected EU member states. Outlook on Agriculture 44, 29–36. https://doi.org/10.5367/oa.2015.0194

Labarthe, P., Laurent, C., 2013. Privatization of agricultural extension services in the EU: Towards a lack of adequate knowledge for small-scale farms? Food Policy 38, 240–252. https://doi.org/10.1016/j.foodpol.2012.10.005

Labarthe, P., Laurent, C., 2011. Économie des services et politiques publiques de conseil agricole. Cahiers Agricultures 20, 343-351 (1). https://doi.org/10.1684/agr.2011.0508

Landini, F., 2020. What does 'quality' mean in the context of rural extension and advisory services? Agronomía Colombiana 38, 133–147. https://doi.org/10.15446/agron.colomb.v38n1.81738

Lien, C.-H., Cao, Y., Zhou, X., 2017. Service quality, satisfaction, stickiness, and usage intentions: An exploratory evaluation in the context of WeChat services. Computers in Human Behavior 68, 403–410. https://doi.org/10.1016/j.chb.2016.11.061

Mathé, S., Audouin, S., Fongang, G., Gerster-Bentaya, M., Knierim, A., Ndah, T.H., Randrianarison, N., Toillier, A., Traore, O.F., 2019. Designing frameworks for characterizing and assessing innovation support services and innovation support providers: SERVInnov project, in: Agricultural Education and Extension Tuned on Innovation for Sustainability. Experiences and Perspectives. Presented at the European Seminar on Extension and Education (ESEE 2019), Acireale, Italie, p. 24.

Ndah, H.T., Audouin, S., Crestin-Billet, S., Randrianarisona, N., Andriamaniraka, H., Toillier, A., Traore, O., Fongang, G., Mathé, S., Knierim, A., 2021. Dynamics and diversity of innovation support services: especially networking service activities on selected agro-food innovation cases in Madagascar and Burkina Faso. Proceedings in Food System Dynamics 35–45. https://doi.org/10.18461/pfsd.2021.2105

Proietti, P., Cristiano, S., 2022. Innovation support services: an evidence-based exploration of their strategic roles in the Italian AKIS. The Journal of Agricultural Education and Extension 0, 1–21. https://doi.org/10.1080/1389224X.2022.2069828

Sulaiman, V.R., Chuluunbaatar, D., Djamen, P., Grovermann, C., Holley, A., 2022. Indicator framework for national extension and advisory service systems – Metrics for performance and outcome measurement. Rome, FAO.

What are the specificities of agricultural innovation systems in the South: an approach based on innovation support services

Mathé Syndhia[1,2,3], Audouin Sarah[1,4], Toillier Aurélie[1,5], Temple Ludovic[1], Ndah H. Tim[6,7], Knierim Andrea[7], Randrianarison Narilala[8], Traoré Ousmane[9], Ngouambe Nestor[10], Guillaume Fongang[11]

[1]Innovation, Université de Montpellier, CIRAD, INRAE, Montpellier SupAgro, Montpellier, France
[2]CIRAD, UMR Innovation, Accra, Ghana
[3]Science & Technology Policy Research Institute, CSIR-STEPRI, Ghana
[4] FOFIFA - Antsirabe, Madagascar
[5]CIRAD, UMR Innovation, Rome, Italy
[6]Leibniz Centre for Agriculture Landscape (ZALF), Müncherberg, Germany
[7]University of Hohenheim, Stuttgart, Germany,
[8]University of Antananarivo, Madagascar
[9]University of Uganda 2, Ouagadougou, Burkina
[10]African Forum for Agricultural Advisory Services, Uganda
[11]University of Dschang, Dschang, Cameroon

Short abstract

The Agricultural Innovation System (AIS) approach is playing an increasingly important role in the management of Research and Development projects in the South. However, there is still considerable scope for progress in operationalising it in Southern countries, particularly to assist policy decisions on improving the environment for innovation. We propose to take stock of the characteristics of AIS in Southern countries on the basis of empirical work that we have carried out in the framework of the LEAP-AGRI SERVInnov project from 2018 to 2022 in light with the emerging concept of innovation support services. Our results enlighten the specifities of AIS in the South that enriching the literature and drawing implications for innovation support policies.

Extended abstract

Purpose

The Agricultural Innovation System (AIS) approach is playing an increasingly important role in the management of Research and Development projects in the South. It has become central to the strategies of development organisations such as the FAO, the European Union and the African Union, as well as international research institutes. The raise of interest toward this concept is rooted into its holistic character and its capacity to include complex thinking. However, there are still many criticisms and challenges to its use, as it is a concept imported from industry on the one hand and from developed countries on the other. Since the application of this approach to the agricultural sector in the South (Hall et al. 2006, World Bank 2006), research has focused on its adaptation and operationalisation in these contexts. While the AIS provides an approach and a framework for analysing the functioning of support for the emergence and development of agricultural innovation at different scales, there is still considerable scope for progress in operationalising it, particularly to assist policy decisions on improving the environment for innovation. Several empirical studies have been carried out, either to identify the components of these systems, or to analyse their functioning or to measure their effects. More than fifteen years after the first mobilisation of this concept, we propose to take stock of the specificities of AIS in Southern countries on the basis of empirical work that we have carried out in the framework of the LEAP-AGRI SERVInnov project from 2018 to 2022 in light with the emerging concept of innovation support services.

Design/Methodology/Approach

Innovation support services

In this study, we mobilise in a cross-cutting way all the data that were collected and analysed in the course of the SERVInnov project. Given that analysis of the data has and will lead to specific publications, we intend to develop a cross-cutting overview of the AIS approach. The data collection was carried out in three countries on the African continent with contrasting contexts (Burkina Faso, Cameroon, Madagascar). We harmonised the data collection tools as much as possible without standardising them to take into account the specificities of each context, and nature of the partnership with development partners. We worked at several scales (case-studies, innovation subsystems, national AIS), while favouring a reflexive approach to the results of our research. We have drawn on the literature on innovation support services (ISS) to design our research (Mathe et al. 2016, Faure et al. 2019, Ndah et al. 2020). ISS are activities carried out between providers and beneficiaries in regular interaction to respond to a specific demand emerging from a joint analysis of a situation (Faure et al., 2019). These are activities by nature, immaterial and intangible, which involve one or more providers and one or more beneficiaries in activities generating interactions to respond to a more or less explicit demand emerging from a problematic situation and formulated by the beneficiaries and to co-produce services aiming at solving the problem (Mathe et al. 2016, Faure et al. 2019). These services are dedicated to help accelerate ideas and inventions, manage a viable innovation project, emerge effective innovation communities, facilitate strategic partnerships between stakeholders for technical or funding purposes, improve the scaling up and scaling down of innovations (Toillier et al. 2018). We have identified seven categories of services (Fig. 1.).

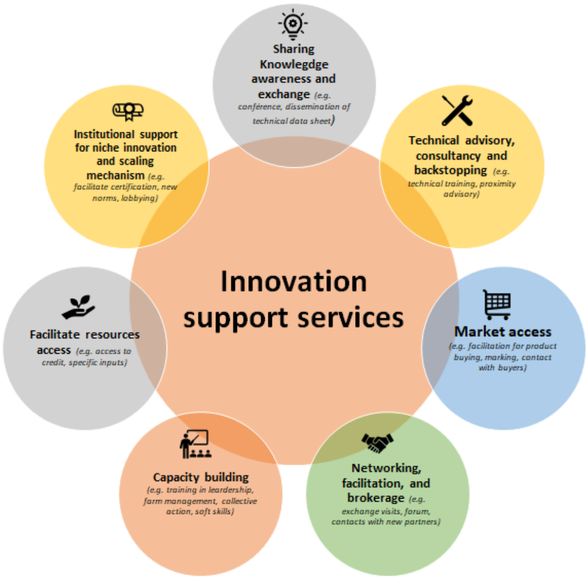


Figure 1. the seven categories of support services

Scales of data collection

Innovation subsystem and support services

In the literature on innovation systems, the scales of study can be sectoral (Malerba 2002), regional (Carlsson 2006) or spatial (Audouin et al. 2018). The mobilisation and application of AIS raises the question of the boundaries of the system and on which features the focus is placed (Mathe et al. 2019). We have studied innovation subsystems under the assumption that these subsystems are shaped and specific to the agricultural sub-sectors (food agriculture, export agriculture) or innovation domain (organic agriculture, digital agriculture) important for the study countries (Mathe et al. 2016, Ndah et al. 2020). An IsubS is a reduced image of a larger system (e.g. a national AIS), focused at the regional (province, district), (sub)sector or product level (dairy, horticulture, organic, etc.), while at the same time some AIS actors and their interactions remain linked to a larger whole (e.g. operating at a national scale) (Ndah et al. 2020). We studied a total of 12 innovation sub-systems across the three countries. This study involved mapping the organisations/actors that provide ISS (innovation service providers) and their ISS for a given innovation sub-sectors or innovation domain.

Innovation cases

To complement the approach of mapping service providers and existing services at IsubS' level, we observed innovations emanating from most of the sub-systems studied in order to have a finer vision of the effective mobilisation of mapped providers and services. In all, we studied twenty cases of innovation across the three countries, including innovations in processing and pre- and post-harvest management, innovations in value chain structuring and innovations in new production techniques and digital technology. In each of these innovation cases, we studied the innovation trajectories, highlighting the services and suppliers along the trajectory as well as the context. We also assessed the quality of the services provided by the actors (beneficiaries and providers).

Restitution and reflexivity

The usefulness and adaptation dimension of the work carried out was central, which is why this research work was co-designed between the research and the practitioners (support service providers). In addition to this organisation, we added events for intra- and inter-country data synthesis (transversal analyses), we organised in each country workshops for restitution, validation and formulation of recommendations with service providers and public decision-makers. At the end of the project, we organised a global reflection workshop on all the results of the project, which gave rise to the idea of this paper.

Findings: Specificities of innovation systems in Southern countries

Structure and components of AIS

Respect to the institutional environment of innovation, we have observed an over-responsibilisation of research ministries because there is an overlap between research and innovation. The innovation policies that are visible as such are those carried out by the research ministries, whereas several ministries contribute to creating an environment favourable to agricultural innovation, notably the Ministry of Agriculture, the Ministry of Transport and the Ministry of SMEs. There appears to be tensions (conflicting responsibilities) between ministries over the designing and putting in place of innovation support policies.

Furthermore, our work has confirmed our hypothesis of a strong and visible organisation of innovation support service providers according to the agricultural sub-sectors (Mathe et al. 2023). These actors can often be specialised in terms of agriculture sub-sector. This is particularly the case for private actors, farmers' organisations and civil society. Due to their proximity, farmers' organisations play an increasingly important role in supporting innovations across all sub-systems (cash crop, staple food, livestock, etc.).

The positioning of research in AIS occurs in a context of low public investment in research (Temple et al. 2017, Audouin et al. 2021). At the same time, we observe that research endorses a diversity of roles in supporting innovation trajectories. Research is involved both in the production of knowledge and in intermediation to facilitate the networking of innovation actors, as well as in the creation of a enabling environment by helping to make the link with political actors (Toillier et al. 2018). However, research is still not very connected to the private (business) sphere (Temple et al. 2017). Universities are increasingly positioning themselves on the issues of supporting agricultural innovation, through the provision of new knowledge.

Extension and advisory services are involved in innovation support. The services provided by these organisations have diversified recently and are intended to be complementary to other support services (Audouin et al. 2021).

Our results shed light on two components actor categories in AIS that do not appear clearly in the current literature: individual actors and hybrid organisations. We have observed individual actors, especially informal ones, who act as providers of innovation support services. These individuals can provide capacity building, networking or resource provision services that are not visible at the AIS scale but at the scale of innovation trajectories. So-called "hybrid" actors were identified during the mapping of organisations that accompany innovation, namely R&D projects and programmes. These shape the AIS and particularly the time-frame of ISS provision (which are project-time and budget limited), and the links between the AIS organisations, who develop ISS under project partnerships.

Functioning of AIS

In the countries of the South, there is an overlap between the AIS and the general support for development (which can be referred to as a development support system). Indeed, the actors who accompany innovation are not specialised and intervene consecutively in both systems. One resulting consequences for this is the lack of professionalisation of service providers toward supporting innovation. However, there are networks of specialised actors emerging, particularly in West Africa (see Afric'Innov Network). We have developed an approach that enables support service providers to assess their own capacity to support innovation as an organisation called the "organisation capacity assessment approach for innovation support (OCATI). OCATI, enables support organisations: to extract and develop their core competence of supporting innovation, to further develop a strategy for strengthening this process, and to become more professionalised and recognised. (Ndah et al. 2021).

The functioning of AISs is project-driven, we can speak of project-led innovation systems. The innovation support services that we have identified mainly come from R&D projects (Kamga et al. 2022). This situation raises the question of the sustainability of the provision of services over time, as this depends on the life of the projects. Indeed, our results have shown discontinuities in service provision in the innovation trajectories linked to project cycles. On the other hand, it also questions the content of these services, but also the links and orientations given to the innovation trajectories and, more globally, the directionality of the AISs and their governance. This situation casts a shadow over who decides about the innovation agenda in the countries.

Furthermore, we observe that the diversity of services varies according to the agricultural sub-sectors and domain of innovation. The economic models of services are diversified with a dominance of non-market services. ISS remain difficult to identify clearly, particularly networking services, which are difficult to trace because they are sometimes merged with other services (Ndah et al. 2021). The quality assessment of services provided should encompass criteria related to the inclusion of women and young people in the provision of services (Crestin-Billet et al. 2022).

Products

Our results were less substantial on the products of AIS; however, we were able to bring out perspectives and raising issues from the composition and functioning described above. The AIS approach is part of the evolutionary approach to innovation. The innovation follows a selection process which that conducted it to be chosen not because it is the best choice a priori but because it has succeeded in adapting to a given context. The context of disconnectedness of innovation support tends to exacerbate this situation leading to the constant initiation of new innovations that are often left in abeyance with little chance of being taken over by endogenous dynamics, leading to a repetitive circle of new technical solutions implemented but little disseminated. At the same time, there is an abundance of endogenous innovations that do not necessarily have access to the necessary support (Waters-Bayer et al. 2015). The current structure and functioning of the AISs leads to the implementation of a system of replication or incrementation of innovations (adaptation of innovations coming from other contexts) and leaves little room for the emergence of breakthrough innovations.

Practical Implications: Implications for innovation support policies

Our results and the regional and national workshops drawn on substantial recommendations to emerge in order to strengthen AIS in the South.

- For service providers
  - Need for professionalization of ISS providers
  - Need for capacity building of suppliers
  - Need for networking platforms for ISPs at national and regional levels
- For the support of innovation
  - Need to track down existing innovations (including endogenous innovations) in order to support them
  - Create meeting places (both virtual and physical) for innovative initiatives and service providers (innovation platforms on ISS)
  - Need to integrate ISS within agronomic curricula at university level both public and private
- For the enabling environment
  - Need for cross-sectoral policies on innovation
  - Need for dedicated funding to support endogenous innovations or those initiated by external actors
  - Regional organisation of innovation systems with inter-country clustering of innovation systems

Theoretical Implications: Rethinking the AIS approach in the South and policies to support innovation

Our results propose a more comprehensive framework for the analysis of AISs integrating structural, functional and processual perspectives (Toillier et al. 2018) and an ambition to operationalise the AIS approach by focusing on the dynamic features of innovation support: the features of the service relationship (Figure 1).

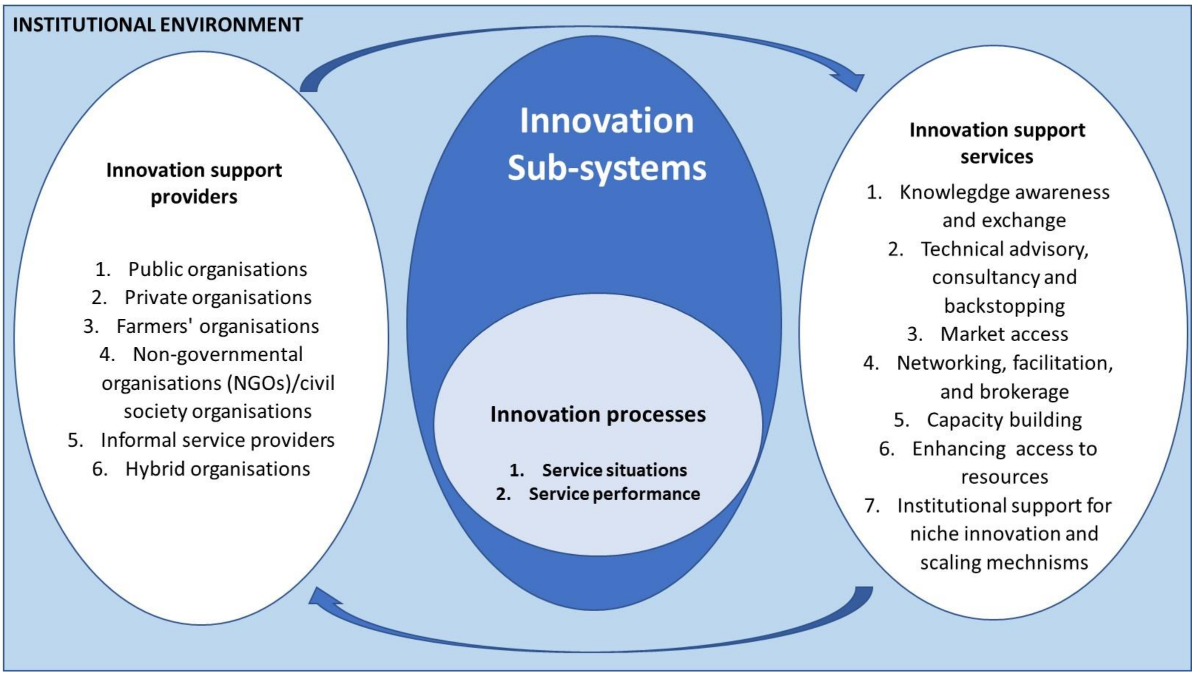


Figure 2. Scheme of services-based analysis of AIS

References

Audouin, S., P. Dugué, N. Randrianarisona, H. T. Ndah, T. Ratsimbazafy, H. Andriamaniraka, E. S. Noharinjanaharya, N. Ralisoa and S. Mathé (2021). "Quelle place du conseil agricole dans les services support à l'innovation à Madagascar?" Cahiers Agricultures **29**(30).

Audouin, S., L. Gazull and D. Gautier (2018). "Territory matters: Exploring the functioning of an innovation system through the filter of local territorial practices-the example of the adoption of cashew trees in Burkina Faso." Journal of Rural Studies **63**: 130-140.

Audouin, S., T. Raharison, J. Rabesoa, E. S. Noharinjanahary, R. Ranaivoson and B. Triomphe (2021). "To what extent can local-led innovation platforms tackle complex agricultural development challenges? Insights from Madagascar." The Journal of Agricultural Education and Extension: 1-24.

Carlsson, B. (2006). "Internationalization of innovation systems: A survey of the literature." Research policy **35**(1): 56-67.

Crestin-Billet, S., A. R. K. Boubda, H. T. Ndah, G. H. F. Fouepe, S. Mathé and A. Knierim (2022). "Strengthening women´ s and youths' access to innovation support services (ISS): The 24 h'cassava retting case in Cameroon." International Journal on Food System Dynamics **13**(4): 440-453.

Faure, G., A. Knierim, A. Koutsouris, H. T. Ndah, S. Audouin, E. Zarokosta, E. Wielinga, B. Triomphe, S. Mathé and L. Temple (2019). "How to strengthen innovation support services in agriculture with regard to multi-stakeholder approaches." Journal of Innovation Economics Management(1): 145-169.

Hall, A., L. K. Mytelka and B. Oyeyinka (2006). Concepts and guidelines for diagnostic assessments of agricultural innovation capacity. UNU-MERIT Working Paper 2006-017, Maastricht Economic and Social Research and Training Centre on Innovation and Technology.

Kamga, R., G. Fongang Fouepe, S. Mathé, S. Crestin-Billet, L. Temple and A. Knierim (2022). Supporting agricultural and agr-food innovation for staple food production in Cameroon: Pluralism of organisations, Duplicity and Discontinuity of services. 14TH European IFSa symposium Farming Systems facing Climate change and resource challenges, 8-14 April Unversity of Évora, Portugal.

Malerba, F. (2002). "Sectoral systems of innovation and production." Research policy **31**(2): 247-264.

Mathe, S., S. Audouin, G. Fongang, M. Gerster Betaya, A. Knierim, H. T. Ndah, N. Randrianarison, A. Toillier and O. Traoré (2019). Designing frameworks for characterizing and assessing innovation support services and innovation support providers: SERVInnov project. Agricultural Education and Extension Tuned on Innovation for Sustainability. Experiences and Perspectives. European Seminar on Extension and Education (ESEE 2019). Acireale, Italy.

Mathe, S., G. Faure, A. Knierim, A. Koutsouris, H. Ndah, L. Temple, B. Triomphe, E. Wielinga and E. Zarokosta (2016). "Typology of innovation support services, WP1 AgriSpin, deliverable 1.4." CIRAD, Montpellier, France.

Mathe, S., F. Fouepe, G. Hansel, M. Sonfack, L. Temple, J. Abega Ndjana, T. Sadeu and M. Brice (2023). "New challenges for innovation support services to improve cocoa quality and sustainability in Cameroon." Science, Technologie, Développement **23**(1): 17.

Ndah, H., A. Knierim, S. Audouin, N. Ngouambe, S. Crestin-Billet, N. Randrianarison, A. Toillier, T. Michel, O. Traoré, G. Fongang and S. Mathé (2021). Guide for Organisational Capacity Assessment Tool for Innovation support (OCATI). SERVInnov's. Deliverable 1.4. Stuttgart, Germany, University of Hohenheim, .

Ndah, H., A. Knierim, M. Gerster-Bentaya, S. Mathé, S. Audouin, S. Crestin-Billet, N. Randrianarison, A. Toillier, M. Melachio, G. Fongang and L. Temple (2020). Guidelines for applying the methodology and tools for characterizing innovation support services and providers,SERVInnov project, Deliverable 1.2. Stuttgart, Germany, Universität Hohenheim**:** 28.

Ndah, H. T., S. Audouin, S. Crestin-Billet, N. Randrianarisona, H. Andriamaniraka, A. Toillier, O. Traore, G. Fongang, S. Mathé and A. Knierim (2021). "Dynamics and diversity of innovation support services: especially networking service activities on selected agro-food innovation cases in Madagascar and Burkina Faso." Proceedings in Food System Dynamics: 35-45.

Temple, L., N. M. Ndzesop, G. H. F. Fouepe, M. N. Nkeng and S. Mathé (2017). "Système National de Recherche et d'Innovation en Afrique: le cas du Cameroun." Innovations(2): 41-67.

Toillier, A., A. Devaux-Spartakis, G. Faure, D. Barret and C. Marquié (2018). "Comprendre la contribution de la recherche à l'innovation collective par l'exploration de mécanismes de renforcement de capacité." Cahiers Agricultures **27**(1): 15002.

Toillier, A., G. Faure, S. Audouin, S. Mathé, B. Triomphe and L. Temple (2018). Literature review of methodologies for the assessment of Agricultural Innovation Systems. Working paper 4. Montpellier, CIRAD-ES-UMR INNOVATION: 41.

Toillier, A., G. Faure and E. Chia (2018). Designing and organizing support for collective innovation in agriculture. In : Guy Faure, Yuna Chiffoleau, Frédéric Goulet, Ludovic Temple, Jean-Marc Touzard, Innovation and development in agricultural and food systems.

Waters-Bayer, A., P. Kristjanson, C. Wettasinha, L. van Veldhuizen, G. Quiroga, K. Swaans and B. Douthwaite (2015). "Exploring the impact of farmer-led research supported by civil society organisations." Agriculture & Food Security **4**(1): 4.

World Bank (2006). Enhancing agricultural innovation: How to go beyond the strengthening of research systems, World Bank.

Mapping ISS functions as a tool for national policymakers across EU countries

Lívia Kránitz[1], S. Aboelnaga[2], S. Vágó[3], Patrizia Proietti[4], Simona Cristiano[4]
[1]Lead Expert-AKI, Hungary, PhD student at University of Győr, Hungary kranitz.livia@aki.gov.hu
[2]Scientific Advisor-AKI, Hungary, Lecturer- Cairo University, Egypt somaya.aboelnaga@aki.gov.hu
[3]Director's Advisor, Lead Expert-AKI, Hungary vago.szabolcs@aki.gov.hu
[4]CREA, patrizia.proietti@crea.gov.it
[4]CREA, simona.cristiano@crea.gov.it

Short abstract

According to the common understanding of ISS functions within ATTRACTISS project, an initial mapping exercise for innovation support services providers across the EU countries was conducted basing two main criteria: 1) the provider already delivers some kind of innovation support service according to the seven ISS functions; 2) the provider has been appointed as an innovation support provider in the Member State or region based on the CAP Strategic Plan. This mapping has successfully gathered 265 ISS providers, mainly from western and southern European countries (Atlantic-North Sea region and the Mediterranean) rather than from eastern and northern Europe (Danube-Balkan and Nordic-Balkan region). The identification of these actors by their characteristics provides a basis for the policymakers responsible for the CAP strategic plans to provide support for innovation, in particular for the preparation and implementation of the EIP-Agri operational groups (OGs). The study is a first attempt to describe ISS providers and their organisation in the agricultural sector, as well as ISS functions they provide.

Extended abstract

1. Purpose

This paper aims at providing a basic knowledge concerning the current innovation support services providers as tool for assisting policymakers throughout the implementation of national/regional CAP Strategic Plan, especially the AKIS Strategic approach. The CAP Regulation (EU) 2021/2115. requires EU Member States (MS) to provide support for innovation, in particular for the preparation and implementation of the EIP-Agri operational groups (OGs). The expected result is a general improvement of connections between actors, policies and programmes/projects, knowledge(s) and experience(s), methods, and instruments to speed up the creation of innovative solutions.

However, innovation support services (ISSs) represent a novelty from a policy perspective and, therefore, require governance models, approaches, competencies, and tools that foster their effective implementation and embedding in the respective national/regional AKIS.

To date, there is no clear definition of the term ISS, nor in-depth analysis concerning the actors providing the services, their linkages with other actors and the support they provide to innovation processes. Furthermore, there is little awareness of the skills and competencies needed to improve service delivery. For this reason, the document attempts to systematise the organisational types of ISS providers among AKIS actors.

Furthermore, the paper intends to draw connections between the organisational type of potential ISS providers and the ISSs provided in agriculture. Therefore, the study contributes to the expansion of IS services in the Member States by shedding light on the potential ISS providers among the AKIS actors and the services they provide.

2. Design/Methodology/Approach

The study is based on a mapping exercise carried by surveying ISSs providers in EU Member States, within the ATTRACTIS project. The mapping is based on the common knowledge and the joint effort of the ATTRACTISS partners.

Several studies show the presence of a multiplicity of actors providing innovation support services, who may also be engaged in the same innovation project by delivering different support functions (Faure et al. 2019; Proietti and Cristiano 2022), and who may operate either through a specific mandate or out of professional and/or personal interest (Knierim et al., 2017; Proietti and Cristiano 2022) (§ 2.1). This raises more than one question about the criteria to be used for mapping ISSs. In this regard, the consortium has decided to adopt inclusive criteria that will allow, at least in this first phase, to map and include in the network all actors who, with different titles and degrees, carry out (support) activities to push the innovation process forward. This choice allows gathering and studying a wide range of cases in order to gain an in-depth understanding of the type of services they provide to support innovation, their scope and their relevance to the CAP. The analysis enables us to identify additional or different criteria for the mappings to be conducted in the following years. Based on current knowledge, the first mapping of innovation service providers is based on two main criteria:

- the provider already delivers some kind of innovation support service according to the 7 ISS functions: ISS1.Awareness-raising and knowledge dissemination, ISS2.Advisory, consultancy and backstopping, ISS3.Demand articulation, ISS4.Networking facilitation and brokerage, ISS5.Capacity building, ISS6.Enhancing / supporting access to resources, ISS7.Institutional support for niche innovation and scaling mechanisms stimulation (Mathé et al., 2016, later refined by Knierim et al., 2018 and Faure et al., 2019; Proietti and Cristiano 2023)
- the provider has been appointed as an innovation support provider in the Member State or region based on the CAP Strategic Plan.

Due to the wide range of criteria, this first mapping also includes actors carrying out other core activities, e.g. research institutes. The ATTRACTISS studies will allow, in the future, to fine-tune the selection criteria and define the innovation support services, leading to possible adjustments in the mapping.

The mapping includes the collection of additional information that characterize the type of provider. These encompasses the provider's characteristics, as well as its service. The first ones include: (1) institution or individual; (2) type of entity; (3) mandate for service; (4) working level; (5) sector; (6) connection with EIP OGs. The characteristics of the service concern (1) frequency of service delivery; and (2) classification of functions.

The inventory has been filled in by the partners according to the 'Snowballing' method: the list of services providers will be constantly expanded throughout the survey with new organisations.

3. Findings

With the contribution of the project partners, altogether 265 ISS providers from 24 countries have been collected, while information from Sweden, Lithuania, Denmark, and Luxembourg were not gathered in this first mapping. The majority of ISS providers was gathered from Belgium, Spain, Austria, Italy, Greece, Finland, and Germany. On the other hand, only a few ISS providers from the Netherlands, Latvia, Cyprus, Czech Republic, Slovakia, and Poland have been identified. Each EU macro-region has at least one country from which we have collected a significant number of ISS providers, but we have a particularly large number of entities from the Mediterranean region, and the North-Baltic region has the lowest representation.

While the types of ISS providers in the list are representing several types of entities, most often they are consultants/advisors, whose organisations represent (19.1%), and Farmer cooperatives/ associations/ chambers, representing (17.6%) of the total. At the same time, Government institutions (14.5%) and Agri-research institutions (9.8%) are also very frequent among ISS providers. On the other hand, the ISS providers identified as Banks, Insurance and financing institutions, NGOs, or consumer organisations are very few. There are also fewer educational organisations in the database than expected, but together with Academic and Training centres their share among ISS providers is approximately (13 %). Finally, the input providers and the Suppliers of agricultural products are nearly (7%) of the ISS providers.

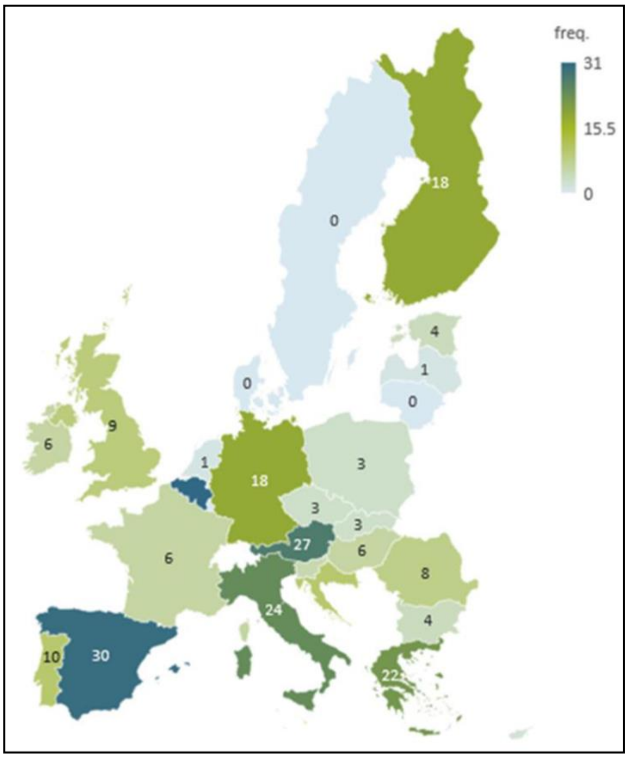


Figure 1 entities across European countries
Source: own edition based on own calculation

More than half of the identified providers do not have a dedicated role in the CAP Strategic Plan, most of them are Academic or educational organisations.

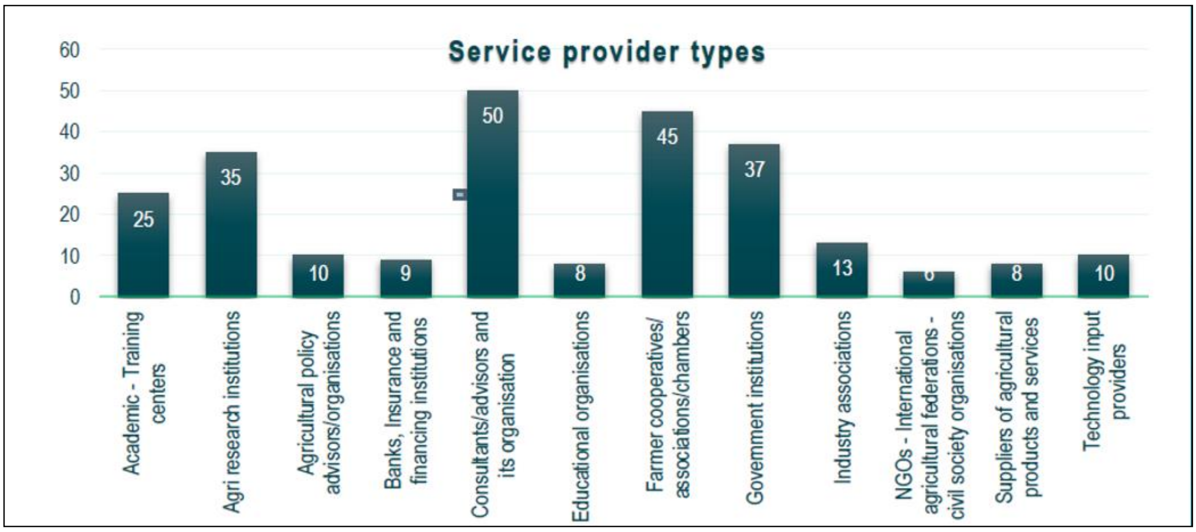


Figure 2 Types of ISS provider
Source: own edition based on own calculation

A significant proportion of the ISS providers is a support unit of the CAP network (21.6%), most often Government institutions and Farmer cooperatives/associations/chambers. Others are designated innovation brokers (15.8%) or are contracted partners (11.1%) (e.g., Austrian regional Chambers). In several

cases, the information is missing, which means that we need to apply different methods to gather this information, such as direct contact with the listed providers, interviews, and surveys.
While regarding EIP operational groups, nearly one-third of the listed ISS providers have no connection with the EIP operational groups. OG coordinators (22.5%) of them, and (24.1%) are OG members. (15%) of the listed entities are EIP innovation brokers.

In general, it is possible to state that ISS providers most often carried out more than one ISS function. (ISS2) Advisory, consultancy and backstopping, (ISS4) Networks, facilitation and brokerage, and (ISS1) Awareness and exchange of knowledge are similarly frequent and strongly related functions, (43.47%) of the providers are active in these. One-third of the listed providers execute (ISS5) Capacity building, one-quarter of providers act (ISS6) Enhancing/supporting access to resources, and (15.5%) of them carry out (ISS7) Institutional support for niche innovation and scaling mechanisms stimulation. (ISS3) Demand articulation was chosen less frequently; its share is only (3.8%) among all the activities.

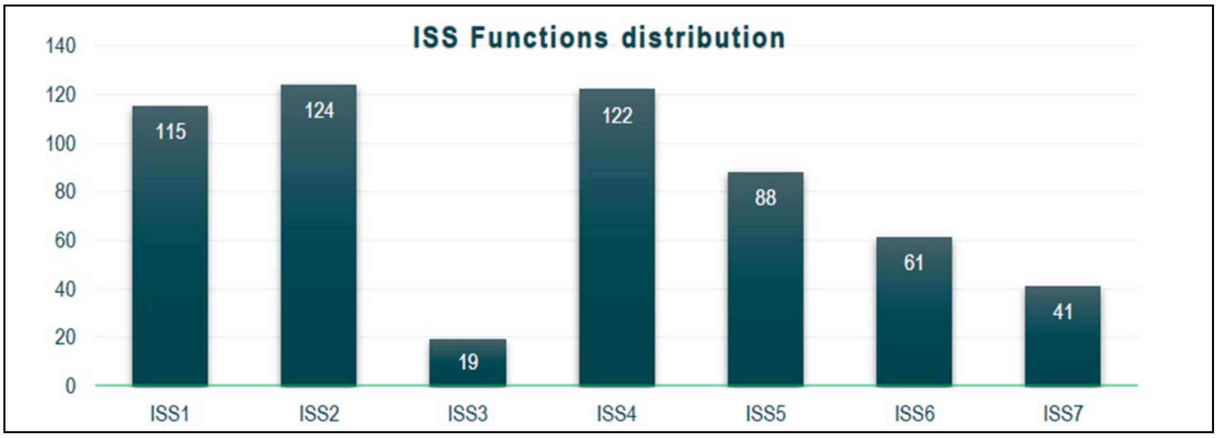


Figure 3 ISS function distribution
Source: own edition based on own calculation

Concerning the type of actors providing the different functions, it is observed that some players are much more specialized for some functions, and some of them provide a wide range of ISS functions. Also, Academic, and educational organisations most often do (ISS5) Capacity building and (ISS1) Awareness-raising and knowledge dissemination. Agri Research institutions carry out all kinds of functions, but they are most active in (ISS2) Advisory, consultancy, and backstopping, (ISS4) Networking, facilitation and brokerage, and (ISS1) Awareness-raising and knowledge dissemination. Banks, insurance, and financing institutions take part only in a few functions, mainly in (ISS6) Enhancing/supporting access to resources. Consultants/advisors, farmers/cooperatives/associations/ chambers and also Governmental institutions and Industry associations provide all ISS functions.

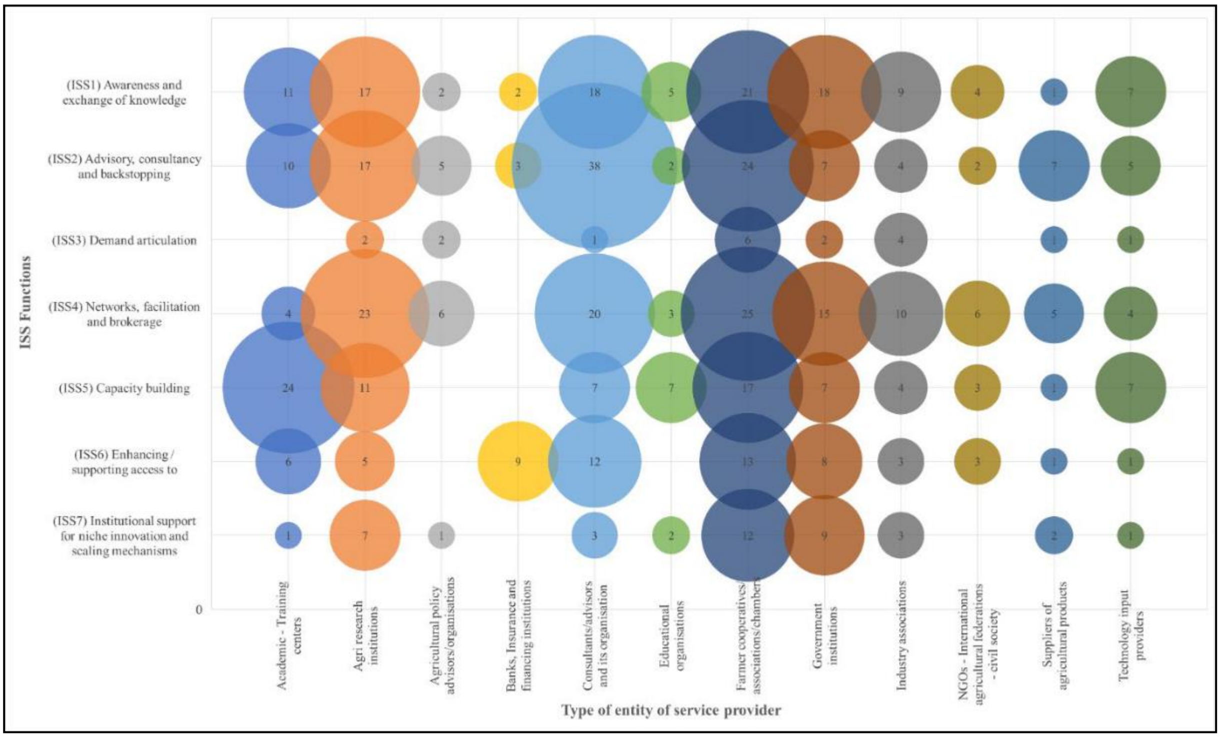


Figure 4 Type of ISS providers and function correlation
Source: own edition based on own calculation

4. Discussion and conclusion

The results described in this paper provide an incomplete and not completely realistic picture since they are based on partial data. However, they highlight some interesting findings.

Firstly, most of the actors providing innovation support services are typical organisation in agriculture. Thus, ISS providers should be primarily sought among consultants, advisory organisations, farmer cooperatives/chambers of governmental institutions and mostly agri-research organisations according to this first mapping. These organisations mostly cover the full range of ISS functions and thus offer a wide range of services/activities to practitioners. Some actors, such as banks, NGOs and industrial associations provide services that are characteristic in supporting innovation, but they seem less meaningful in agriculture. However, the relevant information is that 50% of current ISS providers (if this mapping can be considered as a representative sample) have no role in the CAP Strategic Plan.

ISS1, ISS2 and ISS4 functions are provided by all types of actors and are specific to agricultural activities. However, only a few types of entities typically provide some functions (mainly ISS3, ISS5) on a regular basis. Some functions are strongly related and are not easily separated; therefore, categorising the providers according to the functions they provide can be done properly only if their activities in supporting the innovation processes are visible.

Finally, some functions are provided to a very limited extent (e.g., ISS3.Demand articulation and ISS7. Institutional support for niche innovation and scaling mechanisms stimulation). Why? With what implications?

To conclude, the information explored in the mapping inventory is fundamentally useful for obtaining an overall picture of ISS providers, but it does not give an accurate depiction of their organisational model, and to what extent and how they reach their farmers/practitioners. A lot of the information in the mapping inventory is not comprehensive because it is based on the knowledge/assumptions of the consortium partners. The mapping will be updated and completed during the lifetime of the project. The work will continue to deepen the functions through other methods (e.g., surveys and interviews) and project activities, which would lead to the development of inventory.

5. References

Beers P. J, A.J. Sol, & E. J. Wals (2010). "Social learning in a multi-actor innovation context". Paper presented at 9th European IFSA Symposium, 4 7 July 2010, Vienna (Austria)

Fieldsend, A., E. Cronin., E. Varga, S. Biró, & E. Rogge (2021). "Sharing the space in the agricultural knowledge and innovation system: multi-actor innovation partnerships with farmers and foresters in Europe". The Journal of Agricultural Education and Extension 27 (4): 423-442 https://doi.org/10.1080/1389224X.2021.1873156

Ingram, J., P. Gaskell, J. Mills, & J. Dwyer (2020). "How Do We Enact Co-innovation with Stakeholders in Agricultural Research Projects? Managing the Complex Interplay Between Contextual and Facilitation Processes." Journal of Rural Studies 78: 65–77. doi:10.1016/j. jrurstud.2020.06.003.

Kilelu, C. W., L. Klerkx, & C. Leeuwis (2013). How Dynamics of Learning are Linked to Innovation Support Services: Insights from a Smallholder Commercialization Project in Kenya, Agricultural Education and Extension, 20(2), 213-232.

Koutsouris, A. (2014) "Exploring the emerging intermediation roles (facilitation and brokerage) in agricultural extension education." International Journal of Agricultural Extension, Special Issue: International Conference – Emerging Horizons of Agricultural Extension for Sustainable Rural Development, February: 21-37.

Leeuwis, C., & N. Arts. (2011) "Rethinking Communication in Innovation Processes: Creating Space for Change in Complex Systems". The Journal of Agricultural Education and Extension 17(1):21-36.

Moschitz, H., D. Roep, G. Brunori, & T. Tisenkopfs (2015). "Learning and Innovation Networks for Sustainable Agriculture: Processes of Co-evolution, Joint Reflection and Facilitation". The Journal of Agricultural Education and Extension 21 (1), pp. 1–11. DOI: 10.1080/1389224X.2014.991111.

Perez, S.A., L. Klerkx, & C. Leeuwis (2010). Innovation brokers and their roles in value chain-network innovation: preliminary findings and a research agenda. ISDA 2010, Montpellier, France

Proietti, P. & Cristiano, S. (2022). "Innovation support services: an evidence-based exploration of their strategic roles in the Italian AKIS". The Journal of Agricultural Education and Extension 29 (3), pp. 351-371. DOI: 10.1080/1389224X.2022.2069828

Proietti, P. & Cristiano, S. (2023). "Conceptual grounds and common understanding: state of the art", Deliverable 1.1 ATRACTISS project

Ecosystem of actors and sectoral governance strategies for agricultural innovation in Cameroon

Temple L.[1,2], Talla SMB.[3], Kamga R.[3], Awah MLA.[4], Mathé S.[1,5,6]
[1]Innovation, University of Montpellier, CIRAD, INRAE, Montpellier SupAgro, Montpellier, France
[2]CIRAD, UMR Innovation, Montpellier, France
[3]University of Dschang, Dschang, Cameroon
[4]University of Yaounde 2
[5]CIRAD, UMR Innovation, Accra, Ghana
[6]Science & Technology Policy Research Institute, CSIR-STEPRI, Ghana

Short abstract

The central problem of this article is how to improve the supply of innovation support services for a transformation of production modes that meet the needs of rural communities in the South. In order to answer this question, two hypotheses are put forward. The first postulates that the organisational, historical and institutional structures that specify the functioning of commodity chains finalise the organisational subsystems of innovation in terms of the configuration of support services. The second questions how the creation of shared collective knowledge on these different subsystems generates a community of actions that can be mobilised to improve synchronisation between the supply and demand of services. The study mobilises the notion of 'ecosystem of actors' as a framework for analysis. It is based on the work carried out as part of the LEAP-AGRI SERVInnov project in 2018 around three subsystems (Food crops, Cash crops and Organic crops). Based on descriptive analyses, we mainly find a specificity of the service offer per innovation subsystem and according to the nature of the services. A diversified service offer but governed by three main actors. A weak offer of central services for the activation of innovation (institutional support) which poses the problem of the sustainability of innovation support. It is recommended to improve the governance of the service offer of donors through better coordination of projects.

Extended abstract

Purpose

The framework for analysing Agricultural Innovation Systems (Touzard et al., 2015) proposes a heuristic approach for studying existing institutional and organisational realities and tools for identifying the dysfunctions that structure innovation policies (Temple and Casadela, 2020). Their methodological operationalisation organises the visibility of the mapping of organisations (research, companies, civil society) that interact to generate, implement and use the resources that activate innovation. The nature of these relationships is structured by institutions (Lundvall, 2016) : norms, laws, markets, evaluation methods, collective coordinations values. The process itself aims to realise the invention in the productive system, and can be characterised by three central dimensions : (i) accessibility to intangible (knowledge, information, skills, etc.) and material (infrastructure, finance, equipment, inputs) structuring resources, (ii) An Ecosystem of Actors understood as a network of actors who interact through links of a regular frequency, (iii) Governance that synchronises the complementary uses of resources that vary according to the phase and the specificity of the ecological, social and economic context.

Synchronisation requires service activities and service providers that ensure the structuring of links and the intensity of their functionality (Bergek et al. 2008). Historically provided by rural communities, the acceleration of knowledge in scientific and technological fields leads to specialisation and professionalisation of these services (Ndah et al. 2018, Faure et al. 2019). It also leads to increasing privatisation and sectoralisation in industrial countries where the number of farmers becomes a marginal component of the working population (Labarthe et al. 2022). This has led to a renewal of approaches to support but also to conceptualise sectoral innovation in agriculture linked to these developments (Knierim et al. 2017). The change in the macro-institutional context in the highly agricultural countries of the South raises the question of the potential inappropriateness of the uses of these renewals when they are transferred from the North to the South (Arvanitis et al. 2022). It therefore requires knowledge of the reality of service structures in these countries, their evolution, and their governance (local, national, international) in order to better inform a conceptualisation of analytical frameworks endogenous to the contexts specified by the societal demands of the agrarian societies of the South and not the conventional one carried by the transformations of industrial agriculture in the North. With regard to this problem, we question how to improve the supply of innovation services for a transformation of production modes that meet the needs of rural communities in the South[25] ?

In the light of the above-mentioned problematisation, we put forward two structuring hypotheses. The first postulates that the organisational, historical and institutional structures that specify the functioning of the sectors (Temple et al. 2023), finalise the innovation subsystems in terms of the configuration of support services : nature, conditions of access. The second question is how the creation of shared collective knowledge about these different subsystems generates a community of actions that can be mobilised to improve synchronisation between the supply of and demand for services.

Design/Methodology/Approach

From a methodological point of view, we mobilise the notion of 'ecosystems of actors' understand as service providers to reveal the different mismatches between 'supply' and 'demand' in terms of service needs that structure agricultural innovation. The ambition is to reveal this mismatch (dysfunction, bottlenecks, etc.) on three variables: (i) the structure of the supplier offer (diversity, competition, complementarity, nature); (ii) accessibility; and (iii) a procedural variable concerning the characterisation of a collective action strategy by the mobilised actor ecosystem. This methodological trajectory is based on a prior sequencing of work carried out in the Cameroonian context, including diagnostic surveys during the various student internships with 61 service providers, which made it possible to obtain a database of 154 services, a typology of organisational subsystems and case study sampling, and a typology of the nature of services. The notion of "ecosystems of actor", based on a social science biology metaphor, implies a representation of the organisational structures of the actor system involved (offenders and service users), and the assumption that this structure is functionalised by a common objective of transforming technical systems.

Findings: From the mapping of service offers to the conditions of their activation by farmers.

The test of the service specificity hypothesis between the different subsystems selected for Foodcrops, Export and Organic Agriculture in relation to the sample of case studies of the sectors (Cassava, Potato, Cocoa, Organic Pineapple) proposes to identify the main similarities and differences between the subsystems.

The specificity of the service offer by innovation sub-system between Export, Food and Organic Agriculture

The structure of service provision *(Figure 1)* in export agriculture, as revealed by the cocoa sector, shows a strong concentration of service provision by public companies specialising in the sectoral and professional governance of these sectors. In some areas, these organisations are supplemented by former organisations, public cooperatives that maintain input supply activities and collective purchasing of cocoa. The liberalisation policy of the 1990s led to the privatisation of cocoa purchasing services, which is accelerating with the recent establishment of private cocoa multinationals in Cameroon, the main one being OLAM.

The structure of the service offer for food crop agriculture (cassava, potatoes, etc.) is structured by two organisational polarities. The first refers to the structuring of public projects and programmes supported by

[25] The notion of "Southern" countries is a metaphor for countries that have not undergone an industrial transformation of their economy, and are often classified as low-income countries in terms of GDP and as fragile states in terms of public policy governance.

MINADER[26] . This structuring can be linked to many projects supported by international cooperation: ACEFA[27] , AFOP[28] , PNDRT[29] . The second is led by the Professional Agricultural Organisations (GIC[30], Cooperative)

Finally, with regard to organic agriculture, the service offer is structured by a polarity between NGOs supported by international cooperation that support the implementation of different forms of certification (European Standards, Participatory Guarantee Systems), as well as private companies outside the national territory (Ecocert) or other product certification companies.

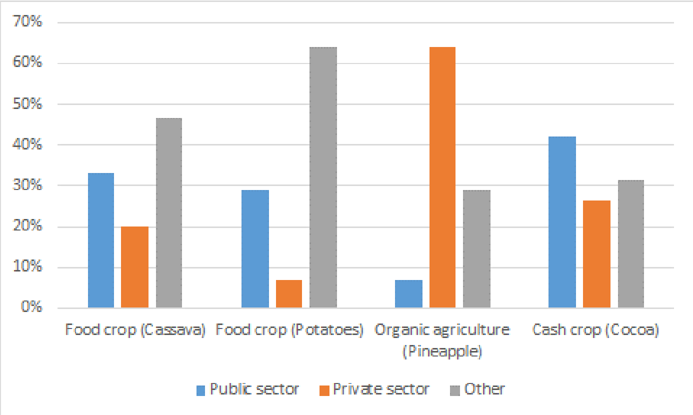


***Figure 1* - Specificities of the service offer by innovation sub-systems**

Service specificities in terms of the nature of the services

Four generic services structure the three innovation sub-systems studied respectively (i) training, technical advice; (ii) access to material resources (seeds, fertilisers, pesticides, small equipment); (iii) dissemination of knowledge (extension results, research, on-farm trials); and (iv) networking and brokering: incubators, networking of producers and buyers (*Figure 2*). Our results highlight three specificities.

The first specificity concerns a category of services that export agriculture benefits from but that are absent from food and organic agriculture. These are services described as institutional support services, which include various activities, mainly the dissemination of price information.

The second is symmetrically about a category of services delivered by private companies that apply international standards, notably on organic farming, which can transversally benefit all sectors with regard to organic farming standards.

The third specificity is the existence of services that can be qualified as "orphan", i.e., that have not been identified or have been identified only to a limited extent, whereas they are identified in the other subsystems.

[26] MINADER: Ministry of Agriculture and Rural Development
[27] Programme to improve the competitiveness of family agropastoral farms
[28] Support programme for the renovation and development of vocational training in the agriculture, livestock and fisheries sectors
[29] National Root and Tuber Development Programme
[30] Joint interest group

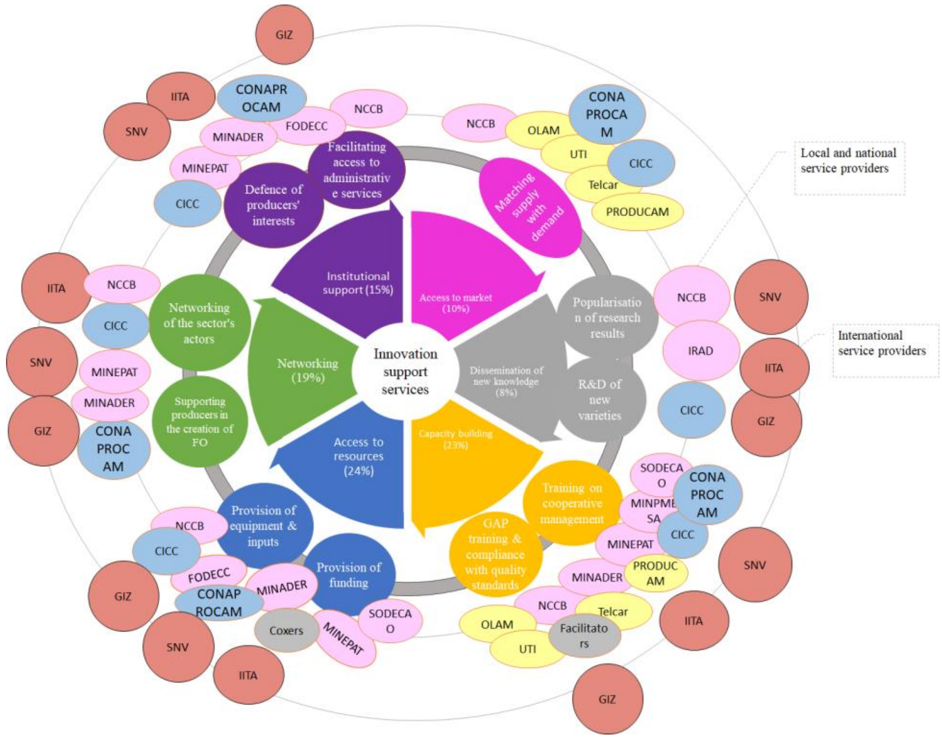


***Figure 2* - Mapping the supply of agricultural innovation support services**
Source: Authors

A diversified generic service offer

The weighting of the number of services by type of provider (*Figure 3*) reveals a relatively diversified offer. However, it highlights the governance by three major providers (67% of the 154 services listed).

Firstly, professional agricultural organisations have become the leading service provider in Cameroon, ahead of public sector organisations and private sector enterprises. In a known context of instability in the governance of these organisations (...), this structuring weight is an interesting 'novelty' that confirms that the various projects and support programmes, as well as professional organisational learning, are beginning to transform the organisational realities of agricultural innovation processes. However, this observation requires us to remember that many of the professional organisations referenced by the surveys actually depend on structural support from public policies.

Secondly, the Public Sector Organisations intervene according to the sub-system via specialised companies under the supervision of the Ministry of Agriculture or via the governance of programmes and projects supported by donors targeted on specific sectors: cocoa, potatoes, etc.

Thirdly, private sector companies and civil society organisations (NGOs) and international organisations provide quantitatively less service provision (contributing less than 16% of service provision per category of actor).

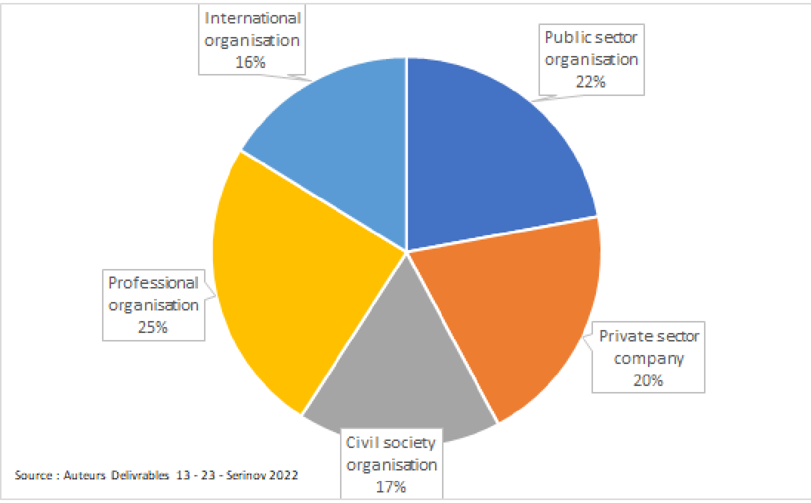


Figure 3 **- Distribution of services offered by type of provider**
Source: Authors (Deliverables 13-23- SERVInnov 2022)

We then analyse the services that are common to these 5 types of providers. Three main services common to all providers are thus highlighted in terms of their quantitative importance respectively:

- Consulting and Training (36% of total services)
- Access to resources (18% of total services)
- Knowledge dissemination (16% of total services)

This knowledge reveals potential situations of competition between "suppliers" to deliver these services. This competition can be qualified, on the one hand, by strategies for attracting funding (international cooperation) that enable these services to be developed and delivered; on the other hand, by situations of competition in companies linked to the delivery of these services to potential beneficiaries.

Weaknesses in the supply of services that are central to the activation of innovation

Institutional support services, which play a central role in strengthening the collective actions of producers, account for only 6% of services. Sixty percent of these services are offered by producer organisations on the basis of projects often supported by international cooperation and organisations. They are therefore very dependent on the outside world and their structuring and sustainability is not very well assured by current public policies.

However, in a context of strong instabilities in the organisational structures of professionalisation of agriculture in Cameroon, the conditions for the emergence of collective actions and organisation of producers at the first level are central to support the mutualisation of investments, infrastructures and collective experiences that mitigate risk-taking and are favourable to innovation (cf. introduction on the specificity of innovation in agriculture). This contributes to strengthening the capacity of farmers to seize the potential offered by science and technology. A central element of these services, which is highly appreciated, is support for the legalisation of producer groups, given the complexity of the administrative procedures encountered in this area.

Networking services account for only 2% of the services offered. They are 70% provided by the PSOs and IOs and are therefore, as before, very dependent on funding from cooperation or development aid policies. These networking services benefit VA and AB very little or not at all.

Practical Implications: Shared collective knowledge and strategic community of action

The observation on the gap between the supply of services and the demand in terms of adaptation to needs, structure of the supply, accessibility of services (inclusiveness of marginal situations), was put to participative debate during a validation workshop with the stakeholders of the service ecosystem revealed by the work.

This workshop enabled the stakeholders to be mobilised in the collective qualification of recommendations in terms of strategies and priorities for action. The expression of these recommendations was however very heterogeneous with regard to the diversity of the actors involved and the cognitive asymmetries on the terminologies used. This heterogeneity led the researchers to reprocess the verbatims expressed, to proceed with thematic groupings based on reformulations with regard to the conceptual grid used. The main results relating to the expression of these recommendations propose the following thematic typology. The relative weight of each theme, i.e. the priority importance given by the ecosystem stakeholders, is given by the occurrence of quotations during the surveys conducted during the workshops (*Figure 4*).

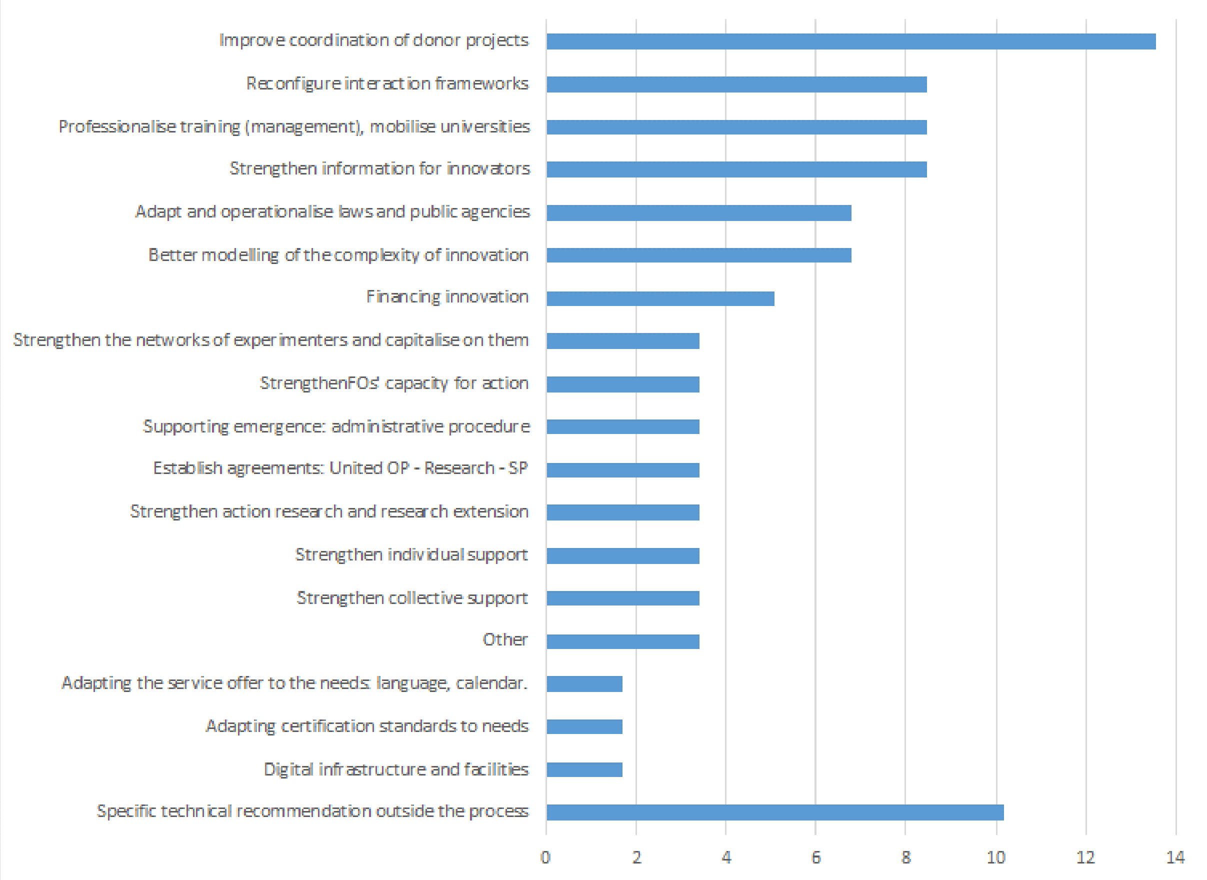


***Figure 4* - Thematic priorities for action strategies to improve the service ecosystem in Cameroun**
Source: Authors

During the debates, a "dicensus" was expressed within the community of actors between the producer and professional organisations, which claim the need to strengthen more inclusive collective support, and the NGOs providing private services, which argue that individual support is more effective.

Intra-thematic analysis on donor project improvement and coordination

The intrinsic analysis of the verbatims that lead to the structuring of the above themes is in itself the subject of a cross-cutting communication to the different countries where this exercise of formulating recommendations has been conducted. In the context of Cameroon, we have chosen to focus on the central recommendation that is highlighted by the work on improving project coordination by donors. In this case, this central recommendation is structured by the following set of constituent items:

- Create coordination between providers to avoid duplication of the same service, competition between providers, encourage synergies between support projects
- Promote improvements in the quality of services in terms of matching demand, specialisation of providers, transparency between (who does what)
- Structuring the synchronisation in the calls for tender on the service offer / short timeframe of projects or extending the duration of projects.

- Enable suppliers to track the innovation they have documented beyond projects

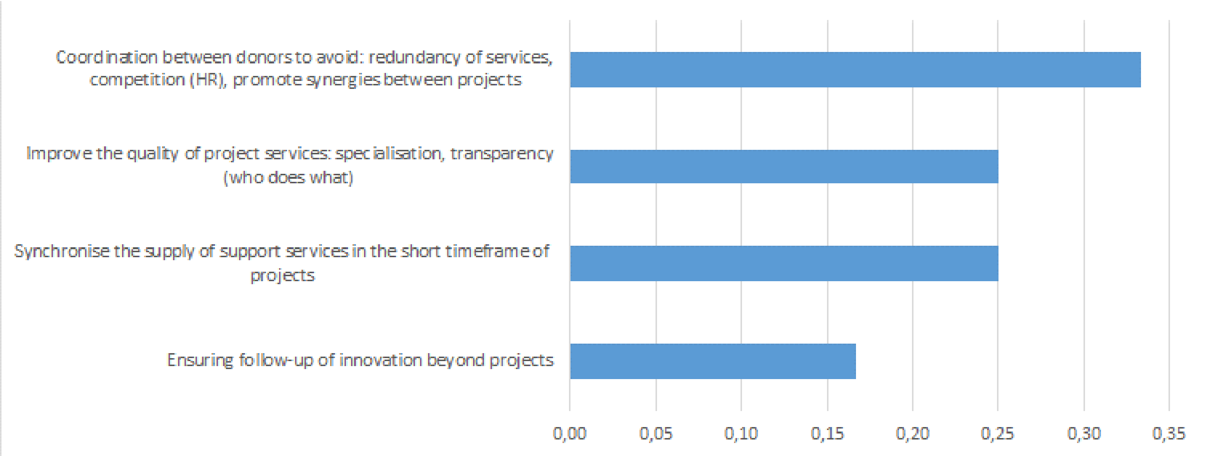


Figure 5 **- Items for improving governance of donor service provision (N= 12)**
Source: Authors

These recommendations were then proposed to policy makers in a specific feedback workshop.

Theoretical Implications

The macro-institutional specificities of Southern countries contextualised by the case study on Cameroon highlight the difficulties of public governance of the supply of support services independent of bilateral cooperation or aid policies. This raises questions about the adaptation of this service offer to the innovation capacities of rural societies. Farmers remain a social category still in a situation of social precariousness, mobilising a basic education that is still not very professionalized, and professional organization structures that are still emerging and unstable. The identification of the structuring role of professional organisations in the quantitative supply of services, the supply of essential services (...), the emergence of entrepreneurship testify to the transformation underway, which should probably be supported. It also questions the need to better understand the capacities of rural communities to renew and become involved in the provision of the necessary services in relation to their own learning resources. This is to empower the adaptation of this offer to the capacity of users to mobilise them according to the diversity of these capacities, and not to a market selection which can only reinforce the mechanisms of inequality of access to innovation. This questioning of a theoretical level questions the relevance of a sectoral specialisation of the analysis of services with regard to other approaches that privilege the macro-institutional analysis of services that strengthen the collective capacities of local community actors to undertake the production of services and to depend less on market supply, or on structuring governed by exogenous financing mechanisms.

References

Arvanitis, R., Mouton, J., & Néron, A. (2022). Funding research in Africa: landscapes of re-institutionalisation. *Science, Technology and Society*, 09717218221078235.

Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., & Rickne, A. (2008). Analyzing the functional dynamics of technological innovation systems: A scheme of analysis. *Research Policy*, 37, 407-429.

Faure G., Knierim A., Koutsouris A., Ndah H.T., Audouin S., Zarokosta E., Wielinga E., Triomphe, B., Mathé S., Temple L. (2019) How to Strengthen Innovation Support Services in Agriculture with Regard to Multi-Stakeholder *Approaches. Journal of Innovation Economics Management*, 145-169.

Knierim A., Labarthe P., Laurent C., Prager K., Kania J., Madureira L., Ndah HT. (2017) Pluralism of agricultural advisory service providers - Facts and insights from Europe. *Journal of Rural Studies* (55): S. 45-5. DOI 10.1016/j.jrurstud.2017.07.018

Labarthe, P., Sutherland, L. A., Laurent, C., Nguyen, G., Tisenkopfs, T., Triboulet, P., ... & Redman, M. (2022). Who are Advisory Services Leaving Out? A Critical Reflection on 'Hard to Reach' Farmers. EuroChoices, 21(1), 50-55.

Lundvall, B. Å. (2016). Innovation systems and development: history, theory and challenges. In Handbook of Alternative Theories of Economic Development. Edward Elgar Publishing

Ndah HT., Knierim A., Koutsouris A., Faure G. (2018) Diversity of innovation support services and influence on innovation processes in Europe - Lessons from the AgriSpin project. 13th European IFSA Symposium: Farming systems: facing uncertainties and enhancing opportunities. 1-5th July

Temple L., Dabat MH., Avadí A. 2023. Integration of social and ecological indicators in the analysis methods of bioeconomical and agri-food chains in developing countries. *Innovation Technology Review* (in press)

Temple L., Casadella V. (2020). Policies and models of innovation in Africa, *Technology innovation:*, Vol 5, N°3. http://www.openscience.fr/Politiques-et-modeles-d-innovation-en-Afrique

Touzard JM., Temple L., Faure G., Triomphe B. (2015). Innovation systems and knowledge communities in the agriculture and agrifood sector: a literature review. *Journal of Innovation Economics and Management*, 2 (17): 117-142.

Worthy ISS provider functions case as a guide for the national policymakers, through mapping ISS across EU countries.

Peter Paree*, Somaya Aboelnaga[2], Lívia Kránitz[1], Patrizia Proietti[3], Simona Cristiano[3]
[*]ZLTO
[1]University of Győr, Hungary
[2]AKI, Hungary, Lecturer- Cairo University, Egypt
[3]CREA, Italy

Short abstract
Based on the common understanding of ISS functions within ATTRACTISS project, an initial mapping exercise for innovation support services providers across the EU countries was conducted, and successfully gathered 265 ISS providers, which identified their characteristics. The research aims to illustrate an example of ZLTO, a worthy case in the Netherlands, a description of Innovation support in a competing environment is provided, as a pilot example of how the ISS providers are capable of managing the various functions and detail innovation activities.

Extended abstract

Purpose
The aim of the paper is to illustrate, through the example of the ZLTO, the activities covered as innovation support services. The ZLTO is also a particularly worthy ISS case study because it provides a broad range of activities for practitioners, covering all types of services/functions.
The new CAP Regulation (EU) 2021/2115 requires EU Member States (MS) to provide support for innovation, in particular for the preparation and implementation of the EIP-Agri operational groups (OGs). The expected result is a general improvement of connections between actors, policies and programmes/projects, knowledge(s) and experience(s), methods, and instruments to speed up the creation of innovative solutions.

Innovation support services (ISSs) represent a novelty from a policy perspective and, therefore, require governance models, approaches, competencies, and tools that foster their effective implementation and embedding in the respective national/regional AKIS.
Within the AgriSpin project, the diversity of services provided to support innovation processes were summed up into 7 functions (Mathé et al., 2016): access to knowledge; advisory, consultancy and backstopping; marketing and demand articulation; networking facilitation and brokerage; capacity building; access to resources; institutional support for niche innovation and scaling mechanisms stimulation.

These were later refined by Knierim et al. (2018; 2020) and Faure et al. (2019), as shown in Table 1.

Table 1 ISS function Definition

ISS FUNCTION	DEFINITION
Source: Faure et al. (2019) And Knierim et al. (2018), Based on Mathe et al. (2016) and Faure et al. (2017)	
Iss1. Awareness-raising and knowledge dissemination *(new definition by ATTRACTISS consortium)*	All activities contribute to knowledge awareness, dissemination of scientific knowledge, or technical information for farmers. For instance, providing knowledge based on information dissemination forums (website, leaflets), meetings or demonstrations and exchange visits
Iss2. Advisory, consultancy and backstopping	Targeted, supportive activities aimed at solving complex problems (e.g., a new farming system), based on demands of actors and the co-construction of solutions
Iss3. Demand articulation	Services targeted to help actors to express clear demands to other actors (research, service providers, etc.). This is targeted support to enhance the innovator's ability to express his/her needs to other relevant actors.
Iss4. Networking facilitation and brokerage	Provision of services to help organize or strengthen networks; improve the relationships between actors and to align services in order to be able to complement each other (the right service at the right time and place). It also includes all activities aimed at strengthening collaborative and collective action.
Iss5. Capacity building	Provision of services aimed at increasing innovation actors' capacities at the individual, collective and/or organizational level.
Iss6. Enhancing/ supporting access to resources	Provision of services for innovators aimed at enhancing the acquisition of resources to support the process. This could be facilitating access to inputs (seeds, fertilizers etc.), facilities and equipment (technological platforms, labs etc.), and funding (credit, subsidies, grants, loans, etc.).
Iss7. Institutional support for niche innovation and scaling mechanisms stimulation	Provision of institutional support for niche innovation (incubators, experimental infrastructures etc.) and for scaling out and scaling up the innovation process. This refers to support for the design and enforcement of norms, rules, funding mechanisms, taxes, subsidies, etc. that facilitate the innovation process or the diffusion of innovation.

Awareness and knowledge dissemination: the support needed in each phase cannot be pre-defined or clearly identified, because the development of needs depends on and evolves according to a variety of context and innovation-related factors. Nevertheless, in some phases, the provision of specific services is a necessary and imperative condition. For instance, during the initial phases of an innovation process, the support must provide the space and resources needed for key actors to innovate. Therefore, it focuses mainly on triggering exchanges, generating new knowledge, facilitating access to seed funds, and setting up informal and flexible networks. Likewise, in the latter phases, there is a need for services aimed at ensuring the scaling and institutionalization of the innovation, both at the farm, value chain and territory levels.

Advisory, consultancy and backstopping (ISS 2) encompass on-demands services aimed at solving complex problems and co-construct solutions. They are characterised by the high content of soft skills and the ability of the advisor to 'handle' the production process, facilitating the connection with other services. The soft management of production processes, which entails communication, the ability to listen and to value farmer's insights, combined with technical capacities and interactional expertise (Ingram, 2008), as well as the ability to collaborate with different kinds of actors and develop adequate practices (Nettle et al., 2017), also underpins the development of multi-actor project pathways.
The function '*networking, facilitation and intermediation'* (ISS 4) is transversal and contributes to/facilitating the other functions and it is crucial in all phases of the innovation process. Networking, in particular, is a strategic function that takes up a large part of the efforts of ISS providers and is fundamental in triggering and finalising innovation pathways.

The '*support to access to resources'* (ISS 6) function plays an important role, especially with regard to access to financial resources, relations with funding bodies and project management, as well as the '*demand articulation'* (ISS 3), which includes key activities to build a multi-actor process from the ground, starting from needs analysis, through to the development of a common vision and the creation of bridges with users and other actors to make the need concrete, defining its contents, specificities and costs.

The provision of *'services aimed at enhancing the capacities of actors'* (ISS 5) does not seem to be a key function and its role is described as being minor compared to information and dissemination activities.

Finally, '*support for niche innovation and the stimulation of scaling mechanisms'* (ISS 7) is mainly offered as dialogue and intermediation activities at various levels, horizontal, supply chain, institutional and community levels.

This function, which includes authorisation processes that are needed to introduce an innovation to the market (standards. intellectual property, patents, etc.), is crucial for the embedding of innovation. Faure et al., (2019) argue that there is no specific type of service provider that is solely responsible for this kind of service, but multiple actors (farmers' organizations, private firms, cooperatives, etc.) can perform the function, either coordinating or not. Proietti and Cristiano (2022) found that, in many cases, there is a lack of awareness of scaling mechanisms, which are often confused with dissemination. On the other hand, the scaling function, meaning the shift from the first circle of users/co-innovators to a wider circle of the user, entails iterative processes that extend beyond the lifetime of projects and, therefore, requires a dedicated budget and the capacities to interact with different systems at multiple levels. This is particularly true for support to the scaling-up or 'vertical development' (with respect to the scaling-out or 'horizontal development, which happens when other groups develop the same innovations with the same methods): in fact, the achievement of a higher degree of diffusion of innovation at multiple levels can be hampered by resistance to change as well as by the emergence of alternative / competing regimes and may require specific services and policy support (Brunori et al., 2011).

Design/Methodology/Approach

The ATTRACTIS project provided a mapping of ISS providers operating in the EU. One of the partners, ZLTO used the framework with 7 ISS functions to do a self-assessment, in the framework of which ZLTO assessed its activities.
Following this internal self-assessment, ZLTO was able to make a deeper analysis of the environment where the organisation does its work.
Famers are members of ZLTO. They expect support from their organisation on different levels: the basic level is lobby work on regional, national and EU levels. To make it effective, the lobby should be fact-based. In order to have the newest information, ZLTO is involved in innovations on the farm and in society. At the same time, innovative farmers/members expect support from their organisations. That's 2nd reason why ZLTO works in innovation. Summarised: provision of Innovation Support by ZLTO is a win-win for farmers and their organisations.

Because there are different motivations to provide the ISS, it's difficult for ZLTO to assess the effectiveness of the services, compared to other organisations. In a self-assessment exercise in ATTRACTISS, partners and competitors in the environment of ZLTO innovation Support Services were mapped, and reflections were made on the opportunities and threads of these services.

Practical implementation: pilot self-assessment: Innovation Support in a competing environment, a case in the Netherlands.

As a pilot case from the gathered ISS providers, we dive into more details to be an example for the further survey and information needed.
ZLTO plays ISS roles for farmers/members. Those roles are played in the Dutch environment, where all support for farmers is organised by private organisations, that cooperate and compete. In the pilot, ZLTO assessed which ISS functions it provides, and the dynamics in which they are provided. Here we describe these dynamics in the 7 functions.

1. **Awareness-raising and knowledge dissemination**: in the Netherlands, all funding of actions in 1st step of innovation is organised in project calls. For this funding, farmers' organisations compete with education and research institutes. The direct link with farmers in these kinds of projects is a positive feature of associations like ZLTO.

2. **Advisory, consultancy &backstopping: farm level /organisation level:** individual advice in the Netherlands is completely privatized, which means it should be paid for by the farmers. Food/feed chain input actors can include this payment in the product price, therefore they are by far the biggest advice providers, though not independent. For specific services, farmers rely on specialists, like land brokers, notaries, and accountants. The latter is obligatory, because Dutch taxes are based on their reports. Generalist individual innovation supporters have difficulty competing with those organisations. A new development: vouchers provided by the ministry, gives independent advisors, like in ZLTO, a better position so that they can play a role in transition and innovation.

3. **Demand articulation:** The main role of farmers' organisations in demand articulation, is not to articulate the technical needs of farmers (this is done by dealers), but to articulate societal needs to the farmers. This is not always a rewarding role: members want that their organisation fights for their position in the lobby work. This tension works in 2 directions: farmers have different opinions about their organisation doing this work and governments often prefer (=pay) other organisations to organise this demand articulation. Still, ZLTO invests time to connect farmers to societal needs, so that they can anticipate societal challenges. With funding for awareness raising (ad 1), ZLTO can finance some of these activities.

4. **Networking facilitation and brokerage:** The quality of farmers' organisations in networking is easy to reach out to members and other farmers, but this cannot be done without external payment. In innovations for societal reasons, governments prefer to involve the regional development offices, which often have a direct link to regional governments.

5. **Capacity building**: Capacity building, also outside the setting of schools, is the domain of educational institutes, which is not affected by the privatization wave in other sectors. For specific trainings, farmers' organisations see a need and they started a national collaboration: LTO academy.

6. **Enhancing/ supporting access to resources**: Application and management of projects under Rural Development Programme innovation calls and other subsidies are too complex for most farmers. ZLTO supports farmers to make use of these calls, but this should be paid from the subsidy. Many organisations compete for this project support, quality of the work differs.

7. **Institutional support for niche innovation and scaling mechanisms stimulation**: ZLTO can invest in innovations that have a chance to survive in the market. This is an activity that differs much from the other work, hard to integrate. Most support for innovation projects comes from government, in the projects.

In the previous description of ZLTO involvement in the innovation functions, the following matrix states the correlation between the actors' types involved and the innovation functions classified on their working level.

Table 2 Activities dynamic within ISS functions in ZLTO

	Type of organisation	ISS function 1	2	3	4	5	6	7
	National							
n1	Ministry of Agriculture, Nature and Food Quality						e	
n2	Min. Economic Affairs; Agency Entrepreneurship						e	
n3	NGOs			1	1			
n4	Research Councils						1	
n5	Topsector Horticulture/Agro&Food						e	
n6	TNO	1		1	1			
n7	NIZO, Louis Bolk Institute	1	1		1			
n8	Research for applied agriculture science	1		1	1			
n9	Universities; 14 Universities, 3x tech, WUR					1		
	Regional							
r1	Universities of Applied Sciences	1	1	1	1	1	1	1
r2	Agricultural Vocational Education				1	1		
r3	Regional governments						e	e
r4	Regional development offices		1	1	1		1	1
r5	Farmer Unions; LLTB / LTO-Noord, ZLTO; LTO-NL	1	1	1	1	1	1	1
r6	Branche and Sector organisations	1		1	1		e	
r7	Independent accountants		1					
r8	indepenent consultants		1					
r9	land brokers and notaries		1					
r10	Banks		1				e	
r11	Food Chain Input industry Actors		1					
r12	Food Processing / Coops				1		e	1

Explanation: 9 types of national (in light grey) and 12 regionally working organisations are distinguished in the overview. Some organisations work (inter)nationally but have connections in the region. Education institutes (dark grey) have a special role in the ecosystem. The activity of a type of organisation in an ISS function is marked with '1'. If an organisation provides funding, it's marked with 'e'.

New insights from the pilot self-assessment

The overview above gave new insights for ZLTO, some on the level of the work are reflected below:

- ZLTO is providing all the ISS functions. Only Universities of Applied Science (r1) provide the same broad spectrum. They have structural government funding and ZLTO has to find a budget for projects. Until this assessment, ZLTO experts and members took this range of services for granted. This overview is food for thought: why is it so hard to organise the work and fund it?
- People outside the organisation often don't see the broad range of service provisions by ZLTO. They expect an organisation 'just like all the others' and assume there is a narrow focus on the lobby. People who learn to know the organisation better are surprised by the expertise that is present.
- In the past, initiatives were taken to focus provide fewer services. These initiatives often failed: the win-win between ISS functions is important for effectiveness.

On the level of the self-assessment itself, it is experienced as high value, that all functions and competitors are summarized in a compact report. Management and board prefer clear overviews instead of long reports. This makes it interesting to develop the self-assessment further.

Discussion and recommendations

The example of ZLTO highlights an important fact, an organization with broad ambitions has such a complex competence scale that makes them/the institution suitable to cover a wide range of ISS services. Of course, a smaller company or a single advisor cannot do this, but even for a larger organisation, the management and funding of such a spectrum is a huge challenge.

The Advantage of a broad spectrum is that an organisation can adapt its own activities/services to the needs of practical actors and the needs of the innovation process (win-wins), which opens up new horizons in the field of services supporting innovation.

It is an important message for policymakers when they design and implement their AKIS strategic approach, to create a clear overview including the range of service providers supporting innovation and their activities. It is likely that an organization with an extensive service portfolio can achieve a great influence on the formation of the EIP operational groups and thus on the development of innovation processes.

This fact is also reflected in the activities of ZLTO and its relationship with CAP. ZLTO supports farmers/members to run Operational Groups (OGs) in CAP, or innovation projects with other subsidies, like Interreg or Regional Economic Support. The CAP support unit often contacts ZLTO, to make connections between OGs, between OGs and science and between OGs and international projects. This innovation support in projects is in a competing environment.

References

Brunori G., Berti G., Klerkx L., Tisenkopfs T., Roep D., Moschitz H., Home R., Barjolle D., Curry N., (2011). Learning and innovation networks for sustainable agriculture: a conceptual framework. Deliverable 2.1 SOLINSA project

Faure G., Davis K., Ragasa C., Franzel S., & Babu S. C., (2016). Framework to assess performance and impacts of pluralistic agricultural extension systems. The best-fit framework revisited Washington DC: IFPRI-CIRAD

Faure G., A. Knierim, A. Koutsouris, T. Ndah, S. Audouin, E. Zarokosta, E. Wielinga, B. Triomphe, S. Mathé, L. Temple, & K. Heanue. (2019). "How to Strengthen Innovation Support Services in Agriculture with Regard to Multi-Stakeholder Approaches", Journal of Innovation Economics & Management, 2019/1 (n° 28), p. 145-169. DOI: 10.3917/jie.028.0145. URL: https://www.cairn.info/revue-journal-of-innovation-economics-2019-1-page-145.htm

Ingram J., (2008). Agronomist-farmer knowledge encounters: an analysis of knowledge exchange in the context of best management practices in England. Agriculture and Human Values, 25(3), 405-418.

Knierim, A., P. Labarthe, C. Laurent, K. Prager, J. Kania, L. Madureira, & H.T. Ndah. (2017) "Pluralism of agricultural advisory service providers – Facts and insights from Europe". Journal of Rural Studies 55:45-58. doi: https://doi.org/10.1016/j.jrurstud.2017.07.018.

Knierim A., Gerster-Bentaya M., Birke F., Bae S., Kelly T., (2020). Innovation advisors for interactive innovation process: Conceptual grounds and common understandings. Deliverable 1.1 i2Connect project

Mathé S., G. Faure, A. Knierim, A. Koutsouris, H.T. Ndah, L. Temple, B. Triomphe, E. Wielinga, & E. Zarokosta. (2016). Typology of innovation support services, WP1 AgriSpin, deliverable 1.4. CIRAD, Montpellier, France.

Nettle, R., L. Klerkx, G. Faure, and A. Koutsouris. (2017). "Governance Dynamics and the Quest for Coordination in Pluralistic Agricultural Advisory Systems." The Journal of Agricultural Education and Extension 23 (3): 189–195.

Proietti P. and Cristiano S., (2022). "Innovation support services: an evidence-based exploration of their strategic roles in the Italian AKIS", The Journal of Agricultural Education and Extension, DOI: 10.1080/1389224X.2022.2069828

Session 4C – Methods and tools to support policies

Assessing performances of advisory services based on their quality: a user-centred evaluation model

Simona Cristiano, Patrizia Proietti, Alberto Sturla, Valentina Carta
CREA-PB

Short abstract

Agriculture is a fast-changing sector and Rural Advisory Services (RAS) change with it. Reg EU 2115/2021 stresses the importance of considering advisory services as an integral part of national AKIS. Such an integration must be pursued in a strategic way, based on the SWOT analysis and related margins for amelioration and also exploit development opportunities.

The topic is central for reaching the modernization objective set by the CAP strategic plans (CAP SP). These latter must describe how advisory services, research and the national CAP network will cooperate to provide advice, facilitating knowledge flows and providing innovation support services and how the actions for knowledge exchange and dissemination of information (Art. 78) are integrated into the AKIS. Fostering integration between advisory services and rest of the AKIS becomes therefore object of funding and, as such, results on that topic are measured with a specific common indicator of the CAP SP (R2).

The efficacy of undertaken actions should be assessed by mean of a proper evaluation framework in order to verify 1) how and to what extent advisory services are connected and integrated within AKIS (at the national and/or regional level), 2) the presence of certain enabling factors to create an environment conducive to such integration (e.g. supporting policies and other contextual factors) and to the achievement of its objectives and 3) the extend to which the provision of advisory services if of good quality and well-tailored upon the needs and expectations of the clients and policy objectives.

This paper presents an assessment methodology that was developed for the purpose of assessing the performances of the advisory services based on context-sensitive and user-centred quality criteria that were fine-tuned during a participatory process of co-design and implementation of the evaluation framework with a group of 35 advisors.

The study was conducted under Erasmus+ RAMONES-PL project.

Extended abstract

Introduction

Aside from their traditional role, much more connected to the results at the level of farm productivity, over the EU programming periods, modern RAS have gained several other functions related to environmental sustainability, animal welfare, health and safety that has been added to the advisors' activities, to the point of including working farmers to prepare their business for managing complex issues such as climate change and supporting farmers' technological development (Christoplos et al., 2012; Faure et al., 2016; Eastwood et al., 2019).

Also, alongside this enlargement of the scope there's have been a progressive shift in the organization of the provision of advisory services, with a growing number of private actors, both single and associated, that have progressively outnumbered the public driven services.

This complexity makes the assessment of performance of the advisory services particularly challenging (Faure et al., 2016), as it has to target purposes that could be extremely different the one each other and also has to fulfil the needs for assessment of a wide variety of advisory actors.

When it comes to clients (i.e.: farmers) the focus should be much more shifted to quality, as a parameter for satisfaction (Landini, 2020) but by taking into account that RAS have direct effects on farm productivity, at the point to affect how people live and how they manage their natural resources (Christoplos et al., 2012). On the other hand, advisors' themselves' interest in performance evaluation lies on the need of assessing the output of their job so to have a measure of their work (or the work of their employees) that could allow the assessment of the quality and quantity of the activities carried out, in order to identify gaps in competences or over-exploited tasks. Ultimately, the policy makers' perspective must be taken in due account, especially in Countries where advisory services provision benefits of public support (e.g. CAP), and the assessment should be, also, aimed at targeting available financial resources more effectively and efficiently (Archer et al., 2007).

Therefore, appropriate monitoring and evaluation (M&E) are in principle important tools both to understand the quality value of RAS, but also to support improvements of the performance of the systems, organisations, and practices (Davis & Rasheed Sulaiman, 2014). There's therefore the need of a complex evaluation system that could bring under a coherent framework the different assessment need of actors in play, as well as the results of the advisory service, taking into account consequences on sustainability, at farm gates and beyond.

On this regard, in the specific case of the European level, there is a lack of adequate approaches, methods and tools for the evaluation of advisory services, even though these have been supported over several CAP programming periods. Whereas, at the international level, major attention has been paid on the evaluation of advisory services for several years now and it is widespread at the different levels of defining the objectives, support and implementation of advisory services. This has made it possible to define, starting from the analytical framework of Birner et al. (2009), approaches, methods and tools for the evaluation of advisory services, which can respond to the different needs of the various potential users and beneficiaries of the same and be adapted to the European context of the implementation of CAP Strategic Plans (Sulaiman et al., 2022; Grovermann et al., 2022; FAO 2022c; Cristiano et al., 2023).

Purpose

The purpose of this study was to design a ready-to-be-put-in-practice framework for the evaluation of the advisory services, both individual advisors and organizations, that could fit the purposes of:

- enabling the advisors and their organizations defining precision learning strategies for increasing appropriate technical and functional capacities in view of improving the quality and the satisfaction of the provision of services,
- collecting on-going, detailed and timely evidence for future evaluations/studies to demonstrate the quality and effects through reconstructing the impacts chain of the advisory services on farmers and agricultural systems,
- providing evidence and accountability to policy makers about the funded provision of services under the CAP Strategic Plans,
- promote the culture of quality evaluation among the advisors in view of a truly satisfaction of clients that could help a major use of advisory services and, consequently, their integration within the AKIS.

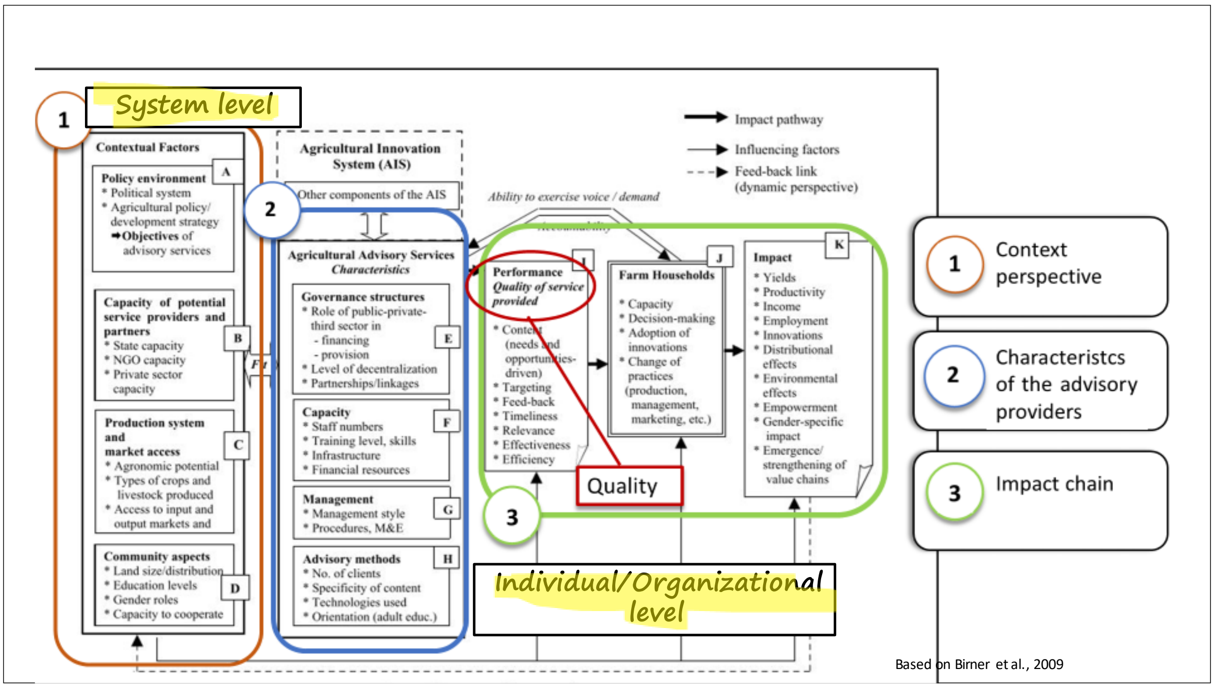
Design/Methodology/Approach

The study is grounded on the analytical frameworks of Birner et. al. (2009) and Landini, (2020).

Birner at al. (2009) developed a holistic approach that suits the needs of evaluation of the advisory performances according to different target groups, beneficiaries and scopes, as well as the different nature of providers of advisory services, since it targets different aspects of the RAS.

In fact, Birner. et al (2009) establishes a framework (Best Fit Approach) that fits the variety of indicators that ought to be used to the purpose, all along the impact chain and it allows deploying causal relationships among the characteristics of advisory services, its organizational performance, its outcomes at the farm level, and, finally, its impact on development (Figure 1).

Figure 22: Framework for Designing and Analyzing Agricultural Advisory Services



Source: Adapted from Birner et al., 2009

More specifically, Box I allows the identification of the outputs of the advisory services and some quality performance criteria, that are usually linked to the type of service and are taken into account for the satisfaction of the clients. Besides, Box J deals with result indicators (that instead concern medium-term performance, related to the effects at the farm household level), respectively, as they describe the immediate products of an advisory activity as well as its external outcomes. Box K is devoted to the impacts of the advisory service. Boxes from F to H, describing the organizational and management capacities as well as cultural variables, lead to outline the features for a proper provision of advisory service, and therefore enter as criteria for performance evaluation from a service provider perspective, as they deal with the methods, skills and competence that should be inherent to the advisors, being them individual or associated.

Output indicators of the advisor's performances are connected to the actual activities performed by the advisor and to characteristics of the service that guarantee the accomplishment of professional tasks and therefore involve the criteria described in Box I. The first one, in fact, define the criteria for evaluating advisory achievements, while the second ones are more focused on the functionality of the advisory services (Prager et al., 2017).

However, quality cannot be conceptualized only as farmers' satisfaction or as extension results as it has different dimensions or components and stakeholders have different points of view about it. It is a multi-faceted concept that includes the ways the service is provided and its outcomes (Landini, 2020), being directly influenced by the characteristics of the advisory services and their providers.

As for the introduction of the advisory perspective, there's the need of translating the assessment of the quality in terms of advisory performances (Landini, 2020). This brings the necessity to describe the elements of an advisory performance that are able to grasp how and to which extent the provision of an advisory service complies with the concept of "quality", so that the integration of the two points of view could result in useful information for improved action, responding to the needs of all those who are involved and for the sustainability of agricultural activities.

Moreover, evaluation must take into consideration that modern agriculture is rooted in complex and holistic innovation systems and that traditional top-down models have given room to a much more integrated system of knowledge, where participation and co-creation are the basis for supporting innovation, also at farm level (Cook et al., 2021). Drawing from these analytical frameworks, we assume that the value of each quality criterion of the services relies on the perceptions and expectations of their potential users: the farmers/clients; the advisors; the policy makers responsible for funding interventions aimed at strengthening the use of advisory services. This highlights the importance of context sensitive assessment strategies that should be based on well-defined values of quality criteria of advisory services. Given these premises, this study applied a full participatory approach based on the engagement of a group a (35) advisors that helped reviewing the definitions and types of quality criteria to ascertain the coverage of the topics and areas of services provision.

The methodology to establish and applied the assessment framework includes the followings:

- Reviewing the quality criteria identified by Birner et al., (2009) and Landini (2020). This was based on participatory meetings, conducted during a period of 14 months (September 2021- November 2022), with a group of advisors. This helped defining two additional ones (detailed soft skills and support to innovations) that apparently needed a major focus for the assessment of the performances of the advisory services.
- Determining the value of each quality criterion according to its significance for potential end users. This was based on surveys to farmers and to advisors operating within certain rural areas in Italy and interviews to policy makers.

The assessment framework was then built up by including the assessment of about 10 quality criteria (table 1) and SERVQUAL model, conveniently modified (Jain & Gupta, 2004; Margolis & Providência, 2021; Adil et al., 2013). The framework has been designed to get feedbacks on quality of a services directly from customers, and it is essentially a scale that defines the level of perceived quality as a gap or difference between customer 'expectations' and 'perceptions.

Table 4- Quality criteria

Area of Performance	Assessment criterion
Relevance of the advisory services	*Contents are Relevant for farmers/clients (Advisory Contents are need and opportunities driven)*
Effectiveness and advisory contents	*Effective in practical terms, for solving problems or reaching specific objectives*
Responsiveness	*Willingness and Capacity to provide satisfactory, prompt and timing advisory services*
Reliability	*The ability to perform the promised service dependably, technically accurate and up-to-date in scientific terms*
Innovation and Transition support	*Ability to support innovation and transition processes*
Tailoring advisory methods and tools	*Methods and Tools are varied/up-to-date/tailored upon the needs of the farmer*
Effectiveness	*Capacity to Influence on capacity increase*
Diversity of clients -type of farms served	*Capacity to serve a differentiated range of farm-types*
Demand Articulation	*Capacity to enable the farmer/client highlighting issues which were previously unaware and articulating demand for service*
Empathy, Assurance and other soft skills	*Ability to convey trust and confidence, to provide caring, individualized attention to client and to perform other soft skills*

SERVQUAL model was applied to assess the extent to which the perceived quality of the services provided by individuals or organizations (based on the average quality perceived by the advisors and the client) reach the 'ideal quality'.

All in all, two "mirroring" questionnaires were developed for the conduction of the systematic assessment: one for the advisor to assess her/his performances; one for the farmers. Interviews were conducted to collect policy makers perspective.

The results of the three assessments are combined to led to scoring the performance of the individual advisor/organization for each of the criterion and at global level.

Findings

At the moment, the findings of this study relate mostly to the methodological aspects of designing a context-sensitive assessment framework for the performance of advisory services at individual and organizational levels.

A first important finding relates to the process itself of this study and regards the need to increase advisors' awareness on the importance of M&E practices aimed at: (1) track advisory activities, measure their outputs in terms of service provision and their results at farm level, with the goal, in a word, of improving the quality of their performances; (2) reconsider "quality" not just a mere reaching of a target, but as a broader concept that includes the way the target is reached, so to includes new set of skills and competences in the evaluation procedures.

Besides, the use of a full participatory approach and the engagement of the group of advisors that acted as steering the application of the methodology, being the first users, and the results of its application resulted in an increased awareness about the significance of the quality criteria and on the usefulness of systematic assessment processes to increase their performances and satisfactory relation with the clients.

The surveys and interviews elicited the different views of farmers, advisors and policy makers on the importance perceived on the different quality criteria (figure 2, 3 and 4)[31]. Particularly, according to farmers the most important criteria are relevance, empathy, Assurance and other soft skills and diversity of clients - type of farms served. The comparison between the different actors (figure 5) shows that this last criterion it is not considered so important by policy makers. This allowed reflecting on the importance of conducting systematic diagnostic assessments that could bring evidence to view to better focus the quality of the advisory services to the expectations of the users. Moreover, advisors reconsidered the importance given to certain quality criteria with respect to their clients' needs and expectations and policy makers had the opportunity to reflect on a range of criteria to monitor and assess the advisory services.

[31] The number of respondents is: n. 22 farmers; n. 39 advisors: n. 5 policy makers.

Figure 23: Importance of quality criteria of advisory services (farmers)

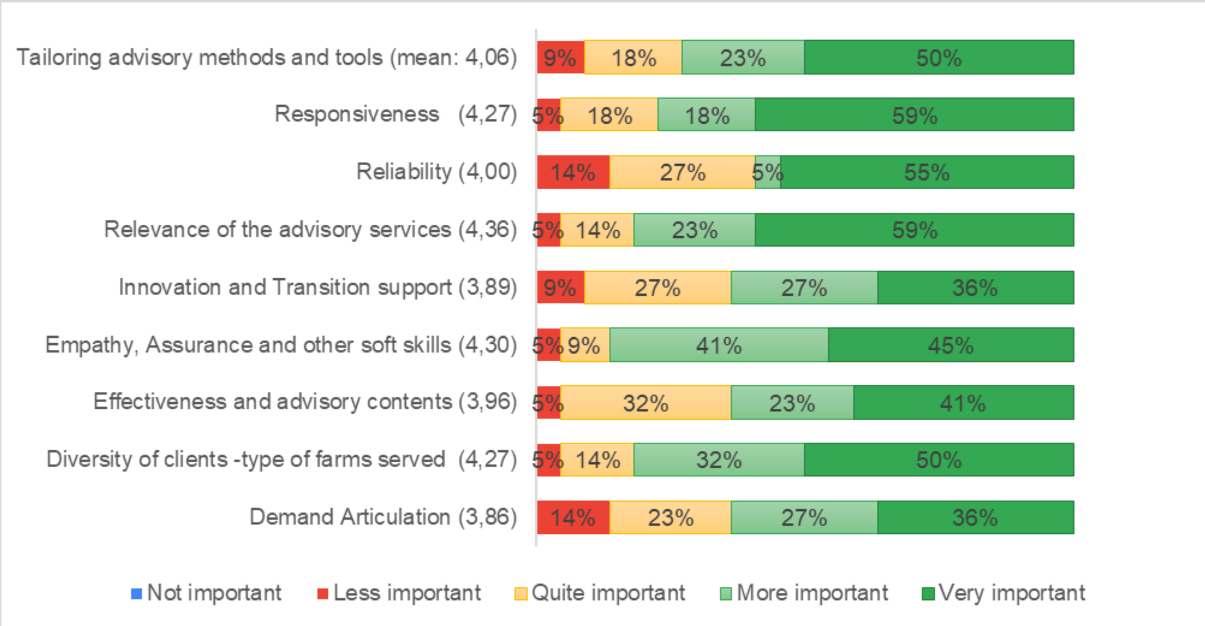


Figure 24: Importance of quality criteria of advisory services (advisors)

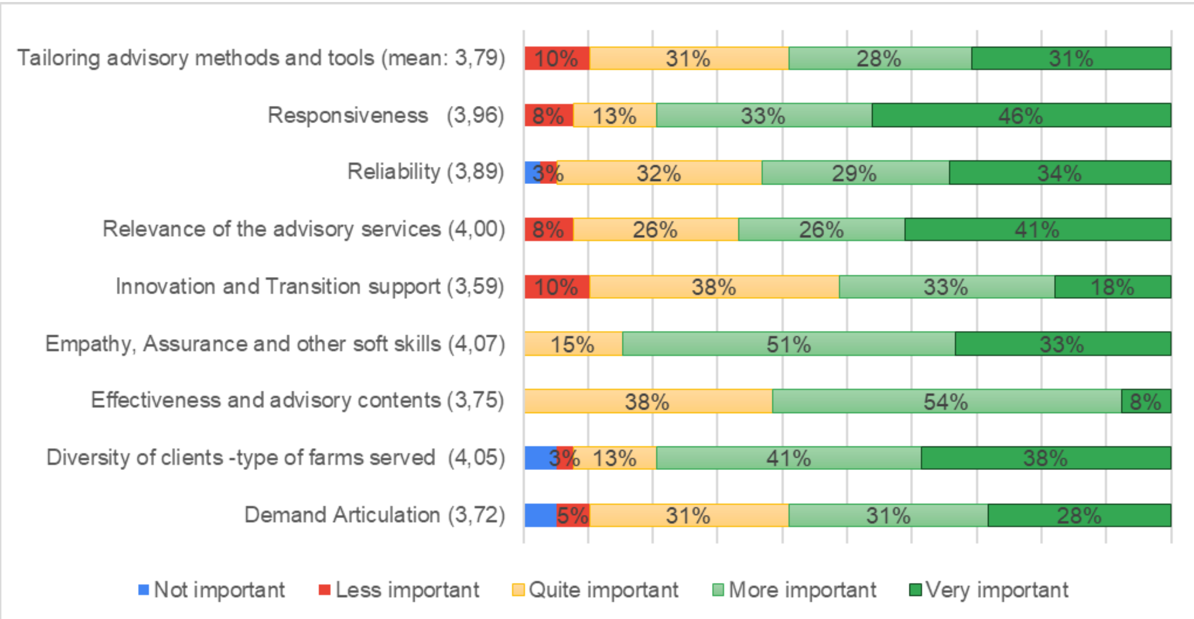


Figure 25: Importance of quality criteria of advisory services (policy makers)

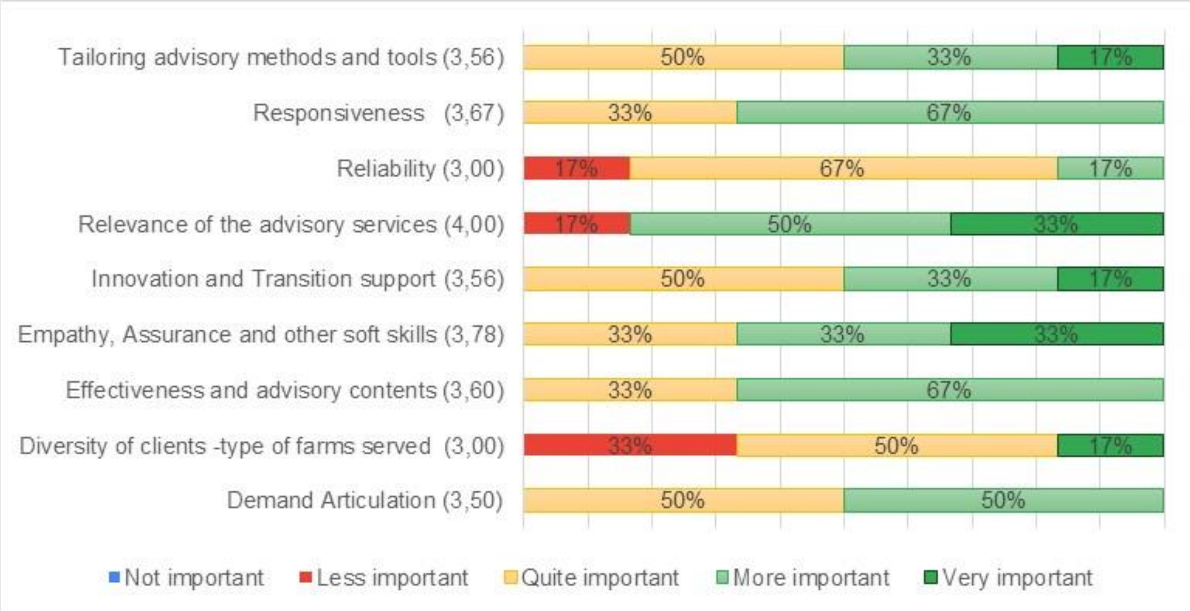
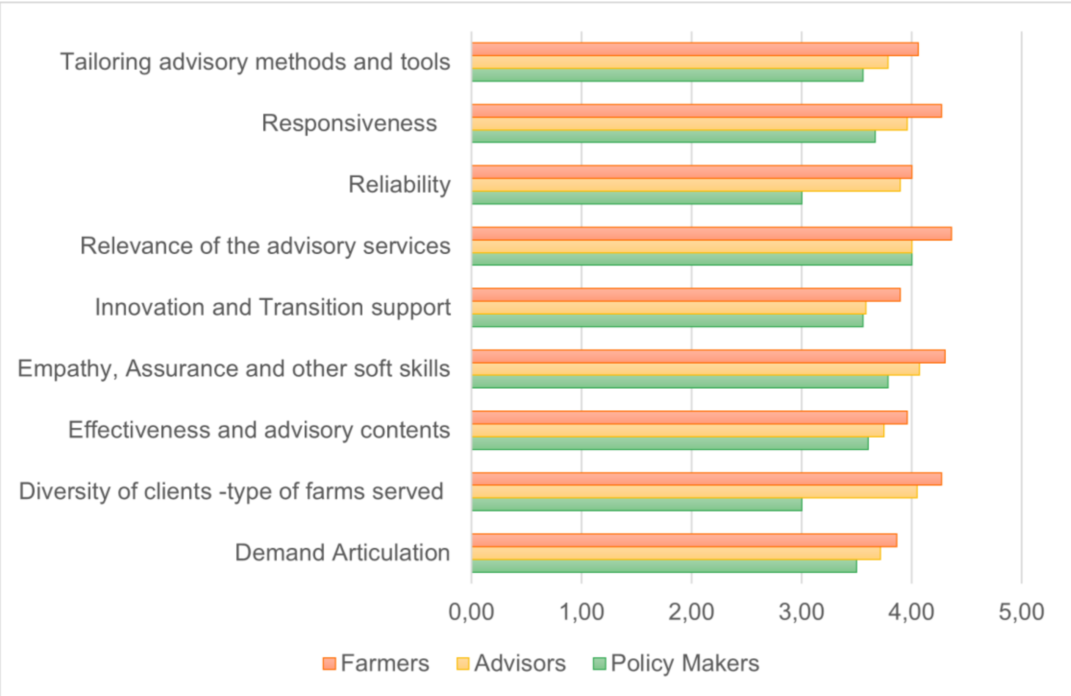


Figure 5: Differences in values by users



The interviews and surveys showed differences also at regional level (figure 6, 7, 8). Particularly, on average in Region 2 farmers and advisors seems to consider more important all the criteria provided, while there is the opposite situation for policy makers.

Figure 6: Differences in values by regions (farmers)

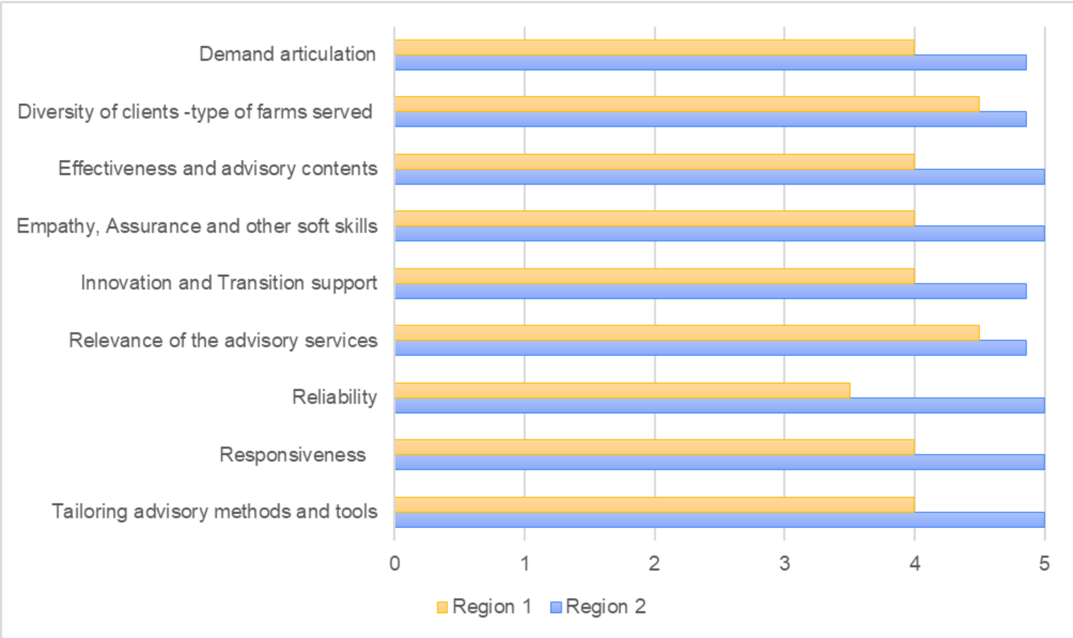


Figure 7: Differences in values by regions (advisors)

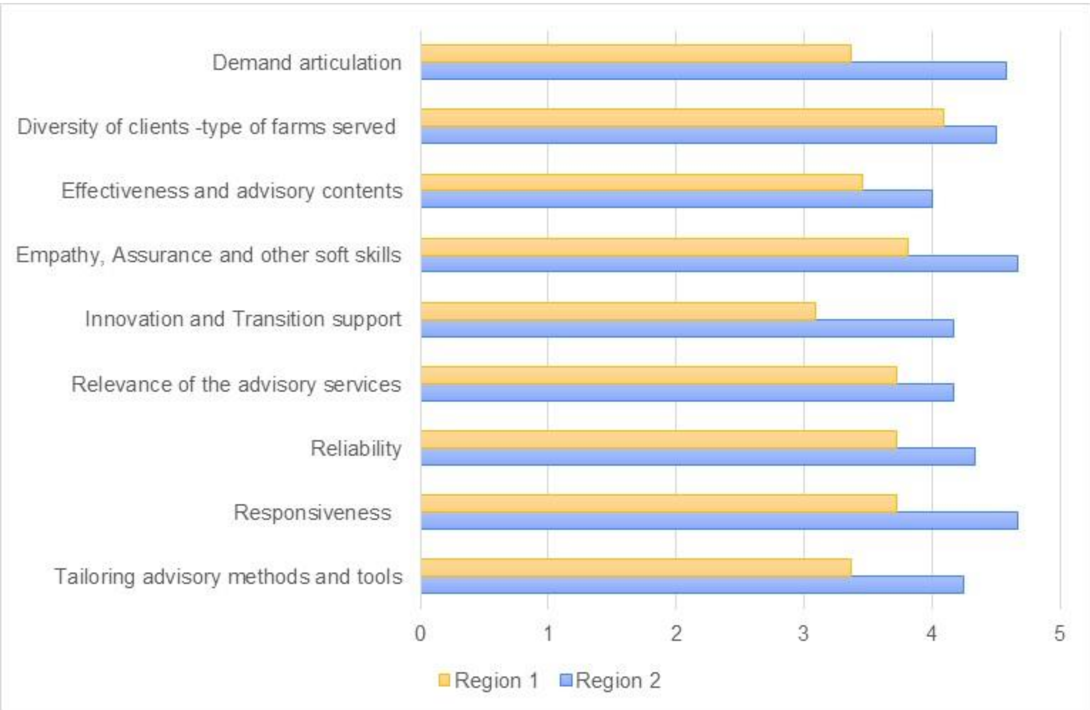
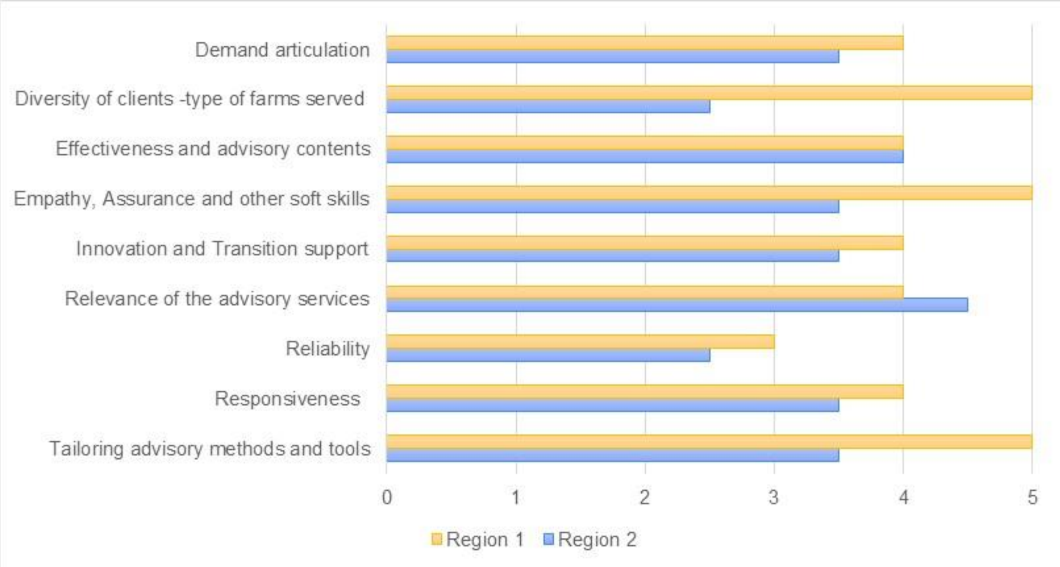


Figure 8: Differences in values by regions (policy makers)



Practical Implications

In general, given the user-centred approach was very worthful in implying practical benefits for the advisors participating during the framework design. They already declared a major awareness gained on the relevance of taking into adequate consideration significant quality criteria when designing and applying service provision, of conducting performance assessment on systematic basis and of considering the perceptions of the clients. Already, those advisors are demonstrating some behavioural changes, for example, in a major activity on professional networking and exchange.

As well, this framework can be used:

- as a diagnostic tool serving, for example, a strategy for strengthening the RAS, by assessing the state of play of the advisory services at different levels and rural areas,
- to collect evidence against expected results, contribution, effects of service provision. For example, the proposed methodology can be used by policy makers and evaluators to comply with the regulatory requirements on the evaluation of relevance, efficiency, effectiveness and impacts of the financed interventions of the CAP strategic plans. In fact, the framework provides a tool for immediate determination of the quality performance level of the services provided by advisors and of the client satisfaction. The questionnaires have already been used by the advisors partners of the project within which the study has been conducted and by some advisors of the partners member states themselves.
- to collect insights for precision learning that might be well tailored upon specific areas of professional development. The methodology enables interconnecting assessment's results with needs for training and professional development that could be funded through the CAP National Strategic Plan that include social sciences and M&E studies (Reg EU 2115/2021, Art. 78 and Art.15).

Theoretical Implications

This study brings some advancement in relevant literature as it follows:

- the already in place theoretical backgrounds are integrated and systematized to assess the performances of the advisory services with a view to: (i) context sensitiveness; (ii) plurality of users' values; (iii) robustness of the assessment methodology.
- this integrated framework confirms the validity of the "best fit approach" insofar as it brings further evidence that the quality of advisory services is context-sensitive. In this regard, it proposes an advancement of the theory from the evidence that the same quality criteria have in the same context a different importance depending on the end user. Therefore, it is necessary that analytical frameworks of evaluation of advisory services are built together with the end users especially regarding the criteria for assessing the quality of services.
- by proposing a robust method for quality standard valuating and real performance assessment, this integrated framework advances already existing analytical frameworks and it brings them into practice.

References

Cristiano S., Carta V., Sturla A., Proietti P. (2021), RAMONES PL PROJECT OUTPUT O2 – Methodology of evaluation. RAS Monitoring and evaluation framework.

Davis K., Rasheed Sulaiman V. (2014). The new extensionist: Roles and capacities to strengthen extension and advisory services. *Journal of International Agricultural and Extension Education*;21(3):6-18. doi:10.5191/jiaee.2014.21301.

Davis K.(2015). The New Extensionist: Core Competencies for Individuals. *GFRAS brief*, GFRAS, Lindau.

European Commission (2021). REGULATION (EU) 2021/2115 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 2 December 2021 establishing rules on support for strategic plans to be drawn up by Member States under the common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulations (EU) No 1305/2013 and (EU) No 1307/2013.

Grovermann, C., Chuluunbaatar, D., Blockeel, J., Sulaiman V, R., Djamen, P. and Holley, A. 2022. The extension and advisory service systems yardstick (EAS-Y) – A scoring tool to generate evidence on performance and outcomes. Rome, FAO. https://doi.org/10.4060/cb8735en.

Knuth, U. (2016-). Interaction with and Governance of increasingly pluralistic AKIS–A changing role for advisory services. In: *Agricultural knowledge and innovation systems towards the future Standing Committee on Agricultural Research (SCAR) -Strategic Working Group AKIS*, , Directorate-General for Research and Innovation, pp. 104-118.

Landini F. (2020) What does 'quality' mean in the context of rural extension and advisory services? *Agronomía Colombiana*. ;38(1):133-147. doi:10.15446/agron.colomb.v38n1.81738.

Measuring the effectiveness of CAP's agri-environmental knowledge transfer: An evaluation framework

Ana Novak, Tanja Šumrada
Biotechnical faculty, University of Ljubljana

Short Abstract: The study aims to contribute to the efforts for a more results-oriented (and thus better-performing) Common agricultural policy (CAP) by developing an evaluation framework for knowledge transfer activities in the agricultural sector. Unlike the diversified and structured evaluation system of the CAP's instruments in other fields, the current evaluation system for knowledge transfer activities is surprisingly weak and needs further improvement. To address this gap, the study developed a set of comprehensive indicators based on the program impact theory and designed survey instruments to assess them. The framework was pilot-tested in the case of Slovenian agricultural policy, where it was found that expanding the range of indicators is necessary for systematic and analytical policymaking. However, the critical challenge is ensuring impartial, continuous, and long-term data collection. The study's findings can inform the development of new policies and extension service programs in the agricultural sector.

Extended abstract

Purpose

Agriculture is facing a range of new challenges driven by shifting societal expectations, environmental and climate crises, and the emergence of new technologies. However, the adoption and implementation of both mandatory and voluntary agri-environmental policy measures remain challenging despite significant efforts and investment in the last three decades (Hasler et al., 2022). Addressing these challenges requires transforming the decision-making processes of agricultural holdings and ensuring that farmers acquire novel and adequate knowledge and skills, which often go beyond the scope of primary agricultural production (Faure et al., 2012). Knowledge transfer and education have thus become increasingly important for the successful adoption of sustainable agricultural practices (Pe'er et al., 2022).

Knowledge-sharing and advisory support is provided through various instruments of agricultural policies. For example, the European Union's Common Agricultural Policy (CAP) provides funding for research, innovation, advisory services, and training programs for farmers (ENRD, 2019). Similarly, the United States Department of Agriculture (USDA) funds knowledge-sharing initiatives through the Cooperative Extension System (CES) (Wang, 2014), and Australia's Rural Research and Development Corporations have established public-private partnerships to promote innovation and knowledge transfer in the agricultural sector (Paschen et al., 2017).

While there are various initiatives and programs aimed at facilitating knowledge transfer in agriculture, the assessment of their impact and effectiveness is often limited due to a lack of clear evaluation frameworks and methodologies, especially when compared to other more prominent and financially extensive interventions, such as investment support and agri-environmental measures (SCAR, 2019). In the CAP, where evaluation is an essential part of the policy cycle and uses a three-level indicator hierarchy, the evaluation methodology in the field of knowledge transfer is currently relatively weakly defined (EC, 2022). Furthermore, it offers a limited list of indicators, which are mostly focused on measuring inputs and immediate outputs of activities in terms of number trainings and participating farmers rather than impact on changes on agricultural holdings (EC, 2022). However, the effectiveness of different approaches to knowledge transfer and their effect on farmers' uptake of sustainable agricultural practices remains relatively poorly researched in the scientific literature as well (Faure et al., 2012; Batáry et al., 2015).

This study aims to develop a rigorous and flexible framework and methodology based on the program impact theory to evaluate the impacts and effectiveness of knowledge transfer initiatives. A set of comprehensive indicators was developed to evaluate the effectiveness of the CAP's knowledge transfer measures promoting agri-environmental. Furthermore, survey instruments were developed to assess the developed indicators, which were pilot tested on the case of Slovenian agricultural policy.

Methodological approach

The methodology and evaluation framework for agri-environmental knowledge transfer measures were designed by using the program impact theory (Chen, 1990; Lipsey, 1993). Program impact theory is a causal theory that connects a policy or program's activities to its intended outcomes or impacts through a logic model. The logic model illustrates the relationships between the program's inputs, activities, outputs, outcomes, and impacts. The theory also forms the basis for the monitoring and evaluation framework of the CAP (EC, 2017; Regulation 2021/2115), where the model components are captured in the three-level indicator hierarchy. The output indicators assess activities and direct products of interventions at the first level. The result indicators are used to assess the immediate results of interventions, whereas the impact indicators evaluate their long-term and broader effects (EC, 2017). The evaluation framework was prepared at the individual indicator levels (Figure 1).

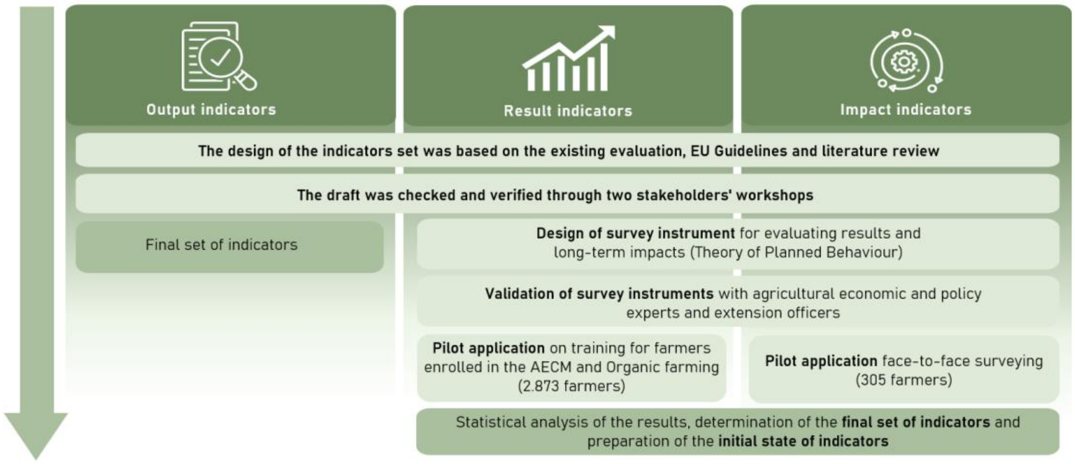


Figure 1: The step-by-step process was followed to prepare the methodology and framework for evaluating agri-environmental knowledge transfer measures.

We first drafted a set of indicators based on the existing evaluations, literature review and the CAP monitoring and evaluation framework (EU 2017). This set was reviewed and supplemented in two workshops with representatives of the Slovenian Ministry of Agriculture and the Public Agricultural Advisory Service, held in June and September 2021. Based on the workshops, we finalised the set of output indicators and drafted measurement instruments for the result and impact indicators.

We then designed a survey instrument to evaluate the immediate results of knowledge transfer activities and the long-term impacts on farmers' knowledge, attitudes, and behaviour. We selected statements for measuring relevant constructs based on the Theory of Planned Behaviour (TPB) (Ajzen, 1991). TPB is often used in educational and behavioural research (Mark et al., 2011) and to explain farmers' decision-making processes and behaviour (e.g. Rezaei et al., 2019). In our study, the framework was expanded with constructs for evaluating the knowledge transfer measures. For the result indicators, we used constructs such as satisfaction with the training content, organisation, and implementation (Gopal et al., 2021). We used a 7-point Likert-type scale to assess individual statements, ranging from strongly disagree (= 1) to strongly agree (= 7).

The survey for assessing impact indicators included three sets of questions (Table 2). The first set assessed farmers' knowledge about nature, conservation, and agri-environmental policy with a ten-question multiple-choice test. The second set assessed farmers' attitudes toward nature and environmental protection based on Ajzen's Theory of Planned Behaviour. The last set measured how knowledge transfer activities affect farmers' behaviour. It includes questions regarding farmers' intention to participate in agri-environmental measures, acquire knowledge on agri-environmental topics, and implement various agricultural practices contributing to nature and environmental protection. The final assessment for the indicators was calculated as the median of the individual responses within one construct. The results could range from 1 to 7 (10), with 1 being a poor indicator state and 7 (10) being an excellent one. Survey instruments for both result and impact indicators were validated in four focus groups consisting of agricultural economics and policy experts and extension officers.

Pilot application of a survey instrument for result indicators was performed in the case of annual trainings for farmers enrolled in the Agri-environment-climate measure (AECM) and Organic farming. A total of 2,873 farmers responded to the online survey, of which 2,467 were considered in the analysis. The survey for the impact indicators was conducted face-to-face with 305 farmers. All farmers who submitted an annual application for agricultural subsidies at two regional public agricultural advisory service units during the survey period were invited to participate. Data collection took place during the spring of 2022.

Findings

The evaluation framework for agri-environmental knowledge transfer aims to assess the effectiveness of relevant agricultural policy measures on three indicator levels: outputs, results and impacts. In total, 38 indicators cover various aspects of knowledge transfer activities. The output indicators consist of five sections that include public expenditure for knowledge transfer activities: the number of trained extension officers; the dissemination of knowledge through publications, website visitors, social media posts, and media coverage of agri-environmental issues; the number of activities and participants in each type of knowledge transfer activity; and the number of other supported knowledge transfer activities, such as communication and EIP projects. The proposed output indicators should be monitored annually and are mostly already included in the current CAP monitoring framework (EC, 2017).

Tables 1 and 2. Aggregated estimation of the result indicators (left) measuring farmers' satisfaction with agri-environmental and organic farming training in spring 2022 (n=2,467) and impact indicators (right) measuring farmers' knowledge, attitude, and behavioural intention in the field of agri-environment in 2022 (n=305).

Result indicators	Scale	Trial results
Overall satisfaction	1-7	6
Quality of moderator		6
Design and organisation		7
Content		4
Attitude		7
Social norm		6
Ability to attend		6
Intention for further participation		6.5

Impact indicators	Scale	Trial results
Knowledge	1-10	5
Attitude	1-7	7
Social norm		6
Perceived control		5
Intention:		
Participation in AEMs		2.5
Knowledge acquisition		5
Agri-environ. practices:		5
▪ arable land biodiversity		3.5
▪ grassland biodiversity		5
▪ landscape features		5
▪ direct conservation action		7
Valorisation of biodiversity		5

The result indicators assess the immediate impact of knowledge transfer interventions by measuring participants' reactions and satisfaction with the training and their preparedness for future collaboration in such activities (Table 1). The indicators indicate a good level of overall satisfaction with the agri-environmental trainings among participants and their positive attitudes towards acquiring knowledge in this field, resulting in a firm intention for further participation (rating of 6.5). However, the indicator for the training content only reaches a satisfactory level (4), as respondents note a lack of practical field visits and annual repetition of content. The proposal includes monitoring on an annual basis, following the implementation of the knowledge training activities, such as lectures, demonstration activities and individual advisory support.

The pilot evaluation of impact indicators (Table 2) shows that surveyed farmers have a moderate level of knowledge (rating of 5) regarding agri-environmental issues, with the weakest area being their knowledge about the requirements of agri-environmental measures. Farmers generally have positive attitudes towards nature conservation and related agricultural practices (7), but the indicator "perceived behaviour control" had a slightly lower rating (5) due to time and finance-related obstacles that limit the implementation of these practices. There were significant differences in the indicators assessing behavioural intention, with the intention to participate in agri-environmental measures (rating of 2.5) and implement nature-friendly practices on arable land having the lowest rating (rating of 3.5), while the intention to preserve biodiversity on grassland and landscape features achieved a moderate level (rating of 5). Farmers showed greater willingness to implement direct conservation practices (rating of 7), such as adapted mowing practices for wildlife and appropriate use of pesticides. They also displayed a moderate intention to value conservation economically (rating of 5) and acquire knowledge of agri-environmental topics (rating of 5).

To monitor the changes and progress over time, the proposed plan involves a representative sample of farmers every few years, such as every three years. This periodic surveying would allow identifying emerging trends and shifts in farmers' knowledge, attitudes, intentions, and behaviours towards agri-environmental practices, which could help assess the effectiveness of existing policies and inform the development of targeted interventions to promote sustainable agriculture.

Conclusions

The developed evaluation framework aims to facilitate a comprehensive assessment of the effectiveness of the CAP measures for agri-environmental knowledge transfer. The enhanced evaluation is particularly crucial considering the key priorities of the CAP post-2022, which seek to reinforce policy instruments' targeting and results orientation. The framework, which employs relatively straightforward quantitative data collection methods, could help policymakers and program implementers make evidence-based decisions to design effective policies and programs that support farmers' educational needs, promote knowledge sharing, and encourage sustainable agricultural practices. It offers valuable insights into planning short-term changes in the agri-environmental knowledge transfer system, such as the organisation of various approaches and knowledge transfer methods. Additionally, it sheds light on long-term requirements and needs that must be addressed in the planning of CAP measures and other activities, such as the requirements and needs of the agricultural advisory service. The framework and developed survey instruments are adaptable and can be utilised to evaluate knowledge transfer measures on other agriculture topics, such as digitalisation and farm management, providing a more comprehensive understanding of the efficacy of various policy interventions.

A particular challenge of this framework is the requirement for unbiased, continuous, and long-term data collection. Furthermore, it is essential to adapt relevant components of the developed measurement instruments when applying them to other topics, different regions and institutional contexts to ensure the quality of the evaluation. However, the most significant challenge is the successful integration of the evaluation results into the entire policy planning cycle, which goes beyond the scope of this study and raises new questions, such as how well the knowledge transfer evaluations are integrated into policy planning and how they are reflected in new policy designs.

1. References

Ajzen, I. (1991). The theory of planned behavior. *Organisational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Batáry, P., Dicks, L. V., Kleijn, D., & Sutherland, W. J. (2015). The role of agri-environment schemes in conservation and environmental management: European Agri-Environment Schemes. *Conservation Biology*, *29*(4), 1006–1016. https://doi.org/10.1111/cobi.12536

Chen, H. (1990). Issues in constructing program theory. *New Directions for Program Evaluation*, *1990*(47), 7–18. https://doi.org/10.1002/ev.1551

EC. (2017). *Technical handbook monitoring evaluation framework of the Common agricultural policy 2014-2020*. https://ec.europa.eu/info/sites/default/files/food

-farming-fisheries/key_policies/documents/technical-handbook-monitoring-evaluation-framework_june17_en.pdf

EC. (2022). *Evaluation of the CAP's impact on knowledge exchange and advisory activities*.

ENRD. (2019). *RDP analysis: Support to environment & climate change—M01 & M02: Knowledge transfer & Advisory services*. European Network for Rural Development. https://enrd.ec.europa.eu/sites/default/files/rdp_analysis_m01-02.pdf

Faure, G., Desjeux, Y., & Gasselin, P. (2012). New Challenges in Agricultural Advisory Services from a Research Perspective: A Literature Review, Synthesis and Research Agenda. *The Journal of Agricultural Education and Extension*, *18*(5), 461–492. https://doi.org/10.1080/1389224X.2012.707063

Gopal, R., Singh, V., & Aggarwal, A. (2021). Impact of online classes on the satisfaction and performance of students during the pandemic period of COVID 19. *Education and Information Technologies*, *26*(6), 6923–6947. https://doi.org/10.1007/s10639-021-10523-1

Hasler, B., Termansen, M., Nielsen, H. Ø., Daugbjerg, C., Wunder, S., & Latacz-Lohmann, U. (2022). European Agri-environmental Policy: Evolution, Effectiveness, and Challenges. *Review of Environmental Economics and Policy*. https://doi.org/10.1086/718212

Lipsey, M. W. (1993). Theory as method: Small theories of treatments. *New Directions for Program Evaluation*, *1993*(57), 5–38. https://doi.org/10.1002/ev.1637

Mark, M. M., Donaldson, S. I., & Campbell, B. (2011). *Social Psychology and Evaluation*. Guilford Press.

Paschen, J.-A., Reichelt, N., King, B., Ayre, M., & Nettle, R. (2017). Enrolling advisers in governing privatised agricultural extension in Australia: Challenges and opportunities for the research, development and extension system. *The Journal of Agricultural Education and Extension*, *23*(3), 265–282. https://doi.org/10.1080/1389224X.2017.1320642

Pe'er, G., Finn, J. A., Díaz, M., Birkenstock, M., Lakner, S., Röder, N., Kazakova, Y., Šumrada, T., Bezák, P., Concepción, E. D., Dänhardt, J., Morales, M. B., Rac, I., Špulerová, J., Schindler, S., Stavrinides, M., Targetti, S., Viaggi, D., Vogiatzakis, I. N., & Guyomard, H. (2022). How can the European Common Agricultural Policy help halt biodiversity loss? Recommendations by over 300 experts. *Conservation Letters*, *n/a*(n/a), e12901. https://doi.org/10.1111/conl.12901

Rezaei, R., Safa, L., Damalas, C. A., & Ganjkhanloo, M. M. (2019). Drivers of farmers' intention to use integrated pest management: Integrating theory of planned behavior and norm activation model. *Journal of Environmental Management*, *236*, 328–339. https://doi.org/10.1016/j.jenvman.2019.01.097

SCAR. (2019). *Preparing for future AKIS in Europe*. Standing Committee on Agricultural Research. https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/report-preparing-for-future-akis-in-europe_en.pdf

Wang, S. L. (2014). Cooperative Extension System: Trends and Economic Impacts on U.S. Agriculture. *Choices: The Magazine of Food, Farm, and Resource*, *volume 29*.

Taking stock of farmers' knowledge and skills needs in Rhineland-Palatinate on light of sustainability transitions. Entry points for the systematic evaluation of AKISs performance

Oliver Müller
Institute for Rural Development Research

Short abstract (200 words):

The presentation discusses the results of a survey (n=391) that operationalises the concept of the agricultural knowledge and innovation system (AKIS) for the systemic recording of farm managers' knowledge and skills needs in light of sustainability transitions. The aim is to work out the benefits of the systemic inventory of regional AKIS' for the definition of strategic as well as thematic priorities for its further development. It points to the need to strengthen the capabilities perspective of farmers / farm advisors and urges evaluations to focus on the question in how far AKIS related interventions have contributed to capacity and skills development.

Extended abstract

Purpose

The assessment of AKISs performance is of high relevance for the post-2022 CAP programming period. EU member states strive for better coordination of CAP interventions and with national and regional initiatives for enhanced networking and knowledge flows with the overall aim to create an innovative eco-system for agriculture, up- and downstream industries and actors in rural areas more broadly. It is pivotal to assess AKISs with regard to "missing links" and functions/services in order to provide the necessary knowledge, practical skills and competencies for sustainability transitions of individual farmers, advisors and other facilitators.

Knowledge exchange and capacity building on the evaluation of AKISs performance is at the early stage of development and it is necessary to share the experiences made. There have been punctual evaluations of AKISs in various EU member states, most notably of singular measures contributing to the overall objectives of improved knowledge exchange. As prior, comparative research has shown, there is a broad variety of AKISs in Europe, with regard to the distribution of functions and tasks between state, farmer-based and private as well as civil society organisations, governance mechanisms and regarding the 'performance' of individual AKIS' (Paul 2014). However, conceptual, methodological and data collection challenges remain pertinent regarding the assessment of AKIS' performance, especially concerning the *assessment of impacts* of knowledge measures and linking them to improved knowledge transfer and cooperation between AKIS' actors or behavioural changes at individual level.

The presentation aims to add to the ongoing discussion on how to assess the functioning and performance of AKISs by sharing insights on AKIS' assessments from the ongoing evaluation of the rural development programme (RDP) of the federal state of Rhineland-Palatinate in Germany.

Taking the drafting the CAP strategic plan as a point of departure, the federal state decided to take stock of its regional AKIS in order to gain insights for the programming of the AKIS interventions, most notably advice, knowledge exchange and information. The overall objective being to attune the programming of interventions to the needs of knowledge users to manage (sustainability) transitions.

Given that AKIS should cater to the needs of knowledge users, i.e. first and foremost (future) farmers and advisory services providing advice and knowledge transfer, these groups have been identified as primary stakeholders for the evaluation.

Design/Methodology/Approach

As an instrument for evaluation, the federal state decided to conduct an ad-hoc study on the state of affairs of its regional AKIS, assessing

a) Actors, organisations and their knowledge exchange interactions in the broadest sense
b) Relevance of current and future advisory themes for farmers
c) Usefulness of advisory and knowledge transfer formats for farmers
d) Needs for advanced training (VET) from the perspective of farmers and advisory services

Instead of focussing on the assessment of single interventions at the level of outputs/impacts, the ad-hoc study investigated the AKIS' architecture from an input and demand perspective, i.e. provisioning of advisory services, knowledge transfer and advanced training measures at regional level by various groups of actors from the perspective of knowledge users. This assessment necessarily included services offered by organisations 'outside' the formal structures of CAP support to knowledge sharing and innovation.

The data collection took place in the period between April and October 2021 and was divided into three main phases:

- April-May 2021: document analysis to identify key actor groups and organizations in Rhineland-Palatinate's AKIS, description of the initial situation, conceptualization of the research design.
- May-June 2021: 25 guided interviews with advisory service providers.
- June-October 2021: broad-based, standardized online survey of farms (n=391).
- September-October 2021: standardized online survey among advisory service providers (n=20).

In order to obtain a comprehensive view of the current state of affairs of Rhineland-Palatinate's AKIS and to describe its characteristics in a differentiated way from the perspective of different actors involved, we used this mixed methods approach combining guided interviews and a standardized survey.

Whereas the qualitative interviews explored the dynamic perspective on knowledge exchange and interactions between AKIS actors in networks and infrastructures of cooperation, the standardized online survey of the agricultural enterprises aimed, on the other hand, at identifying and evaluating information, knowledge and skills needs of farmers. The online survey intended to identify concrete topics and contents for the further development of advisory services, knowledge transfer and advanced training from the perspective of farmers and advisory services.

For the standardized survey, we used a structured questionnaire that allowed a detailed characterization of the surveyed farms, both in terms of farm structures and forms of agricultural organization. In addition, detailed information was obtained on the use of and requirements for offers of advisory services, further training and knowledge transfer. The questionnaire covered the following topics:

- **Thematic focus** of the advisory services, information measures and advanced training courses used; usefulness of the services used; needs with regard to the future thematic design of advisory services and advanced training offered.
- **Formats and methods** of advice, advanced training and information measures used and their usefulness; needs with regard to the future design of formats of advice and knowledge transfer.

Respondents were able to pick from a variety of items or add other options if the advisory service provider or topic of advice/knowledge transfer/advanced training was not contained in the preset of items.

Findings

Accordingly, the findings relate to four distinct, albeit interrelated planes of farmers' knowledge needs:

1. ***Future contents of advice***: Whereas 'classical' themes such as crop protection and pest management, marketing and distribution, improvement of economic performance and fertilization remain highest on the agenda of respondents, ecological themes such as soil conservation, climate-adapted agriculture and conservation of biodiversity are gaining in importance (fig. 1). Interestingly, advisory service providers come to a different conclusion regarding the future design of advisory services compared to farmers' views. With regard to individual farm advice, the advisory service

providers believe that the topics of business management, farm restructuring/modernization and the sustainable securing of farms (e.g. farm succession) should be offered more intensively in the future.

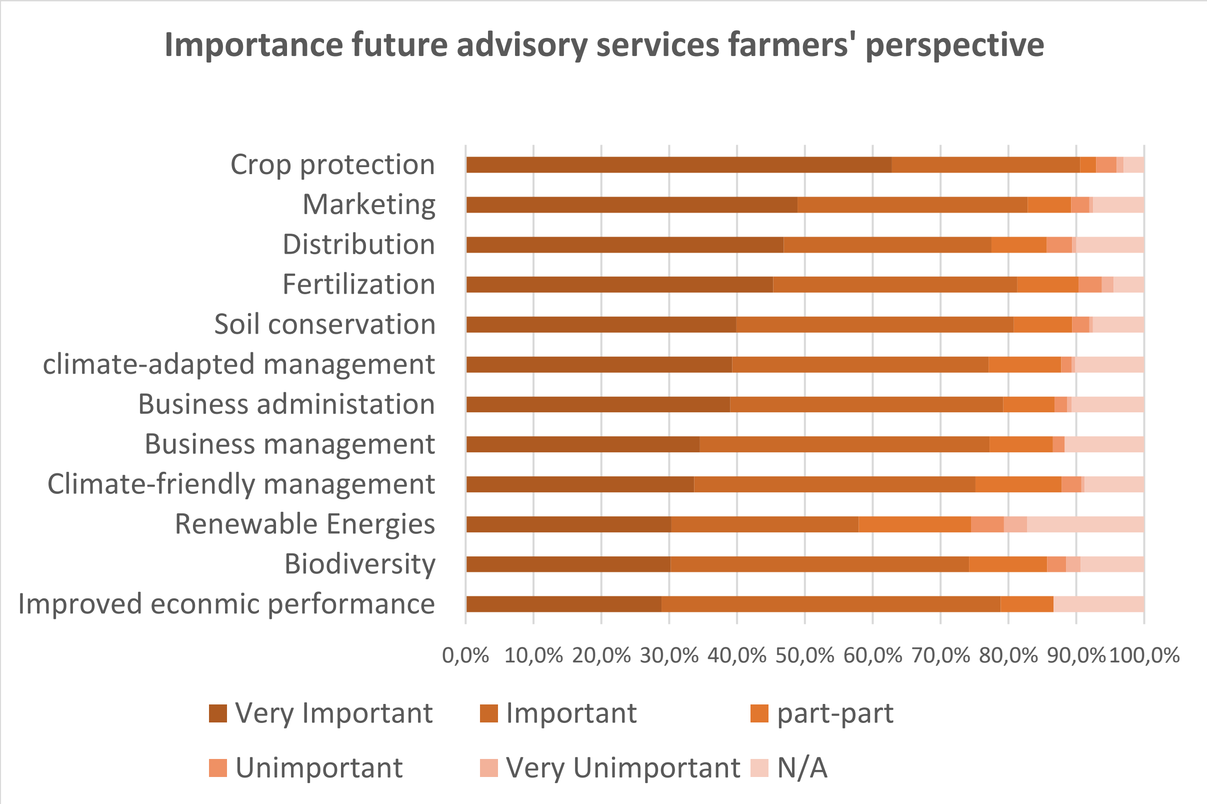


Figure 26 Importance of future thematic advisory services from farmers' perspective

2. ***Future formats of advice and knowledge transfer***: Respondents use a wide array of formats from multiple providers of advice and knowledge transfer. Among the most often used formats are field days and demonstration activities, digital formats (e.g. weather forecast and information systems for integrated crop protection) and seminars for a broad variety of topics. Respondents, depending on the topic at stake and the complexity of information, consider all formats used useful for knowledge transfer in one way or another. Unsurprisingly, formats that rely on the direct exchange of advisors and farmers or farmer-to-farmer are considered most useful, e.g. advice on-site.
3. ***Advanced training of farmers***: Regarding future design of advanced vocational training, 19.5% of the respondents would like to see further qualifications to strengthen competitiveness and diversification, followed by environmental and resource protection (18%) and skills for the use of new technologies/machinery (15%). Among the topics of environmental and resource protection, the topic of soil conservation management stands out (fig. 2). With regard to other qualifications, the respondents would like to see more training in business administration, leadership and management skills, acquiring skills in dealing with and using digital technologies and services, and in communication, image building and public relations.

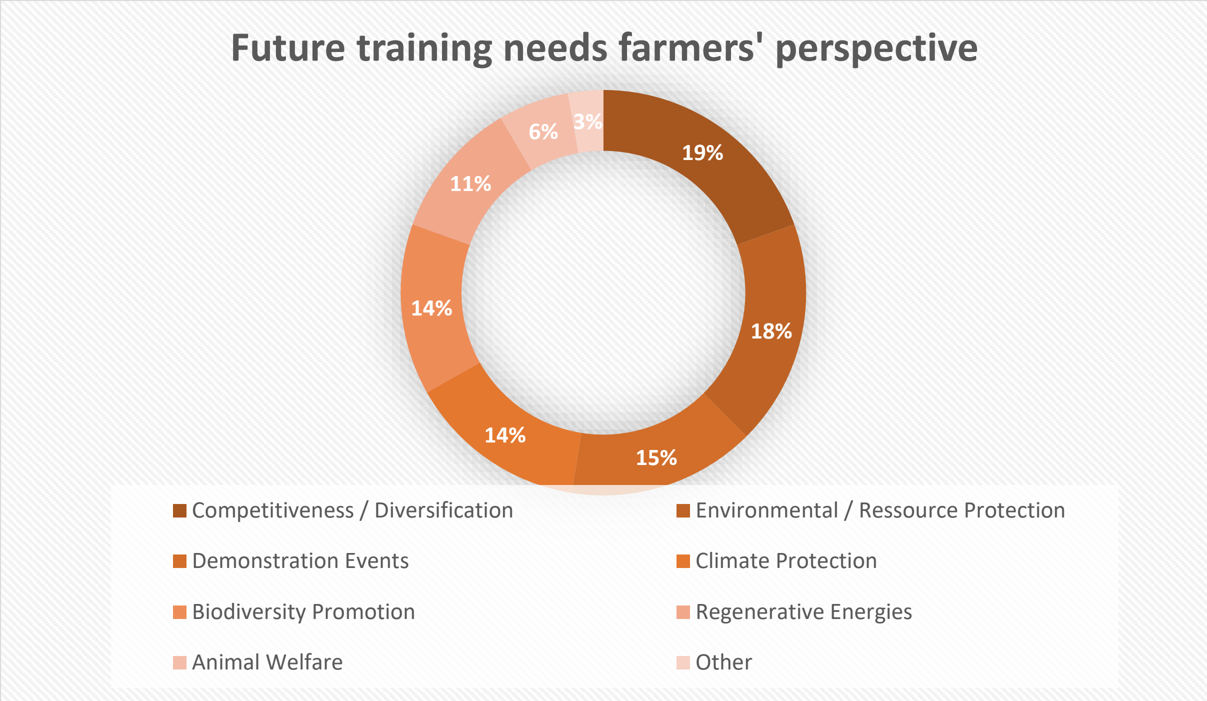


Figure 27 Future training needs from farmers' perspective

Interestingly, the future needs contrast strongly with the advanced training made in the past as only about 1% of the training made related to agri-environmental resource protection (fig. 3).

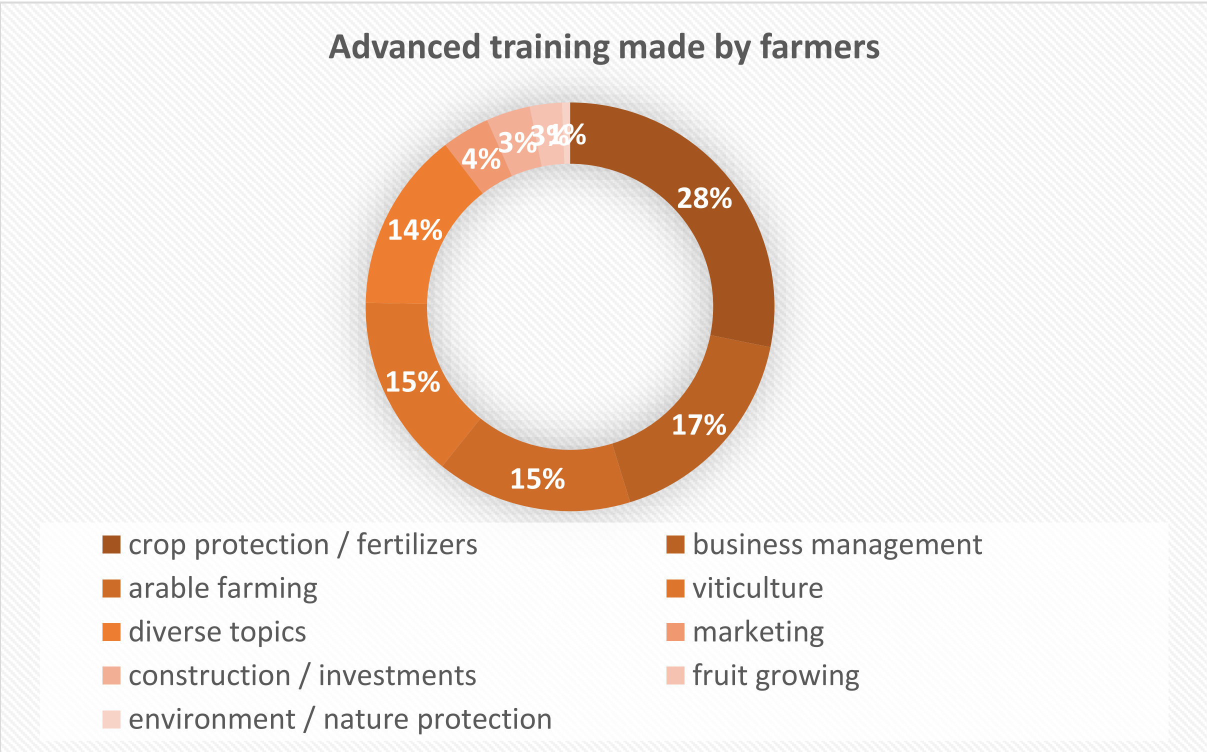


Figure 28 Advanced training made by farmers

4. **Advanced training of advisors**: Respondents stress that a high degree of professional competence and technical qualification is a prerequisite, but that methodological and social skills are gaining in importance (fig. 3). Among the most often named skills and competencies are:

competencies to use digital tools, communication skills (speaking the language of the target group, based on empiric intuition and experience), interdisciplinary thinking and cooperation skills, social (problem-solving) skills (e.g. moderation, conflict resolution), willingness to engage with and openness to innovation.

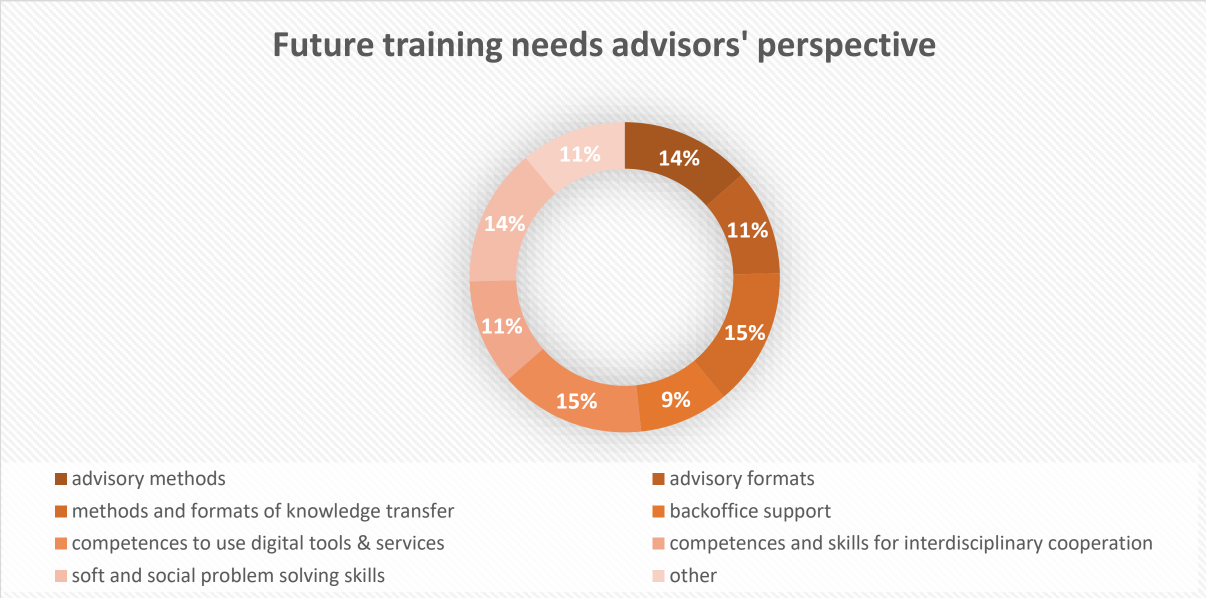


Figure 29 Future training needs from advisors perspective

Practical Implications

On a very general level, the findings confirm a skills and capabilities mismatch/gap on three levels:

a) On a strategic level, the strategic objectives of CAP-SP, farm-2-fork and Green Deal do not align easily with what farmers consider the most pressing needs related to advisory services, i.e. crop protection and fertilization.
b) On a market level, current supply and future demand are insufficiently attuned and it is unclear, who will provide advisory services and training for sustainability transitions in the future. This raises questions regarding the functional performance of advisory / advanced training providers.
c) On an individual level, the consciousness and capacity to act in the future in terms of implementing sustainable practices on farm is hampered by individual abilities in the present.

In light of these findings and different perspectives on AKIS evaluation (structural, processual, functional), this presentation argues to strengthen the perspective on capacity and skills development of farmers and farm advisors on an individual, organisational and systemic level.

Therefore, it is argued, with regard to evaluation of AKIS strategic approach, a perspective on capacity and skills development is needed: A capacity development perspective helps identify strengths, bottlenecks, weaknesses and opportunities arising from the social and human characteristics of the different AKIS actors that ultimately enable or hinder the system capacity to tackle sustainability transitions at the different levels. This does not imply that structures and networks should not be taken into account when designing an evaluation framework, but that their contribution to capacity and skills development should be the focus of attention.

Theoretical Implications

Focusing on the knowledge and skills demand perspective of farmers and advisory services is a fruitful point of departure for taking stock of and develop a systemic perspective on a regional AKIS. Such an explorative approach is a suitable entry point to characterize the knowledge infrastructures of a regional AKIS and gain preliminary insights into their strengths and weaknesses. Moreover, moving beyond the evaluation of singular CAP interventions, which do only account for a minor part of its budget, opens up the perspective for a multiplicity of actors involved in the generation, transfer and facilitation of knowledge and skills uptake.

There numerous factors, which influence the implementation of new knowledge and skills by farmers, first and foremost the availability and access to (knowledge) resources. But even more so, the ability to take action on the basis of the knowledge available. In order to address sustainability challenges and realise the potential of knowledge/innovations available, farmers and advisors need to build capacities to act for change at different levels.

References

Paul, Caroline; Knuth, Ulrike; Knierim, Andrea; Ndah, Hycenth Tim; Klein, Marlene (2014): AKIS and advisory services in Germany. Report for the AKIS inventory (WP3) of the PRO AKIS project. Leibniz-Zentrum für Agrarlandschaftsforschung e.V. (ZALF) (PROAKIS). Available Online http://proakis.webarchive.hutton.ac.uk/sites/www.proakis.eu/files/Country%20Report%20Germany%2014%2004%2014.pdf, last accessed 21.03.2021

New directions in changing farmer behaviour: extension lessons from the HerdAdvance project (Welsh Government/AHDB)

David Rose[1], Juliette Schillings[2], James Breen[3,4], Rosie Morrison[4]

[1] Royal Agricultural University, Cirencester, UK

[2] School of Veterinary Medicine and Science, University of Nottingham, UK.

[3] Map of Ag, UK

[4] School of Water, Energy and the Environment, Cranfield University, UK.

Short abstract

Welsh Government and the Agriculture and Horticulture Development Board undertook a three-year EU-funded project (HerdAdvance) to change the animal health planning behaviour of 500 dairy farmers in Wales, representing a third of the total Welsh dairy herd. Through the involvement of many different stakeholders in the AKIS, farmers, veterinarians, extension officers, project managers, and other third parties, attempts were made to help dairy farmers adopt more proactive animal health planning behaviours. Our role was to assess the impact of the behavioural interventions used in HerdAdvance, which were inspired by the RESET model – rules, economics, social norms, economics, and tools. We found behavioural change was facilitated by a combination of interventions, including free disease testing, free veterinary advice, and data collection. However, the ability of these behavioural interventions to change behaviour was made possible by the knowledge brokering role of the extension officers using their 'soft' skills to foster collaboration between the AKIS. We also observed how subsidised veterinarian time changed the relationship between farmers and vets, allowing them to do proactive management rather than fighting fires. We reflect on the lessons that Welsh Government, and the AHDB, are taking into future agri-innovation policies.

We acknowledge we received funding from the AHDB/Welsh Government who have given permission for us to use material from our internal project reports for this paper.

Extended abstract

Purpose

HerdAdvance was a three-year EU-funded project aimed at facilitating behavioural change of 500 dairy farmers in Wales, which comprised a third of the Welsh dairy herd. The project was delivered on behalf of the Welsh Government by the Agriculture and Horticulture Development Board (AHDB) who designed the project and engaged the services of various contractors to evaluate the success of the project. The precise aim of the HerdAdvance project was to improve the animal health planning behaviour of dairy farmers across a range of diseases, encouraging proactive management and data collection, rather than reactive firefighting of problems. Through the involvement of many different stakeholders in the AKIS, farmers, veterinarians, extension officers, project managers, and other third parties, attempts were made to help dairy farmers adopt more proactive animal health planning behaviours. Our role was to assess the impact of the behavioural interventions used in HerdAdvance, which were inspired by the RESET model – rules, economics, social norms, economics, and tools. We were particularly interested in exploring four key areas with a view to learning lessons for the future delivery of similar projects:

1. Factors affecting farmer participation in the project
2. Factors affecting behavioural change/uptake of measures
3. Benefits of the project for the farm and farmers/vets involved
4. Challenges faced during the project

Design/Methodology/Approach

The academic team did not have a role to play in designing the delivery of the project. The approach to be used and the interventions employed were decided before our involvement. As such, the project is not designed to be a behavioural experiment using a randomised control trial. There was no control group – all 500 participants were able to benefit from the same range of interventions appropriate for each disease. Therefore, we could not definitively say which behavioural interventions facilitated change, but we could ask everyone involved for their perception of what helped to create behavioural change and what some of the challenges were. Each of the 500 dairy farmers, recruited in different cohorts, received an initial visit from the AHDB extension officer who collected various pieces of data on the farm.

The extension officer then accompanied a veterinarian to visit the farmer regularly during the project, for free. In agreement with the veterinarian, each farmer agreed on up to three priority health areas per year (e.g. lameness, mastitis, Johne's) and agreed on various actions to implement. They received help to implement these actions, either receiving free testing, knowledge supporting tools, educational advice and visits, regular collection and monitoring of data, and some farmers shared learnings in regional focus groups. They received clear rules to follow. We were mindful of the time commitment of farmers and other members of the AKIS given to the project and could not make them give up large amounts of time to answer many questions. We hence chose a mixed methods approach.

We conducted two online surveys of farmer participants.

The first survey was filled in by farmers whilst they were involved in the project and receiving interventions. It consisted of 21 close- and open-ended questions, focused on their experiences of being involved, was offered in Welsh or English, and was filled in by 169 of the approximately 500 farmers involved. A second survey was distributed to farmers who had finished the project by November 2022. This focused on their experiences of the project and behaviours post-project. This was filled in by 54 farmers. Throughout the project, the AHDB retained a copy of farmers who had dropped out of the project and tried to ascertain reasons for this.

We also conducted a focus group with the AHDB extension officers involved in the project to hear their experiences of what worked and what didn't. Veterinarians also played a key role in the HerdAdvance project. We undertook seven in-depth interviews with this group focusing on:
1. Reasons why their farmer clients had signed up to the project
2. Barriers to implementing herd health actions before the project
3. How HerdAdvance had changed interactions with clients
4. Important factors helping farmers to implement herd health actions
5. Barriers to implementing herd health actions in the project
6. Benefits of the project
7. Important factors determining farmers' ongoing herd health management after HerdAdvance finishes

We also conducted a survey of 27 further veterinarians on similar subjects. Towards the end of the project, we were also able to interview five farmers and five veterinarians in-depth about their experiences of the project.

All interviews and focus groups were audio recorded, transcribed, and thematically analysed.

Findings
• Farmer feedback about the project was very positive. 98% of farmers said HerdAdvance had matched, partially matched, or exceeded their expectations.

• Over three-quarters of farmers noticed the benefits of being involved in the project, which is positive considering many of the approaches taken usually take a long time to affect disease.

• 96% of farmers who had finished the project carried on with proactive animal health management in some form.

• All of the behavioural interventions used in the project worked in combination to help farmers deliver new practices.

• Financial incentives, free veterinarian advice, and data collection were the most helpful interventions for farmers.

• However, these interventions were only possible to deliver through involvement of the AKIS and through the knowledge-brokering role of the extension officers.

• Organised project management, and the knowledge-brokering role of the AHKEMs, helped in delivering the project, including collecting data and communicating with all parties. This required the implementation of important 'soft' skills required to help each stakeholder deliver.

• Some farmers expressed criticisms of the project relating to delays in receiving tests and the effect of COVID-19 on limiting face-to-face knowledge exchange.

• Veterinarian-farmer relationships changed as part of the project with HerdAdvance offering the ability for proactive advice, rather than clock-based firefighting. Veterinarians said this had improved their own practice.

Practical Implications

• For government agencies, or extension bodies, planning projects aimed at farmer behaviour change, it is important that different types of interventions are combined to facilitate change.

• Headline-grabbing 'free' offers might initially encourage change, but the reason for change needs to be backed up by data collection.

• Extension officers, and their 'soft' skills of communication and negotiation, have a key role to play in facilitating interactions in the AKIS. All stakeholders involved in the project need to work together effectively to facilitate change.

Theoretical Implications

• Reinforces the value of the RESET model of behaviour change.

• Illustrates the importance of combining insights from AKIS studies, with behavioural change frameworks, to plan effective national policies aimed at behaviour change.

References

Alarcon, P., Wieland, B., Mateus, A.L.P., Dewberry, C. 2014. Pig farmers' perceptions, attitudes, influences and management of information in the decision-making process for disease control,Preventive Veterinary Medicine, 116 (3): 223-242.

Bellet, C., Woodnutt, J., Green, L. E., Kaler, J. 2015. Preventative services offered by veterinarians on sheep farms in England and Wales: Opinions and drivers for proactive flock health planning, *Preventive Veterinary Medicine*, 122: 381-388

Jones, P.J., Marier, E.A., Tranter, R.B., Wu, G., Watson, E., Teale, C.J. 2015. Factors affecting dairy farmers' attitudes towards antimicrobial medicine usage in cattle in England and Wales, Preventive Veterinary Medicine, 121 (1-2)L 30-40.

Lam, T. J. G. M., Jansen, J., and Wessels, R. J. 2017. The RESET Mindset Model applied on decreasing antibiotic usage in dairy cattle in the Netherlands, *Irish Veterinary Journal,* **70**, 5

Rose, D. C., Keating, C., and Morris, C. 2018. Understand how to influence farmer decision-making behaviour, report to AHDB, https://ahdb.org.uk/knowledge-library/understand-how-to-influencefarmers- decision-making-behaviour

Scherpenzeel, C. G. M., Santman-Berends, I. M. G. A., and Lam, T. J. G. M. 2018. Veterinarians' attitudes towards antimicrobial use and selective dry cow treatment in the Netherlands, *Journal of Dairy Science*, 101: 6336-6345.

Speksnijder, D. C., Wagenaar, J. A. 2018. Reducing antimicrobial use in farm animals: how to support behavioral change of veterinarians and farmers, *Animal Frontiers*, 8(2): 4

The needs of extension and education and governance of AKIS for the revival of chestnut growing in Italy

Tatiana Castellotti
CREA

Short abstract

Italian chestnut production is experiencing a slow decline, due to the problems of economic sustainability of the crop, accentuated in recent years by phytosanitary emergencies. Nevertheless, the chestnut remains one of the representative products of *Made in Italy*. Italian chestnut growing is carried on by family farms, run by heads of farms with low schooling, mainly elderly, for whom farming is the exclusive source of income. Moreover, chestnut farms are characterized by little diversification: almost absent are activities such as agritourism, environmental services, direct sales. Data on the farm income show that chestnut farms cannot remunerate family work. The purpose of this study is the identification of training and innovation needs and the identification of appropriate governance for the diffusion of innovation for the relaunch of national chestnut cultivation.

Eextended abstract

Purpose

Italian chestnut production is experiencing a slow decline, due to the problems of economic sustainability of the crop, accentuated in recent years by phytosanitary emergencies. Nevertheless, the chestnut remains one of the representative products of *Made in Italy*. In fact, Italy is the second world exporter of chestnuts, after China, and was a net exporter until 2011, when, following the phytosanitary emergency of the chestnut cynipid (the so-called Chinese wasp), which drastically reduced national production, imports exceeded exports.

On the other hand, the biological fight against this parasite, supported and financed by MASAF, has given the expected results, so the phytosanitary emergency has been overcome. However, national production is struggling to take off, because the too low price of chestnuts paid to chestnut growers does not make harvesting convenient.

The chestnut tree characterizes the Italian landscape: it is widespread throughout the Apennines where it plays an important role in the conservation of biodiversity and the protection of the territory. According to the data of the National Forest Inventory, referring to 2015, there are no phenomena of hydrogeological instability in about 83% of chestnut surfaces while pollution phenomena are completely absent.

In Italy, from the Alps to Sicily there are about 350 varieties of chestnuts (Atlas of native Italian fruit trees, MASAF, 2016); these have different names representing the places of origin, a culture and tradition but also their peculiar characteristics that make them unique.
The purpose of this study is the identification of training and innovation needs for the enhancement of Italian chestnut cultivation and chestnut biodiversity and the identification of appropriate policies for the diffusion of innovation for the relaunch of national chestnut cultivation.

Design/Methodology/Approach

As regards the methodology, the identification of training and innovation needs emerged from focus groups, interviews to privileged interlocutors and literature review.

As regards the first aspect, I have been part of the MASAF (Ministry of Agriculture, Food Sovereignty and Forestry) group for the elaboration of the National Plan of Chestnut Sector for the period 2010/2013 and 2022/2025. As part of this task, focus groups were organised with the associations of chestnut growers, farmer's associations, researcher, processors, public bodies (municipalities and regions). Finally, to monitor the situation of the sector over the years, interviews were carried out with privileged interlocutors.
From a study carried out by the Centre for Policies and Bioeconomy of Crea on the basis of data from the Farm Accountancy Information Network (FADN) (CREA, 2016), it appears that Italian chestnut growing

is carried on by family farms, run by heads of farms with low schooling, mainly elderly, for whom farming is the exclusive source of income. Moreover, chestnut farms are characterized by little diversification: almost absent are activities such as agritourism, environmental services, direct sales (ibidem, 2016). Data on the farm income show that chestnut farms cannot remunerate family work.

In this not very comforting panorama, the only positive aspect is the lower use of pesticides compared to farms with other permanent crops.

Despite the difficulties of the sector, the Italian chestnut growers take care of and defend their chestnut groves; proof of this is the effort made in facing the phytosanitary emergency of the chestnut cynipid. In fact, they have made a fundamental contribution to the success of the biological fight against this pathogen, financed by MASAF. The three national chestnut associations (Associazione Nazionale Città del Castagno, Castanea, Centro Studi e Documentazione sul Castagno) participated, together with the research bodies (CREA and University of Turin) to the realization of the project and the individual chestnut growers financed first-hand the biological phytosanitary actions in their farms, where they could not get the funds of the MASAF (ibidem, 2016).

On the basis of surveys with chestnut growers it emerges that the chestnut represents for the farmers much more than a simple fruit plant: it constituted the energy base of the mountain people's diet (it was called "bread") and expresses their love and their ancestors, for a "generous plant" (of food and wood), for the territory (which held with its roots), for biodiversity, for the landscape and for an authentic symbol of the human/nature relationship.

The strong link between chestnut growing and territorial identity is also represented by the 16 Italian products based on chestnuts PDO/PGI brand out of the total of 25 European products. However, a survey based on interviews with privileged interlocutors showed that producers are unable to get a higher price than chestnuts without a designation.

Chestnuts and their derivatives, such as flour, are produced gluten free and a food rich in carbohydrates, proteins, fats, fibers and mineral salts. Flour, for example, contains potassium, iron, phosphorus and some B vitamins in quantities higher than 00 wheat flour. Potassium, an indispensable element for many metabolic processes, is present in higher quantities than all the most common flours used in cooking. The same applies to calcium and iron. The amount of phosphorus, important for nerve tissues and determining, together with calcium, for the structuring of bones, is second only to wholemeal flour. Chestnut flour is poorer in protein than wheat flour commonly used, but has a greater amount of fiber than whole wheat flour; this gives it a greater satiating capacity and a lower caloric value.

Findings

Despite everything, chestnut represents an important source of income for many Italian territories and chestnut is one of our representative products of Made in Italy.
The relaunch of chestnut fruit growing should be accompanied by training and innovation throughout the supply chain, from production to consumption.

But training and innovation must have specific contents, suitable for the Italian chestnut territories. The chestnut grove performs important functions: together with the economic function of producing food and income for vast territories it performs no less important functions of nature, landscape, historical and cultural.

It seems necessary that the revival of chestnut growing through a process of enhancement that is sustainable not only economically but also from the environmental and social point of view, so that it can reflect the authentic vision of the relationship of chestnut growers with their trees and the territory.
The economic sustainability of chestnut fruit cultivation, therefore, cannot pass through a model of industrial agriculture that leads to a process of "liberation from the territory" in which the inhabitant and any kind of relationship with a living and hospitable territory is denied and replaced by the producer-consumer. The economic development model for the relaunch of chestnut cultivation must, instead, go through a process of "re-territorialization" understood as an awareness of the need to take care of your natural environment and to find in this care a world rich in lifestyles and identity.

The identification of the territorial identity (at the different scales of the geographical region and of the single place) is fundamental to start processes of re-territorialization, that is, acts that rebuild the relations between local community and territory. Referring this reasoning to the chestnut fruit and chestnut territories, it is necessary to identify those actions and practices through which this reappropriation of the territory and its identity can be realized, so that consumers can become inhabitants again, building sociability. As far as production is concerned, in the chestnut sector there is little activity of training and professional updating. Often knowledge is passed on to young people in the family so the transfer of innovative aspects provided by the research is also limited. We need to think of a new figure of chestnut farmer, rich in traditional knowledge but also capable of adopting technical and social innovations.

In particular, the training and transfer of innovations must cover both more traditional aspects such as cultural techniques, the management of traditional chestnut groves and new chestnut groves, genetic and varietal improvement, plant diseases but also more innovative aspects such as the creation of associations of producers, the processing of the product, the sale of chestnut new food on the market and the construction of relations. With regard to networking, the low diversification of the farm activity indicates the need for a training requirement on the construction of relations with the territory through tourism, social chestnut grove (school, health services…), and ecosystem services.

As regards the processing phase, the training and innovation needs concern the possibility of extending the very short consumption period for fresh chestnuts. Derived products, such as flour, and new chestnut products with nutraceutical value can perform this function. From this point of view, we could introduce, for example, production in sales channels related to the well-being and health of people.
On the consumer side, the relaunch of chestnut fruit growinservg should be accompanied by promotion of the consumption of chestnuts and derived that can encourage the domestic and foreign consumption of this precious treasure chest of important nutrients. For this reason, training must involve not only chestnut growers but also consumers: restaurateurs, tourism operators, schools, health services (food is physical health, chestnut territories can contribute to mental health) in order to promote a conscious consumption of chestnuts and chestnut territories.

Practical and theoretical implications

The relaunch of chestnut growing requires a global (from production to consumption) and territorial approach. In particular, should be set up un a national innovation ecosystem by enhancing knowledge flows between the AKIS players as well as strengthening links between research and practice. Collaboration between various actors to make best use of complementary types of knowledge (scientific, practical, organisational, etc) in view of co-creation and quick spreading of solutions/opportunities ready to implement in practice . The chestnut growers through their associations must be involved in the dissemination of research results. The chestnut farm is a small farm in the inner areas and is subject to regional policies that do not have the same objectives and time frame of implementation. Often, the cultivation of fruit chestnuts is allocated residual financial resources and without a global approach. On the basis of the governance of the biological fight against Cynipides, it would be desirable a national direction that is implemented at regional, territorial and farm level with the support of chestnut associations.

References

Mariotti B., Castellotti T., Conedera M., Corona P., Manetti M.C., Romano R., Tani A., Maltoni A., (2019) - Linee guida per la gestione selvicolturale dei castagneti da frutto. Rete Rurale Nazionale 2014-2020, CREA, Roma, ISBN 978-88-3385-017-7.

Corona P., Frangipane M.T., R., Lo Feudo G., Castellotti T., Massantini R. (2021), Chestnut Cultivar Identification through the Data Fusion of Sensory Quality and FT-NIR Spectral Data, Foods, 2021, doi: 10.3390/foods10112575.

Castellotti T., Doria P. (ed.) (2016), La castanicoltura da frutto in Italia. Caratteristiche strutturali, risultati economici e politiche pubbliche, Quaderni RICA, CREA Roma, ISBN 9788899535265,.

Castellotti T., Lo Feudo G. (2016), Tradizione e innovazione per la valorizzazione della castanicoltura da frutto: dal legame con il territorio al panel di assaggio, Agriregionieuropa.

The trusted advisor: a farmer-centric case study in North-West Greece

Eleni Pappa, Alex Koutsouris
Agricultural University of Athens

Short abstract

Given its fragmented and weak Agricultural Knowledge and Innovation System (AKIS), the design of structures able to provide effective, efficient and accountable Innovation Support Services (ISS) in Greece is required (including the new CAP). In this respect in the current piece of work we present the first results of a farmer-centric research taking place in North-West Greece aiming at addressing the hot spot of trust in advisory relationships. In order to gain deeper insights in the topic, thus far largely missing from extension literature, we utilize the well-known model of Mayer et al. (1995) focusing on the three antecedents of trust: ability, benevolence and integrity. The qualitative research showed that, among others, farmers are in favor of knowledgeable and experienced advisors, who are honest and reliable and show in practice interest for them; farmers have a keen interest in developing a collegial, and indeed a human relationship with advisors. Within such a framework two elements are of major importance: the visits paid by the advisor to the farmer's field and the 'mode' of communication (to be initiated by the advisor). Based on the current findings future work aims at assessing various actors-as-advisors' roles in farmers' micro-AKIS.

Extended Abstract

Purpose

The advisory landscape in Greece the last three decades has been marked by the absence of a structured (public) extension service and/or advisory system (Koutsouris and Zarokosta, 2022). Moreover, the Greek AKIS is weak and fragmented (Koutsouris and Zarokosta, 2020). In this piece of work, given the attention paid by the new CAP to advisory services and AKIS (Reg. (EU) 2021/2115) we explore farmers' views on advisory services. In particular, given the importance of trust development between farmers and advisors (see, *inter alia*, Sutherland et al., 2013; Hilkens et al., 2018; Thomas, et al., 2020; Hammersley et al., 2022; Rust et al., 2022) and the lack of such a relationship between farmers and agronomists-as-advisors in Greece (see, *inter alia*, Kaberis and Koutsouris, 2012; Koutsouris et al., 2014, Koutsouris and Zarokosta, 2022), we aim at identifying characteristics of the trusted agronomist with whom farmers would prefer to build advisory relationships.

Design/Methodology/Approach

As aforementioned, trust ("that one party is willing to rely on the actions of another party"; Sutherland et al., 2013: 97) has been underlined in research concerning agricultural extension/advisory literature. Hilkens et al. (2018) argue that "if a client lacks trust in the advisor, (s)he is unlikely to ask for or use the advice provided by that advisor" while also enhancing "loyalty of the client to the advisor" (p. 85). Thus, for Hammersley et al. (2022) "trust and confidence between client and advisor sets the groundwork for the knowledge exchange process to occur" (p. 4). On the other hand, O'Keefe et al. (2002) argued that advisors have to earn the confidence of farmers; advisors' characteristics such as trustworthiness, knowledgeability (and/or experience), and reliability have been shown to be important (see, Sutherland et al. 2013). Nevertheless, relevant research in the field can be said to be, on the one hand, of major importance (Klerkx, 2020; Sutherland and Labarthe, 2022) while, on the other hand, short in terms of analytical depth.

Trust literature outside 'agriculture/advisory' field(s) underlines that despite its popularity, trust is a concept difficult to define and measure (Legood, et al. 2022) since it is vague, highly complex, multi-dimensional and context-specific (Ezezika and Oh, 2012). Nevertheless, in all disciplines trust is relational (Carolan, 2006) and trust implies vulnerability and/or some level of dependency (willingness to depend on another party) (Burke, et al., 2007).

Researchers have long investigated the antecedents as well as the outcomes of trust at different levels (Legood, et al. 2022). One of the most well known, influential models which define trust as separate from its antecedents has been that of Mayer et al. (1995). The model examined the antecedents of trust focusing on three elements: ability, benevolence and integrity. Since then it is widely acknowledged that the great majority of antecedents falls within one of the abovementioned three categories (Burke, et al., 2007). Since we are going to use this model as the basis of our exploration, a short account of these antecedents is provided.

Ability (or 'competence') concerns a trustor's belief that a trustee has the ability, skills, and expertise to perform effectively in specific domains and satisfy the trustor's needs. Benevolence is a trustor's belief that a trustee conveys authentic concern and genuinely cares about the trustor. Integrity has been defined as "the trustor's perception that the trustee adheres to a set of principles that the trustor finds acceptable" (Mayer et al., 1995, p. 719) and is judged through previous trustees' behaviours.

Furthermore, each of the three antecedents has been further delineated to specific skills, behaviors or virtues. Ability for example, has been mainly linked with effectiveness, experience, knowledge or expertise - including local knowledge, skills and professional development. Benevolence has been delineated to markers for trustee's benevolence such as showing consideration, sensitivity/ compassion and respect for trustor's needs, interests, goals, concerns and conditions (i.e. individualized consideration) plus refraining from exploiting others for the benefit of one's own interest or acting opportunistically.

Finally, behavioral integrity refers to the consistency between words and deeds with commonly mentioned elements being: honesty, credibility, openness and transparency, promise keeping, responsibility and accountability. Behavioral consistency is an equally important aspect of trust since if the trustee behaves consistently over time and across situations, trustor's confidence should increase; it thus strongly relates to reliability/predictability.

Methodology.

Our research took place from January to March 2022 in the Prefecture of Ioannina (Epirus Region) which borders with Albania and the Ionian sea. Out of its 8 municipalities, 5 municipalities covering 86.8% of the cultivated land were selected (the rest are mountainous with few sheep and goat semi-nomadic breeders). The total cultivated land of the target area is 2654 ha., half of which (1345 ha.) is devoted to the cultivation of fodder crops; other important crops are vineyards and potatoes (in one out of the 5 municipalities each), corn and tree orchards.

The field research addressed professional farmers who are in contact with agronomist(s)-as-advisors. An aide memoire (based on the abovementioned theoretical scheme) was used. Overall, 51 farmers were interviewed following a snowball technique for each of the 5 municipalities. The material (recorded and afterwards transcribed - computer generated documents using Google docs) comprised 570 pages which were then analyzed per topic (exploratory analysis; Sarantakos 2005); some of the topics were based on the literature review while others emerged from the primary material.

Findings

The average age of the interviewees is 45 years (min=26, max=76yrs); most of the farmers fall in the 35-55 group (41.3%) with the other two groups being almost equal. Their average farm size is 22 ha., out of which 70% is rented; 46.9% work mixed farms. Over 90% of the interviewees do not work outside agriculture. Their educational standards are high (21.5% higher education plus 55% higher secondary graduates).

Ability. According to the interviewed farmers the knowledge of the advisor is a given since all advisors are university graduates (agronomists). Furthermore, the advisor's in-depth and updated knowledge, surpassing that of the experienced cultivator, reinforces farmers' trust towards him/her. This is further strengthened in the case the advisor can provide 'holistic' advice (i.e. both cultivation and economic advice) and the knowledge of local conditions and cultivations (related to experience).

So the good advisor is continuously seeking to update his/her knowledge to be able to advice farmers on the new/forthcoming challenges (e.g. climate change, new diseases, etc.). In this respect, s/he loves his/her job and subject matter, which reflects his/her interest for farmers.

Another important issue for the farmers concerns the specialization of the advisor; farmers argue that a non-specialized advisor will not be an expert and thus will not be able to provide the advice they need to become top producers. Moreover, some farmers claimed that a good advisor is the one who is also a cultivator.

Finally, the advisor is judged by farmers based on his/her experience; while theoretical knowledge is needed, to become useful it has to be integrated with practice. Such experience (either through extended farm visits or as a cultivator him/herself) should be at local level and long-term.

Furthermore, the abovementioned issues are found to be 'mediated' through specific actions and behaviors. One of the most important ones concerns communication; the 'mode' the advisor communicates with the farmer shows to the cultivator that the advisor has the required abilities so as to trust him/her. In this respect, the advisor has to 'speak as a scientist', i.e. his/her advice and answers to farmers' questions must be analytical and substantiated. Furthermore, the advisor has to be able to respond to complex/ difficult questions, including alternative production systems. Additionally, the advisor must be confident about the advice provided to the farmer, which has to be concrete to convince the cultivator to follow it; farmers do not like to take risks. Finally, the advisor has to be able to find the appropriate ways (channels and codes) to communicate with farmers (re: accessibility and understanding).

On the other hand, farmers have certain 'demands' concerning the role and working methods of the advisor: asking farmers for information along with the search for and utilization of relevant data are of critical importance. Thus the advisor should collect a wide array of (production and socio-economic) data; make own studies as well as experimentation/ trials (own if a cultivator or in cooperation with farmers); provide appropriate, concrete and stepwise advice while also supporting *in situ* farmers when implementing the advise. All interviewees stressed that the presence of the advisor on the farm (either on a, more or less, regular basis or at times of crisis) is the major 'criterion' which makes a good (and trusted) advisor. Of course, all the aforementioned actions on the part of the advisor should lead to effective solutions to farmers' problems, leading to the improvement of yields and the prosperity as well as widening the (cognitive) horizons of the farmer.

<u>Benevolence</u>. With regard to the antecedent 'benevolence' the interviewed farmers underlined that the trusted advisor is the one who strives to ensure farmers' interests. In turn, the advisor should not be entangled in any kind of interests which might work against them; s/he should not be involved in or related to private companies. Thus farmers clearly favor the existence of a public extension service.

Additionally, farmers argue that the advisor must show his/her interest for them, i.e. to undertake concrete actions which, taking into account farmers' needs and objectives, will benefit them. Furthermore, the advisor should be able to put him/herself into their shoes. The issue of empathy is related to past negative farmers' experiences along with the demand that the advisor respects farmers' efforts and visits their farms.

As in the case of 'ability', 'benevolence' is also found to be 'mediated' through specific actions and behaviors. According to the interviewees the communication between farmers and the advisor is of major importance; the establishment of communication is the responsibility of the advisor since farmers may face various barriers (time, culture, status quo, etc.); it also manifests the advisor's interest for them.

Additionally, the advisor should put questions to the farmer (and visit their farm). This is understood as a clear sign of the advisor's interest and the building of a personal relationship which may allow the farmer to reveal facts, ideas, etc. not shared with others. This will allow the advisor to know, for example, the farm (including infrastructure) and its history as well as the results of the implementation of the advice s/he provided to the farmer. Farmers appreciate the advisor's endeavors to provide tailor-made solutions/ advice to each farmer; it makes the farmer feel safer vis-à-vis the implementation of the advice while also underlines the advisor's interest to help. Therefore, the advisor will have to devote time to each farmer, i.e. not to try to 'escape' through, for example, the provision of general recommendations in order to visit another 'client'.

Farmers insist to the aforementioned need for the advisor to be on the farm here signaling the interest of the advisor.

Integrity. In the first place, according to the farmers, integrity means that the advisor will be in the area servicing all farmers on an equal footing; farmers strongly dislike to see the advisor treating different farmers in different ways due to their, for example, farm size, locality, etc. Additionally, farmers demand that the advisor is 'speaking the truth'; the advisor must be honest and transparent, including informing the farmer about the expected results of the implementation of his/her advice. Farmers also want the advisor to be frank about their mistakes and dare to intervene so that they avoid making mistakes. Integrity also means consistency on the part of the advisor which, in turn, makes the advisor's behavior, more or less, predictable in the sense that farmers can rely on the advisor to help them with their needs and problems. Therefore, the advisor must be open, transparent and accountable for his/her interventions and recommendations.

Not surprisingly, the farm visit is again the major mediator for 'integrity' as well. Moreover, the farm visit must not be incidental (especially in critical moments of the cultivation period) as the advisor is able to 'see' something that farmers do not. In the same vein, the advisor must be available; farmers need to know that the advisor is 'there' to provide assistance, especially in critical times or crises. Finally, with reference to openness and transparency, farmers said that the advisor must establish a dialogue with farmers, which, in turn, means that s/he will have to transfer his/her knowledge to the farmers and explain to them both their mistakes and his/her recommendations.

Practical Implications

This piece of work in progress will further allow for the better understanding of the degree farmers trust various types of agronomists (public, private, company representatives) and other actors-as-advisors and thus of their (current and potential) role(s) in farmers' micro-AKIS (Sutherland and Labarthe, 2022). It may also assist in the design of effective, efficient and accountable extension/ Innovation Support Services (ISS) in Greece given that as shown farmers certainly prefer a collegial relationship with the advisor meaning that the trusted advisor has to work together with farmers (two-way communication and exchanges in all stages from awareness creation till the implementation of the advice) with 'farm visits' being a crucial element for the development of the relationship. On the contrary, farmers dislike someone who would only instruct them 'what to do', 'once and for all'. This of course means that the trust relationship is characterized by equality and complementarity which, in turn, improves both sides (re: knowledge and experiences) and the overall result. Such argumentation implies a personal relationship (friendship) between the advisor and the farmer, a 'human relationship'. And such an approach will have to be seriously taken into account by Higher Educational Institutes (agronomic universities) which, at least in Greece, still educate future advisors with an 'expert ethos' (Papaspyrou and Koutsouris, 2018). And while this piece of work concerns an area in North-West Greece it may be of interest to find out similarities or dissimilarities with farmers' views elsewhere and under different AKIS, etc. circumstances.

Theoretical Implications

This piece of work also aims at triggering more nuanced research on the topic of trust in advisory relationships. A farmer-centric contribution to the theory of trust is urgently needed vis-à-vis the revival of the interest (in both research and current policy orientations) for (plural but also inclusive and independent/impartial) advisory services.

References

Burke, C. S., Sims, D. E., Lazzara, E. H. and Salas, E. (2007). Trust in leadership: A multi-level review and integration. *The leadership quarterly*, *18:* 606-632

Carolan, M. S. (2006). Social change and the adoption and adaptation of knowledge claims: Whose truth do you trust in regard to sustainable agriculture? *Agriculture and human values*, *23:* 325-339

Ezezika, O. C., & Oh, J. (2012). What is trust?: perspectives from farmers and other experts in the field of agriculture in Africa. *Agriculture & Food Security*, 1: 1-9

Hammersley, C., Richardson, N., Meredith, D., Carroll, P. and McNamara, J. (2022): Supporting farmer wellbeing: exploring a potential role for advisors. *The Journal of Agricultural Education and Extension*, DOI: 10.1080/1389224X.2022.2082498

Hilkens, A., Reid, J., Klerkx, L. and Gray, D. (2018) Money talk: How relations between farmers and advisors around financial management are shaped. *Journal of Rural Studies*, 63: 83-95.

Kaberis, N. and Koutsouris, A. (2012) Reflections on the 'expert syndrome': a Greek case study on extension education. http://ifsa.boku.ac.at/cms/fileadmin/Proceeding2012/IFSA2012_WS1.1_Kaberis.pdf

Klerkx, L. (2020) Advisory services and transformation, plurality and disruption of agriculture and food systems: towards a new research agenda for agricultural education and extension studies. *The Journal of Agricultural Education and Extension*, 26: 131-140

Koutsou, S., Partalidou, M. and Ragkos, A. (2014) Young farmers' social capital in Greece: Trust levels and collective actions. *Journal of Rural Studies*, 34: 204-211.

Koutsouris, A. and Zarokosta, E. (2022) Farmers' Networks and the Quest for Reliable Advice: Innovating in Greece. *Journal of Agricultural Education & Extension,* 28: 625-629.

Koutsouris, A. and Zarokosta, E. (2020) Supporting bottom-up innovative initiatives throughout the Spiral of Innovations: Lessons from rural Greece. *Journal of Rural Studies* 73: 176-185.

Legood, A., van der Werff, L., Lee, A., den Hartog, D. and van Knippenberg, D. (2022). A Critical Review of the Conceptualization, Operationalization, and Empirical Literature on Cognition-Based and Affect-Based Trust. *Journal of Management Studies,* doi:10 .1111/jom s .12 811

Mayer, R., Davis, J. and David Schoorman, F. (1995) An Integrative Model of Organizational Trust. *The Academy of Management Review*, 20: 709-734

O'Keeffe, J., Buytaert, W., Mijic, A., Brozović, N. and Sinha, R. (2016). The use of semi-structured interviews for the characterisation of farmer irrigation practices. *Hydrology and earth system sciences*, 20: 1911-1924.

Papaspyrou, S. and Koutsouris, A. (2018) The educational philosophy of Greek extensionists vis-à-vis contemporary extension thinking: a critical appraisal. *The Journal of Agricultural Education & Extension* 24(4): 345-360

Rust, N., Stankovics, P., Jarvis, R., et al. (2022) Have farmers had enough of experts? *Environmental Management*, 69: 31–44

Sarantakos, S. (2005). *Social Research*. Basingstoke: Palgrave McMillan.

Sutherland, L-A. and Labarthe, P. (2022) Introducing 'microAKIS': a farmer-centric approach to understanding the contribution of advice to agricultural innovation. *The Journal of Agricultural Education and Extension*, 28: 525-547.

Sutherland, L-A., Mills, J., Ingram, J., Burton, R., Dwyer, J. and Blackstock, K. (2013) Considering the source: Commercialisation and trust in agri-environmental information and advisory services in England. *Journal of Environmental Management* 118: 96-105

Thomas, E., Riley, M. and Spees, J., (2020) Knowledge flows: Farmers' social relations and knowledge sharing practices in 'Catchment Sensitive Farming'. *Land Use Policy*, 90 (2020) 104254.

From farm advisory regimes to KIBS market menageries. Effects of privatisation on technological change in the agricultural sectors of seven European countries.

Pierre Labarthe
INRAE, UMR AGIR

Extended abstract

Purpose

Agriculture combines a set of characteristics that induce specific needs for services to support technological change, such as farm advisory services. First, the sector is made of a large number of small production units. Second, the conditions of production are characterised by their strong heterogeneity and variability, for instance in relation to soil and climate conditions. Third, the sector is associated with high production costs and fixed capital, linked to specific investments in land and equipment. Fourth, the functioning of the sector is strongly framed by public policies, through investments and standards related to issues on food safety and security, social cohesion, occupational health, environment, or biodiversity.

As a result, the development of farm advisory services had been framed by the central role of the state and of collective organisations of farmers. In most countries, these services were primarily delivered directly by the State to farmers, or by diverse farmers owned organisations. These organisations include cooperatives, unions, associations, chambers of agriculture, etc. They were often supported by public funds.

In the 1980s, there was a global turn towards privatization of these services. This related both to a willingness to reduce public expenditures but also to new doctrines. The withdrawal of the state was meant to lead to the emergence of a market of independent consultants of Knwoledge Intensive and Business companies (KIBS) that provide fee-for-service advice to farmers. This was expected to reduce bureaucracy and favor the development of more demand-driven services.

Since the late 2000s, farm advisory services are back on the agenda of policy makers that identify them as a key driver toward more ecological and sustainable agriculture. These policies are implicitly framed upon the idea to compensate for "market failures" induced by privatization (Leeuwis 2000, Hanson & Just 2001). For instance, they aim at:

- Compensating for solvability and inequalities issues: as the need for advice is not propositional to farm size or to farmers' capacity to invest in advice, supporting farmers' demand (e.g. with vouchers) is expected to favour access to farm advice for certain groups (e.g. small farms);
- Reducing asymmetries of information on quality of services issues: official certification and/or accreditation of advisors are expected to compensate for the uncertainty that farmers face when they have to first choose between competing farm advice suppliers;
- Better integrating agriculture's environmental externalities into farm advice: call for tender for advisory environmental projects are expected to steer the supply of advice towards these themes;
- Network failures: call for multi-actor programs are supposed to extend advice and innovation networks and include new actors.

Policy instruments based on such ideas had a rather low impact in Europe, as illustrated by the instrument of *Farm Advisory System* (Labarthe and Beck 2022): there was a much lower level of expenditure by Member States than expected and few farmers were actually reached. Bureaucracy is often put upfront as a potential explanation, especially associated with the complexity of implementing public procurement procedures.

Our hypothesis is that the failure of these policies are also linked to the fact that they are based on distorted vision of farm advice. Their low impact relates to a segmentation of services: the institutions regulating farm advice are influenced by actors that are not "traditional" advisory organisations but suppliers linked to other economic interests (Seeds, fertilizers, chemicals, high-tech & apps, agro-food…). A sign of this situation is an emerging debate about the definition of "independent" advice (Sutherland & Labarthe, 2022). Indeed, the privatization of extension services lead to much more complex configuration of supply of advisory than initially planned. The supply of services is now characterised by a huge diversity of actors (Knierim et al. 2017), where 'independent" advisors cohabit with "linked advisors" that provide services with other services or trade of inputs (seeds, fertilisers, pesticides) or outputs (commodities, etc.). In other words, there is a paradox: the idea that an "advisory market" exists is challenged but advisory policy are still framed by the idea to compensate for the failures of such markets. There is a need to provide sound empirical evidence to feed this debate.

The aim of this paper is to better understand new configurations of farm advice and their consequences on the institutions framing the directionality of technological change in the agricultural sector. Using institutional and political economics (Mahoney & Thelen 2009), we combined a top-down and a bottom-up perspective, with two propositions.

- **Proposition 1. National farm advisory policies are the reflection of long term models regarding the respective roles of public, private, NGOs and Farmers Based Organisations (FBO).**
- **Proposition 2. Gradual institutional change may also occur at a more micro-level, related to changes in the nature of actors investing in farm advice in various innovation areas.**

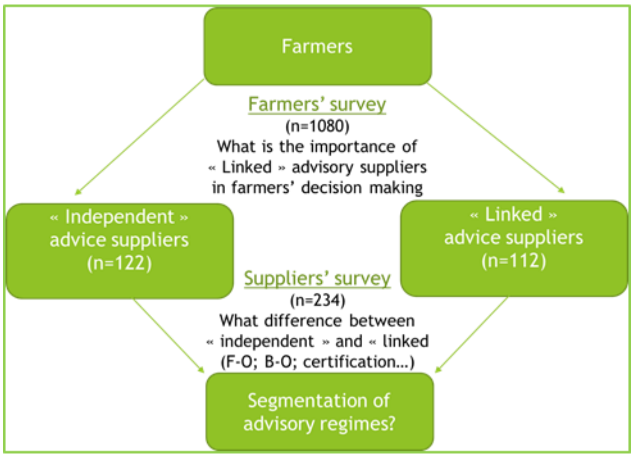
In other words, we posit that there is a switch in trend, from a period where the conception of farm advice where driven by the features of a "liberal regime" toward a situation of "segmentation" of the institutions of farm advice. The notion of segmentation is based on Kathleen Thelen's seminal work on institutional change (Thelen 2009).

Design/Methodology/Approach

The analysis is based on a comparison between seven European countries (Czech Republic, France, Greece, Poland, Portugal, Spain, UK), and a mixed method combining qualitative interviews, an analysis of public policies, and a multiple correspondence analysis (MCA) of a data base of 200 farm advice suppliers. Investigations were carried out in various innovation areas from ones related to digital technologies to others related to new forms of labour organisation in the sector (including outsourcing). Our methodology started from farmers' perspectives and followed three steps:

1. Exploring farmers' sources of advice in different innovation areas (technological, process, social, organisational);
2. Understanding the service models of a diversity of suppliers mentioned by farmers;
3. Analysing the role and position of linked suppliers.

The figure below summarizes the methodology.

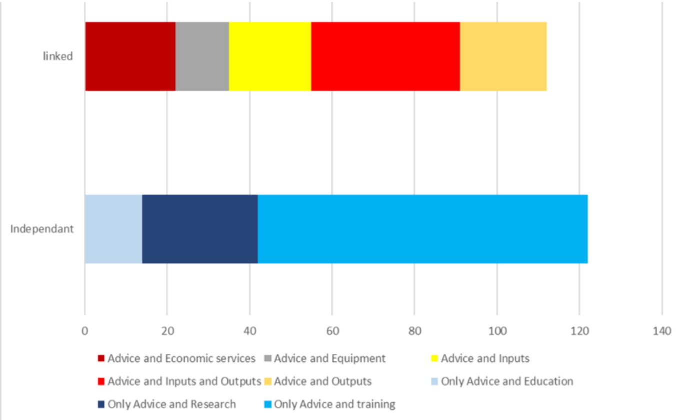


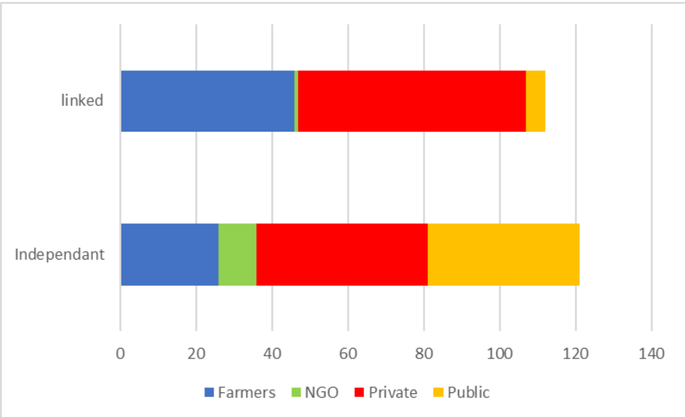
Our assumption is that the role of "linked suppliers" is an expression of the segmentation of farm advisory regimes. We propose the following categorisation:

- Independent advice suppliers provide only advice, or advice together with other R&D activity (training, education, research), regardless owner of the suppliers (public, private, FBO, NGO);

- Linked advice aggregate all other actors, providing advice with trade on input, outputs, machinery or economic services (banking, bookkeeping, insurance)

We end up with a quite balanced distribution between independent (n=122) and linked (n=112). The two figures below shows how the two groups were built.





Findings

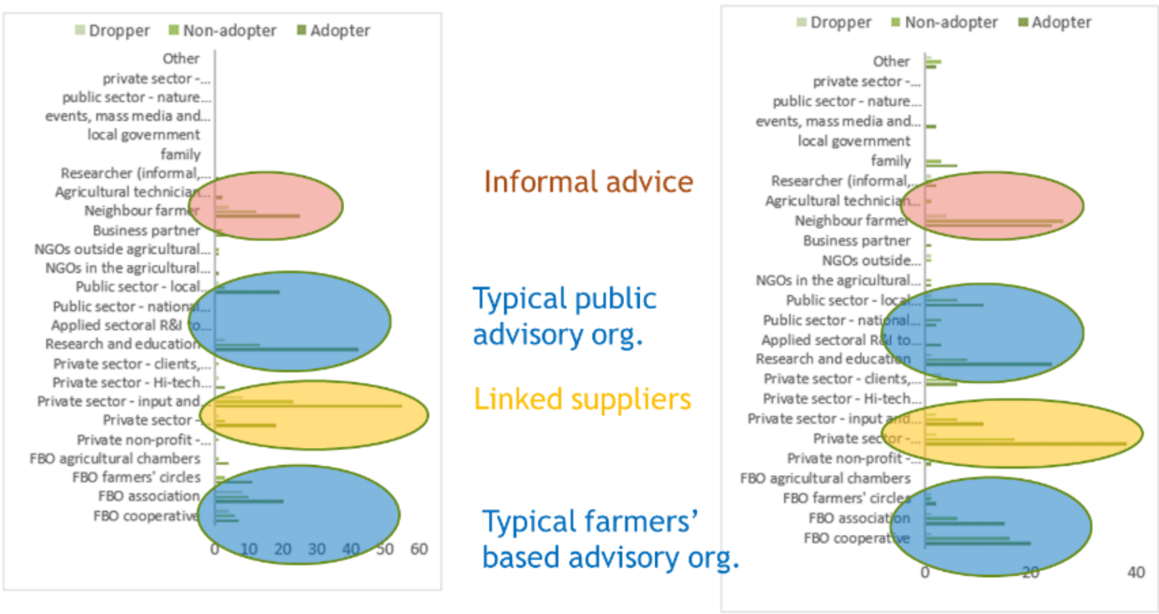
Our research show discrepancies between the model underlying public policies and the actual institutions regulating the relations between supply and demand for farm advisory services

First, we show that if national advisory policies are still based on a variety of models of farm advisory regimes, they are more and more framed by liberal doctrines. They are expected to regulate markets where private consultants or KIBS companies would compete (certification to avoid asymmetries, vouchers to support demand, competitive calls, etc.).

Second, results at a more micro-scale however reveal a very different picture. Many innovations come with new actors in the supply of services. These actors often do not sell services but provide advice as a joint/side activity of the diffusion of innovation. The figure below presents the main sources of advice of farmers in different innovation areas.

Figure 11. Advisory suppliers at awareness stage (TECH cluster)

Figure 15. Advisory suppliers at awareness stage (BIOP cluster)



Third, these “linked” suppliers often provide service with features that do not differ radically from specialised advisory organisations, and farmers sometimes build trust with these suppliers. The Table below summarizes the results of Chi-2 test performed on various variables characterising services to compare “independent” and “linked” advice. Variables for which there is no significant difference are highlighted in green. It shows that there is no significant differences in key indicators (Prager et al. 2016) of the nature of KIBS services provided by “linked” vs. “independent” advisors, especially in front-office (method, degree of personalisation, experience and skills of advisors).

However, this come with some more hidden changes in the back-office dimension of services, especially in the knowledge upon which they base their advice: “linked” suppliers are much more dependant on downstream industries but not have ties with public research or University. There is a risk of underinvestment on certain sustainability topics (e.g. occupational health) and of decrease of the reliability of evidence about the effectiveness and adverse of technologies that farmers can adopt.

Service characteristics	Variable	Test Chi-2
1-Funding-structure	Size	17,79%
1-Funding-structure	Funding	0,00%
2-HR-capacity-skills	Specialisation	2,39%
2-HR-capacity-skills	Education	0,75%
2-HR-capacity-skills	Experience	64,84%
4-Front-Office	Personalisation	47,22%
4-Front-Office	Method	17,89%
5a-Back-office	Share BO	22,11%
5b-Back-office	Training	23,60%
5b-Back-office	Training-University	0,00%
5b-Back-office	Training-Pub-Research	0,01%
5b-Back-office	Training-NGO	2,00%
5b-Back-office	Training-Indus-Upstream	7,35%
5b-Back-office	Training-indus-Downstream	1,16%
5b-Back-office	Training-private-consult	95,53%
5b-Back-office	Training-FBO	83,91%
5c-Back-office	Network-farmers	10,11%
5c-Back-office	Network-indus-Upstream	62,50%
5c-Back-office	Network-indus-Downstream	0,57%
5c-Back-office	Network-hightech	87,01%
5c-Back-office	Network-NGO	6,96%
5c-Back-office	Network-public_research	0,01%
5c-Back-office	Nework-university	0,14%
5c-Back-office	Network-private-consult	58,85%
6-Certification	EU-FAS	0,75%
6-Certification	National standard	17,37%
6-Certification	Professional standard	22,63%

No significant difference in size distribution (number of advisors), but as could be expected, differences in funding sources, independent advice relying more on fee-for-services and public funding)

Unsurprisingly, Independent suppliers are more specialised in farm advice (share of advisors in total staff). They advisors have higher education degree. However, their advisors are not more experienced than those of linked suppliers

Interestingly, there are no difference in <u>front-office</u>, not only in the level of personalisation of services (number of farmers/advisor), but also in the method: both linked and independent suppliers clearly prioritise one-to-one advice

The features in <u>back-office</u> are also interesting. Linked suppliers have similar resources allocation between FO & BO than independent advisors. They also have the same frequency of training of their advisors.

However, <u>there are some sharp differences in the source of training of advisors</u>. Linked advisors have hardly any training from public research, university and NGO, but benefit from downstream, compared to independent suppliers.

The same differences apply more globally for the sources of knowledge of suppliers.

Interestingly, input suppliers and private consulting companies are used rather heavily by both types of suppliers.

Linked advisors are not accredited in the frame not EU-FAS. However, there are no significant differences in their certification/accreditation by national standard and professional standards

Theoretical Implications / Discussion

Our results tend to confirm a gradual conversion of farm advisory regimes:

- Linked suppliers are considered as advisors by farmers;
- They provide services with similar attributes as advisory organisations for farmers (free, face-to-face one-on-one, with experienced advisors)
- But they rely in very different sources of training and knowledge in back-office to update the knowledge of their advisors.

We consider that the combination of these three facts could be the sign that we evidence a segmentation of farm advisory regimes in the making. Linked suppliers are not considered as advisors within public policies, especially at EU level and are much less visible to policy makers. As a result, the "segment" of farm advisory regimes negociated by the State and farmers' unions gradually shrinks compared to the segment steered by linked suppliers, in sectoral or intersectoral dynamics with upstream and downstream actors. This could be a new institutional dimension of path-dependance or lock-in in the agricultural sector, relating to further power of upstream/downstream industries in the dynamics of knowledge production of the sector.

In total, the discrepancies between the models of regimes within advisory policies and bottom-up changes mostly stems in the profile of suppliers of services. This brings new layers in the institutions of advice, which are not related to advisory policies but to the dynamics of innovation areas, resulting in "market menageries" (Srinivas 2012), as evidenced in other sectors.

References

Hanson, J. C., & Just, R. E. (2001). The potential for transition to paid extension: Some guiding economic principles. *American Journal of agricultural economics* 83(3), 777-784.

Knierim, A., Labarthe, P., Laurent, C., Prager, K., Kania, J., Madureira, L., & Ndah, T. H. (2017). Pluralism of agricultural advisory service providers–Facts and insights from Europe. *Journal of rural studies* 55, 45-58.

Labarthe, P., & Beck, M. (2022). CAP and Advisory Services: From Farm Advisory Systems to Innovation Support. *EuroChoices* 21(1), 5-14.

Leeuwis, C. (2000). Learning to be sustainable. Does the Dutch agrarian knowledge market fail?. *The Journal of Agricultural education and extension* 7(2), 79-92.

Mahoney, J., & Thelen, K. (Eds.). (2009). Explaining institutional change: Ambiguity, agency, and power. Cambridge University Press.

Prager, K., Labarthe, P., Caggiano, M., & Lorenzo-Arribas, A. (2016). How does commercialisation impact on the provision of farm advisory services? Evidence from Belgium, Italy, Ireland and the UK. *Land Use Policy* 52, 329-344.

Srinivas, S. (2012). Market menagerie: health and development in late industrial states. Stanford University Press.

Sutherland, L. A., & Labarthe, P. (2022). Should 'Impartial'Advice be a Priority of European Agricultural and Rural Policies?. *EuroChoices* 21(1), 15-22.

Thelen, K. (2009). Institutional change in advanced political economies. *British Journal of Industrial Relations* 47(3), 471-498.

Local Action Groups and Leader approach in innovation transfer and governance policies: The case of Turkey

Mücahit Paksoy[1], Orhan Özçatalbaş[2]
[1]Kahramanmaraş Sütçü İmam University, Turkiye mpaksoy@ksu.edu.tr
[2]UAkdeniz University, Turkiye ozcatalbas@akdeniz.edu.tr

Short abstract (200 words): As an innovative tool of EU-OTP, LEADER and LAGs are also a source of inspiration for pre-accession candidate countries. LEADER is planned to be an effective tool of local development. The basic idea is; local needs can best be identified and resolved by local actors. Therefore, it is an innovative approach developed to improve local communities' own development capabilities. In addition, world experiences show that; Top-down approaches have mostly been applied in regional or national development plans. Leader, on the other hand, is based on a bottom-up approach. LAG; It is a partnership of public, private sector and non-governmental organizations. Local is important, and local action groups are the basic implementation units of this approach. Here, with public-private partnership; It is aimed to contribute to the long-term sustainable development of the region. As can be seen, leaders and LAGs have important functions in technology and innovation transfer for rural development. In this paper, the roles of leaders and LAGs in innovation transfer and governance policies will be discussed. The paper will be evaluated through the example of Türkiye.

TOPIC 5 - Inclusion and the social dimension of sustainability

Session 5A – Social farming

The Advisors' role in Social Farming: a case study project

Giulia Granai[1], Francesco Di Iacovo[1], Alessandra Funghi[2] and Roberta Moruzzo[1]
1 Department of Veterinary Science, University of Pisa, Viale delle Piagge 2, 56124 Pisa, Italy;
2 Agronomist - freelance professional

Short abstract (200 words):

From a multifunctional perspective of the agricultural sector, Social Farming (SF) is a rising practice that offers various typologies of initiatives involving different actors. Among the various stakeholders involved there are advisors, whose role in this kind of projects is still quite unclear. In this paper, we take into account as a case study an Italian SF project in which advisors are actively involved and with their work contribute to the good success of the user integrations. The analysis of the strengths and the weaknesses of the project based on the role of the advisors pointed out a series of good results such as the satisfaction of the farms in having a complete assistance in the various phases of the project. Reflecting on the good efficacy of this method, it was possible to understand that economic resources both for the work of the advisors and their training are needed. To codify useful lessons regarding the future organization of sustainable Social Farming services the development of further research comparing the level of involvement of advisors in the organization and development of SF experiences in different territories is also required.

Extended abstract

Purpose

The dynamics of the agricultural sector have changed throughout the years, and they have been gradually oriented from an only productive purpose towards multifunctionality with the aim of creating new opportunities of employment, income and social inclusion [1]. Since the agricultural context naturally offers the conditions to respond to the social needs of communities developing specific relations between people and with the environment [2], an example of multifunctional activity in agriculture that in recent decades has attracted scientific attention is social farming.

Social Farming (SF) is a key concept that expresses the link between the use of agricultural resources and the provision of social services at the farm level in both traditional and innovative business activities [3] involving different stakeholders. Albeit this phenomenon is increasingly spreading offering innovative solutions to a multitude of people for well-being, therapy, rehabilitation, social inclusion, job inclusion and civil services for both peri-urban and rural areas [4–7], some confusion in the approaches and definitions in literature is still made. The main difference in the approach to SF is the term used in literature to refer to the concept: Green Care [8], Care Farming and Social Farming. In the Italian studies it is mainly used the term SF, and it concerns "the use of commercial farms and agricultural landscapes as a base for promoting mental and physical health, through normal farming activity" [9].

Although the interest in this topic is spreading, both at scientifically and practically level, there are many difficulties in the systematization of the implementation for various reasons. Among these the greatest difficulty is to ensure the efficacy and continuity of user's integration, also for bureaucratic reasons. Another point often to the displeasure of the implementation of these practices is that farms that are involved in SF projects are often located in particular and rural areas [10,11]. This represents a logistical obstacle for the users in reaching the farm, as well as a possible difficulty in carrying out the activities depending on the category of users.

Another current problem is that, among the various stakeholders involved in the organization and development of these projects, the persons who provide technical advice in the agricultural field – freelance professionals and agricultural trade associations - are not properly involved or do not have a clear role [12]

in supporting farms and in the coordination work aimed at facilitating and improving the user integration process.
This work aims to understand how the various subjects that make advice in agriculture can be involved and coordinate with each other in order to contribute to have a more effective management of SF projects in the various territories. To understand what is currently being done and what would be needed to codify a proper process, we took advantage of a SF project that takes place in Tuscany in which the advisors have had an important role in the good success of the user integrations.

Approach

The case study that addresses this topic is the project "AGER", a two-year project of SF in a territory of the Tuscany Region (Pisan Area, Valdera and upper Val di Cecina), Italy. The project was funded by RDP 2014-2020 Measure 16 Cooperation - Sub-measure 16.9 " Diversification of agricultural activities into health care, social integration, community-supported agriculture and environmental and food education activities". One of the general objectives of the project is to create relationships and cooperation between the different stakeholders. The project was presented in December 2018, but although the two years planned duration, the period has been longer for various reasons. The first reason was the long bureaucratic steps to define the preliminary investigations in the initial phase and subsequently the covid-19 pandemic that caused the interruption of any planning. Following a request for extension, the project will end in November 2023.

Figure 30. Location of Valdera and Alta Val di Cecina territory

The project considers SF activities for the purpose of socio-therapeutic and socio-occupational integration. Table 1 show some details about the project.

Table 5. Details about AGER project

Number of farms involved	7
Number of users	22
Beneficiaries	Mentally disadvantaged/disabled people, minors and adults
Activities of the farms	Horticultural activities; activities in the agritourism (preparation of tables in the restaurant, arrangement of the locals, etc.…); fruit harvesting; products packaging

Unlike many other SF projects in which this has not been foreseen, the farm trade associations, in particular Coldiretti and CIA, were formally involved in the project from the beginning both through their advisory firms, as well as agronomists – freelance professionals. Thanks to this involvement, the advisors, both the advisory firms and the professionals, played a crucial role in the success of the project, dealing with various activities at different stages of the project (table 2).

Table 6. Roles of the advisors in the different stages of the project

Phase of the project	**Specific activities of the advisors**
Scouting	Research of the farms to insert in the project
Learn about the farms	Analysis of the characteristics of the farms involved
Requirements for the farms	Support to the farms in the fulfillment of the bureaucratic aspects required to carry out SF activities
Integration activities	Support to the farms for their needs during the development of the project; Evaluation and monitoring of the activities/users together with the social subjects

The advisors carried out a scouting activity initially in a preliminary phase of the formalization of the project through the research of the farms that then became project partners. After the scouting phase, the work of the advisors consisted of an in-depth analysis of the structural and administrative characteristics of the farm significant for the course of the SF activities. The farms potentially interesting and interested in the project have been identified by the advisors through two criteria: (1) previous knowledge - they have been active in the SF field for several years; (2) research in the territory through direct advice to farms potentially adequate. In the case of criteria (2) advisors favored the farms that applied for funding on the RDP for other measures rewarding the activities of SF as activity of business diversification. The scouting phase was followed by a survey of the farms' characteristics, carried out by the advisors in collaboration with the University of Pisa. The advisors made a survey aimed at highlighting the characteristics of the farms involved (location, farm experience, production processes, people involved in the farm, multi-purpose spaces etc...), useful for the design of SF activities. These forms were shared with educators and social services, to make a first hypothesis of matching between farm and user.
During the project the advisors also provided important support to the farms in checking all the bureaucratic fulfilment necessary for the correct integration of the person in the farm (safety aspects in the workplace, insurance, documentation and paperwork…) and during the activities. Throughout the project, in fact, the advisors have kept an active role, and they worked together with third sector subjects and the public institutions responsible for social matters to evaluate and monitor the evolutions of the integrations.

Findings

The active participation of the advisors has led to diverse positive results that contributed to the success of the project. A first positive aspect can be related to the satisfaction of the farms that have been followed step by step and had a complete assistance in the various phases of the project. This point was important especially for those farms to their first SF experience. Unfortunately, this aspect is not often considered in this type of projects. A good and structured organization, both for the bureaucratic aspects and for the relationship with the various stakeholders, encourages the farm to continue this type of activity and to feel part of a structured context in a shared path. Another positive result immediately measurable is the good success from the point of view of the integrations. The constant and codified monitoring of the users, shared among the various stakeholders, allows in fact to evaluate how the organization of an advisory work is essential to simplify the development of SF processes and to improve their efficacy.

Another positive aspect emerged from the analysis of this project is the high degree of collaboration between stakeholders that, if well structured, allows to assemble a network at a territorial level. This network can then be preserved and proposed again in order to create permanent SF activities. This kind of work implicated a waste of time and energy at an early stage to structure the network on the territory, but once the methodology is launched, knowledge and skills created allow to carry out a homogeneous and high-quality work and to introduce new stakeholders each time.
Since this is a subject still little known and for which courses or training at technical level are still limited, a critical point is that in many cases the success of the assistance provided by the advisors is linked to the availability and the skills of individual people and not to the organizations they represent.

Practical Implications

The method proposed in the case study showed a good efficacy in terms of positive results achieved by the project, and it could be repeated in other projects because it is based on sharing and collaboration. It is necessary, however, that the advisors have competence in this field in order to be able to play their role in a functional way. The advisors involved could already have acquired experience and knowledge in the field, in the case of the involvement of new advisors instead it is necessary that they are adequately trained. As a result, therefore, it becomes essential in the planning of the projects to consider some economic resources, as well as for the development of the activities of the advisors, also for training activities, coordination and creation of relationships on the territory. The training becomes a pivotal point both from the point of view of advisors for farms and for the figures that interact with them from the point of view of the social part, to ensure that all stakeholders can collaborate and dialogue effectively.
Therefore, if it were possible to structure policies that plan the active involvement of advisors in SF projects and specific training opportunities for them, this method could be codified.

Theoretical Implications

From a theoretical point of view it might be useful to develop further research that will compare strengths and weaknesses and the level of involvement of advisors in the organization and development of SF experiences in different territories. It often happens to carry out investigations on single territories, it could instead be useful a comparison between territorial areas. In the case of Tuscany, it could start from the three "Aree Vaste" that refer to the Local Health Authority competence (starting from a zoning on a public health service basis), to get to the regional level (the Tuscany Region is working on a specific regional legislation in compliance with the provisions of National Law 141/2015) to be able to further extend so as to codify a univocal and functional working method.
This type of research could improve the current state of knowledge and experiences in the field of SF because in this way we could give clear and unambiguous answers to all stakeholders. This work could facilitate and codify certain procedures that are currently complex and unclear, as they relate to sector and cross-sector regulations. This would make the work of the advisors easier because by simplifying the procedures it would be possible to expand the number of farms involved and thus to create a better and more accessible offer to services.

References

1. Nicolosi, A.; Laganà, V.R.; Di Gregorio, D.; Privitera, D. Social Farming in the Virtuous System of the Circular Economy. An Exploratory Research. *Sustainability* **2021**, 13, 989. https://doi.org/10.3390/su13020989
2. Genova, A.; Maccaroni, M.; Viganò, E. Social Farming: Heterogeneity in Social and Agricultural Relationships. *Sustainability* **2020**, 12, 4824; doi:10.3390/su12124824
3. di Iacovo, F.; O'Connor, D. *Supporting Policies For Social Farming in Europe: Progressing Multifunctionality in Responsive Rural Areas*; ARSIA: Firenze, Italy, 2009.
4. Giarè, F.; Borsotto, P.; Signoriello, I. Social Farming in Italy. Analysis of an «inclusive model». *REA* **2018**, 73, 89–105. https://doi.org/10.13128/REA-25107.
5. Giarè, F.; Ricciardi, G.; Borsotto, P. Migrants Workers and Processes of Social Inclusion in Italy: The Possibilities Offered by Social Farming. *Sustainability* **2020**, 12, 3991. https://doi.org/10.3390/SU12103991.
6. García-Llorente, M.; Rubio-Olivar, R.; Gutierrez-Briceño, I. Farming for Life Quality and Sustainability: A Literature Review of Green Care Research Trends in Europe. *Int. J. Environ. Res. Public Health* **2018**, 15, 1282.
7. Moruzzo, R.; di Iacovo, F.; Funghi, A.; Scarpellini, P.; Espinoza Diaz, S.; Riccioli, F. Social Farming: An Inclusive Environment Conducive to Participant Personal Growth. *Soc. Sci.* **2019**, 8, 301.
8. Sempik, J.; Hine, R.; Wilcox, D. *A Report of the Working Group on the Health Benefits of Green Care, COST 866*; Loughborough University: Loughborough, UK, 2010; ISBN 9781907382239.
9. Scuderi, A.; Timpanaro, G.; Cacciola, S. Development policies for social farming in the EU-2020 strategy. *Suppl. Qual. Access Success J.* **2014**, 139, 76–82.
10. Bock B.B. (2016). Rural marginalisation and the role of social innovation; a turn towards nex- ogenous development and rural reconnection. Sociologia Ruralis, 56(4): 552-573. DOI:10.1111/soru:12119
11. Di Iacovo F., Moruzzo R., Rossignoli C., Scarpellini P. (2014). Innovating rural welfare in the context of civicness, subsidiarity and co-production: social farming, Conference Paper, Pro- ceedings of the 3rd EURUFU Scientific Conference, 25th of March 2014.
12. Dalla Torre, C.; Ravazzoli, E.; Dijkshoorn-Dekker, M.; Polman, N.; Melnykovych, M.; Pisani, E.; Gori, F.; Da Re, R.; Vicentini, K.; Secco, L. The Role of Agency in the Emergence and Development of Social Innovations in Rural Areas. Analysis of Two Cases of Social Farming in Italy and The Netherlands. *Sustainability* **2020**, 12, 4440. https://doi.org/10.3390/su12114440

How is animal well-being affecting employees farmers and extension on large dairy farms ?

Louise Axelson
Swedish University of Agricultural Sciences

Short abstract

The purpose of this qualitative study is to contribute knowledge about the extension situation in large milk-producing farms with employed staff. Dairy farms in the industrialized world, including Sweden, have undergone a structural change. Family farms have decreased in number and at the same time, large dairy farms with employees have increased in number. The employees are of great importance for milk production animal well-being and the business of a dairy farm. From this point of view, it is valuable to gain an insight into what factors are of importance in large dairy herds with employed staff. Twenty-five semi-structured interviews were conducted on three different farms. The interviewees were farmers, employees and advisors. The interview material was analysed using a qualitative approach, inspired by qualitative content analysis. For the farmers and the employees animal well-being was central for various reasons and from different perspectives. An increased and deeper understanding of the different perspectives and needs arising from the different roles of farmers and employees can provide knowledge for advisors in an extension situation that can be valuable for successful change work towards better animal health.

Extended abstract

Purpose

Swedish milk production has undergone a structural transformation over the past three decades. The number of farms has decreased by half each decade, while milk -producing herds have become larger. According to statistics from the Swedish Board of Agriculture (2022), the average number of cows in a herd was 27 in 1995, and in 2021, the average number of cows per herd has risen to 102. During the same period, the average milk production per cow has increased from 7319 kg ECM (energy corrected milk) to 11,009 kg ECM (VÄXA, 2022). Both better knowledge and increased production requirements have driven a substantial increase in milk yield. Farms have gone from family farms without employed staff to larger units with employed staff carrying out the daily work with the animals. The role of the farmer has changed from being the one who carried out all the day-to-day work with the animals to a person with new and expanded responsibilities (Hagevoort et al., 2013). This has not only happened in Swedish dairy farming but is also seen in an international perspective (Barkema et al., 2015). Structural change entails further changes that require greater advisory communication, as discussions which had previously only been between the farmer and the adviser must now also involve employed staff. The staff may have varying degrees of education, work experience, cultural background and language knowledge, contributing to a more complex counselling situation (Dockes et al., 2018).
The implementation of the advice may be influenced by several factors, as far more people are involved in the process on the larger farms compared to dairy farms without employed staff. Factors influencing the implementation process can be of different nature such as different types of needs (expressed, inferred or unspoken), relationships between farmers and staff and the presence of different barriers. These new circumstances place new demands on advisory organisations with the changing conditions in dairy farming (Nettle et al., 2018).
An extension situation frequently leads to a process of change, which often involves the employees' work with the animals. Durst et al., 2018 point to the importance of employees on a farm for a successful production. These persons are significant for the health and well-being of the animals (Hemsworth & Coleman, 1998). Seen from another point of view, the animals and their importance in work and for the employees' work situation is an area of research that lacks more profound knowledge (Hannah & Robertson, 2017). The aim of this study is to provide insight into the importance of animal- human relations from the perspective of the farmer and the employees based on their different roles. More specifically, this study explores how animal well-being affects farmers and employees; it strives to form an

understanding of the factors important for the creation of conditions for animal well-being from a management perspective associated with communication and change processes.

Design/Methodology/Approach

Qualitative research can be described as a way of reflecting people's opinions and points of view on various issues and contexts (Yin, 2013). With the aim of creating, an in-depth understanding of extension on milk-producing farms with employed staff and exploring what factors affect the implementation of the advice the study was conducted in the form of a qualitative study on farms. In the study, data were collected using semi-structured interviews and observations. Kvale & Brinkman (2014) states that a qualitative interview contributes to data through the interviewees words about their experiences, actions and their lifeworld. A qualitative interview was considered an appropriate method to collect data since an open-minded approach, broad knowledge and a deeper understanding of the advisory situation on farms with employed staff were desirable.

The sampling method, at the broader level, used in the study was based on deliberate sampling and thus belongs to what in qualitative research is referred to as purposive sampling. This sampling method provides rich and relevant data (Yin, 2013). The selection, at the broader level, of the farms was based on the following criteria: 1) the farm should have milk production, employed staff performing animal care and make use of some form of animal health advice, and: 2) the farms should be located within a geographically limited area allowing interviews and auscultation to be conducted on-site. The geographical limitation could imply a certain bias in the answers given in the interviews. There was no selection of interviewees as all the employees associated with animal management on the three farms were asked to participate in the study. This contributed to a broader perspective.

The data collection took place during spring 2022 in the form of individual semi-structured interviews and observations of advisory visits at the farms. Before the data collection, three interview guides were created. The interview guides were adapted to the roles and tasks of the three different interview groups, farmers, employees and advisors. Each guide consisted of two parts concerning extension (knowledge, experiences and expectations) and motivation concerning work and change processes. Prior to the interviews, a test-interview was conducted. The owners of the farms were initially contacted by telephone and verbally informed about the project and asked about interest in participating in the study. In a follow-up telephone call, the farm owner confirmed interest in participation in the study and a date for an information meeting for staff, farm owners and advisors was set. An information meeting was held at the farms and information was given about the study.

The interviews of the employees and the farm owners were conducted individually. In all 17 employees, six farm owners and two advisors were interviewed. Four of the interviews were conducted with the help of a polish speaking interpreter due to language difficulties. The interviews took place in the staff room or farm office at each farm. Each interview lasted 30 - 90 min. One interview with an advisor was done on zoom. All interviews were recorded. After the interviews, the interview material was anonymised and transcribed into separate coded Word documents.

Inspired by the method of qualitative content analysis, the interview material was interpreted and categorized. The analysis is based on Graneheim and Landman's (2003) description of qualitative content analysis. The text material was read through several times in order to get to know the material on a deeper level. Based on the interview material four domains were created. Meaning-bearing units were selected from each domain. Graneheim and Lundman (2003) argue that a meaning-bearing unit is a piece of text whose content is coherent in terms of content and which provides a basis for further analysis. The next step in the qualitative analysis was the condensation of the meaning-bearing units in order to concentrate the meaning of the longer mass of text into the most essential in terms of content. The condensation was followed by creating categories for each domain of the research group. The research group identified, originating from all categories and considering the context, a theme that pervades the interviews and helps to create a deeper understanding of needs and obstacles for agricultural extension in big dairy farms with employee staff.

The analysis is conducted with accuracy and a transparent approach with recurring discussions with the research group regarding the analysis work. The reliability of a study's result can be improved through collaboration and discussion (Lundman and Hällgren Graneheim, 2012).

Ethical aspects

The data collection was preceded by an ethical review application, which was approved (No. 2021-05686-01) in accordance with the act on ethical review of research involving humans (SFS 2003:460). All participants received written and oral information and written consent was obtained from all.

Findings

The importance of animal well-being for job satisfaction and peace of mind

The analysis of the interview material showed that animal well-being was a central and important factor for both employed staff and farmers from several different aspects. The different aspects were linked to the different roles of the two groups on the dairy farm.

For the employees, the well-being of the animals was central and an important prerequisite for job satisfaction. The animals and their well-being was essential for the employee's opportunities to feel personal satisfaction in having done a good job of contributing to animal wellbeing. The employees received positive feedback, wordlessly and indirectly from the well-being animals. Also by appreciative feedback on the work effort from the farmers the employees' experience of job satisfaction was positively affected.

The farmers experienced job satisfaction in situations characterized by peace of mind. Peace of mind seen from the farmers point of view was partly individual but at the same time dependent on the employees and their opportunities to feel job satisfaction. Since the well-being of the animals is central to the employees' job satisfaction, animal health will also indirectly affect the entrepreneur's job satisfaction, and non-functioning staff groups or staff who cannot perform expected tasks will affect the business in a negative direction.

The importance of communication and cooperation for animal welfare

To create good working conditions for the employees and ensure the well-being of animals, cooperation is required and in some cases, an advisor can be involved in the process. Communication and collaboration are cornerstones in any effort to effect change. They are necessary to create new knowledge and clarity within a change process. Communication does not simply contributes to the transfer of information, it also contributes to enhanced job satisfaction through positive feedback Furthermore, collaboration formed the basis for a sense of belonging in that the employees were available to each other in different work situations and worked together towards the same goal, where the focus was on the well-being of the animals

The importance of animal welfare in change processes

The farmers expressed a desire to implement change, while the role of the employed staff was to participate in the change. The desire for change and development with a financial incentive often affected milk production, which affected the animals, in turn affecting the staff who participated in the change process in their work with the animals. Various factors influenced the staff's willingness to participate in change. Change leading to improved animal health, economic outcomes and working conditions are factors facilitating change work.

A fundamentally important part of a change process is the communication of information and a dialogue between employees and farmers. It may be important to bear this in mind to create a sense of participation and the best possible conditions for implementing changes regarding the amount of information, frequency and time for self-reflection and questions.

Practical Implications

Extension work often involves and leads to employees being confronted with new work situations and tasks. For the advisors, knowledge of employee needs and background to the emergence of feelings of job satisfaction can be valuable in gaining a deeper understanding and contribute to a more successful dialogue and advisory work. The fact that animal welfare is central for both employees and farmers but from different aspects and interlinked can contribute to new perspectives in the advisory situation. It can be valuable for the farmer, in the role as an employer, to have an understanding of how animal welfare is related to employee job satisfaction. This knowledge is a piece of the puzzle in the development of human resource management.

Theoretical Implication

We expect to gain a deeper understanding of the needs and role of staff in relation to extension work in dairy herds. What perspectives are essential to consider in order to gain insight into the underlying factors that are of importance to employees? To clarify the importance of animal well-being for employee job satisfaction and the farmer's job satisfaction and peace of mind can contribute to a well-functioning organisation that is successfully changing towards improved animal well-being and production. To broaden the field of knowledge related to animal-human interactions from the perspective of the importance of animals in the work situation and the development of understanding in the workplace can be valuable and provide new insights for a deeper understanding of extension work on large milk-producing farms.

References

Barkema, H.W., Von Keyserlingk, M.A.G., Kastelic, J.P., Lam, T.J.G.M., Luby, C., Roy, J.-P., Leblanc, S.J., Keefe, G.P., & Kelton, D.F. (2015). Invited review: Changes in the dairy industry affecting dairy cattle health and welfare. *Journal of Dairy Science 98*, 7426–7445. doi:10.3168/jds.2015-9377

Dockes, A.-C., Chauvat, S., Correa, P., Turlot, A., & Nettle, R. (2018). Advice and advisory rolesabout work on farms. A review. *Agronomy for sustainable Development*, *39*(1). https://doi.org/10.1007/s13593-018-0547-x

Durst, P.T., Moore, S.J., Ritter, C. & Barkema, H.W. (2018). Evaluation by employees of employee management on large US dairy farms. Journal of dairy science, 101 (8), 7450–7462. https://doi.org/10.3168/jds.2018-14592

Graneheim, U. H., & Lundman, B. (2003). Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse education today, 24*, 105-112. https:// doi: 10.1016/j.nedt.2003.10.001

Hagevoort, G.R., Douphrate, D.I. & Reynolds, S.J. (2013). Review of Health and Safety Leadership and Managerial Practices on Modern Dairy Farms. Journal of agromedicine, 18 (3), 265–273. https://doi.org/10.1080/1059924X.2013.796905

Hemsworth, PH & Coleman, GJ 2011, Human-livestock interactions: The stockperson and the productivity and welfare of intensively farmed animals. 2nd edn, CABI, Wallingford UK.

Hannah, D.R. & Robertson, K. (2017). Human-Animal Work: A Massive, Understudied Domain of Human Activity. Journal of management inquiry, 26 (1), 116–118. https://doi.org/10.1177/1056492616655076

Kvale, S., Brinkmann, S. & Torhell, S.-E. (2014). Den kvalitativa forskningsintervjun. Tredje [reviderade] upplagan. Lund: Studentlitteratur.

Lundman, B. & Hällgren Graneheim,U. (2012). Kvalitativ innehållsanalys. M. Granskär, B.
Höglund-Nielsen (Red.), *Tillämpad kvalitativ forskning inom hälso- och sjukvård* (s. 219-234).
Studentlitteratur

Nettle, R., Crawford, A., & Brightling, P. (2018). How private-sector farm advisors change their practices: An Australian case study. *Journal of Rural Studies, 58*, 20-27. https://doi.org/10.1016/j.jrurstud.2017.12.027.

SFS 2003:460. *Lag om etikprövning av forskning som avser människor.* https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/lag-2003460-om-etikprovning-av-forskning-som_sfs-2003-460

Swedish Board of Agriculture. (2022). *Lantbrukets djur i juni*. (JO0103). Jordbruksverkets statistikrapporter - Jordbruksverket.se

VÄXA, Sweden. (2022). *Cattle statistics*. * Växa statistik - Kokontroll/KAP (qbank.se)

Yin, R.K. & Retzlaff, J. (2013). Kvalitativ forskning från start till mål. 1. uppl. Lund: Studentlitteratur.

Social Farming and Animal Assisted Intervention in rural context: a cultural change in social and health services for people

Morgana Galardi[1,2], Laura Contalbrigo[2], Roberta Moruzzo[1]
[1] Department of Veterinary Science, University of Pisa, Viale delle Piagge 2, 56124, Pisa, Italy
[2] National Reference Centre for Animal Assisted Interventions, Istituto Zooprofilattico Sperimentale delle Venezie, Viale dell'Università 10, 35020, Legnaro (PD), Italy

Short abstract (200 words):

This pilot study aimed to identify strategies for the development of Social Farming and Animal Assisted Interventions in farms, improving the network with Local Health Units to offer new social and healthcare services in the rural context filling some gaps in the Welfare governance in Veneto Region. Starting from a critical analysis of the National Health Service organization, we used a co-creative methodology based on Grounded Theory with the use of different tools to collect qualitative data (semi-structured interviews, focus group, and Scenario workshop). Our results highlighted the need of education, advisory and mediation between the Social Farming field and Local Health Unit to create network between the stakeholders. We pointed out how new energy and resources could be found in a circular and "*One Welfare*" vision, where the diversification of services provided by farmers enhanced the territory with both material and social products engaging the traditional healthcare service.

Extended abstract

Purpose

The Italian National Health Service was ranked at the beginning of 2000 as one of the most advanced in the world (World Health Organization 2000) and nowadays it maintains high standards of services for the Italian population (World Health Organization 2021). However, beyond statistics, the Italian health and social assistance service has many gaps and a certain resistance to innovation, even though in the past years some reforms were done to increase efficiency, effectiveness, and equity (Raucci, Dyczkowski, and Agostinone 2021). Since 1978, when the Italian Health Service was established, its main aim has been to guarantee equal access to health services to all Italian citizens (Repubblica Italiana 1978). Theories and concepts behind the law were innovative and wanted to introduce the idea of "*care*" and "*community medicine*"; with this purpose, Local Health Units were established in all Italian Regions and they are still operating nowadays (Adinolfi 2014). In 1992, another reform had the goal to improve the management efficiency of the Local Health Units (Repubblica Italiana 1992) but the government didn't succeed because healthcare providers didn't orient their efforts toward the real population healthcare needs (Adinolfi 2014). Therefore, in 1999, a new approach to healthcare governance was adopted empowering the Local Health Units with more technical and financial autonomy and improving the in-service training of all healthcare workers, which become mandatory (Repubblica Italiana 1999). However, some weaknesses persist, like the lack of coordination among the healthcare services on the territories (Adinolfi 2014). Italian healthcare legislation is apparently focused on prevention and healthcare service integration to support the health and welfare of all citizens, but in practice, many categories of patients, especially fragile populations, have no access to social and healthcare services due also to the reduction of economic investments in health and social care (Ministero dell'Economia e delle Finanze 2022).

In this framework, we need to find innovative perspectives in healthcare services able to produce value for citizens. Focusing on territorial assistance, our pilot study investigated the different perspectives of Social Farming in the area of Veneto Region (North-eastern Italy). Social Farming (SF) is an innovative practice in agriculture that was defined by Di Iacovo et al. (2016) as a practice that "*[...] involves the use of resources from agriculture (plants and animals) and farms in order to reinforce social/health services within the framework of a reduction in public expenditure and a personalisation of solutions to human needs.*" (Di Iacovo et al. 2016).

Like the Netherlands, the United Kingdom and Norway, Italy is one of the countries where this approach is more rooted and studied at academic level (Jarábková, Chreneková, and Varecha 2022). SF is regulated by law at national level (Repubblica Italiana 2015) with specific requirements (Ministero delle Politiche Agricole Alimentari e Forestali 2018) for its application on the territory, including animal assisted interventions in rural contexts. Animal Assisted Interventions (AAI) are regulated by the Italian Ministry of Health (Ministero della Salute 2015) and are officially defined as "*therapeutic, rehabilitation, educational or recreational projects with the involvement of domestic animals*" (Simonato et al. 2018). AAI can be provided in rural contexts both with pets and farm animals with benefits for people involved (Galardi et al. 2021). Our pilot study aimed to identify strategies for the development of SF and AAI in farms improving the network with Local Health Units to offer new social and healthcare services in the rural context filling some gaps in the Welfare governance in Veneto Region.

Design

The methodological framework used in our study was the Grounded Theory (GT). GT is useful in the exploration of a dynamic phenomenon in its context and has the characteristic of overlapping the data collection and analysis phases to permit the conceptualization of the theory (Glaser and Strauss 2017).
In this framework, the tools used to explore and understand the sectors of SF and AAI and the opinions of providers and Health Care Service staff were qualitative and based on co-creation principles (Galvagno and Dalli 2014). We interviewed the institutional stakeholders involved (Regional authorities, Local Health Units), and did focus groups with farmers that offer these services. Lastly, we adopted Scenario Workshop methodology clustering collected data in two Scenarios (Andersen and Jaeger 1999). Participants discussed together to identify practical actions to be carried out. The two scenarios were set up using five macro-topics with different issues: law, education, environment, management and economy. The actions identified by the two groups were discussed in a plenary meeting and a shared action plan was established.

Findings

Actions identified by stakeholders to improve the development of SF and AAI in the Veneto Region and its integration with the traditional healthcare and social services for frail categories of citizens were clustered into five steps. Here, we focused on the topic "*education*".
Stakeholders highlighted that training programs provided to farmers by law are insufficient to guarantee the specific knowledge they need both in regional and national legislation. Moreover, they need specific competencies about different categories of users to offer high-quality services.
Local Health Unit staff pointed out also their need for specific training to know deep AAI and SF. Even healthcare professionals with previous positive experiences with SF and AAI services lacked of knowledge about the legal and organizational frameworks of these fields.
For the healthcare professional, continuing education programs could be enforced with these innovative approaches to promote effective "*community medicine*" and prevention, which are theoretical pillars of the Italian National Health Service.
Education and advisory actions are important for the development of AAI and AS sectors because research and legislation alone are not enough to promote the cultural change needed to implement the traditional Health Service. We can recognize this weakness in the Italian healthcare laws that since the '90s have supported the territorial integration of the offer with the social and health needs of people, but cannot face the current gaps of assistance (highlighted also by our interviews with the stakeholders).

Practical Implications

Our study pointed out the lack of advisory and mediation figures in Italy. Researchers of the National Reference Centre for Animal Assisted Interventions and the University of Pisa played this role and acted as facilitators supporting the stakeholders in the networking actions. Participants asked for a mediator and advisory role that have no specific interests in the field and can support the development of the sectors. Moreover, specific training programs addressed to farmers and healthcare professionals need to be provided to standardize the quality of services and encourage networking.

Theoretical Implications

The connection between human health, animal health, and the environment is already well known and the "*One Health*" concept has found its application in the public health service (American Veterinary Medical Association (AVMA) 2008). However, nowadays, new perspectives need to be found and tested in a wider vision of healthcare governance in which the concept of health is extended to those of welfare considering the sustainability of each action from the social and economic point of view. SF and AAI could be the

practical application of a new concept "*One Welfare*" (Pinillos 2018) according to the specific needs of the territories considered, in our case, the Veneto Region.
In Veneto, as well as in other Italian regions, the demographic features of the population are quickly changing, and as a consequence, their needs in terms of social and healthcare services. At the same time, public resources are reducing due to an economic recession phase that is destabilizing the national healthcare service. In this framework, an effective "*community care"* approach in the rural context, with a preventive role for frail people like the elderly or disabled persons seems to be a possible answer.
Our project highlighted how new energy and resources could be found in a circular vision where the diversification of services provided by farmers enhanced the territory with both material and social products engaging the traditional healthcare service. These new perspectives need a cultural change in farmers and healthcare professionals, which can be reached only identifying an advisory and mediation institution able to provide also specific education and training programs.

References

Adinolfi, Paola. 2014. "Barriers to Reforming Healthcare: The Italian Case." *Health Care Analysis* 22(1):36–58. doi: 10.1007/s10728-012-0209-0.
American Veterinary Medical Association (AVMA). 2008. *One Health: A New Professional Imperative*. Schaumburg, IL (USA).
Andersen, Ida-Elisabeth, and Birgit Jaeger. 1999. "Scenario Workshops and Consensus Conferences: Towards More Democratic Decision-Making." *Science and Public Policy* 26(5):331–40. doi: 10.3152/147154399781782301.
Galardi, Morgana, Marta De Santis, Roberta Moruzzo, Franco Mutinelli, and Laura Contalbrigo. 2021. "Animal Assisted Interventions in the Green Care Framework: A Literature Review." *International Journal of Environmental Research and Public Health* 18(18):9431. doi: 10.3390/ijerph18189431.
Galvagno, Marco, and Daniele Dalli. 2014. "Theory of Value Co-Creation: A Systematic Literature Review" edited by E. Gummesson, C. Mele, and F. Polese. *Managing Service Quality* 24(6):643–83. doi: 10.1108/MSQ-09-2013-0187.
Glaser, Barney G., and Anselm L. Strauss. 2017. *The Discovery of Grounded Theory*. New York, USA: Routledge.
Di Iacovo, Francesco, Roberta Moruzzo, Cristiano M. Rossignoli, and Paola Scarpellini. 2016. "Measuring the Effects of Transdisciplinary Research: The Case of a Social Farming Project." *Futures* 75:24–35. doi: 10.1016/j.futures.2015.10.009.
Jarábková, Jana, Marcela Chreneková, and Lukáš Varecha. 2022. "Social Farming: A Systematic Literature Review of the Definition and Context." *European Countryside* 14(3):540–68. doi: 10.2478/euco-2022-0027.
Ministero dell'Economia e delle Finanze. 2022. "Documenti Di Finanza Pubblica." Retrieved (https://www.mef.gov.it/documenti-pubblicazioni/doc-finanza-pubblica/index.html).
Ministero della Salute. 2015. *Interventi Assistiti Con Gli Animali (IAA). Linee Guida Nazionali*. Atti n. 60/CRS del 25 marzo 2015.
Ministero delle Politiche Agricole Alimentari e Forestali. 2018. *Definizione Dei Requisiti Minimi e Delle Modalità Relative Alle Attività Di Agricoltura Sociale*. D.M.12550 del 21 dicembre 2018.
Pinillos, Rebeca García. 2018. *One Welfare: A Framework to Improve Animal Welfare and Human Wellbeing*. Boston, USA: CABI.
Raucci, Domenico, Tomasz Dyczkowski, and Stefano Agostinone. 2021. "'Seeking Performance-Based Accountability in Italian Public Healthcare Organizations.'" *Transylvanian Review of Administrative Sciences* 63 E(63):151–74. doi: 10.24193/tras.63E.8.
Repubblica Italiana. 1978. *L. 883/1978*. GU n.360 del 28 dicembre 1978.
Repubblica Italiana. 1992. *D. L. 502/1992*. GU Serie Generale n.4 del 07 gennaio 1994.
Repubblica Italiana. 1999. *D. L. 229/1999*. GU Serie Generale n.165 del 16 luglio 1999.
Repubblica Italiana. 2015. *L. 141/2015 - Disposizioni in Materia Di Agricoltura Sociale*. GU Serie Generale n.208 del 08 settembre 2015.
Simonato, Martina, Marta De Santis, Laura Contalbrigo, Daniele Benedetti, Elisabetta Finocchi Mahne, Vincenzo Ugo Santucci, Silvio Borrello, and Luca Farina. 2018. "The Italian Agreement between the Government and the Regional Authorities: National Guidelines for AAI and Institutional Context." *People and Animals: The International Journal of Research and Practice* 1(1):1–11.
World Health Organization. 2000. *The World Health Report 2000*.
World Health Organization. 2021. *The European Health Report 2021*.

The potentials of an integrated approach to social sustainability in natural resource management – Swedish experiences from 50 land owner groups

Magnus Ljung, Lars Johansson
Department of People and Society, Swedish University of Agricultural Sciences

Short abstract

Social sustainability is context-dependent and highlights traditions, practices, preferences and places that people want to see maintained or improved. It involves three levels, the individual, the community and the societal. New approaches have been developed and implemented over the last years focusing on ecological and economic sustainability. One of these developed in Sweden is the Land Use Dialogues on local level. The purpose of this study is to describe and critically reflect on how the Land Use Dialogues and similar approaches to facilitate changes in land use management might contribute to and strengthen the social sustainability on both individual, community and societal level simultaneously. Analysing over 50 farmer groups, involving more than 500 participants and involving 5.000 hectares of land, shows the importance of approaching social sustainability as multifaceted. This study argue for an integrated perspective on social sustainability, and that if we develop and use good working approaches, it might lead to; a) increased meaningfulness and strengthened self-esteem and self-confidence (individual level), b) strengthened relationships and social capital (community level), and c) increased responsibility and strengthened legitimacy for society's institutions (societal level).

Extended abstract

Purpose

Background

Sustainable development requires an integrated perspective. Today it is about enabling a green, bio-based and social economy. Above all, in the political sphere, sustainable development is not only seen as achieving a balance between three independent pillars (economic, social and ecological sustainability), but social sustainability is described as the goal, ecological sustainability constitutes framework conditions (cf. planetary boundaries) and the economy is seen as a tool to achieve this (Alfredson & Wijkman, 2014).

This perspective has subsequently been popularized in descriptions of sustainable development such as "the donut economy" (Raworth, 2017). This economic model puts twelve basic social goals at the centre, which reflect the global sustainability goals (SDG) (United Nations, 2015). In order to connect to Agenda 2030, such approach has a development perspective on social sustainability. That is, social sustainability is not a fixed state, but understood in its context and from cultural, historical and transformative perspectives.

Defining social sustainability

There are several different definitions of social sustainability in the literature (Partridge, 2014). The subject is not free from either political ideologies or current policy discussions, and different scientific disciplines deal with social sustainability based on their respective subject and methodological frameworks (psychology, anthropology, economics, sociology, etc.). Vallance et al (2011, p 346) concludes that "*ubiquitous references to social sustainability have created a rather messy conceptual field in which there is a good deal of uncertainty about the term's many meanings and applications*". Social sustainability is often considered as the least developed dimension of sustainability, and analysis of literature shows a great need for further development of the social aspects of sustainability (Missimer, 2013). Colontanio et al (2009) argues that the concept of social sustainability has been under-theorized or often oversimplified in existing theoretical constructs, resulting in that different authors or policy makers derive their own definition according to discipline-specific criteria or study perspectives, making a generalized definition difficult to achieve.

The conclusion is that research and practice are still searching for a definition of social sustainability that is general enough to be applied independently of contextual, spatial and temporal boundaries, but which is at the same time concrete enough to guide decision-making and supporting measures so that we move in a more sustainable direction.

A place-based perspective on social sustainability

Social sustainability is context-dependent and highlights traditions, practices, preferences and places that people want to see maintained or improved. A place-based perspective on social sustainability is therefore about how social and cultural qualities as well as the natural environment are maintained over time, and it stresses that it is the everyday actions that ensure these qualities. Strong forces of change, major changes or external demands are often experienced as a threat. Questions about social acceptance of new policies or instruments become of central importance (see e.g. Assefa and Frostell, 2007).

A place-based and process-oriented perspective on social sustainability is in line with research and experiences on what constitutes successful multi-actor collaboration within natural resource management (Ljung, 2021). It is about involving several different perspectives, managing complexity and uncertainty, building trust through participation and getting support from others to initiate and implement measures (van Epp & Garside, 2019; De Kraker, 2017). Furthermore, it is an iterative process. Cooperation between for instance landowners, animal keepers and other stakeholders requires continuity, the opportunity to test and refine measures taken (Beers et al, 2016; Basson et al, 2018). The goal may be to create a locally anchored learning community ("communities of practice") that feel a shared responsibility for the continued administration and that support each other when necessary (McDonagh & Tuulentie, 2020; Blackmore, 2019; Pereira et al, 2018).

This is strongly reminiscent of the methodology that has been developed in recent years and is labelled Land Use Dialogues (Naturbruksdialog) and Land Use Plans (Naturbruksplan) (Johansson & Skalstad, 2021) in Sweden. This methodology has so far involved more than 50 groups of landowners, approximately 500 individual participants and led to new management strategies for over 5,000 hectares (mainly high nature value farming). Although the main focus in these processes have been to improve the ecological and economic sustainability by changing land use, the importance of social sustainability has become more and more obvious for all involved actors.

The purpose of this study is to describe and critically reflect on how the Land Use Dialogues and similar approaches to facilitate changes in land use management might contribute to and strengthen the social sustainability on both individual, community and societal level simultaneously.

To support each level of social sustainability might be difficult enough, but how to create synergies in a process of change, might be more challenging.

Design/methodology/approach

This research has evolved over a decade. Development of new approaches and the early application of Land Use Dialogues was made by advisors as part of their development work. When the emerging methodology became part of a larger EU-funded project, the Swedish University of Agricultural Sciences got involved and were able to both contribute to and study the ongoing work. Today there are more than 50 land-owner groups working, both within agriculture, forestry and water management. They are all approaching their challenges using the same methodology, and with the facilitative support of advisors – Land Use Dialogues.

The overall research design is based on action research (following the approach described by Ljung, 2001), where the two authors also are engaged in working with these groups and other stakeholders. By documenting all activities, facilitating meetings and analysing outcomes in terms of Land Use Plans, we have developed an empirical understanding of both what it takes to succeed and the limitations of the methodology. This study focus solely on the social aspects of sustainability, although the outcomes and content are much broader than so.

The field work has been complemented with bibliographic work. Bibliographic searches were made in the scientific database Scopus, but supplemented with the search engine Google Scholar. Initial searches with "social sustainability" together with the concepts and various combinations of the same "agriculture", "farming", "grazing", "semi-natural grassland", "pasture", "animal production", "husbandry", "biodiversity" , "farmer", "swedish" and "sweden" showed a limited outcome, but also that the focus of these studies was generally held and lacked new empirical evidence. Therefor the search was broadened by combining the original concepts with other concepts, e.g. "quality of life", "well-being", "recognition", "social capital", "network", "farm economy" and "viability". An extensive amount of literature that in various ways touched on social sustainability in agriculture emerged.

Findings

The complementary literature review concludes that there are some recurring themes among existing studies. One conclusion is that loneliness and vulnerability are problems that needs to be managed. Dysfunctional external relations reflects the impact of the abstract social system on which the farm business depend, but which can create a feeling of helplessness. At the same time, studies show that farmers fundamentally enjoy their work tasks and the freedom they have. If farmers have good contacts with colleagues, authorities and/or consumers, they get the connections that make certain social sustainability problems less prevalent. In addition, social cohesion can lead to reduced vulnerability with regard to work environment and other risks, and a more positive societal image of farming in itself creates attractiveness that makes future recruitments and the will to continue farming stronger.

The action research and field study of farmer groups support the findings from the literature, but complement and elaborate these aspects in more detail. At the individual level, factors that have to do with basic human needs, quality of life, identity and place belonging ("sense of self in place"), continuity (historical, cultural, etc.), autonomy, freedom, self-realization, notions of freedom of action, stewardship, as well as self-image, self-esteem and self-confidence (which are impacted by e.g. society/media), were stressed as crucial by the land-owners.

On a more relational or community level, factors that describe the social context were also mentioned. This was about access to significant others (closeness, life partner, family, co-workers, etc), social safety net and psychosocial work environment, counselling, the treatment by administrative staff in local and regional authorities (trust and confirmation), but also status (e.g. being perceived as a good manager by tending natural pastures, ie. the ‘good farmer’ perspective). Other central concepts on a more relational level were social capital (for example the reciprocity that makes you trust other people in society), as well as "community capital", i.e. the collective resources of the local community (structures and processes). Central to the community level of social sustainability are the relationships people have with each other (in social networks or in a village).

At the societal level, above all, socio-economic aspects of social sustainability were mentioned by the land-owners. These are all aspects of social sustainability that have been discussed a lot in recent years due to the development of agriculture at large. This was about structural transformation processes (e.g. depopulation and closure of social services), socio-economic factors, access to competence, advisors and other parts of the AKIS, participation and social legitimacy (decisions made by authorities should be rational, seen as sound and based on the participation of those concerned), etc. The core of the societal level of social sustainability is the supporting structures that enable people to fulfil their desired life plans, but also the legitimacy of society's institutions.

All the identified dimensions of social sustainability are ideally taken into account when facilitating processes of change in agriculture. The aim of this study was to analyse if a new approach, Land Use Dialogues (Naturbruksdialog), has proven to enable such processes. In general, our conclusion is that this is the case, but only if the right preconditions for this facilitation exist. Such preconditions is about experience and competence, funding for the resource persons as well as specific measures, mandate, and normative support from core organisations. But if these preconditions exists, there is a great potential to make important changes both socially, ecologically and economic.

The individual level of social sustainability is mainly about meaning making. Within the Land Use Dialogues the farmers are given the opportunity to formulate their own visions, goals and understanding of the situation, but also to be part of social contexts where they have influence, get recognition, are met with respect and can learn new things. All important conditions for social sustainability. By becoming aware of the importance of their own local context, incl natural resources, and how their own decisions regarding land use actually influence their perceived quality of life, their understanding of, for example, biological diversity and aesthetic has also been seen to grow.

In order to feel well and secure in their work, many farmers would benefit from participating in more social communities – colleagues, networks, but also contexts that support them to develop their businesses and learn from and support each other. The Land Use Dialogues have strengthened the social cohesion locally and have helped build various forms of capital (social, relational, community based, etc). Building on the unique local context and its strengths (values), and by facilitating the interaction between relevant actors, who can contribute in different ways to a positive development, increased social sustainability has been supported.

Finally, a weak social legitimacy for public institutions have become an increasing problem. The Land Use Dialogues has shown that by involving local and regional (or even national) authorities, their legitimacy has increased locally. By engaging authorities in new ways, emphasising their importance in supporting desired and feasible changes, we have seen an increased interest to involve them also in other processes, reflecting that trust has been built. An aspect of social sustainability that will be increasingly important in future processes of transformative change.

Analysing over 50 farmer groups and their ongoing work shows the importance of seeing social sustainability as something multifaceted and which is about both personal development, social community and participation in society at large. This study shows the importance of having an integrated perspective, and that if we develop and use good working methods, this leads to:

- Increased meaningfulness and strengthened self-esteem and self-confidence (individual level)
- Strengthened relationships and social capital (community level)
- Increased responsibility and strengthened legitimacy for society's institutions (societal level)

Land Use Dialogues put the person, the place and the process in focus, with the aim of strengthening the meaningfulness for the landowner/farmer, creating a social context and showing that authorities and other actors are serious about new ways of working. Such processes will be able to contribute to social sustainability at all levels simultaneously.

Practical implications

This research project has resulted in some general recommendations for policy makers.

1. *Prioritize resources for facilitators who can initiate and manage local processes*

It is important that there are people who have the mandate and resources to initiate, plan and facilitate Land Use Dialogues. The important thing is the function rather than exactly where these people have their affiliation in today's AKIS, and there must be financial resources and competence to be able to take the role, being able to work on different geographical scales and places.

2. Create a forum to discuss social sustainability with greater nuance

The agricultural sector should learn from the urban development sphere when it comes to working with social sustainability more analytically, consciously and with greater richness of nuance. A first step should be to create a special forum to talk about what social sustainability in agriculture is and how it should be tackled.

3. Focus on social sustainability to reach other goals (environmental, economic, etc)

By putting an integrated perspective on social sustainability in focus, and organising processes aiming to strengthen all dimensions, we have seen that other goals are easier to reach. By building trust, learn together, build social capital etc., we create preconditions for environmental measures and farm viability.

Theoretical implications

1. Further studies of social sustainability in agriculture are needed

There is a lack of scientific studies of social sustainability in (Swedish) agriculture. In addition, some are based on very few interviews, while others do not include new empirical data. This means that the knowledge base is very thin. Especially when it comes to relationships and connections between different aspects of social sustainability and to the other pillars of sustainable development.

2. Validation of new working methods for strengthened social sustainability

From a research perspective, there is a need for empirical validation. We need to investigate in more depth whether the working methods and efforts proposed here are applicable, understandable, relevant and in support of the actors who work to develop sustainable production systems. It has not yet been studied what the long-term results of different alternative strategies and working methods will be. It will require a rigorous research approach, but it is an important next step in validating and improving the conceptual models we might want to implement.

References

Alfredsson, E. & Wijkman, A. 2014. *The Inclusive Green Economy: Shaping society to serve sustainability – Minor adjustments or a paradigm shift?* Mistra, Stockholm.

Assefa, G. & Frostell, B. 2007. Social sustainability and social acceptance in technology assessment: a case study of energy technologies. *Technology in Society* 29, 63–78.

Basson, M., van Rensburg, H., Cuthill, M. & Erdiaw-Kwasie, M.O. 2018. Is Regional Government-Governance Nexus Delivering on Social Sustainability Promises? Empirical Evidence from Moranbah in Australia. *Local Gov. Stud.*, 44, 826–847.

Beers, P.J. van Mierlo, B. & Hoes, A.-C. 2016. Toward an Integrative Perspective on Social Learning in System Innovation Initiatives. *Ecology and Society*, 21, 33.

Blackmore, C. (Ed.) 2010. *Social Learning Systems and Communities of Practice*. London, UK: Springer.

Colantonio, A., Dixon, T., Ganser, R., Carpenter, J. & Ngombe, A. 2009. *Measuring Socially Sustainable Urban Regeneration in Europe*. Oxford Institute for Sustainable Development (OISD), School of the Built Environment. Oxford Brookes University.

De Kraker, J. 2017. Social Learning for Resilience in Social–Ecological Systems. *Curr. Opin. Environ. Sustain.*, 28, 100–107.

Johansson, L. & Skalstad, B. 2021. *Naturbruksdialog och naturbruksplan*. Presentation på Naturvårdsverkets webinarium om samverkan om hållbart nyttjande i odlingslandskapet. 2021-10-06.

Ljung, M. 2001. *Collaborative learning for sustainable development of agri-food systems*. Department of Landscape planning, Swedish University of Agricultural Sciences. PhD thesis.

Ljung, M. 2021. *Leadership manual. Building trust in cross-sector local water management*. Report in the Interreg-project "Water driven rural development in the Baltic Sea Region" Nr. R094 WATERDRIVE.

McDonagh, J. & Tuulentie, S. (Eds). 2020. *Sharing Knowledge for Land Use Management. Decision-Making and Expertise in Europe's Northern Periphery*. Cheltenham, UK: Edward Elgar Publ.

Missimer, M., 2013. *The Social Dimension of Strategic Sustainable Development*. Licentiate Dissertation. Blekinge Institute of Technology.

Partridge, E. 2014. Social sustainability. Michalos, A. (Ed). *Encyclopedia of Quality of Life and Well-Being Research*. London, UK: Springer.

Pereira, L.M.; Karpouzoglou, T.; Frantzeskaki, N.; Olsson, P. 2018. Designing Transformative Spaces for Sustainability in Social-Ecological Systems. *Ecol. Soc.*, 23, 32.

Raworth, K. 2017. *Doughnut Economics: Seven ways to think like a 21st century economist*. London, UK: Penguin Random House.

United Nations. 2015. *Transforming our World: The 2030 Agenda for Sustainable Development*. New York.

Vallance, S., Perkins, H.C. & Dixon, J.E. 2011. What is social sustainability? A clarification of concepts. *Geoforum*, 42, 342–348.

van Epp, M. & Garside, B. 2019. Towards an Evidence Base on the Value of Social Learning-Oriented Approaches in the Context of Climate Change and Food Security. *Environ. Policy Gov.*, 29, 118–131.

Theatre-Based Behaviour Change Intervention as an Agricultural Extension Tool for Farm Health, Safety and Wellbeing Training for Farmers

Sinead Flannery, Anne Markey
School of Agriculture and Food Science, University College Dublin, Belfield, Dublin 4, Ireland

Short abstract
The purpose of this paper is to design, test, and evaluate a novel theatre-based intervention for addressing farmers' knowledge, attitude, and intended behaviour with respect to farm health and safety.
The study consisted of two research phases: (i) development and roll-out of farm health and safety training; (ii) evaluation of training using a KAB (knowledge-attitude-behaviour) survey. The intervention was designed based on a survey (n=647 respondents) and focus groups (n=15 participants). The training was delivered to farmers using two different modes of delivery: (i) live theatre performance and discussion; (ii) pre-recorded theatre performance delivered via Zoom and virtual discussion.
Farmers' knowledge, attitude, and intended behaviour with respect to vulnerable groups, stress and time management, farmer mental health and wellbeing, and management of hazards/risks on farm increased after participation in training. The difference in before and after knowledge, attitude, and intended behaviour was greater following participation in the live theatre performance, with a greater difference in intended behaviour change over farmers' knowledge and attitude. Hence, there appears to be an opportunity to influence change in farmers' behaviour through the medium of theatre as an educational approach.

Extended abstract

Purpose

The purpose of this paper is to design, test, and evaluate a novel theatre-based intervention for addressing farmers' knowledge, attitude, and intended behaviour with respect to farm health and safety. Farming is one of the most dangerous occupations, with higher work-related fatalities, injuries, and illnesses compared to any other economic sector. Over the past decade, in Ireland, 42% of work-related fatalities occurred in agriculture (HSA, 2021). Across all other economic sectors fatality rates have declined while the number of fatalities in agriculture have increased. Hence, farming is a high-risk industry and priority must be given to safety, health, and welfare on farms. Historically, occupational safety and health interventions in agriculture have focused on increasing awareness of occupational hazards and risks and health and safety legislation (Cole, 2000; Cole, 2002; Petrea, 2001). However, raising awareness alone is not sufficient to influence behaviour change. A change in farm operations and individual behaviours is required to reduce work-related injuries and illnesses (McCallum et al., 2022). Thus, the aim of this paper was to develop and test a novel intervention which could address health and safety behaviours through the voices of farmers in rural communities. Theatre was chosen as an innovative, non-traditional educational approach in the delivery of health and safety training to farmers. The approach engages farmers in discussions around farm health and safety in a nonthreatening, casual setting supportive of change.

Drama has been used to promote health for many years while research suggests farmers prefer to receive health and safety information through personally relevant stories (Cole, 2002; Rose et al., 2018). Farmers respond positively to social interactions, theatre, and peer-to-peer interactions (Reed and Claunch, 2017), hence theatre as an innovative approach to the delivery of farm health and safety training was deemed appropriate. The KAP (knowledge-attitude-practice) theory, also found in the literature as KAB (knowledge-attitude-behaviour), divides the process of human behaviour change into three steps: (i) knowledge acquisition; (ii) generation of attitudes; and (iii) formation of behaviour (Fan et al., 2018). The theory states behaviour change is affected by knowledge and attitude (Xu et al., 2010). Knowledge acquisition may result in changes in attitudes which in turn can lead to changes in behaviour (Sas et al., 2021). The theory suggests knowledge is the foundation of behaviour change while attitudes are the driving force of behaviour change (Fan et al., 2018). KAP theory has been widely applied in educational intervention design across many disciplines including agriculture (Liao et al., 2022). Individual intention to change behaviour is increased when attitude towards a behaviour is positive and the individual believes the behaviour is possible and helpful (Ajzen, 2011). Previous farm health and safety interventions have promoted knowledge exchange without addressing attitudes within a social context resulting in lowly effective training with regard to changing farmer behaviour (Cole, 2000; Cole, 2002). Therefore, it was important within this paper to design an intervention which supported changing perception of social norms through group processes and engaged discussions. The theatre approach supported this as farmers identified with real stories depicted by theatre, harnessing farmers' affinity towards storytelling. Farmers processed new information within the context of existing knowledge and experience which is supportive of experiential learning.

Design/Methodology/Approach

This study consisted of two research phases: (i) development and roll-out of farm health and safety training; (ii) evaluation of training using a KAB (knowledge-attitude-behaviour) survey. Participants were randomly selected from a target population of cooperative members/suppliers located in the South-West of Ireland. The target population consisted of adult farmers of any age and gender, inclusive of all farming enterprises and sizes. The intervention was designed based on a survey (n=647 respondents) and subsequent focus groups (n=15 participants) which guided the development of the theatre script for the training. Four key farm health, safety and wellbeing themes emerged from the survey and focus group data collected: (i) vulnerable groups; (ii) stress and time management; (iii) farmer mental health and wellbeing; and (iv) management of hazards/risks on farm. The script developed incorporated these four themes and comprised of four scenes, each 10-15 minutes in length, allowing time for discussion after each scene. While some of the incidents and issues presented in the four scenes were sensitive (i.e. stress, generational renewal, mental health, etc.), humour was permeated throughout the script, providing a relaxed, non-threatening learning environment. The training was delivered to farmers using two different modes of delivery: (i) live theatre performance and discussion; and (ii) pre-recorded theatre performance delivered via Zoom and virtual discussion. The two different modes of delivery were evaluated for effectiveness and impact using a KAB survey in the form of a semi-structured questionnaire. A retrospective pretest-posttest (RPP) design was applied to support the simultaneous collection of pre- and post-test data. The questionnaire was administered at the posttest stage (i.e. immediately after the training was delivered). Participants were asked to report their current knowledge, attitudes, and intended behaviours after completing the training, and, at the same time, retrospectively report what their knowledge, attitudes, and intended behaviours were before completing the training.

Findings

Two research phases: (i) development and roll-out of farm health and safety training; (ii) evaluation of training using a KAB (knowledge-attitude-behaviour) survey, led to the design, development, and evaluation of a novel theatre-based intervention for addressing farmers' knowledge, attitude, and intended behaviour with respect to farm health and safety.

Research Phase I

Four key farm health, safety and wellbeing themes emerged from the survey and focus group data collected: (i) vulnerable groups; (ii) stress and time management; (iii) farmer mental health and wellbeing; and (iv) management of hazards/risks on farm.

I. Vulnerable Groups

Farms are a high risk environment for children, young persons, elderly, and other vulnerable groups. 56% of respondents in this study allowed up to three child safety practices which are not permitted under road traffic legislation, safety legislation, or code of practice. The most common practice permitted by respondents was allowing children under 7 years of age a ride on a tractor. Within the focus groups, participants acknowledged the farm is often both a workplace and a home making it difficult to maintain boundaries:

"Our children sometimes are used as labour units when they come back from school and we think when they're twelve years old they're capable of being as good as ourselves (Focus Group Participant)*".*
Over a quarter of respondents have elderly people (i.e. >65 years of age) working on their farm (29.2%) while one-third of older farmers who responded to the survey potentially do not consider themselves as older. 37.8% of respondents who were >65 years of age said there was no one >65 years working on the farm. Additionally, over half of respondents (56%) agreed their ability is compromised with ageing.

II. Stress and Time Management

Interestingly, the biggest obstacle to implementing safety measures on farm in this study was 'other priorities keeping a busy farm going' (49%). Often the perception is financial obstacles are the biggest barrier to investing in safety measures on farm, however, this was not the case in this study. Worryingly, 49% of respondents always or regularly feel their isn't enough time and they are constantly chasing their tail. While 46% always or regularly feel overwhelmed with the amount of work they have to get through. A participant within the focus groups commented specifically on this finding:

"What's frightening to me is to think that you have six hundred and forty farmers responded and thirty-six of them feel overwhelmed every day of the week. Now that's just frightening to me (Focus Group Participant)*".*

These findings suggest farmers are under pressure and potentially over-worked which raises concerns in terms of farmer wellbeing and overall farm safety.

III. Farmer Mental Health and Wellbeing

Within this study, 17% of respondents always or regularly feel isolated and no one would understand what they are going through. The study found farmers' feelings of chasing their tails, being overwhelmed, and isolated are all interrelated. As feelings of being overwhelmed increased so did feelings of chasing their tails and feelings of isolation. Approximately 4% of the study population appeared to be struggling without support which, when compared to the national population of farmers in Ireland, equates to approximately 720 dairy farmers nationally or approximately 5500 farmers nationally. Additionally, a surprising 43% of respondents do not have a hobby that makes them leave their farm at least once a week. Evidently, there are significant challenges emerging in relation to farmer mental health and wellbeing with 86% of respondents suggesting a tailor-made support service for farmers experiencing difficulties within their mental health is required. Focus group participants however suggested farmers' mental health is an: *"..incredibly personal thing. Farmers by their very nature are very, very conservative people* (Focus Group Participant)*"* with participants acknowledging that farmers: *"..are very slow to display what they view as weaknesses..* (Focus Group Participant)*".*

IV. Management of Hazards/Risks on Farm

Findings suggest farmers are aware of physical hazards/risks on farm but yet they still take risks. 55% of respondents agreed to undertaking jobs on farm alone they know they should have help with, particularly related to livestock safety (87%). There is an acceptance of risk on farm with 41% agreeing 'farms are, by their very nature, a dangerous workplace and there is always risk'. It was identified that those not taking risks have fewer accidents compared to those taking risks, completing jobs they know they should have help with. A sizeable proportion of the sample population in this study had been involved personally in a farm accident previously (24%). Participants in the focus groups acknowledged that safety often only becomes a priority after a near miss or accident:

"It only becomes a priority for me anyway when I see something, a near miss, and you say I have to do something about that before somebody gets seriously hurt or killed (Focus Group Participant)*".*

Each of the four themes identified from the survey and focus group data informed the development of the theatre script for the training delivered to farmers which was subsequently evaluated post-delivery. The script developed incorporated the above four themes and consisted of four scenes, each 10-15 minutes in length. The script was entitled 'The Clock's Ticking' and was delivered to farmers using both live (in-person) and virtual (Zoom) settings.

Research Phase II
This study examined change in farmers' knowledge, attitude, and intended behaviour as a result of participating in farm health and safety training, delivered using theatre as the educational approach. The study found that for both live and pre-recorded theatre performance via Zoom, farmers' knowledge, attitude, and intended behaviour with respect to vulnerable groups, stress and time management, farmer mental health and wellbeing, and management of hazards/risks on farm increased after participation in training when compared to their retrospective reporting on their before training knowledge, attitude, and intended behaviour (Figure 1). The difference in before and after knowledge, attitude and intended behaviour was greater following participation in the live theatre performance compared to the pre-recorded theatre performance via Zoom. Finally, there was a bigger difference between before and after reports for intended behaviour change compared to the difference for farmers' knowledge and attitudes.

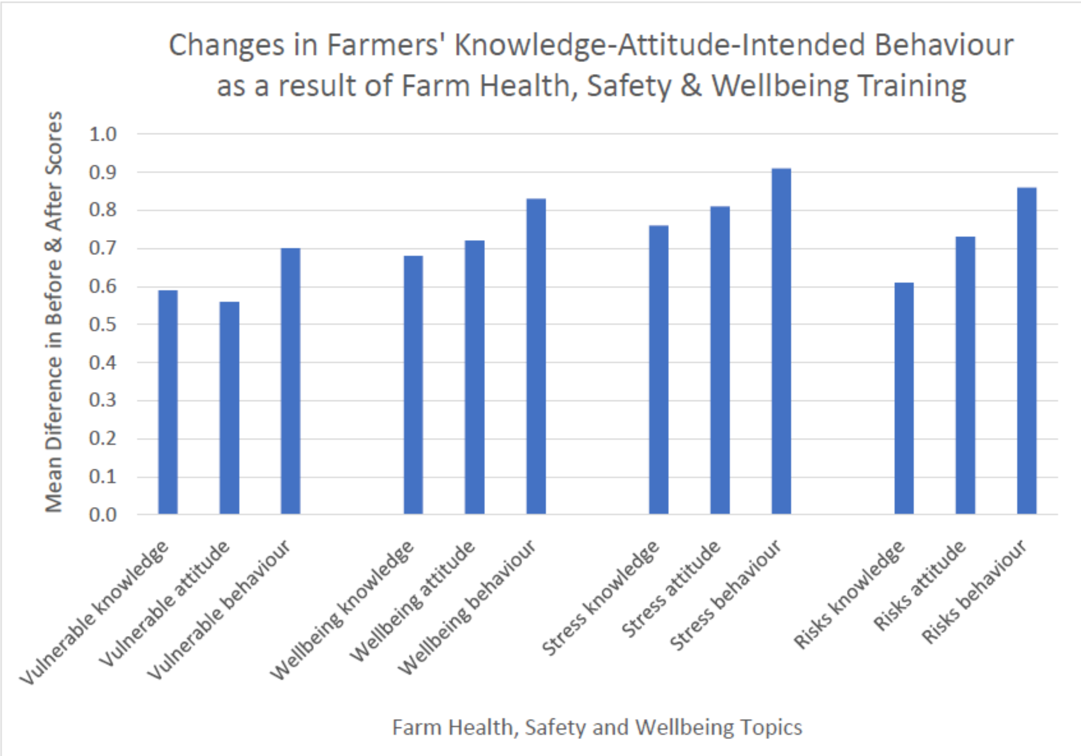


Figure 1: Mean difference between before and after knowledge, attitude and intended behaviour scores (1-4) for farmers participating in farm health, safety and wellbeing training for four health and safety topics (n=108)

Previous research suggests farmers have a preference for health and safety training delivery through personally relevant stories as opposed to the traditional, impersonal written materials (Cole, 2002; Reed and Claunch, 2017; Rose et al., 2018). This study supports this as farmers responded positively to the innovative, non-traditional educational approach (i.e. theatre) used in the delivery of farm health, safety and wellbeing training. The findings suggest farmers are somewhat aware of the hazards and risks present on farm given the smaller difference in before and after reporting of knowledge, however, there appears to be an opportunity to influence change in farmers' behaviour through the medium of theatre as an educational approach. The intended behaviour changes reported within this study have the potential to reduce risks of injury/illness and improve the overall safety, health and wellbeing of farmers in the long-term. Thus, future research should include a follow-up assessment to determine actual change in farmer behaviour as a result of participating in the training. Such an assessment was beyond the scope of this study.

Practical Implications

There is evidence to suggest that some behaviour change is likely to occur as a result of farm health and safety training delivered through the medium of theatre. Therefore, agricultural extension services should empower farmers and agricultural communities to improve their overall safety, health, and wellbeing through the provision of farm health and safety training using theatre as the medium. A move away from the traditional extension methods of lectures, brochures, and instructional videos towards a forum which supports farmers and their families in addressing health, safety and wellbeing issues is recommended.

Theoretical Implications

This study used the knowledge, attitude, and behaviour (KAB) model to examine farmers' knowledge, attitude, and intended behaviour with respect to farm health, safety and wellbeing both before and after training delivery. Evidence suggests farmers are aware of hazards and risks on farm, however, there is an opportunity to influence change in farmers' behaviour through the medium of theatre as an educational approach. Accordingly, theatre as an agricultural extension tool provides a robust model for improving the overall safety, health and wellbeing of farmers in the long-term. Previous farm health and safety studies have focused on promoting knowledge exchange interventions, without addressing attitudes within a social context, resulting in lowly effective training with regard to farmer behaviour change. This paper addresses this gap as the theatre-based intervention addresses attitudes within a social context. The KAB model provides a structured approach for measuring effectiveness and impact of theatre-based interventions. This paper elucidates the value of theatre-based interventions as agricultural extension tools over the traditional, impersonal written materials. Farmers resonate with personally relevant stories. In summary, the findings provide unique insights into how agricultural extension services can mediate hazards and risk and contribute to farmers' overall safety, health and wellbeing using theatre-based interventions. Sustained translation from research to practice can be accomplished through theatre-based interventions.

References

Ajzen, I. (2011). The theory of planned behaviour: Reactions and reflections. Taylor & Francis.

Cole, H. (2000). Knowledge is not enough.

Cole, H. P. (2002). Cognitive–Behavioral approaches to farm community safety education: a conceptual analysis. *Journal of Agricultural Safety and Health,* 8 (2).

Fan, Y., S. Zhang, Y. Li, Y. Li, T. Zhang, W. Liu and H. Jiang (2018). Development and psychometric testing of the Knowledge, Attitudes and Practices (KAP) questionnaire among student Tuberculosis (TB) Patients (STBP-KAPQ) in China. *BMC infectious diseases,* 18 (1).

HSA, (2021). *A Review of Work-Related Fatalities in Agriculture in Ireland 2011-2020* [Online]. Health and Safety Authority (HSA). Available: https://www.hsa.ie/eng/publications_and_forms/publications/agriculture_and_forestry/a_review_of_work-related_fatalities_in_agriculture_in_ireland_2011-2020.html [Accessed 20th July 2022].

Liao, X., T. P. L. Nguyen and N. Sasaki (2022). Use of the knowledge, attitude, and practice (KAP) model to examine sustainable agriculture in Thailand. *Regional Sustainability,* 3 (1).

McCallum, D. M., D. B. Reed, D. T. Claunch, C. M. Davis and M. B. Conaway (2022). Farm Dinner Theater: testing an innovative health and safety intervention among older farmers and their families. *The Journal of Rural Health,* 38 (2).

Petrea, R. E. (2001). The theory of planned behavior: use and application in targeting agricultural safety and health interventions. *Journal of agricultural safety and health,* 7 (1).

Reed, D. B. and D. T. Claunch (2017). Moving social work norms via theater for senior farmers. *Journal of safety research,* 60.

Rose, D. C., C. Keating, E. Vrain and C. Morris (2018). Beyond individuals: Toward a "distributed" approach to farmer decision-making behavior. Wiley Online Library.

Sas, M., G. Reniers, K. Ponnet and W. Hardyns (2021). The impact of training sessions on physical security awareness: Measuring employees' knowledge, attitude and self-reported behaviour. *Safety science,* 144.

Xu, W., G. Sun, Z. Lin, M. Chen, B. Yang, H. Chen and K. Cao (2010). Knowledge, attitude, and behavior in patients with atrial fibrillation undergoing radiofrequency catheter ablation. *Journal of interventional cardiac electrophysiology,* 28 (3).

Session 5B – Occupational health, safety and well-being

Managing Stress on the Farm

Suzanna Windon, Carolyn Henzi
The Pennsylvania State University

Short abstract

Previous studies found that higher levels of psychological stress, depression, and anxiety in farmers negatively affect their personal life and agriculture (Rudolphi et al., 2020). Increased stress levels are associated with severe occupational accidents, poor health, farming turnover intention, depression, and in more severe cases, farmers' suicide (Dudensing et al., 2017). It is important to build resilience among farmers that help them overcome experiences of adversity (Grotberg, 1997, p.13). This study explored farmers' stress during the COVID-19 pandemic and how it relates to farmers' demographic variables. We used a convenience sample approach and an online survey for data collection. We reported data from 186 goat and sheep producers. The mean score of the overall occupational stress was 3.11 (SD = .65) and personal stress 2.80 (SD =.82). The work hours during the busy season and farm size were significant predictors of farm stress during COVID-19. Extension professionals can design stress management workshops for farmers.

Extended abstract

Purpose and Context

Previous studies found that higher levels of psychological stress, depression, and anxiety in farmers negatively affect their personal life and agriculture (Rudolphi et al., 2020). Increased stress levels are associated with severe occupational accidents, poor health, farming turnover intention, depression, and in more severe cases, farmers' suicide (Dudensing et al., 2017). It is important to build resilience among farmers that help them overcome experiences of adversity (Grotberg, 1997, p.13). McElrone et al. (2022) found that farmers experienced higher stress following needs such as housing, food insecurity, utilities, childcare, and finances during the pandemic. In addition, the COVID-19 pandemic increased uncertainty because it was an unexpected and unpredictable global health issue. Previous findings revealed that farmers with small and medium farms experience higher stress due to limited profit from their farm operations. Large farm operators have employees they trust who can take breaks or time off, helping to reduce stress (Greenhill et al., 2009). Small and medium farmers usually live and work on the same land, with fewer farm workers, higher workloads, and farm responsibilities (Greenhill et al., 2009). This study aims to explore perceived farmers' occupational and personal stress amidst the COVID-19 pandemic. Also, it describes the relationships between overall farmers' stress and demographic variables such as farmers' age, tenure, work hours during a busy season, and farm size.

Design/Methodology/Approach

The target population for our study was 3000 Pennsylvania farm operators registered on the Pennsylvania University State Extension database, who were mainly goat and sheep producers. Our study used a census approach and followed Dillman et al. (2014) online data collection technique. We invited farmers to participate in our voluntary online study. We sent four email reminders to collect data. Data collection occurred in the spring of 2021. The response rate was 10% (n= 332). The final data set comprised 186 responses after cleaning the data. This study used a two-scale instrument to measure farmers' stress. The first scale is *Farmers' Occupational Stress,* and the second is *Farmers' Personal Stress*. The Cronbach Alpha coefficient for the occupational stress scale was .84, including the on-farm stress level subscale at .79 and the off-farm scale at .74. The Cronbach Alpha coefficient for the personal stress scale was .81.

Findings

The overall mean score for occupational stress was 3.11 (SD = .65, n =186). Mean score of on-farm stress was 3.07 (SD = .67, n=186); off-farm stress was 3.18 (SD = .81, n =186). The mean score of the overall occupational stress was 3.11 (SD = *.65*). The mean score of the overall on-farm stress was 3.07 (SD = .67). The higher score was among the following factors of on-farm stress levels: unbalanced workload, worrying about the farm business in the future, and financial issues on the farm. The mean score of the overall off-farm stress was 3.18 *(SD* = .81). The higher score was among the following off-farm stress factors: governmental regulation, the market price for agricultural commodities, and unpredictable weather conditions. A multiple linear analysis showed that demographic variables predicted a significant proportion of the total variation of 11.3% in overall farmers' stress, F (4, 194) = 6.152, p < .001. The strongest predictors of overall farmers' stress were work hours during the busy season (β = .160; p-value < .001) and farm size (β = .246; p-value = .002). Farmers' age and tenure in farming were not significant factors in the overall farmers' stress.

Implications

Previous studies recognized the importance of building resilience and coping skills (Stier-Jarmer et al., 2020; Walker & Walker, 1987). Rudolphi et al., 2020 suggested supporting farmers by offering opportunities for educational interventions. Extension educators should design farmers' stress-prevention programs that teach farmers to implement practical strategies that help to reduce occupational stress and cope with tough times. The education curriculum should include balancing workload during busy seasons, farm finance, and business planning. Also, the curriculum should contain resources related to the governmental support of agricultural commodities and producers, including information about agricultural market price regulation.

References

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method*. John Wiley & Sons.

Dudensing, R., Towne, S., & McCord, C. (2017). Preventing farm-related stress, depression, substance abuse, and suicide. *Surviving the Farm Economy Downturn*, pp. 84-86. https://www.afpc.tamu.edu/extension/resources/downturn-book/chapters/20-Preventing-Farm-related-Stress-Depression-Substance-Abuse-and-Suicide.pdf

Grotberg, E.H. (1997). The International Resilience Project. Presented at the International Council of Psychologists conference, Graz, Austria. Retrieved March 19, 2004, from http://resilnet.uiuc.edu/library/groy98a.html.

Greenhill, J., King, D., Lane, A., & MacDougall, C. (2009). Understanding resilience in South Australian farm families. *Rural Society*, *19*(4), 318–325. https://doi.org/10.5172/rsj.351.19.4.318.

McElrone, M., Russomanno, J., & Wroth, K. (2022). A pilot study assessing the impacts of COVID-19 on Tennessee farmers' social needs and pandemic-related anxiety. *Journal of Agriculture, Food Systems, and Community Development*, *11*(3), 1–11. https://doi.org/10.5304/jafscd.2022.113.009

Rudolphi, J. M., Berg, R. L., & Parsaik, A. (2020). Depression, Anxiety, and Stress Among Young Farmers and Ranchers: A Pilot Study. *Community Mental Health Journal*, *56*(1), 126–134. https://doi.org/10.1007/s10597-019-00480-y

Stier-Jarmer, M., Oberhauser, C., Frisch, D., Berberich, G., Loew, T., Schels-Klemens, C., ... & Schuh, A. (2020). A multimodal stress-prevention program supplemented by telephone-coaching sessions to reduce perceived stress among German farmers: Results from a randomized controlled trial. *International Journal of Environmental Research and Public Health*, *17*(24), 9227. https://doi.org/10.3390/ijerph17249227

The mental wellbeing of young farmers in Ireland and the UK: driving factors, helpseeking and support: Implications for advisory and extension services

Deirdre O' Connor
University College Dublin, Ireland

Short abstract

Whilst research attention on the mental wellbeing of farmers is growing, there are few studies focused on young farmers. Our research set out to better understand the factors affecting young farmer mental wellbeing and help-seeking behaviour while addressing the implications for advisory and extension services. We draw insights from a combined study in Ireland and the UK, supplemented by previous separate studies conducted by the same author team in both places. Through the use of young farmer interviews and surveys, as well as interviews with those who support young farmers regarding their mental wellbeing, we identify a mixed picture of mental wellbeing and a plethora of factors affecting it. Though many of these factors have been identified in the wider literature, the impact of socialisation and time off the farm were specifically identified in our study. In some cases, young farmers were considered to be better at speaking about mental wellbeing than their older counterparts, but our study indicated that some people in this demographic fail to seek assistance because of stigma, stoicism, and possible lack of confidentiality. Notwithstanding the above, the presence and potential role of extension and advisory contact as "accidental counsellors" is also noteworthy. Improving the accessibility of mental wellbeing services, as well as normalising conversations on the subject and providing support in a variety of settings, were identified as key recommendations.

Extended abstract

Purpose

The purpose of this paper is to explore the factors affecting the mental wellbeing and help-seeking behaviour of young farmers. There has been a proliferation of social research to understand the prevalence and drivers of poor mental wellbeing in farming communities across all demographics, as well as the availability and accessibility of support services. A recent study by the Royal Agricultural Benevolent Institution (RABI) in England and Wales discovered that around a third of farmers were probably or possibly depressed (RABI, 2021; Wheeler and Lobley, 2022), while in Ireland, farmer mental health and suicide is a major concern for those actively involved in farming with 23.4% of farmers being considered at risk of suicide (Stapleton *et al*, 2022). Whilst we may still lack detailed information on whether and how the prevalence and driving factors of poor mental wellbeing varies between different types of farmers, (Chiswell, 2022), recent studies have indicated that demographics do have an influence. However, there is still relatively little academic research which specifically examines the drivers of poor mental wellbeing and the help-seeking behaviours of young farmers, including in the UK and Ireland. Our study combines insights from studies in Ireland and the UK with the specific aims of understanding the drivers of poor mental wellbeing in a young farmer demographic, as well as help-seeking behaviour. We seek to build the empirical knowledge base to make recommendations for how to understand wellbeing in this demographic and how to ensure that support interventions are best targeted towards them.

Design/Methodology/Approach

For this paper, we combine insights from a number of different studies undertaken by research teams in Ireland and the UK. The teams worked separately initially but then subsequently worked jointly on a follow-up study. The initial two studies were conducted separately during 2019 (Ireland) and 2021 (UK) respectively, while the joint work was conducted in late 2022/early 2023.

We targeted two specific groups in this research - young farmers themselves and those who supported farmer wellbeing in various roles. For the purposes of this research, interview and survey recruitment focused on farmers between the age of 18 and 40 (in line with an EU definition.

The aforementioned Irish 2019 study was survey-based, containing open-ended and closed questions, relating to respondents' backgrounds; farmer wellbeing; availability of, and access to support services; and a mental wellbeing scale. The questionnaire was completed by 59 farmers aged 17-40 across the North-West of Ireland.

The survey undertaken in the UK in 2021 focused on factors affecting both farmer wellbeing and help-seeking but did not specifically target young farmers. It used an online survey distributed via social media and farmer contacts in the UK between November and December 2021. In total, 207 responses were gathered with 41 responses from farmers under 35 being analysed in this paper.

The collaborative research between the UK and Irish research teams comprised interview-based work, undertaken in late 2022/early 2023. We gained the views of 21 young farmers via common semi-structured interviews in Ireland (11 interviewees) and the UK. (10 interviewees). The interviews focused on the two main objectives outlined above: drivers of poor mental wellbeing and help-seeking/support. In the UK, volunteers were recruited between October and November 2022 via social media posts (Twitter, LinkedIn, The Farming Forum) and by emailing student unions and representatives at the major UK agricultural colleges and universities In Ireland, volunteers were recruited between October 2022 and January 2023 via the young farmer organisation (Macra na Feirme), agricultural colleges and universities, and agricultural extension services. The sample was skewed towards male farmers (Ireland [10 males, 1 female], UK [7 male, 3 female]) and towards the livestock sector in Ireland. Interviews were conducted over the phone or online, recorded, transcribed, and manually thematically coded to pick out drivers of poor mental wellbeing and views related to help-seeking and support services.

Findings

Our findings indicate a mixed picture of young farmer mental wellbeing, with some individuals struggling more than others who enjoy farming, a picture mirrored elsewhere in surveys across different farming demographics. However, our focus on young farmer mental wellbeing particularly highlighted the prominence of the impact of socialisation and time off the farm (or lack thereof) on the mental wellbeing of this demographic.

On the subject of help-seeking behaviour and the accessibility of support for poor mental wellbeing, we too noted some similarity in factors as identified in the wider literature, with stigma featuring prominently as a major barrier to gaining support. Whilst conversations about mental wellbeing may be more prominent than before in young farmer clubs and other social settings, our research indicated that stigma is still a primary factor affecting the ability of some young farmers to seek support.. Our research also reinforced conclusions in previous literature that informal social settings may be the best place to provide support to young farmers (e.g. Young Farmers Clubs), but professional support is still required, especially for those who feel that they cannot open up to friends, peers, and family. Our results also indicated that technological forms of mental wellbeing could also be useful for young farmers in particular.

Practical Implications

Our recommendations to improve the accessibility and acceptability of support for mental wellbeing are rooted in the suggestions made by young farmers themselves. It is not just a case of improving the availability of support services in remote rural locations, increasing the farming knowledge of professional supporters, and equipping all individuals who come into contact with farmers with the skills needed to spot signs of distress and signpost towards support. Whilst all of these actions are important, further normalising conversations around poor mental wellbeing in all of the spaces that young farmers occupy (schools, colleges, universities, workplaces, social settings) is vital. Such normalisation may not always overtly take the form of support for mental wellbeing. Young farmers in our study argued for mental wellbeing support that masquerades as something less intrusive or scary; for example, social activities and discussion groups where farmers may be encouraged to open up or reflect on how they are feeling without the pressure of talking specifically about mental wellbeing. These actions also requires the action of a wide range of people who engage young farmers and therefore highlights the need for farming support organisations (especially peer groups) to work in and beyond traditional farming settings and to embrace digital technologies as a means of complementing face-to-face support.

Theoretical Implications

Our findings reinforce recent calls for further research into the impact of the combination of multiple stressors on farmer mental wellbeing and how these are distributed across different types of farmers (Chiswell, 2022; Rose *et al.*, 2022; Wheeler and Lobley, 2023). We also know that different types of farmers – young/old, male/female, arable/livestock etc. – face varying pressures that affect mental wellbeing. Consequently, we need further research into understanding how the stacking of different demographics and situations affects mental wellbeing and which combination might make someone particularly vulnerable; for example, how do the drivers of, and risk for, poor mental wellbeing differ between a young, female, livestock farmer as compared to an old, male, arable farmer.

Academic studies of interventions to improve mental wellbeing for young farmers could test the efficacy of various methods of engagement, centering on variables like format (e.g. digital, paper), location (in-person, digital, young farmers clubs, colleges/universities, workplace), and who delivers it (e.g. peers, medical professionals).

References

Chiswell, H. (2022). Psychological Morbidity in the Farming Community: A Literature Review. *Journal of Agromedicine*. https://doi.org/10.1080/1059924X.2022.2089419

RABI. (2021). The Big Farming Survey The health and wellbeing of the farming community in England and Wales in the 2020s. Available at https://rabi.org.uk/wp-content/uploads/2021/10/RABI-Big-Farming-Survey-FINAL-single-pages-No-embargo-APP-min.pdf (April 2022).

Rose, D. C., Shortland, F., Hall, J., Hurley, P., Little, R., Nye, C., and Lobley, M. (2022). The impact of COVID-19 on farmers' mental health: a case study of the UK. *Journal of Agromedicine,* https://doi.org/10.1080/1059924X.2022.2137616

Stapleton, A.; Russell, T.; Markey, A; McHugh, L. (2022): Dying to Farm: National-Level Survey Finds Farmers' Top Stressor is Government Policies Designed to Reduce Climate Change. figshare. Poster. https://doi.org/10.6084/m9.figshare.21681377.v1

Wheeler, R., & Lobley, M. (2022). Health-related quality of life within agriculture in England and Wales: results from a EQ-5D-3L self-report questionnaire. *BMC Public Health*, 22(1), 1-12.

Dying to Farm – understanding the factors affecting famer mental health and the support requirements

Tomás Russell, Alison Stapleton, Anne Markey, Louise McHugh
University College Dublin, Belfield, Dublin 4, Ireland.

Short abstract

Farmer mental health is continually identified as a concern for those working in the agricultural sector and by those engaged in supporting farmers. Given the position of trust held by many agricultural practitioners who work with farmers, they are often in situations where they are supporting farmers with mental health issues. This study looked to identify what are the key factors that affect farmer mental health and suicide in Ireland and to identify the type of supports and interventions required. It Identified that 23.4% of farmers surveyed were at risk of suicide with high levels of stress and anxiety noted. The key driver of this suicide risk was stress and farmers identified government policy designed to reduce climate change and non-farmers not understanding the farm as key stressors. Farmers identified the need for group-based approaches that are culturally relevant and delivered by people with experience in agriculture and psychology. This identifies the need for a new skillset for extension agents and others who work closely with farmers on these issues.

Extended abstract

Purpose

Mental health problems and suicide are continually reported as major concerns for those actively employed in the Irish farming sector. Relative to other occupational groups, farmers experience a higher burden of health problems including mental health (Roy et al, 2013) and suicide (Roberts et al, 2013). Agriculture is also the most dangerous sector in Ireland in which to work (HSA, 2020). However, from 2014 to 2019, death from suicide and self-harm for farmers in Ireland is consistently higher (with the exception of 2017) than death from farm accidents. Despite this, research has focused more on farm safety than mental health or mental health supports for farmers. To date, no published research has examined risk factors associated with suicide among Irish farmers nor has any published research examined intervention acceptability among farmers.

Aims

- Investigate risk factors of mental health and suicide among farmers in Ireland.
- Identify acceptability/format/type of interventions to support mental health among the farming population in Ireland.

Method

The Dying To Farm project was comprised of three studies:

1. One-to-one interviews: Ten male farmers completed a 30-minute semi-structured interview with the Researcher via Zoom, an online video call application. Interview topics included farmers' views of existing mental health support services, farmers' mental health, and which interventions were likely to work well for farmers (e.g., duration, delivery style, etc.).

2. Focus groups: Three sets of five farmers and one set of five professionals providing support services to farmers participated in hour-long focus groups. In addition to responding to prompts used in the one-to-one interviews, focus group participants completed three popular exercises used in psychological interventions to feedback on their experience, perceived utility, etc.

3. National-level survey: 256 farmers (185 male; 71 female) were recruited via social media posts and invited to complete self-report measures of psychological distress, well-being, suicidality, farming-related stressors, farm attachment, and psychological skills through Qualtrics, an online survey platform. To determine the relationships between farmers' distress, well-being, suicidality, farm stress, and psychological skills, a series of one-tailed Pearson's product moment correlations were used. Relationships between farm attachment and other variables were analyzed using a series of two-tailed Pearson's product moment correlations. To determine whether farm holders and non-holders differed in terms of distress, well-being, suicidality, and farm stress, independent-samples t-tests were used.

A note on representativeness of this sample: As per the Central Statistics Office's Census of Agriculture 2020, the distribution of males and females in our national-level survey sample was comparable to the Irish agriculture labor force. However, our sample were younger than the CSO's cited age, likely due to our recruitment strategy (i.e., online advertisements). As such, knowledge users should exercise caution in applying/generalizing our findings to the entirety of the agriculture labor force on the island of Ireland.

Findings

As per our qualitative interview and focus group data:

• Key factors impacting farmer mental health and suicide include identity (e.g., "as a farmer you're expected to get on with things as such"), farming-specific stressors, representation in the media (e.g., "You'd often feel that the young farmer doesn't have a voice in the media, and I suppose that's our own fault"), and relationship with the land (e.g., "Land gets in the lad's mind like, on his own all day and thinking about it, thinking about it, thinking about it he's just going to snap at some stage. Whether it's the snap on his own or kill someone else and kill himself afterwards").

• Farmers prefer experiential, group-based interventions delivered by experts in psychology that are also familiar with the nature of farming.

• Exercises used in psychological interventions targeting farmers need to be tailored.

In our national-level survey sample of 256 farmers:

• 23.4% of farmers were considered at risk for suicide (i.e., reported having suicidal thoughts and/or urges over the past two weeks).

• Farm holders reported statistically significantly higher suicidal ideation and higher distress than non-holders.

• 55.5% of farmers reported experiencing moderate to extremely severe depression, 44.1% of farmers reported experiencing moderate to extremely severe anxiety, and 37.9% of farmers reported experiencing moderate to extremely severe stress.

• The top five stressors for farmers were: (i) government policies designed to reduce climate change, (ii) outsiders not understanding the nature of farming, (iii) concern over the future of the farm, (iv) not enough time to spend together as a family in recreation, and (v) limited social interaction opportunities.

• Farm stress is statistically significantly associated with higher suicidal ideation and higher distress. Psychological skills were associated with lesser suicidal ideation and lesser distress.

Implications

Overall recommendations

- Provide farmers with tailored, experiential mental health supports that are delivered by professionals in psychology that are familiar with farming.
- Evaluate the efficacy and effectiveness of experiential mental health supports that are tailored towards farmers.
- Include farmers in the development and implementation of public policies that impact the occupation of farming (e.g., policies designed to reduce climate change).
- Present these findings to policy makers and service providers to get insights from their perspectives, particularly with regard to the feasibility of scaling the identified type of interventions (i.e., group-based, peer-led, experiential interventions) to the farming community at large.
- Publicly engage in mental health awareness events (e.g., #AgMentalHealthWeek) to normalize mental health challenges and increase awareness of existing mental health supports.

Recommendations for policy makers

- Include farmers in the development and implementation of public policies that impact the occupation of farming.
- Support initiatives testing tailored, experiential mental health supports for farmers.

Recommendations for services

- Employ professionals in psychology that are familiar with farming to deliver support services to farmers. Provide additional suicide alertness training to these employees.
- Support existing employees working with farmers in acquiring a broad knowledge of farming and its associated challenges and benefits.
- Include farmers' voices in the development and implementation of support services intended to beneficially impact farmer mental health and well-being. For example, survey farmers of their experience of existing supports, support initiatives aiming to facilitate peer-led interventions, etc.

Recommendations for front-line practitioners

- When providing support services to farmers, consider using experiential, group-based interventions.
- When providing support services to farmers, acquire a broad understanding of the nature of farming and its associated challenges and benefits.

Recommendations for Farmers

- Engage in mental health awareness events (e.g., #AgMentalHealthWeek) to normalize mental health challenges and increase awareness of existing mental health supports
- When safe and possible, continue to advocate for yourself and other farmers to ensure your voice is heard.
- Reach out to existing support services if you or someone you know want support or are experiencing distress.

What would a relevant evaluation of occupational safety and health advisory services in agriculture be? Evidence of conflicting perceptions in the French context.

Pierre Labarthe[1], Catherine Laurent[2], Nathalie Jas[3], Agnès Labrousse[4]
[1]UMR AGIR, INRAE, University of Toulouse, Castanet-Tolosan, France
[2]UMR IRISSO & SAD-APT, INRAE, Paris, France
[3]UMR MOISA, INRAE, Institut Agro Montpellier, Montpellier, France
[4]UMR TRIANGLE, Sciences Po Lyon, Lyon, France

Short abstract (200 words):

How to assess the quality of evidence produced by the evaluation of advisory services dedicated to occupational safety and health (OSH)? Besides the "level of evidence" (i.e. statistical robustness), another very important dimension of the quality of the evidence is its "relevance" (i.e. its ability to deal with the issue that is considered a priority, to take-into-account the context of the intervention and the structural sources of inequalities, to have access to reliable data to design and implement the evaluation). The goal of the research was to characterize what different types of stakeholders (farmers, farm workers, advisors, managers...) consider to be a relevant evaluation of OSH advice in agriculture. The methodology combined three sources of data in France: (i) semi-structured interviews (n=33) with different types of actors, (ii) administrative and statistical data, (iii) scientific literature, regulations, official reports. The results show five contrasted perceptions of what would be a relevant evaluation system for farm OSH advisory services. They also reveal antagonistic positions about the relative importance of some topics (e.g. pesticides exposures) and the importance to be given to different types of beneficiaries (e.g. non-permanent workers). They confirm that the trade-offs between level of evidence and relevance are a sensitive issue for the design and the implementation of the evaluation of OSH advisory services.

Extended abstract

Purpose

This presentation deals[32] with the evaluation of advisory services dedicated to occupational safety and health (OSH) in agriculture in France. The goal of the research was to characterize what different types of stakeholders (farmers, farm workers, advisors, managers...) consider to be a relevant evaluation of OSH advice in agriculture.

The French context

In the French agriculture, OSH advisory services fall under the *Mutualité sociale agricole* (MSA) which is part of the national agricultural welfare system. The MSA results from a complex history. It has been constructed since the end of the XIXth century, by farmers associations, with the support of the State. The current organisation is based on a network of 35 regional associations with contracts to provide public services. This network is coordinated at the national level by a central body (*Caisse centrale de la Msa -CCMSA-*). The MSA delivers services regarding all social welfare issues in the sector (health care, old age, maternity leave, OHS….). About 5,6 million people are affiliated to the MSA. This includes self-employed people (farmers, contractors…) and employees in various types of enterprises of the sector: farms, contractors, forestry, and cooperative companies (including banks such as the *Crédit Agricole*). The core budget is being negotiated with the State by the CCMSA. For the whole organisation, the overall budget was of 33,7 billion € in 2021 (36% fees, 64% transfer from the State (as "national solidarity"). MSA governance is based on boards with representatives from three types of electoral colleges: 1) farmers who do not employ permanent workers, 2) salaried workers (employees of farms, contractors, cooperatives…) and, 3) employers (farmers employing permanent workers, contractors…). This structure gives a majority of votes to farmers, despite the fact that

[32] This research (Projet "Preuves") was financed by the scientific council of the CCMSA (Laurent et al.2023)

salaried workers are now the majority of the workers in the French agriculture sector (Forget *et al.,* 2019, Laurent, Nguyen 2022, Magnan 2022).

This system is quite specific. Very few countries still have in Europe a separate welfare system for agriculture. In addition, France is the only one that includes both farmers and farm workers. This system is quite specific in the French context as well, since the governance of the welfare systems of the rest of the population is based on a parity of employers and employees' representatives, which is not the case for the MSA.

Occupational safety and health advice

Agriculture is known to be a sector with a high level of occupational injuries and occupational diseases. Workers are exposed to many hazards (machinery, animals, chemicals, zoonoses, allergies, musculoskeletal disorders, solar radiation, outdoor temperatures, psycho-social risks, transport accidents, etc.). The expectation about advisory services are high, and involve different potential target populations: salaried farm workers (both permanent and non-permanent), farmers (who may be employers or not), employees of farm intermediary organisations (contractors, cooperatives, etc.). Hence expectation could vary from one population to another, both in terms of content, target and methods for support services.

On the supply side, OSH and associated services involve various categories of professionals: first- and second-line advisors, physicians, administrative staff, elected representatives of various unions (farmers' unions or workers' unions).

The perception of the activity may also vary between these categories of professionals, as well as the criteria identified to evaluate whether advisory services fulfil their mandates or not.

When talking of type of knowledge that the evaluation should generate (Berriet *et al.* 2014), it is often referred to the "level of evidence" (i.e. statistical robustness), and the gold standard to reach the best "level of evidence", the random controlled trials) (Banerjee, Duflo 2009). However, this emphasis on the level of evidence is a source of controversies (Deaton, Cartwright 2016, Rothwell 2005).

Another very important dimension of the quality of the evidence generated by an evaluation is its "relevance" (Dewey 1938, Schutz 1979, Hall 2020, Kirkhart 2016), i.e. its ability
(i) to deal with the issue which is considered a priority (e.g. Musculoskeletal disorders? Exposures to pesticides? Machinery?...),
(ii) to consider the context of the intervention (e.g. Financial management? Interactions with farmers?),
(iii) to take-into-account structural sources of inequalities (e.g. Different types of farm workers? Of farmers?),
(iv) to have access to reliable data to design and implement the evaluation (e.g. Demographic data on target groups…).

In spite of general statements that posit the need to evaluate the impact of OSH advisory services, it is never possible to evaluate all the dimensions of a set of interventions. It is too costly. However, the hierarchy of priorities is barely discussed. As a consequence, the evaluation methods that emphasize the level of evidence are increasingly recommended while they are not necessarily the most appropriate for the issues at hand. The issue of *relevance* is often forgotten.

As a consequence, there is a risk to focus on what we know best, or to produce results considered uninteresting by some of those directly concerned, or even to produce evaluation results that generate conflicts.

In this context, the aim of our research was to understand what are the perceptions of what is considered a relevant evaluation of OSH advice in agriculture by different types of stakeholders (farmers, farm workers, advisors, managers...). Which evaluation methods could be applied? What kind of evidence about the advisory activity should the evaluation generate?

Design/Methodology/Approach

In order to analyse what would be an evaluation system considered relevant from the point of view of the various actors involved in OSH advice provided by the MSA, we combined three sources of data.

- Semi-structured interviews (n=33) with different types of stakeholders (full transcription of the interviews (850 p.):
  - Employees from the MSA directly involved in the OSH advice (medical doctors, OSH advisors) (n=13),
  - elected board members from the 3 colleges of the MSA (farmers, employers and employees) considering the diversity of Unions for both the farmers and the employees) (n=11) in two regions,
  - other experts and stakeholders directly concerned by OSH advice (academics, associations...) (n=9).
- Administrative and statistical data on labour (socio-demographic characteristics of the population concerned...)
- Scientific literature, regulations, official reports

We collected information regarding:

- the approach to OSH advice in agriculture and its assessment;
- the type of evidence that should be produced for the assessment in an ideal system to be relevant (Effectiveness? -does it work? Mechanisms? -how does it work? Presence? - Measures of level of exposure, of levels of pain…),
- the methods to be adopted (Self-evaluation? Participatory Approach? Measure of results? Measure of number interventions implemented?),
- the target audiences to be favoured (Farmers? Permanent farm workers? Casual workers? Young people? etc.),
- the objects on which the assessment should focus (Which topics? Which dimension of the assessment? Regulatory issues? Organisational issues?

Data were analysed by combining thematic analyses and a multiple correspondence factorial analysis.

1. Two main findings

First, we identified five contrasted conceptions about what should be a relevant evaluation system for farm OSH advisory services. A representation of these five conceptions can be visualised thanks to the factorial analysis (figure 1). Different views coexist; they are all well-argued. They are based on concrete experience, and on precise consideration of the context in which they embedded. They can be roughly characterized as follows:

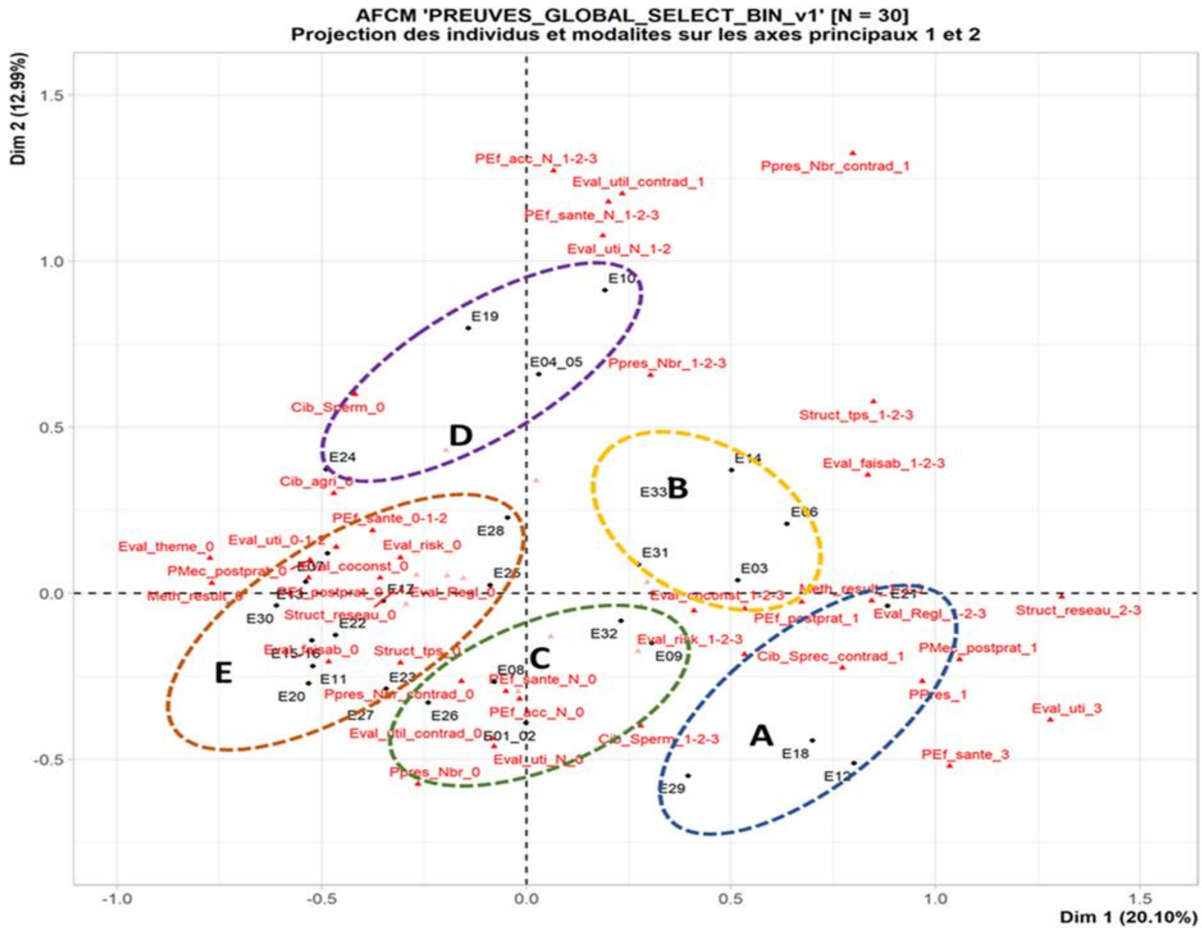
A. "Pragmatism and high level of information": *Evaluation process should be co-designed with the target population of the intervention, and should fully consider field work situations*

B. "Management & regulation": *Evaluation process enables to assess the adjustment between regulation and intervention, and provides a justification for the financing of OSH advisory services.*

C. "Inclusion": *Evaluation must check that all potential beneficiaries are taken in account, with their specific needs, including casual workers*

D. "Ambiguity": *It is difficult to decide what could be a useful evaluation, and which type of reliable and relevant knowledge should be produced*

E. "Disengagement": *Feeling of a lack of legitimacy to get involved in the design of the evaluation of OSH advice.*



Second, discussion about evaluation also reveal antagonistic positions about the very conception of occupational health farm advice, about what themes / target population / methodology … should be the prioritised. This concerns various items:

- Target groups: precarious workers constitute an invisible group for most interviewees.
- The content of the advice: the issue of exposure to pesticides and the responsibility for prevention of chemical risk appears to be divisive.
- Back-office of the advisory services: controversial issues are mentioned regarding the skills that occupational health advisors should have, or regarding the types of intervention they should implement. Other controversial issues emerge regarding the overall organisation of the MSA's OSH advisory services, the resources provided to them, and the choice of priorities.

Overall, the interviews reveal very contrasting assessments, sometimes very minimalist, sometimes very elaborate, of OSH problems met at farm level.

Practical implications

In the literature on evaluation, randomised controlled trials and related methods are considered to be the leading method for measuring the effectiveness of an intervention with high-level evidence. For example, in the field of farm occupational health in France, a recent survey assessed the impact of "OSH prevention contracts" implemented by the MSA (Hillion, Nedjar-Calvet 2021). This type of approach, which becomes more and more important in the field of evaluation of farm advice, especially in the context of global South countries (see Waddington et al. 2014 for a review of the evaluation of farmers' field schools), is based on outcome indicators and carried out on a blind basis. Such approaches focus their calculations on the data which are likely to measure the effects of the interventions (for Hillion & Nejar -Calvet, the rate of occupational injuries). They do not analyse the mechanisms generating these effects. Therefore, their results may be quite difficult to interpret.

This is probably why it was rarely mentioned by the people we met. They rather evoke alternative evaluation options, but consider they are associated with insurmountable methodological difficulties. We feel however that such options could be explored by connecting to recent international initiatives or debates regarding evaluation. For instance:

"Pragmatism and high level of information": In this group, people call for an evaluation which is concerned with the whole process of the intervention (design, implementation, results); an evaluation which includes a context analysis to address relevant issues and documents the degree of generality of the produced knowledge for a certain type of intervention. As a matter of fact, these concerns are shared by the promotors of "methodologies of evaluation of complex interventions" (e.g. Craig *et al.* 2008; Moore *et al.* 2015; Coutarel, Récopé 2022).

"Management & regulation": In this group, people call for methodologies which measure the impact of interventions with a good level of evidence … but systematically informed by field experience. Such interactions could be organized in an organisation like the MSA.

"Inclusion": In this group people insist on the need to systematically assess the OSH reliability and the impact of various interventions considering the specificities of the target population (e.g. on new educational tools such as "serious games" for young people)

"Disengagement": for this group a better understanding of what is at stake on OSH advisory services might be sought through participatory assessment methodologies (using assessment to learn, as a collective process) (e.g. Rochs, Navarro 2008), for example, to raise risk awareness and develop a culture of safety at work.

Theoretical implications

There is a clear need to further explore the issue of the relevance of evaluation of OSH advisory services. There is strong evidence in the scientific literature that policy evaluation may have adverse effects. There are large controversies regarding the quality of evidence that should be delivered by policy evaluation (e.g. Deaton, Cartwright 2018 on RCT, Berriet *et al.* 2014). Evaluation must produce evidence which is both reliable and relevant for the question at stake. However, they are trade-offs. There are situations where the relevance may be sought at the sacrifice of a very high level of evidence. These trade-offs between level of evidence and relevance are a core issue of the design and the implementation of the evaluation of OSH advisory services.

References

Banerjee AV, Duflo E. 2009. The experimental approach to development economics. *The Annual Review of Economics*, Vol. 1, p. 151–78.

Berriet-Solliec, M., Labarthe, P., & Laurent, C. (2014). Goals of evaluation and types of evidence. *Evaluation*, 20(2), 195-213.

Coutarel F., Récopé M. 2022. L'évaluation des interventions ergonomiques : pourquoi et comment questionner les interventions sous l'angle d'une ontologie relationnelle ? *Activités,* p. 19-2.

Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., & Petticrew, M. (2008). Developing and evaluating complex interventions: the new Medical Research Council guidance. *Bmj*, 337.

Deaton, A., & Cartwright, N. (2018). Understanding and misunderstanding randomized controlled trials. *Social science & medicine*, 210, 2-21.

Dewey J. 1938 [1991]. Logic: theory of inquiry. In Boydston J. A. (Ed), *Later Works 12*. Carbondale & Edwardsville Southern Illinois University Press.

Forget V., Depeyrot J.-N., Mahe M. Midler E., Hugonnet M., Beaujeu R., Grandjean A., Herault B. (2019.) *Actif' Agri - Transformations des emplois et des activités en agriculture.* La documentation française. 242 p.

Hall J. N. 2020. The Other Side of Inequality: Using Standpoint Theories to Examine the Privilege of the Evaluation Profession and Individual Evaluators. *American Journal of Evaluation*, Vol. 41, n°1, p. 20-33.

Hillion, M., & Nedjar-Calvet, S. (2021). *Étude de l'impact d'un programme de prévention sur la sinistralité des entreprises agricoles.* Document d'étude de la Dares. 35 pages.

Kirkhart K. E. 2016. Equity, privilege, and validity: Traveling companions or strange bedfellows? In Donaldson S., Picciotto R. (dir.). *Evaluation for an equitable society*. Charlotte, NC: Information Age, p. 109-131.

Laurent C., Jas N., Labarthe P., Labrousse A. 2023. *Evaluer le conseil relatif à la prévention des risques professionnels dans les exploitations agricoles pour produire quelles connaissances. De la pertinence sociale des preuves.* Inrae. 55. p. + annexes

Laurent C., Nguyen G. (2022). Innovation in Labour Organisation and Social Conditionality: Implications for Farm Advisory Services. *EuroChoices,* 21(1), 56-62.

Magnan A. 2022. *Le développement du salariat précaire dans l'agriculture française : une approche d'économie institutionnelle.* Thèse de doctorat en sciences économiques, Paris, Université Paris-Saclay.

Moore G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., ... & Baird, J. (2015). Process evaluation of complex interventions: Medical Research Council guidance. *Bmj*, 350.

Rochs F., Navarro M. 2008. Soft System Methodology: an intervention strategy. J*ournal of International Agricultural and Extension Education* 15(3), p. 95–9.

Rothwell P. 2005. External validity of randomised controlled trials: to whom do the results of this trial apply? *Lancet,* Vol. 365, p. 82-93.

Schütz A. 1970. *Reflections on the Problem of Relevance.* Yale: Yale University Press.

Waddington, H., Snilstveit, B., Hombrados, J., Vojtkova, M., Phillips, D., Davies, P., & White, H. (2014). *Farmer field schools for improving farming practices and farmer outcomes: A systematic review.* Campbell systematic reviews., 10 (1), i-335

Session 5C – Designing farm advisory services for Hard-to-reach population

'I was always the farmer': The dynamics of young farmer education choices in Irish agriculture

Brian Leonard, Tomás Russell
University College Dublin

Short abstract

An ongoing ageing of the farming population at a global level has resulted in policy measures and research interest in recent decades, with supporting generational renewal being cited as a key objective of the Common Agricultural Policy on the European stage. In the Irish context, family farming is currently the dominant farming model, while the average farmer is aged 58 (Teagasc, 2022). This research focuses on the area of agricultural education decision making for young farmers in one of Irelands largest farm systems, dairying. This study investigates the factors that affect young farmer decision making in their choices to pursue agricultural education with a particular focus on the impact of succession decisions on this. The study also considers the role of agricultural extension and education services in supporting these young farmers when completing agricultural education. Results from the mixed methods research reveal a range of key motivators for young farmers when choosing third level agricultural education, while the importance of family influence and collaborative farming and their impact on succession and inheritance decision making also emerged.

Extended abstract

Purpose

Agricultural Education plays an important role in the development and formation of the young farmers of the future and within this there are many factors which impact on the decision to study an agricultural course. This study investigates the factors that affect young farmer decision making in their choices to pursue agricultural education with a particular focus on the impact of succession decisions on this. The study also investigates the role of agricultural extension and education services in supporting these young farmers when completing agricultural education.

Design/Methodology/Approach

A mixed methods approach was used for this research. Both quantitative and qualitative methods were employed in order to ascertain data that provided an indication of trends at high level, whilst also ascertaining farm level data on the nuances of decision making.

First, a survey was distributed online to students undertaking third level agricultural education pertaining to dairy farming. Across the 3 courses targeted (Dairy Business, Professional Diploma in Dairy Farm Management, and Advanced Programme in Dairy Herd Management) 118 students responded. A key aim of the survey was to identify what the educational choices were made among dairy students, what were the main influences on those choices, how influential a particular choice was and what, if any, effect the educational choices had on the succession status on the home farm. Students were also asked about their home farm situation; did they come from a dairy farm, how much land was farmed, if a successor had been identified, and if so, what stage was the succession process at, and when any particular succession decisions were made. All these questions were important in identifying areas to expand on further in the case studies.

Second, based on the survey results, 3 students from each of the aforementioned dairy courses were chosen for interview. The student and where possible one or both of their parents were then interviewed in their own home. They were asked to talk about their family and farm and to outline their thoughts on succession and steps taken. Education was also discussed and the effects it had on the selection of the successor and vice versa. Finally, they were asked about their thoughts on how Teagasc could encourage greater levels of succession among their students.

With regard to analysis, the survey data was analysed using SPSS, while thematic analysis was undertaken on the interview data.

Findings

The results revealed a range of key motivators for education choice in agriculture, these include whether or not a student was from a dairy farm, influence of parents, succession plans, and financial incentives. Within the quantitative results, a notable link between agricultural education and plans to engage in a form of collaborative farming was evident.

In terms of qualitative results, a number of key themes emerged. These include succession planning, long term preparation of a successor, family relationships, and elements of the course. Succession plans were evident for most interviewees, with many planning on or already being in a farm partnership. This highlights the ongoing multigenerational nature of farming in which a farmer and their successor often enter a period in which both farm at once. The implication here is that the processes of succession/inheritance and retirement happen simultaneously as opposed to as separate individual events.

Practical Implications

The results ascertained here have implications for agricultural education providers and agricultural advisory practitioners. The prominence of collaborative farming arrangements, or plans to enter them, signals a need for additional support from farm advisors, and practical course materials related to the setup of same from the perspective of education providers.

Theoretical Implications

It is apparent from the results acquired in this study, that a key influence of young farmer decision making relates to family, in particular the opinion of parents. In addition, the processes of farm succession, inheritance, and retirement are often heavily intertwined and taking place across various life stages of a farmer, their successor, and their family.

References

Conway, S.F., McDonagh, J., Farrell, M. and Kinsella, A., 2021. Going against the grain: Unravelling the habitus of older farmers to help facilitate generational renewal in agriculture. Sociologia Ruralis, 61(3), pp.602-622.

Ingram, J. and Kirwan, J., 2011. Matching new entrants and retiring farmers through farm joint ventures: Insights from the Fresh Start Initiative in Cornwall, UK. Land Use Policy, 28(4), pp.917-927.

Leonard, B., Farrell, M., Mahon, M., Kinsella, A. and O'Donoghue, C., 2020. Risky (farm) business: Perceptions of economic risk in farm succession and inheritance.

Lobley, M. and Baker, J.R., 2016. Succession and retirement in family farm businesses. In Keeping it in the Family (pp. 1-20). Routledge.

Russell, T., Breen, J., Gorman, M. and Heanue, K., 2020. Advisors perceptions of their role in supporting farm succession and inheritance. The Journal of Agricultural Education and Extension, 26(5), pp.485-496.

Institutional Evolution of Gender in Farm Advisory Services: A Canada-France Comparison

Rivellie Tschuisseu
Institute of Environmental Sciences, Université du Québec à Montréal

Short abstract
Agricultural advisory, the main channel for the acquisition of knowledge by farmers, is based on the relationship that the advisor develops with farmers whereas belonging in social groups plays an important role. However, studies conducted on gender in agriculture barely address gender in agricultural advisory services, despite the increasing number of women in agricultural advisory bodies. This research aims to understand how the feminization of the profession of agricultural advisor in Canada and France transform the social relations of gender in agricultural services and its effects on the definition, implementation and evaluation of sustainable agricultural practices and climate change policies by women farmers. To do so, we will first, analyze what this feminization of agricultural advice consists of. After, we will focus on the work practices and approaches of women agricultural advisors. Finally, through a case study, we will analyze the link between the feminization of agricultural advisory services and a specific environmental issue: the exposure of advisors to pesticides in agriculture. This study uses a feminist methodology based on empirical research and field interviews and a combination of three theoretical approaches: gender in agriculture, women entrepreneurship and the economy of service in the field of agriculture.

Extended abstract

Purpose

The agricultural advice has been an important support mechanism for the agricultural sector and is currently facing new challenges in an evolving context. Agricultural advisory plays a central role in agriculture [1-4] and is an important channel by which farmers gain knowledge, manage their farms and find funding opportunities in order to maintain the growth of their business. The relationship between the agricultural advisor and the farmer is called a service relationship, where the agricultural advisor's membership in specific social groups plays an important role [5]. Women are highly involved in the development of the agricultural sector [6]. Their contribution in terms of the percentage value of agricultural production is about 49% [7]. The percentage of trained women farmers is increasing, and they seem to implement alternative production systems, which would contribute to sustainable agriculture and environmental protection [8]. Surprisingly, researches on agricultural advisory services rarely integrate neither the gender dimension of the profession of agricultural advisors nor the analysis of its dynamics, particularly in developed countries [9-12]. Few studies that exist are oriented toward women's entrepreneurship on the farm [13-15], yet the number of women advisors is increasing exponentially [10]. In March 2021, a research on gender in rural agricultural advisory services concluded that women are increasingly present in advisory organizations as entrepreneurs and employees [16]. That research addresses an issue not yet studied, but that would be crucial for understanding gender dynamics in both agricultural professional services and agricultural production. From this perspective, the aim of the present study is to analyze how and to what extent the gender aspect is taken into account in agricultural advisory services and in the way agricultural advisors practice their profession.

The research question is how the feminization of the profession of agricultural advisor in Canada and in France transforms gender relations in agricultural advisory services, influence the service of agricultural advisors and what are the effects on the visibility of women farmers and on the adoption of sustainable agricultural practices? To answer this question, three specific objectives have been defined. Firstly, we will describe the feminization of agricultural advisory services in Canada and in France. In fact, our hypothesis here is that despite the feminization of the profession of agricultural advisor, there is still a sexual division of labour in the professional organization of agricultural advice. Secondly, we will analyze how gender issue is taken into account when it comes to the co-construction of knowledge with and for women farmers in Canada and in France. The hypothesis here is that services offered by women agricultural advisors make women's farmers' work more visible through social relationships and networks that promote inclusion.

Thirdly, this study will examine the methods used by agricultural advisors in terms of the promotion and adoption of agri-environmental practices, including pesticide exposure issues and sustainable agricultural practices in Canada and France. Our hypothesis here is that women agricultural advisors may systematically integrate health and environmental issues into their advisory activities.

Theoretical framework of research: Feminist approach—Gender

This research mobilizes three complementary theories focused on the gender perspective in agriculture, particularly in the context of entrepreneurship and the economy of services. The choice of these theoretical approaches is justified by the fact that gender in agricultural advisory services organizations has emerged and evolved in these contexts. As such, these analytical frameworks find in the litterature allows us to develop the parameters that need to be taken into account at different scales of the integration of gender in the services offered by agricultural advisory organizations. In fact, gender, social construction, is an analytical framework that helps to understand the driven force between men and women relations, the sexual division of labor, the social behavior and the economic context [17]. In this research, we consider that gender is based on the sex to which it owes its invention, its use and interpretation [18]. We will thus use gender as a tool for analyzing power relations [19] within farm advisory organizations and farms. The second theory involved in this research is gender and entrepreneurship. In fact, entrepreneurship identifies and analyzes the legal and institutional environment, sociocultural factors, access to knowledge and resources, training and risk-taking when establishing a business [20-22]. In this research, gender in entrepreneurship refers to women who take the initiative to start their own business [21]. In this respect, agricultural entrepreneurship refers to women who start consulting businesses in the agricultural sector. The third concept involved in this study is the economy of services. The economy of services is use to analyze innovation as a social inclusion factor, resulting from the relationship between the service provider and his client [23, 24]. This can be observed in the professional sectors of agricultural advisory services [4, 5]. The economy of services helps to analyze and measure the particularity of the intangible services observed in relation such as those where agricultural advisors are involved in [25]. In this research, the economy of services will be used to analyze strategies for gender integration: 1) the definition of the purpose of the agricultural advice, 2) the design of the advisory service offer at the institutional level and 3) the performance analysis of agricultural advisory firms.

Design/Methodology/Approach

Despite the importance of comparative studies in defining policies and valuing research results in similar or different contexts, there are very few in the literature when it comes to agriculture in developed countries [26, 27]. From this perspective, comparing Canada and France in terms of the institutional evolution of gender in agricultural advisory services is particularly interesting. In fact, the organizational structure of the agricultural advisory services is: fragmented in Western Canada, and the Maritimes [28], centralized in Quebec for agri-environmental advice [29] and in France with chambers of agriculture [30, 31]. For data collection, a quantitative and qualitative method will be combined through an empirical study. This will be complemented by semi-structured face-to-face interviews with a sample of women advisors working in agricultural advisory organizations in Canada and France. Those organizations will be selected on three levels: national, provincial and local. Their funding method: public, private, semi-public and non-profit will also be considered. The study will be divided into two main phases of work: 1) the first one will help achieve the first specific objective, which is the description of the feminization of agricultural advisory through mapping. This will be achieve through an empirical study; 2) the second phase will tackle the second and third objectives. This will be achieved through a semi-structured interview with women advisors and will enable us to analyze and describe the different profiles of the women agricultural advisors. Systematic analysis with thematic synthesis will be done (gender, age, positions held, job specifications, knowledge coproduction and updating).

Originality of the expected results

This research is part of a qualitative and quantitative research methodology from a feminist perspective and is original in three points; 1) it focuses on the place of women advisors as agents of knowledge transfer in agriculture through their relations with women farmers, 2) aims at contributing to a better understanding of gender relations in agriculture as experienced by women agricultural advisors, and 3) will help fill gaps and encourage knowledge production on gender aspect of agricultural advisory.

Practical involvement

The field survey across Canada and France will allow us to determine the structural impacts of the under-representation of women in agricultural advisory services organizations and its effects on agricultural practices. There are very few studies on the link between the absence of women in the agricultural advisory, the different visions of agriculture (industrial, ecological, etc.) conveyed by these organizations and their impact on the work of women farmers in developed countries. The under-representation of women as advisors in agricultural advisory service may potentially affect farming practices and their impacts on the environment. This may also affect agri-food policies as well as agricultural governance more broadly. It is recognized that women farmers, supported by agricultural advisors, contribute in a significant but understudied way to food security and sustainable development objectives in their agricultural enterprises. The originality of this project is to have a deeper look on the issues of the feminization of agricultural advice on the management practices of agricultural businesses.

References

1. Goulet, F., C. Compagnone, and P. Labarthe, *L'émergence des conseillers privés. De nouvelles interrogations pour la recherche*. 2015. p. 201-216.
2. Compagnone, C. and B. Simon, *Cooperation and competition among agricultural advisory service providers. The case of pesticides use.* Journal of rural studies., 2018. **59**: p. 10-20.
3. Gerdal, C.R., *L'évolution du conseil en agriculture et les enjeux d'aujourd'hui.* séminaire international CSA et FWA-UAW-FJA, 2017.
4. Labarthe, P., *La privatisation du conseil agricole en question. Evolutions institutionnelles et performances des services de conseil dans trois pays européens (Allemagne, France, Pays-Bas).* 2006.
5. Labarthe, P., *Services immatériels et verrouillage technologique. Le cas du conseil technique aux agriculteurs.* Économies et sociétés (série économie et gestion des services), 2010. **11**: p. 173-196.
6. VanDe Velde, P., V. Stanleym, and M. Stickler. *Invisible Farmers: Why recognizing and supporting women farmers is key to food and nutrition security*. 2020 [cited 2020 2021-10-09]; Available from: https://blogs.worldbank.org/developmenttalk/invisible-farmers-why-recognizing-and-supporting-women-farmers-key-food-and.
7. Henningham, N. and H. Morgan, *Update: The Invisible Farmer: Securing Australian farm women's history.* Archives and Manuscripts, 2018. **46**(1): p. 90-99.
8. Farhall, K. and L. Rickards, *The "Gender Agenda" in Agriculture for Development and Its (Lack of) Alignment With Feminist Scholarship.* Frontiers in Sustainable Food Systems, 2021. **5**(20).
9. Ball, J.A., *Women farmers in developed countries: a literature review.* Agriculture and Human Values, 2020. **37**(1): p. 147-160.
10. Dunne, C., C. Siettou, and P. Wilson, *Investigating the economic visibility and contribution of UK women in agriculture through a systematic review of international literature.* Journal of Rural Studies, 2021. **86**: p. 330-345.
11. Pini, B., R. Panelli, and L. Dale-Hallett, *The Victorian Women on Farms Gatherings: A Case Study of the Australian "Women in Agriculture" Movement.* AUSTRALIAN JOURNAL OF POLITICS AND HISTORY, 2007. **53**(4): p. 569-580.
12. Trauger, A., et al., *Agricultural education: Gender identity and knowledge exchange.* Journal of Rural Studies, 2008. **24**(4): p. 432-439.
13. Adinolfi, F., et al., *Gender differences in farm entrepreneurship: Comparing farming performance of women and men in Italy.* New Medit, 2020. **19**(1): p. 69-82.
14. Dias, C.S.L., R.G. Rodrigues, and J.J. Ferreira, *What's new in the research on agricultural entrepreneurship?* Journal of Rural Studies, 2019. **65**: p. 99-115.
15. Horská, E., Z. Kapsdorferová, and M. Hallová, *Innovative Approaches for Sustainable Agriculture and Food Systems Development: Conference proceedings.* 2020.

16. Sheridan, A. and L. Newsome, *Tempered disruption: Gender and agricultural professional services.* Gender, Work & Organization, 2021. **28**(3): p. 1040-1058.

17. Guétat-Bernard, H., *Travail des femmes et rapport de genre dans les agricultures familiales : analyse des similitudes entre la France et le Cameroun.* Revue Tiers Monde, 2015. **221**(1): p. 89-106.

18. Guillaumin, C., *La confrontation des féministes en particulier au racisme en général : remarques sur les relations du féminisme à ses sociétés.* Sociologie et sociétés, 2017. **49**(1): p. 155-162.

19. Verschuur, C., *Quel genre?Résistances et mésententes autoutur du mot « genre» dans le développement.* Revue Tiers Monde, 2009. **50**(200): p. 785-803.

20. Agasalim, A.A., *Importance and role of women within the business community of Azerbaijan.* Journal Women's Entrepreneurship and Education, 2021. **2021**(1-2): p. 84-107.

21. Belingheri, P., et al., *Twenty years of gender equality research: A scoping review based on a new semantic indicator.* PLoS ONE, 2021. **16**(9).

22. Gawel, A. and A. Głodowska, *On the relationship between economic dynamics and female entrepreneurship: Reflections for the visegrad countries.* Administrative Sciences, 2021. **11**(3).

23. Gadrey, J. and F. Gallouj, *The Provider-Customer Interface in Business and Professional Services.* The Service Industries Journal, 1998. **18**(2): p. 01-15.

24. Gadrey, J. and F. Jany-Catrice, *Les nouveaux indicateurs de richesse*. 2016, Paris: La Découverte. 128.

25. Labarthe, P. and C. Laurent, *Economie des services et politiques publiques de conseil agricole.* 2011.

26. Annes, A. and W. Wright, *Agricultrices et diversification agricole : l'empowerment pour comprendre l'évolution des rapports de pouvoir sur les exploitations en France et aux États-Unis.* Cahiers du Genre, 2017. **63**(2): p. 99-120.

27. Warsame, J.W., *Comparative Analysis of Agricultural Extension in Ontario, Yaroslavl Oblast and Crimea*, in *Capacity Development and Extension*. 2015, The University of Guelph: The University of Guelph. p. 143.

28. Hedley, D.D. *The Evolution of Agricultural Support Policy in Canada*. 2015 [cited 2022 February]; Available from: https://caes-scae.ca/wp-content/uploads/2018/11/2015-Hedley-Evolution-Ag-Policy-Fellows-Paper-RI.pdf.

29. Gaboury-Bonhomme, M.-È., *Evolution of governance and policies on agricultural advisory services in Quebec (Canada).* Cahiers Agricultures, 2011. **20**: p. 359-363.

30. Chambres d'agriculture. *Nous connaître: Les Chambres d'agriculture au service du développement des agricultures et des territoires*. CHAMBRES D'AGRICULTURE FRANCE 2022 [cited 2022 February]; Available from: https://chambres-agriculture.fr/chambres-dagriculture/nous-connaitre/#:~:text=Les%20Chambres%20d'agriculture%2C%20cr%C3%A9%C3%A9es,propri%C3%A9taires%2C%20salari%C3%A9s%2C%20groupements%20professionnels%E2%80%A6.

31. Compagnone, C., et al., *Forme et réforme organisationnelles des Chambres d'agriculture. Une lecture à partir des régimes d'action des conseillers.* Économie Rurale, 2013(337): p. 19.

Supporting women's roles within family dairy farms – A case study of an Irish learning initiative

Monica Gorman[a], Beth Dooley[b], Marion Beecher[c]
[a] *School of Agriculture and Food Science, University College Dublin, Dublin, Ireland*
[b] *EU CAP Network, CAP Implementation Contact Point, Brussels, Belgium*
[c] *Teagasc, Animal and Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork, Ireland*

Short abstract (200 words):
Women's roles on Irish dairy farms are often overlooked due to the perception that farming is a male activity as traditionally females rarely inherit land. Consequently, education and training tend to be directed towards males. Most farm women have off-farm careers when 'marrying into' the farm, yet they play an important role in terms of financial contributions and work on the farm. The importance of farming couples working together to determine the direction of their joint life and business is increasingly recognised as a critical factor in the success of a family farming business. Thus, there is a need for learning initiatives that support partners/spouses in building the knowledge, skills, capacity and confidence to shape and fulfil their evolving roles within the family farm business. This examination of the experience of farm partners who are involved in a learning initiative reveals that their roles within the farm are evolving. They are bringing a diversity of backgrounds, skills, knowledge and perspectives and in most cases are beginning to see how they can strengthen and develop their role within the business. This case study suggests that bespoke learning initiatives specifically designed for farm women can enhance their role within the farm business.

Extended abstract

Purpose

Family farms are the dominant type of farm structure worldwide accounting for 98% of all farms (Graeub et al., 2016). In Ireland, 99.7% of farms were classified as family farms in 2016 (CSO, 2016) while over 88% of family farm holders were male. In 2016, 265,400 people worked on Irish farms. Of these, 51.7% (137,100) were the farm holders, 41.4% (109,800) were family members and the remainder were non-family workers (18,500). Over a quarter (71,700) of those working on farms were female. However, less than one quarter (16,100) were holders of the farms on which they worked.

The most common entry route to farming for Irish women is still through marriage, as women acquire farms by gift, inheritance or otherwise only in exceptional circumstances (Molloy et al., 2017; Shortall 2017). Most farm women have careers and off-farm employment when 'marrying into' the farm. The importance of women's off-farm work and income to the survival of low profit family farms has been considered by Kelly and Shortall (2002), who found that a primary motivation for women to find work off-farm is to enable the continuation of the family farm. Molloy (2017) examined the roles played by farm women in one Irish county (Wexford) and found that they contributed significantly to the farm especially in the areas of accounts and administration, but also in the areas of animal husbandry and health and safety. Molloy's (2017) study examined women's low engagement with farm advisory services and identified the main barriers are: the feeling that women wouldn't be taken seriously; that they are unwelcome; lack of self-confidence; lack of knowledge and training; and isolation. Her suggestions to improve engagement included having more events and information targeted at farm women, having women-only discussion groups, including spouses/partners in correspondence, and highlighting female farmers more in the media.

In 2020, two independent consultants developed a learning initiative aimed at dairy farmers' partners and spouses, recognising that farm business decisions affect family, lifestyle, finances, health and wellbeing (i.e. 'the partners programme'). Since the abolition of milk quotas in 2015, Ireland's dairy farming sector has undergone significant expansion. The importance of farming couples working together to determine the direction of their joint life and business is increasingly recognised as a critical factor in the success of a family farming business (Suess-Reyes and Fuetsch, 2016). This has not been explicitly promoted in mainstream agricultural advisory programmes where the emphasis has been on working with the named (usually male) 'farm holder'. This learning initiative was advertised to encourage partners/spouses to consider their role within the farm and their current and potential contribution to the governance, human resources, management and strategic direction of the business. Because the consultants had previously delivered a variety of training initiatives to commercial dairy farmers, this audience was also targeted when promoting the partners programme.

Fifty farm women attended the initial programme, which involved two online (Zoom) meetings. Their engagement and feedback highlighted a desire for a more extended learning programme. In 2021, twenty-one of the women who participated in the 2020 initiative signed up to participate in a series of 8 group sessions of which 5-6 would be virtual and 2-3 face to face. This paper examines the experience of this pilot initiative to provide learning for the future potential of greater engagement between advisory service providers and farm women.

Using this pilot initiative as a case study the following research questions were developed:
• How are women developing their role within family dairy farm businesses?
• What motivated them to join this year long programme and what is their experience to date?

Design/Methodology/Approach
The authors were invited to present and explain their research proposal to the members at their first meeting in the series of eight. Initially, a questionnaire survey of the participants was conducted at the start of the programme to understand their backgrounds and their current involvement within the family farm business. The questionnaire was anonymous, but participants were asked to give contact details if they were willing and interested to take part in a follow up semi-structured interview with the authors via Zoom or by phone. The interviews were conducted when 2-3 meetings of the group had taken place. They were transcribed and anonymised. The three authors individually read and examined the transcripts to identify themes in relation to development of roles within the farm business, motivations for joining the programme and their learning experience to date. This was followed by a collective discussion and examination of our interpretations. Timelines were constructed by highlighting significant events in an individual's life in chronological order. Towards the end of the one-year programme, the findings were presented back to the group members at one of their face-to-face meetings for validation.

Findings

"*We are all very different – what we have in common is that we are all married to farmers*".

Twenty-one participants completed the survey while 15 women participated in the interviews. The survey revealed a variety of backgrounds with 27% having grown up on farms, 37% from a rural nonfarming background and 36% from an urban background. Over half the participants (64%) had a part-time or full-time job off the farm in a variety of careers including, *inter alia*, teaching, science, law, banking, childcare, and environmental services. Their off-farm incomes were contributing to household expenses (92%), savings and investment (69%) and farm expenses (15%). Participants included young, recently married women with no children, women with small and school-age children and older women with grown-up children. Their (partners') dairy farm businesses were larger than the average Irish dairy farm of 103 cows (CSO, 2022), with 76% of participants farming 201 cows or more and the remainder farming between 100 and 200 cows. All of their farms employ non-family labour with a mix of part-time and full-time employees. The participants' individual length of involvement on their farms varied from less than 5 years to greater than 16 years, with 50% of those surveyed involved on the farm between 6 and 15 years. Participants identified a wide range of roles that they are involved in on their farms, but they are mainly focused around fulfilling business and administration tasks with some also involved in calf rearing and milking.

Analysis of the interviews and timelines revealed similar trajectories in terms of role development. They all 'married in' to the farm business and before marriage they had considered that farming was 'his job' while they had their own careers. Some who came from farm backgrounds felt that this prepared them better for the realities of dairy farm life while others recalled their shock at the busyness of the calving season and also the realisation that in-laws often had expectations of them in terms of bookkeeping and care responsibilities. In the early days of courtship and marriage, some interviewees did get involved in activities such as bringing cows in or milking as a means of spending quality time with their partner and enjoying the outdoor life. Two recently married interviewees with no children yet were still at the stage of minor but enthusiastic involvement, while still fully committed to their own careers.

The arrival of children was a critical time in terms of role realignment. In the majority of cases, responsibility for childcare and for the domestic sphere was not shared but was seen as the responsibility of the woman. This was heightened in a period of rapid farm expansion and a growing farm workload. Thirteen of the interviewees were in, or had passed, this juggling stage where they were trying to balance children, domestic and elder care responsibilities, their own careers and their role within the farm business, which led to decisions about career breaks, reducing their off-farm employment to part-time or quitting their jobs altogether. For some, this period was a struggle in terms of professional identity.

One interviewee who happily had given up her off-farm job when the children arrived got involved in various aspects of helping her husband to develop the farm, and spoke of reaching a crossroads, questioning what her role was on the farm. A pivotal point in the majority of cases was a decision to take part, as a couple, in a strategic management course facilitated by the same consultants who developed the partners' programme. The outcome of this was an overarching reorientation towards seeing the farm as their family business rather than something that their spouse did and in which they had just a tangential role.

One interviewee spoke about this shift as being coupled with the realisation that *'it's kind of irresponsible not to know what's going on. You know, if anything happened my husband, and I had no idea what was happening I think that could just be an awful situation for me to find myself in*'.

One of the older interviewees who has confidently reached the stage of identifying herself as 'a farmer' developed her role in the areas of calf care, human resource management and administration while also initiating a farm tourism project by renovating an old building. Another undertook a vocational qualification in agriculture while on maternity leave so that she would understand the business better and is now focused on introducing lean management techniques within the farm business. Most were still at the stage of exploring the content and scope of their roles, with some trying to leverage their skillset and interests in claiming responsibility for certain types of tasks and others still struggling to find a role that they feel willing and able to take on.

Although the interviews took place at a relatively early stage of the participants' involvement in the programme, they still revealed what the women believed they were gaining and learning from the initiative. The interviewees also spoke positively about the fact that the programme participants have a diversity of backgrounds that they bring to the group discussion. After a number of online meetings, the participants were excitedly anticipating the programme's first face-to-face meeting.

Four main themes emerged regarding motivations to join this programme. These included developing a peer network, help in shaping their role, desire for learning and encouragement from their partner.

Building networks and support amongst peers

Two interviewees mentioned that they had encouraged the consultants to set up a 'partners' programme specifically because few women really engage with the mainstream discussion groups which are typically male dominated. Participants expressed significant appreciation for the networking and connections that the programme facilitated and fostered with other women in similar situations, as well as the sense of validation and affirmation they felt within the space of the programme. This was attributed to the development of an atmosphere amongst the participants where no-one is judged by how much or how little they know in terms of technical farming knowledge. The need to find peers in similar circumstances who would understand the challenges in dairy farming was mentioned by most interviewees, in particular by those from non-farming backgrounds who felt they could not seek advice from their family and friends who had little to no idea about farming as illustrated in the quote:

"*I didn't know any other dairy farmer's wives until I met these 20 other women who are lawyers, teachers, all sorts… and I kind of was like okay this is good, I'm not the only one…having peers is just so invaluable'*

Some interviewees spoke about how they valued the opportunity to share experiences in confidence and discuss sensitive issues such as communication about farm family finances. This was especially prominent given the relational dynamics of the participants having married into the farm and many sharing the experience of being considered 'the daughter-in-law' or a newcomer to the family farm unit, while having strong economic, familial and emotional ties to the business.

Carving out a role within the business

The second common theme was the opportunity to explore and consider how they might develop their role. This was especially important for those women who were struggling to find a role they were comfortable in, while younger women mentioned their desire to know how other women had navigated their roles. Some interviewees discussed how they were connecting their learning from this programe with previous scientific and business knowledge and allowing them to visualise the potential meaningful role they could have on farm while utilising their existing knowledge and skills.

"I can see that [the programme] being another huge opportunity to identify skills I have, what are they, how do I utilize my skills more to help add value to the business?"

Learning and capacity building

The third theme was the desire for continuous professional development, to understand the farm business better and realising that knowledge is power. Some had very specific areas they wanted to upskill on, such as financial management or human resource management, while some just wanted to stay up-to-date with technical information and one said she wanted to '*get her head around dairy farming'*. Even more experienced farm women talked of the importance of continuous learning so that you do not get '*lax*' and that they could refresh their knowledge and share learning with younger less experienced women. All of the interviewees discussed how pleased they were with the technical knowledge they were gaining from the consultants, invited speakers and from each other.

Many expressed that they felt more confident in discussing the farm business with their partners. They had one session on environmental management that was universally appreciated and some interviewees discussed how they were now looking at ways to improve biodiversity on their farm and other indicators of environmental sustainability. Others mentioned what they were learning about farm financial management and their plans to learn more about office management and human resource management. Some had previously participated in other agricultural advisory events, while others were gradually becoming more interested in reading Teagasc and other farming publications. One interviewee told how she had attended a national event showcasing dairy research for the first time this year and was delighted when she *"got a tip on the shoulder. It was one of the girls from the programme so even that is massive, you know, to say "oh you're here too" like"*.

Partner encouragement and confidence boosting

The fourth theme was support and encouragement from their partners ranging from a partner showing his wife the flyer, saying '*you might like this'* to more confidence building where individuals had doubts such as '*like am I good enough for that course?'* One interviewee felt she would be intimidated by other women who likely had powerful careers, but the encouragement of her partner and the consultants helped to overcome those fears.

4. Practical Implications

Partners who are seeking to develop their role within family farm businesses require tailored learning supports. This case study demonstrates that farm women will engage with programmes that are specifically designed for them in format, content, and approach. Facilitated learning amongst peers can enhance capacity, confidence and skills to support women in developing their roles within family farm businesses while also providing a supportive space to discuss the challenges they face. Where women 'marry into' a farm, this type of learning opportunity can enable them to assess how their diverse, transferable skills can be integrated into the family business in a way that enhances their status while strengthening the farm business and enhancing the lives of those living on the farm.

Theoretical Implications

The family dimension of dairy farming requires more attention in extension including consideration of approaches that are family- and woman-friendly. In supporting the engagement of farm partners / spouses in the family business, there is a challenge in ensuring that this is not reinforcing patriarchal norms but enhancing the visibility and status of farm women.

References

Graeub, B. E., Chappell, M. J., Wittman, H., Ledermann, S., Kerr, R. B. and Gemmill-Herren, B., 2016. The state of family farms in the world. World development., 87, pp.1-15.

Kelly, R. and Shortall, S., 2002. 'Farmers' wives': women who are off-farm breadwinners and the implications for on-farm gender relations. Journal of Sociology, 38(4), pp.327-343.

Molloy, A., 2017. How Teagasc advisory services can improve engagement with and empowerment of farm women, University College Dublin.

Molloy, A., Gorman, M. and Kavanagh, J., 2017. How Agricultural Advisory Services Can Improve Engagement with Farm Women. In 23rd European Seminar on Extension (and) Education, Chania, Greece. http://esee2017.maich.gr/proceedings/proceedings.

Shortall, S., 2017. Changing gender roles in Irish farm households: continuity and change. Irish Geography, 50(2), pp.175-191.

Suess-Reyes, J. and Fuetsch, E., 2016. The future of family farming: A literature review on innovative, sustainable and succession-oriented strategies. Journal of Rural Studies, 47, pp.117-140.

How to make Johne's Disease extension strategies more inclusive of 'disengaged' farmers

Rosie Morisson[1], David Rose[4], Pete Orpin[2], James Hanks[3], Emma Taylor[3],
[1] Cranfield University
[2] MyHealthyHerd
[3] Pan Livestock
[4] Royal Agricultural University, Cirencester, UK

Short abstract (200 words):
Johne's Disease (JD) is an infectious ruminant disease that is prominent in dairy herds across the UK. JD can cause a reduction in milk yields, infertility in cows and poses a threat to animal welfare. Current extension and education efforts to tackle JD tend to be focused on engaging farmers who are already proactive and concerned about the disease. This presents a problem as previous studies suggest that there is considerable divergence in how engaged and proactive farmers behave towards JD control. 'Disengaged' farmers are less likely to implement on-farm JD control measures due to a variety of reasons, some of which may be outside of their individual control. A lack of action on JD can have serious repercussions on the herd and animal health. It is therefore important that extension strategies are adapted to be more inclusive of these disengaged farmers. This research seeks to use in-depth interviews and workshops with both vets and farmers to gather data on the barriers that disengaged farmers face regarding JD control. This knowledge can then be used to inform future extension and education strategies to make them more inclusive and effective.

Extended abstract

Purpose

Johne's Disease (JD) is an infectious ruminant disease that is prominent in dairy herds across the UK. JD can cause economic loss for farmers through reduced milk yields and infertility and it has negative implications for animal welfare. Controlling JD can be challenging due to the long incubation period of the disease and the poor sensitivity of tests (Strain, 2018). However, eradicating it, or at least managing its prevalence within a herd is possible if the correct management practices are put in place (ibid.). Despite this, previous research on JD highlights that there is considerable divergence in how engaged farmers are in prevention and control (Ritter, et al., 2015). Some farmers do not believe JD presents any real threat to their herd; some do not believe the recommended control measures are effective whilst others do not have the resources to implement the control measures (ibid.). If these farmers do not engage in JD control, they run the risk of losing milk buyer contracts, raising animal welfare concerns, experiencing reductions in their productivity and, in worst case-scenarios, losing a large proportion of their herd. This research study therefore seeks to identify how extension and education strategies can be made more inclusive to reach these 'disengaged' individuals and promote achievable JD control strategies amongst them. Importantly, we acknowledge that there will be many reasons why some farmers are 'disengaged' with JD control strategies, some of which are likely to be outside the control of the individual farmer. These may include the supportiveness of the innovation environment, rules imposed by milk buyers, and the relevance of JD advice. Thus, in a similar way to the work of Hurley et al. (2022) on 'harder-to-reach' farmers, we do not use the term 'disengaged' farmers in a way that casts judgement on individuals.

Current approaches to JD extension and education in endemically affected countries are not sufficient to reach disengaged farmers. Instead, they tend to cater towards farmers who are already proactive on JD resulting in them being the beneficiaries of resources. The majority of JD control programmes are voluntary, and farmers choose whether they participate or implement the measures (Sorge, et al., 2010; Kovich, et al., 2006; Kanankege, et al., 2019). Disengaged farmers may find it difficult to take part. Extension officers and vets have also been found to face communication issues when working with disengaged farmers, who themselves tend to get frustrated at vets for constantly talking about JD (Robinson, 2020). These vets and extension officers do not always have the skillsets to manage difficult farmers (Roche, et al., 2019) and additional training may be needed as evidence has previously shown that communication tools are key to increasing farmer engagement in disease management (Ritter, et al., 2017).

This study therefore seeks to offer an in-depth insight into the barriers that farmers face when deciding to implement Johne's control measures and how these barriers can be overcome. The findings will inform JD extension strategies to ensure they are more inclusive and can reach disengaged farmers.

Design/Methodology/Approach

The data collection comprises of workshops and interviews that will take place between October 2022 and April 2023. Twenty workshops attended by roughly 20 farmers and their vets have been arranged and will be facilitated by experts on JD. The workshops have been designed so they are interactive for farmers and vets and include poll questions throughout to elicit conversations and debates amongst farmers. Workshop participants are assured of their anonymity before the workshop begins. Notes are made in the workshops on any key themes and questions that arise. The findings from the workshops that have taken place to date have been used to produce interview guides for semi-structured interviews with farmers and vets.

When identifying participants for interview, it was important we developed a targeted sampling strategy to identify and contact the disengaged farmer group. Generally disengaged farmers are less likely to attend outreach events, such as our workshops, and due to their apathy are less likely to be forthcoming for interviews. Two key routes for participant recruitment where therefore identified. The first route is through vet practices who have attended workshops already. After the workshops we ask vets to approach their most disengaged and worst performing farmers to request interviews. The second route is through farming cooperatives and farming groups, where we approach the leaders of these groups and ask them to disseminate information about the research project to their members. Interviews with vets and more proactive farmers will also be carried out as they can provide insight into disengaged farmers and their mindset and also wider contextual barriers.

The data collection will follow an iterative approach. As themes are identified in interviews, they will be discussed in workshops and vice versa.

Findings

The data collection is still ongoing, and we therefore do not have any firm findings to currently report. Initial workshops and interviews have highlighted several themes which will be explored further. These include the role of milk buyer/processor demands for JD control, resource constraints such as a lack of space and concerns over maintaining milk levels. However, until we conduct in-depth interviews and more workshops (February and March 2023), it is not possible to determine the magnitude of the effect of these factors or provide any more detail.
In our presentation, we will present the results of the workshops and interviews. Using these results, we will offer insight into how JD extension and education strategies can be made more inclusive and meet the needs of a wider range of farmers.

Practical Implications

The overall aim of this study is to provide evidence on how JD extension and education can be adapted to become inclusive of all farmers. Practically, this may mean rethinking of our current approaches to JD extension including resulting in higher levels of JD control and increased productivity and animal welfare.

Theoretical Implications

This study will expand our understanding of farmer behaviour change and agricultural practice adoption. Using existing theoretical frameworks such as the Theory of Planned Behaviour (TPB) and the Transtheoretical model (TTM) a better insight into farmer attitudes, experiences and social norms will be developed. The ambition of this study to obtain data from 'disengaged' farmers also presents a unique opportunity to gain insight into these farmers opinions, as due to the difficulties associated with accessing this group, many studies fail to include their perspectives.

References

Kanankege, K. S. T. et al., 2019. Use of a voluntary testing program to study the spatial epidemiology of Johne's disease affecting dairy herds in Minnesota: a cross sectional study. *BMC Veterinary Research,* Volume 15.

Kovich, D., Wells, S. & Friendshuh, K., 2006. Evaluation of the Voluntary Johne's Disease Herd Status Program as a Source of Replacement Cattle. *Journal of Dairy Science,* 89(9), pp. 3466-3470.

Orpin, P., 2019. *New Red Tractor Dairy Standards Announced.* [Online] Available at: https://www.myhealthyherd.co.uk/new-red-tractor-dairy-standards-announced/ [Accessed January 2023].

Ritter, C. et al., 2017. Invited review: Determinants of farmers' adoption of management-based strategies for infectious disease prevention and control. *J. Dairy Sci,* Volume 100, pp. 3329-3347.

Ritter, C. et al., 2015. Factors associated with participation of Alberta dairy farmers in a voluntary, management-based Johne's disease control program. *Journal of Dairy Science ,* 98(11).

Robinson, P., 2020. "They've got to be testing and doing something about it": Farmer and veterinarian views on drivers for Johne's disease control in dairy herds in England. *Preventive Veterinary Medicine,* Volume 182.

Roche, S. et al., 2019. Exploring dairy producer and veterinarian perceptions of barriers and motivators to adopting on-farm management practices for Johne's disease control in Ontario, Canada. *Journal of Dairy Science,* 102(5).

Sorge, U. et al., 2010. Attitudes of Canadian dairy farmers toward a voluntary Johne's disease control program. *Journal of Dairy Science,* 93(4), pp. 1491-1499.

Strain, S., 2018. Johne's disease control: a challenging yet achievable goal. *The Veterinary Record,* 182(17).

ESEE 2023

AGIR

AGroécologie - Innovations - TeRritoires

LEREPS

TOULOUSE

9 782958 956905