Business models

Deliverable D2.5

Project AGROinLOG "Demonstration of innovative integrated biomass logistics centres for the Agro-industry sector in Europe"

Grant agreement: 727961

From November 2016 to April 2020

Prepared by: CIRCE

Date: 08/05/2020

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 727961

DELIVERABLE FACTSHEET

Project start date:	November 2016
Project website:	www.agroinlog-h2020.eu
Deliverable number:	D2.5
Deliverable title:	Business models handbook
Lead Partner:	CIRCE
Work Package no. and title:	WP2 - Tailored Business Plan and Exploitation of the Innovative Business Models
Task no. and title:	Task 2.4. Updating business model and elaboration of the exploitation plan after demonstration in real operational environment
Version:	Final
Version Date:	08/05/2020

Diffusion list

Dissemination level	
X	PU = Public
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Approvals

	Company
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Reviewer	RISE, CERTH, APS, Lantmännen

Documents history

Version	Date	Main modification	Entity
Draft 1	24/04/2020	Draft version	CIRCE
Draft 2	02/05/2020	Improved version	CIRCE
Draft 3	06/05/2020	Demo's partners review	CERTH, APS, RISE, Lantmännen
Final	08/05/2020	Final version	CIRCE

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ABBREVIATIONS

IBLC: Integrated Biomass Logistics Centre

BM: Business model

d.b.: dry basis (w/w %)

w.b.: wet basis (w/w %)

O&M: Operation and maintenance

ESCOs: Energy Service Companies

PGI: Protected Geographic Indication

PDO: Protected Designation of Origin

OTP: Olive tree prunings

TPOMW: Two-phase pomace mill waste

PARTNERS SHORT NAMES

CIRCE: Fundación CIRCE

WFBR: Stichting Wageningen Research

ZLC: Fundación Zaragoza Logistics Centre

CERTH: Ethniko Kentro Erevnas Kai Technologikis Anaptyxis

RISE: RISE Research Institutes of Sweden

CREA: Consiglio per la Ricerca in Agricoltura e L'analisi dell' Economia Agraria

APS: Agroindustrial Pascual Sanz S.L

NUTRIA: Anonymi Biomichaniki Etairia Typopiisis Kai Emporias Agrotikon

LANTMÄNNEN: Lantmännen Ekonomisk Förening

PROCESSUM: RISE Processum AB

Spanish CO-OPS: Cooperativas Agro-Alimentarias de España. Sociedad Cooperativa

INASO: Institouto Agrotikis Kai Synetairistikis Oikonomias INASO PASEGES

AESA: Agriconsulting Europe S.A

UCAB: Association Ukrainian Agribusinessclub

UBFME: University of Belgrade. Faculty of Mechanical Engineer

EXECUTIVE SUMMARY

The IBLC concept allows extending the business core of an agro-industry, obtaining new products for new or already existing customers. This can be done by adapting the agro-industry methods and processes to manufacture these new products and by establishing new relationships with different suppliers and customers, always taking advantage of their current commercial activities and channels. Despite all these advantages, all these adaptations and innovations might imply new investments and running costs so that the economic, environmental and technical feasibility of the new business has to be analysed.

The final deployment of these IBLCs in each one of the project demo cases required not only the execution of several demonstration activities and performance tests, but also the development of precise business models. The business models were developed following the Canvas method.

During the demos execution the business models have been reviewed, updated and tuned according to the data obtained during the demo activities which contributed to the deeper analysis of all the factors involved (suppliers, consumers, costs, etc.). The most appropriate and profitable business model for the company can only be defined if all aspects affecting the topics included in the Canvas model (definitive suppliers, production costs, market prices according to market evolution and quality achieved, delivery costs, etc.) are thoroughly examined.

The work performed so far has allowed to refine the strategies and modify significantly in some cases the assumptions considered in the first business model version. The refinement process has been different in the three demo cases according to the specific characteristics and needs of each agro-industry.

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INTRODUCTION

The AGROinLOG project analyses the idea to transform current agro-industries into IBLCs. An IBLC is defined as a business strategy for agro-industries to take advantage of unexploited synergies in terms of facilities, equipment and staff capabilities, to diversify regular activity both on the input (food and biomass feedstock) and output side (food, bio-commodities & intermediate biobased feedstocks) thereby enhancing the strength of agro-industries and increasing the added value delivered by those companies.

Even if each agro-industry presents specific conditions that should be considered in order to successfully implement the IBLC concept, there are some common characteristics, such as: integrated value approach towards food and biobased markets, regional availability of biomass, logistic, storage operations and pre-treatment activities, possibility to exploit the central position.

In order to do so, a business model was developed in the first period of the project (July 2017) which was then upgraded to produce the intermediate business model and finally updated at the end of the project (April 2020).

A business model defines the way a company creates, develops and captures value. The blocks of the business model developed following the Canvas method cover (Osterwalder, A. and Pigneur, 2010), see Figure 1:

- Key partners
- Key activities
- Key resources
- Value propositions
- Customer relationship
- Channels
- Customer segment
- Cost structure
- Revenue streams

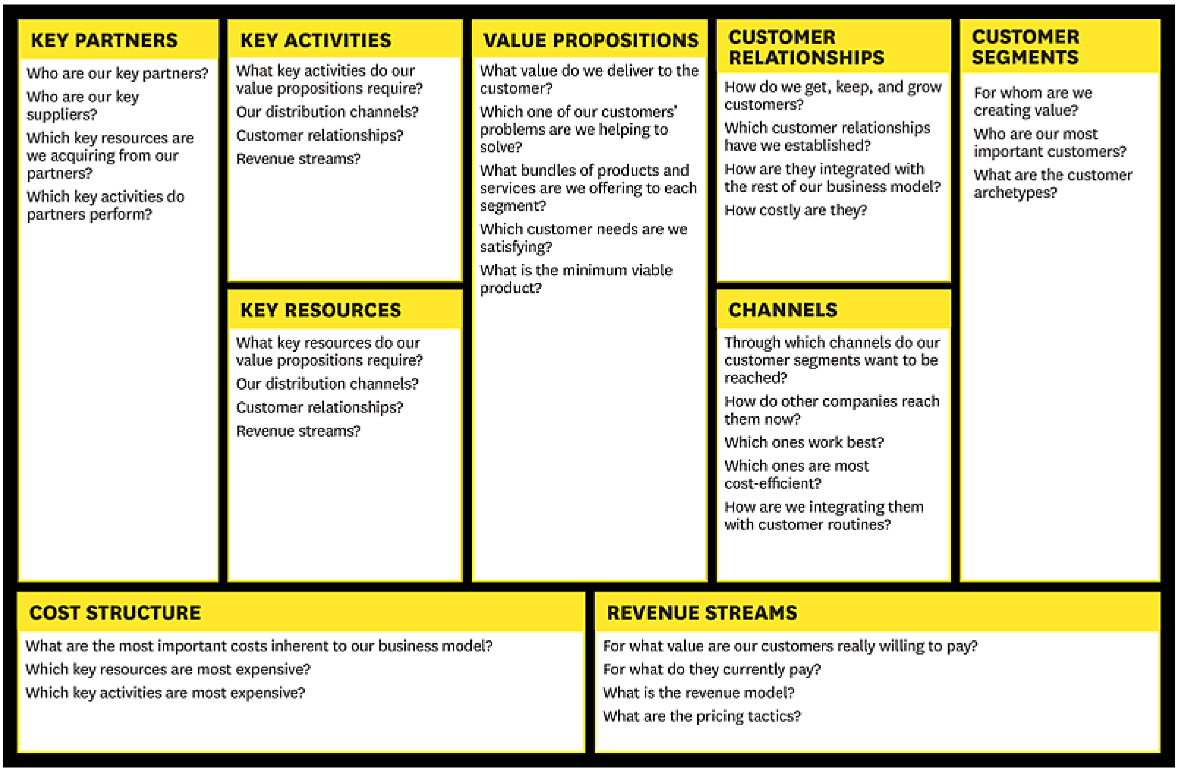

Figure 1. Canvas methodology for a business model generation (Figure obtained from http://seasofchange.net/ibtrainer)

The work performed so far has allowed to refine the strategies and modify significantly in some cases the assumptions considered in the first business model version. The refinement process has been different in the three demo cases according to the specific characteristics and needs of each agro-industry.

1 IBLC BUSINESS MODEL

The term Business model (BM) can be defined as the conceptual structure supporting the viability of a business, including its purpose, its goals and its ongoing plans for achieving them. The concept was originally defined by Osterwalder & Pigneur (2004, 2010) [1]: "A business model describes the rationale of how an organisation creates, delivers, and captures value". The most widespread methodology used to develop a Business Model is by the Canvas methodology in which by nine building blocks it is shown the logic of how a company intends to make money. The blocks cover the main areas of a business: customers, offer, infrastructure and financial viability (Osterwalder & Pigneur). Figure 1, presented earlier in the report, depicts the CANVAS method with some basic explanation regarding the content of the blocks that compose the Business Model.

The IBLC concept allows extending the business core of an agro-industry, obtaining new products for new or already existing customers by adapting the agro-industry methods and processes to manufacture them and establishing new relationships with different suppliers and customers, always taking advantage on their current commercial activities and channels. Despite all these advantages, all these adaptations and innovations might imply new investments and running costs so that the economic, environmental and technical feasibility of the new business has to be analysed.

The deployment of the three IBLCs demo of the project has required not only the execution of several performance tests but also the development of precise business models.

The agro-industry production needs to be described in detail in order to understand the processes and products. The different blocks to develop a business model need to be defined considering not only the specific conditions and characteristics of the agroindustry but also the product competitivity, market conditions variability, etc.

These nine blocks included in the Canvas business model used express how the three new business lines expect to create, deliver and capture value regarding the different aspects identified in the blocks.

The accuracy of the input data needed is key to be able to successfully define the business model. Therefore, during the project operational test, analysis of the existent equipment synergies for the new line, economic assessment, validation test, contacts with possible suppliers and end users, etc. were performed.

During the demos' execution, the business models have been reviewed, updated and tuned according to the data obtained during the demo activities which contributed to the deeper analysis of all the factors involved (suppliers, consumers, costs, etc.). The most appropriate and profitable business model for the company can only be defined if all aspects affecting the topics included in the Canvas model (definitive suppliers, production costs, market prices according to market evolution and quality achieved, delivery costs, etc.) are thoroughly examined.

Further details of each demo case business model are provided in chapters 2, 3 and 4.

2 AGROINDUSTRIAL PASCUAL SANZ S.L (APS)

2.1 General description

Agroindustrial Pascual Sanz (APS) is an agro-industry dedicated to the production of dehydrated forage (lucerne) for the animal feed market. The dehydrated forage is sold both in bales and pellet formats.

As any company from the agro-industrial sector, APS business is highly dependent on the market demand which considerably fluctuates every year. APS' customers are both national and international (around 50 % national; EAU 40 % and China 10 % being the main international markets). To provide an overview of the production within the last years, the approximated figures following summarise APS production data:

- Production of 27,000 t/year of lucerne in a high density bales format, being around 22-24,000 t/year of 100 % lucerne (65-80 % of these bales are for international market) and 3-5,000 t/year of the animal feeding blend (100 % for international market).
- Production of 18,000 t/year of lucerne pellets format for animal feed market (10 % for international market).

2.2 IBLC business model

The agro-pellet production strategy should, just as for the feed pellet production strategy, try to produce during the hours when the operational cost is lower and consider the power contracted in order not to exceed it or assume the cost associated to exceeding the tariff contracted if the benefits obtained make it profitable. Even if the fundamental strategy will follow this principle there might be conditions in which it might be interesting to exceed the contracted power if the benefit achieved is higher than the price paid due to the surplus of power consumed. This same principle is again applied to the forage production.

Additionally, in order to avoid contamination risk and therefore time required to produce with lower quality material, the strategy established aims to continue their regular activity for the animal feeding market from April to November and concentrate the energy pellet production from December to March (scenario 1). Therefore, during the idle period only energy pellets will be produced and the animal feed products will only be produced from April to November.

However during the last years, the animal feed market has been extended during the idle period to produce animal feed pellets therefore reducing the time available to produce energy pellet (scenario 2).

The final distribution among the two business lines will depend on the existing market conditions. As previously mentioned, if the market conditions are advantageous for the energy pellet the production could also be planned at certain moments out of the idle period and, on the contrary, if the animal food market is more profitable the animal pellet production can be extended during the idle period.

Therefore, in the first scenario considered the installation will be dedicated to animal food production from April to November and to energy pellet production from December to March. Out of the total hours adding the different tariffs, restrictions have been applied when the electricity consumption excess involved a price too high to make profitable the energy pellet production.

Concerning scenario 2, this scenario is closer to the current situation in which the animal feed market shows a better profitability than energy pellet market; therefore the energy pellet production is carried out from December to March but whenever the installation is not producing animal feed products. This scenario considers that for instance during the last years the animal feed production has been extended during the idle period, therefore the time available to produce energy pellets during the idle period is decreased comparing to scenario I.

These results highlight one of the main advantages of the IBLC model, its flexibility to adapt their secondary business line to the market conditions in order to optimize the profitability of the agroindustry while contributing to diversify the business.

Canvas model for the feed and fodder demo case is presented in Figure 2. Feed and fodder demo case Canvas model A summary of the main findings of the business model can be consulted in Deliverable 3.7.

Key partners

- Farmers supplying the agro-residues
- Suppliers of the wood chips
- Farmers cooperatives
- Boiler manufacturers
- Boiler operation and maintenance services
- ESCOs or other intermediaries companies (APS considers for now two possibilities regarding the distribution. APS could take over the distribution of the new products to the final users or might decide to sell all the new production to intermediaries, distributors, ESCOs) or other logistics companies.

Key activities

- Drying process
- Milling and pelletizing
- Demonstrate the agro-pellet combustion in industrial boilers (demonstration activities with potential customers for instance)
- Improve the feeding system (hopper) of the peletisation line to achieve a continuous operation and improve the design to avoid moisture related inconveniences inside the hopper
- Confirm the possible increase concerning the maintenance operation of the dies or any other equipment
- Raw materials quality traceability in order to achieve a competitive product
- Confirm the average electricity consumption based on the first years of production (to check the previsions developed during the project).

Key resources

- Agro-residues and woody material needed as a raw material in the process
- Machinery to dry, mill and pelletize

Value position

- Agro-pellets (60 % wheat straw-40 % forestry wood)
- Agro-pellets for other bio-applications (100 % herbaceous pellets)

Customer relationship

- Strengthen relation with their customers based on a good customer services and having continuous feedback regarding performance and satisfaction.
- Overcome the customers mistrust (linked to the validation activities)

Main commercial strategy adopted is the word of mouth so that customers have to be satisfied, not only with APS' agro-pellets but also with customer services.

Channels

- Other farmers who are satisfactorily using the agro-pellets
- Explore the possibility to collaborate with a boiler manufacturer that will be interested to develop a boiler able to efficiently burn this biofuel.

Customer segment

Medium or large scale boilers placed in the cattle or food sectors or in the rural community (farms, agro-industries, etc.)

Cost structure

Raw materials: 59 €/$t_{w.b.}$
Production costs: 51-61 €/$t_{w.b}$
Transport & logistics to the customers: 10-22 €/$t_{w.b.}$
Fixed costs: 8-10 61 €/$t_{w.b}$
Industrial margin: 13 %.
Selling price at destination: 145.5-155 €/$t_{w.b.}$
Selling price at retailer: 157-167 €/$t_{w.b.}$

Revenue streams

Considering 15 €/$t_{w.b}$ as minimum benefit to start the business and the production cost, the final price of the agro-pellet for farms and agro-industries could vary between 145 to 167 €/$t_{w.b}$ considering the agro-indsutry could produce 4,500 t of 60 % straw and 40 % wood blend pellets.

Figure 2. Feed and fodder demo case Canvas model

3 Anonymi Biomichaniki Etairia Typopiisis Kai Emporias Agrotikon (NUTRIA S.A.)

3.1 General description

NUTRIA S.A. is an agro-industry dedicated to the production of olive oil, pomace oil and seed oil. NUTRIA is currently involved in three main business lines:

- The main activity of NUTRIA is the refining of the olive oil coming from small olive mills all over Greece in order to increase its added value. NUTRIA increases the quality of the olive oil by a second refining process and ensures its final quality through its chemical laboratory. In addition, NUTRIA has implemented standardised processes and control quality procedures to be able to certify the olive oil with Protected Designation of Origin (PDO) or Protected Geographic Indication (PGI).
- A secondary activity of NUTRIA is the operation of a small olive mill within its facilities. The mill is used to produce olive oil from olives coming from local farmers.
- A third activity, unconnected to the previous ones, has to do with the storage of cereal grain. Nutria owns 8 silos that each can store up to 2,500 tons of cereals. Currently, NUTRIA rents them to brewery companies to store cereal grains.

3.2 IBLC business model

In terms of NUTRIA's development into an IBLC, the key unexploited biomass resource to be considered are olive tree prunings (OTP). Olive tree prunings are regularly (usually on annual or biannual basis) produced as a result of agronomic operations in olive groves and represent a huge agro-biomass potential in the major olive oil and table olives producing countries: Spain, Italy and Greece. The most common way of handling this residual stream is open-field burning; within the AGROinLOG project, the vision is the transformation of olive tree prunings into a tradeable bio-commodity as hog fuel or through their upgrade and "standardization" via a pelletization process.

During the AGROinLOG project, NUTRIA is evaluating the possibility of introducing in their facilities several unit processes and operations. It is worth pointing out that during the AGROinLOG proposal preparation phase, NUTRIA was considering the expansion of its activities by building a new TPOMW (two-phase pomace mill waste) processing plant, essentially a new pomace mill. Despite envisaged as a state-of-the-art facility, actually the pomace mill on its own is nothing new and several such plants operate in Greece. The key point for AGROinLOG was that the TPOMW facility would include a drying plant, that was also to be evaluated in its potential as a drying plant for olive tree prunings, before their pelletization. This was considered the "ideal" IBLC concept for industries in the olive sector, and more specifically for the pomace mills which are the most sophisticated industries in terms of handling residues of the sector. In this light, most of the activities of this concept was demonstrated in the AGROinLOG project, as it can be a highly replicable concept in the olive sector.

However, since the investment of the TPOMW has not materialized in NUTRIA, and probably will not due to external reasons, and due to the results of the so far demonstrations in the project, the current business plan for NUTRIA has been reshaped into concepts without the use of a TPOMW unit. In addition, so far results from the demonstration activities throughout the whole duration of AGROinLOG project resulted to refocus the business plan of NUTRIA towards new scenarios of exploiting the olive tree prunings of the area and expanding the existing business activities of NTURIA.

Since the beginning of the project, the main exploitation of OTP prunings was focused on their conversion into pellets. However, after the results derived from the demonstrations and validation tests during the AGROinLOG project, it was concluded that the marketing of OTP pellets in Greece (and probably in most other European countries) can be a risky business:

- It is very hard for OTP pellets to compete in the industrial solid biofuels market which is currently dominated by other, lower cost products (sunflower husk pellets, exhausted olive cake). Even though it can be claimed that some quality characteristics of OTP fuel are better, the industries are not willing to pay the price difference.
- Surprisingly, interest for OTP pellets has been seen in the domestic solid biofuels market. It is purely a cost-driven decision from consumers, who can get an equal heating value for a reduced cost. However, compared to the wood pellets for the domestic heating market, OTP pellets perform worst in fuel properties.

On the other hand, the difficulties encountered, led to other potential concepts that can be applied. One of them, is the exploitation of olive tree prunings as hog fuel. Base on the results achieved during the project, especially in this last period with the final results obtained it was highlighted that it could more profitable for an IBLC to use OTP hog fuel directly.

In this light, the practical implication of the above is the refocusing of the final business model and of NUTRIA regarding the exploitation of OTP. Thus, the alternative and more suitable strategies applicable for NUTRIA as an IBLC are the following:

- Scenario 1 OTP hog fuel scenario: NUTRIA remains with the existing infrastructure and equipment (the one integrated harvester/ shredder, and storage/ handling facilities of NUTRIA) and becomes a logistic centre for harvesting, storing, handling and selling hog fuel derived from olive tree prunings. The hog fuel is produced for external consumers (e.g. third biomass power plants) and maybe 1-2 local heating boilers. The final product commercialized in this case will be around 2,500 tons of hog fuel harvested per year.
- Scenario 2: The Greek IBLC will remain the first two years with the existing infrastructure (basically, the one harvester and storage / handling facilities of NUTRIA) and commercializes hog fuel as described in the previous scenario. After two years, and once more experience has been accumulated in biomass handling, the Greek IBLC will expand its harvesting capacity up to 8,000 tons of OTP hog fuel and NUTRIA will evaluate two cases:

- Concept 1: investment on a biomass power plant of 1 MWe that will be using exclusively the hog fuel of OTP. Electricity generated will be sold directly to the grid.
- Concept 2: creation of own pellet plant. NUTRIA would invest on an OTP pellet plant with a targeted annual production of 5,000 tons pellets. The consumption would come from the domestic heating market, with a possible re-evaluation of the industrial market every year, in connection with the price developments of competing fuels and the potential coal-to-biomass conversion project. However, this plan would be susceptible to influences from legislation (e.g. banning of low quality pellets for the domestic heating market, as was the case in Italy[1]).

Canvas model for the olive oil demo case is presented in Figure 3. A summary of the main findings of the business model can be consulted in Deliverable 4.8.

[1] Bioenergy Europe Statistical Report 2019 – Pellets. Available on https://epc.bioenergyeurope.org/wp-content/uploads/2020/02/SR19_Pellet_final-web-1.pdf

Key partners	Key activities	Value position	Customer relationship	Customer segment
• Farmers • Local agricultural cooperative • Distribution company • National grid operator (power plant scenario)	Hog fuel related technical activities: • Harvesting and haulage of OTP hog fuel to the storage site of the IBLC. • Storage of the hog fuel. • Commercialization and distribution • Verify pruning yield and supply figures • Develop pruning logistics and treatment process • Confirm calculation regarding machinery equipment • Come in agreement with the local Agricultural cooperative to secure for each year the essential amount of olive groves (applicable for every concept) OTP pellet technical activities: • Harvesting and haulage of OTP hog fuel to the storage site of the IBLC. • Storage • Pretreatment of the hog fuel (chipping, milling, drying) and pelletization. • Maintenance of the pellet plant. • Commercialization and distribution • Confirm figures regarding the consumption of the different equipment and machinery involved in the production of the OTP-pellet further measurements Power plant main technical cactivities: • Harvesting and haulage • Storage and feeding to the power plant throughout the year • Maintenance of the power plant Market introduction activities:	OTP-Pellets and hog fuel and electricity depending on the scenario considered. Additionally the IBLC concept will contribute to enhance the rural economy and reduces the internal migration from rural to urban population nucleus	For OTP-pellets: • Strengthen a close relationship with their customers based on a good customer service that might include training regarding boiler O&M activities, above all in the first weeks. • NUTRIA might support and offer solutions in the case of boiler malfunctions caused by fuels operation. In the case of hog fuel commercialization: NUTRIA should be in place to secure the agreed demand of hog fuel.	OTP pellets: • Greenhouses • Municipalities • NUTRIA's self-consumption • Medium- Large Industries • Domestic users Hog fuel: • External Power plants • Public buildings with suitable feeding system • Nearby Medium- Large Industries with biomass boilers able to consume hog fuel • Self-consumption (in case NUTRIA retrofits its boiler's feeding system) Power plant: grid operator

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- NUTRIA could retrofit its boiler in order to burn their own olive pruning derived fuel (hog fuel), and as a result have cost reductions for NUTRIA and advertise its produced fuel to attract more industrial users
- Additional validation activities with both OTP fuels at industrial facilities to advertise the product
- Additional validation activities with OTP pellets in appropriate domestic boilers
- Evaluate yearly the industrial fuel market for the prices of the competing industrial fuels
- Further promote different types of diffusion activities with different goals

Key resources

- Olive tree pruning
- New equipment,machinery and personnel

Channels

Regarding the OTP pellets:

- Collaboration with boilers manufacturers of selling appropriate domestic boilers together with an amount of OTP pellets
- Collaboration with various retailers shop in the area could help in the dissemination of the products
- Dissemination through stands in local supermarkets could be applied to further advertise the selling of to domestic users.

Regarding the hog fuel market, not additional communication are needed.

Cost structure

Hog fuel commercialization with the existing equipment:

- Raw materials (harvesting, first haulage to NUTRIA)
- New personnel
- Distribution
- Commercialization

Revenue streams

Hog fuel: The revenue comes to the IBLC by selling the amount of hog fuel produced to the end users. For the basic concept, where NUTRIA continues with the existing equipment and facilities, the commercialization of 2,500 tons hog fuel will increase the annual turnover of NUTRIA by 125 k€, by assuming a selling price of 50 €/tw.b at the IBLC gate.

OPT pellets: • Raw materials (harvesting, first haulage to NUTRIA) • Production costs • Investment in equipment, machinery and infrastructure • New personnel • Distribution • Commercialization Power plant: • Raw materials (harvesting, first haulage to NUTRIA) • Production costs • Investment in equipment, machinery and infrastructure • New personnel	OTP pellets: OTP pellets are produced, based on the results obtained so far, it has been estimated that these pellets could be sold in the Greek market at a price around 150-170 €/tw.b. for the OTP-pellet. For an annual production of 5,000 t of OTP-pellets, NUTRIA will obtain around 0.75- 1 M€ turnover per year in this new business. Power plant: The annual revenue for NUTRIA will be coming from selling electricity to the grid. By assuming a selling price of 198 €/ MWh (selling price of biomass power plant in Northern Greece), the turnover of NUTRIA would be increased by around 1.5 M€

Figure 3. Olive oil demo case Canvas model

4 LANTMÄNNEN EKONOMISK FÖRENING (LANTMÄNNEN)

4.1 General description

Lantmännen is an agricultural cooperative owned by more than 20,000 Swedish farmers. It has around 10,000 employees and is Northern Europe's leader in agriculture, machinery, bioenergy and food products. Lantmännen creates value throughout the grain value chain, from working their fields to working with the center of agribusiness and thus stand for a long-term responsibility and sustainable business development (Figure 4).

Figure 4. Lantmännen agricultural-related operations.

In Sweden, Lantmännen produces gluten, bread, bioethanol and animal feed pellets. The grain is delivered from farmers mainly during harvest, from August to October. In total, from July to September 1.7 Mt of grain each year are delivered to Lantmännen plants. The agribusiness or agro-industry works continuously throughout the whole year. However, due to volatile grain prices and ethanol sales price, risk minimization for feasibility of the bioethanol production is of great importance. A secure grain feed as well as stable grain pricing can be achieved by implementing an IBLC at Lantmännen.

4.2 IBLC business model

The intermediate business model developed was not economically profitable for the agro-indsutry based on the result from the economic assessment carried out. Therefore, in the final business model, input data has been refined and a wastewater treatment unit producing biogas as additional revenue has been included (scenario 1). The economic feasibility in this case is better and indicates a small profitability, but it is still not enough to motivate an investment. Thus, an additional consideration has also been assessed including a second raw material in the value chain (scenario 2).

In brief, two scenarios have been assessed for the final business model. All the amounts indicate dry tonnes.

- Scenario1 (base case): 68,000 t straw feed to the pretreatment unit.
- Scenario 2: 68,000 t straw fed to the pretreatment unit and 35,000 t sawdust fed into the HTL unit.

The major driving force to introduce sawdust as a second raw material in scenario 2 is to be able to increase the size of the HTL unit in order to improve the scale of economics, as the lignin fraction from the pretreatment and enzymatic hydrolysis is relatively small. In theory, also straw could have been fed directly into the HTL, but having two raw materials is beneficial for the business model as it lowers the sensitivity of the concept to for example straw shortage in the case of unfavourable weather conditions a specific year.

Canvas model for the grain demo case is presented in Figure 5. A summary of the main findings of the business model can be consulted in Deliverable 5.7.

Key partners

- Farmers: for straw supply
- Sawmill: for sawdust supply
- Catalysts suppliers: supply core catalyst for the pretreatment and HTL, enzymes for the enzymatic hydrolysis and yeast for the fermentation process
- Equipment suppliers: supply of the new equipment needed for the new process

Key activities

- Ensure product quality
- Establish straw supply throughout the year with maintained quality
- Install and commission the new processes
- Layout for integrating the new process in the existing bioethanol plant
- Ensure quality of products

Key resources

- Straw supply from farmers
- Sawdust supply from sawmill
- Straw and sawdust collection, storage and timely delivery
- Production facilities for bioethanol. Biooil and biogas

Value position

- Offering new sustainable product from local underutilized residues, sawdust and straw
- Ethanol: 2Gbioethanol which meets REDII
- Biooil: bunker oil quality with higher oxygen content but sulfur free as compared to fuels derived from fossil oil. Meets REDII
- Biochar: not feasible application yet identified due to high ash content
- Biogas: sustainable produced biogas upgraded to vehicle fuel quality

Customer relationship

- Extended relationship with current refineries, e.g. Preem. Sell more bioethanol and biooil. Investigate interest in joint venture
- Establish partnership with biogas distributer, such as Gasum.
- Establish relationship with new customer

Channels

- Customer for bioethanol and biooil
- Customer for biogas

Customer segment

- Large-scale refineries are the main interested customer for 2G bioethanol and biooil
- Biogas distributor is the intended customer of the biogas

Swedish government and citizens benefit from national fuel production as means to meet national sustainability targets, secure fuel supply and create local jobs

Cost structure

- Raw material cost including logistics costs: for straw and sawdust
- Operational costs: handling of raw material, enzymes, heat, electricity, additives, maintenance and staff costs
- Costs related to the factory and the investment: Depreciation on estimated total investment, insurance and income tax

Revenue streams

- 2G Bioethanol:
  Market price estimated to 950€/t
  Both scenarios produce 16,000t
- Biooil:
  Market price estimated to 500€/t
  Case 1 produce 11,000t and case 2 produce 30,000t
- Biogas:
  Market price estimated to 1,000€/t

Case 1 produce 1,900t and case 2 produce 2,500t

Figure 5. Grain demo case Canvas model

5 Conclusions

The Canvas model allows to have a visual of all the factors affecting the business in each demo case and refine the strategy before launching the new product in the market, namely blend pellet for energy purposes, OTP hog fuel (and possibly OTP pellets), second generation bioethanol and biooil.

For the feed and fodder demo case, two scenarios have been considered according to the results achieved during the project. Scenario 1 aims to avoid problems concerning the quality of the final product and reduce the work associated to the dies handling when changing from feed pellet production to energy pellet and vice versa. The strategy established plans to continue their regular activity for the animal feeding market from April to November and concentrate the energy pellet production from December to March. Therefore, during the idle period only energy pellets will be produced, and the animal feed products will only be produced from April to November. Scenario 2 was designed taken into account the last years data in which the animal feed market has been extended during the idle period to produce animal feed pellets therefore reducing the time available to produce energy pellet.

For the olive oil demo case, two scenarios have been considered considering the findings obtained during the project lifetime. In the OTP hog fuel scenario, NUTRIA remains with the existing infrastructure and equipment and becomes a logistics centre for harvesting, storing, handling and selling hog fuel derived from olive tree prunings. In the second scenario, NUTRIA will remain the first two years with the existing infrastructure and commercializes hog fuel as previously described. But after two years the Greek IBLC will expand its harvesting capacity up to 8,000 tons of OTP hog fuel and NUTRIA. Based on this second scenario two cases have been evaluated. The first concept implies the investment on a biomass power plant of 1 MWe that will be using exclusively the hog fuel of OTP. Electricity generated will be sold directly to the grid. The second concept implies the creation of own pellet plant.

For the grain sector demo case, two cases were considered, taking into account the output obtained throughout the project, especially in the last period, which prompted the redesign of the business model approach. For the first scenario, input data has been refined and a wastewater treatment unit producing biogas as additional revenue has been included. In this scenario 68,000 t of dried straw is fed to the pretreatment unit. But due to the low profitability achieved, an additional scenario has been designed which uses both straw and sawdust as raw material. However, the sawdust is fed directly into the HTL unit. In this second scenario, 68,000 t of dried straw is fed to the pretreatment unit and 35,000 t sawdust fed into the HTL unit. The major driving force to introduce sawdust as a second raw material is to be able to increase the size of the HTL unit in order to improve the scale of economics. In theory, also straw could have been fed directly into the HTL but having two raw materials is beneficial for the business model as it lowers the sensitivity of the concept to for example straw shortage. Furthermore, sawdust could also be fed into the pretreatment meaning that 2G bioethanol could have been produced from straw and saw dust which shows the wideness of the model.

Key partners and key activities have been defined for all cases. According to the scenario considered the main actors and activities could slightly change but the agro-industries are well positioned to cover the different approaches.

Regarding the key resources, as it has been pointed out throughout the project, the supply guarantee of the new resource, in terms of quantity, quality and price, is a key parameter that can greatly affect the feasibility of the new business line. The raw material availability was confirmed for all three demo cases based on the results achieved. However, the variability of its price has been pointed out as a highly relevant parameter that can endanger the suitability and profitability of the model. Operational costs have been refined based on the results achieved even though depending on the readiness of the technology further refinement might be required for the industrial scale up. Finally, the potential of the product or products targeted has been studied in detail and has led to the refinement of the strategy trying to reduce the risk.

Potential customers and channels have been defined in each case and the corresponding strategy to approach them designed. Nonetheless in cases such as the feed and fodder sector demo case the target clients represent a narrow fraction which increases the risk to guarantee the selling. On the other hand, new developments concerning boilers able to operate with this type of biofuel could greatly improve the demand. Regarding the customers relationship, based on the results achieved from the valorisation activities and the additional contacts with potential customers carried out it can be stated that the agro-industries are well positioned in this regard, see as example the existent relation that Lantmännen holds with PREEM.

The three remaining blocks, value proposition, cost structure and revenue streams have been described for the scenarios considered in each case even though some of the figures considered for the new scenarios designed should be further refined.

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