highlights

of agricultural research

Volume 24, No. 4

Winter 1977

Agricultural Experiment Station
R. Dennis Rouse, Director

Auburn University
Auburn, Alabama

Director's Comments

THE FOOD and Agricultural Act of 1977 passed by Congress and signed by President Carter on September 29 is the most comprehensive farm legislation in the history of this Nation. For the first time, the Farm Bill included an agricultural research title. It began as a research title but early in the deliberation extension was added and later teaching was added. I was given the responsibility by the other 55 State Agricultural Experiment Station Directors of this Nation of being their spokesman and representing them in deliberations with the Division of Agriculture of the National Association of State Universities and Land Grant Colleges, with public research interests outside the Association, with the research component of the USDA, and with the House and Senate Agricultural Committees.

R. Dennis Rouse

It has been a demanding experience. Although I had great support from the other Directors, it required that I spend about half time in Washington. This put a heavy burden on the associate and assistant directors and I'm most appreciative for the fine job they have done.

The 1977 Farm Bill, Title XIV—National Agricultural Research, Extension, and Teaching Policy Act of 1977—is designed to augment, coordinate, and supplement the planning, initiation, and conduct of existing agricultural research programs. To accomplish this, the legislation designates the Department of Agriculture as the lead agency in food and agricultural research within the Federal Government, it provides for coordination of research, extension, and teaching activities of food and agricultural sciences throughout the Nation, federal, state, or private sectors to the extent possible, it provides a mechanism for communication and joint planning, it provides for review and recommendation by users, it provides a system for continuing evaluation and review by both the executive and the legislative branches of the Federal Government.

This title recognizes (1) the necessity for increased funding of the agricultural sciences; (2) the responsibility of the Federal Government in providing increased support to meet both operational and facilities' needs on a continuing basis not only to in-house research agencies of the Federal Government but to State Agricultural Experiment Stations, Schools of Forestry and of Veterinary Medicine, and all Land Grant Colleges and Universities, including those of 1862 and 1890 and Tuskegee Institute; and (3) the need to draw on special competence wherever it exists through competitive and special grants programs. The title includes aquaculture and human nutrition as a part of agricultural sciences and provides for special emphasis in human nutrition. It provides special funding for agricultural energy research-pilot programs and demonstration—and for special studies of important concerns such as weather.

It provides for special oversight, review of all programs funded under this title, and the requirement, beginning in 1983, for termination or reenactment of all existing authorizations after 1982.

A great amount of thought and effort has gone into each of the 70 sections that make up Title XIV which has the objective of improving the agricultural base of this Nation through improved research, extension, and teaching in the agricultural sciences. Now the big "if." If Congress appropriates the funds required to fulfill the plans set forth in this legislation and if those with responsibility for carrying out these plans ably do their job, Title XIV will make an important contribution to all America.

The present investment in agricultural research and extension has been calculated to provide an annual rate of return of 36%. Surely, Congressmen and the taxpayers they represent recognize this high return for investment in agricultural research and extension is a sound investment. Surely Congress will continue to appropriate funds at a level that will more adequately support the existing legislation for agricultural research. It is hoped that Congress will fund the important new program in Title XIV.

may we introduce . . .

Dr. Emmett F. Thompson, head of the Department of Forestry. He took over the leadership role in the Department early in 1977, following the return to teaching of former Department Head, Prof. W. B. DeVall.

Born in El Reno, Oklahoma, Dr. Thompson earned the B.S. degree from Oklahoma State University, an M.S. from North Carolina State University, and the Ph.D. from Oregon State University. His area of specialty is forest management and economics.

Prior to coming to Auburn, Dr. Thompson was on the staff at VPI from 1962-73, leaving as a professor. Since 1973, he has served as Professor and Department Head in the Forestry Department at Mississippi State University.

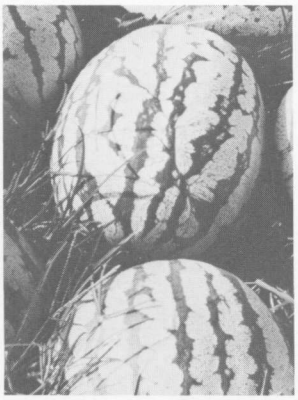
Dr. Thompson is a member of Phi Kappa Phi, Xi Sigma Pi, and Sigma Xi honoraries and several professional forestry associations, including the American Forestry Association. He has served on numerous committees on forestry economics, management, and employment and has authored over 30 research and popular articles, primarily in the area of forest economics.

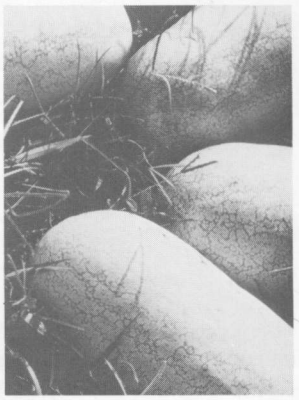
HIGHLIGHTS of Agricultural Research

WINTER 1977 VOL. 24, NO. 4

A quarterly report of research published by the Agricultural Experiment Station of Auburn University, Auburn, Alabama.

ON THE COVER. Joe Norton, Department of Horticulture, proudly displays a product of his watermelon variety research. See story on page 3.





Some varieties tested, left to right, were Crimson Sweet, Jubilee, and Charleston Gray.

EVALUATION of WATERMELONS for ALABAMA

J. D. NORTON and H. M. BRYCE, Department of Horticulture
C. C. CARLTON and K. C. SHORT, Chilton Area Horticulture Substation
J. E. BARRETT and F. B. SELMAN, Gulf Coast Substation
M. H. HOLLINGSWORTH, North Alabama Horticulture Substation
J. G. STARLING and O. F. FARRIOR, Wiregrass Substation

YIELD OF MARKETABLE MELONS, disease resistance, interior quality, size, and factors affecting market acceptability are all important considerations in the selection of a watermelon variety.

Special market preferences demand that melons with certain types of rind color, fruit size, and shape be grown. Anthracnose and fusarium wilt-resistant varieties are essential to reduce risk from disease losses. However, due to competition from other growers and regions, only high yielding varieties are profitable.

Description of Test

In variety tests conducted by the Auburn University Agricultural Experiment Station, watermelons were planted in hills 4 ft. apart in rows spaced 88 in. apart. Fertilizer was applied according to soil test recommendations. An additional application of 100 lb. of ammonium nitrate per acre was applied at locations where there was excessive rainfall during the early growing season. Plantings were made at the proper date for each location.

Each planting was harvested two times at weekly intervals when fruit were mature. Yield was recorded by number and weight of marketable fruit for each harvest. Disease resistance was evaluated using a plant injury rating from 0 to 5 on a disease index scale. Fruit weight, length, diameter, thickness of rind, total soluble solids, taste, and color were recorded for eight melons of each variety from each harvest.

Variety Comparison

The comparative yielding ability, quality, and characteristics of eight large fruited and three small fruited (ice box) varieties are given in the table. Charleston Gray is probably the best all-round melon because of high yield, excellent quality, and resistance to disease and sunburn. It has ability to produce good quality melons consistently, even under adverse conditions. Jubilee is probably the second leading variety in acreage; although it is a large melon, smaller fruit size has been observed on wilt infested soil. Crimson Sweet has excellent fruit quality; however, the near round shape of the fruit causes difficulty in stacking them in trucks and cars for shipment. Garrisonian is an excellent melon where large size is in demand. Yet, its white seed color has limited the market acceptability of the variety. Resistance to anthracnose makes it preferable to older similar varieties.

Congo is a good shipping melon with green rind and darker green stripes faintly visible. A tough rind, good interior quality, and anthracnose resistance has kept Congo in popularity despite fusarium wilt susceptibility.

Although Black Diamond, also known as Cannon Ball and Florida Giant, had a higher yield than other varieties in tests, it is not recommended because of unreliability, low quality, and susceptibility to disease.

Two new varieties, Allsweet and Smokylee, are not recommended. Although Smokylee produces high yields of excellent quality fruit, the fruit are misshapen and sunburn badly. Lower yields and misshapen fruit also make Allsweet unsuitable as a commercial variety.

The three icebox melons have limited acceptability as commercial varieties. Graybelle, an excellent quality melon, is a poor shipper. Although Sugar Baby is an excellent shipper, it is highly susceptible to disease. Petite Sweet is both a poor yielder and susceptible to disease.

Although none of the 11 varieties is resistant to two major diseases of watermelon, gummy stem blight and anthracnose, race 2, a breeding program at the Agricultural Experiment Station is currently in progress to develop commercial types with resistance to both diseases.

YIELD, AVERAGE WEIGHT, AND QUALITY OF WATERMELON FRUIT AT FIVE ALABAMA LOCATIONS

Variety	Yield by location					Av. yield[1]	Fruit weight	Soluble solids	Taste preference	Width, length ratio	Rind thickness	Days to maturity	Rind
	Chilton	Gulfcoast	Auburn	Cullman	Wiregrass								
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Pct.			In.		
Charleston Gray	15,490	16,790	20,180	15,930	7,020	15,082	19.4	11.3	1	.44	0.56	80	Gray
Smokylee	8,280	17,310	22,160	17,070	12,620	15,488	18.3	12.0	2	.43	.69	80	Green
Black Diamond	19,860	22,000	30,610	18,920	10,330	20,344	22.3	10.2	10	.82	1.30	90	Green
Congo	14,240	13,160	18,880	15,760	7,060	13,820	18.8	10.7	8	.74	1.00	85	Striped
Crimson Sweet	14,680	16,040	22,730	13,580	10,130	15,432	17.4	11.7	3	.62	.86	80	Striped
Garrisonian	16,210	13,360	22,260	13,940	7,130	14,580	25.1	11.1	7	.44	1.00	90	Striped
Jubilee	12,700	13,870	18,710	10,010	10,060	13,070	19.5	11.3	4	.43	1.00	90	Striped
Petite Sweet	5,530	8,050	10,330	6,870	5,540	7,264	9.2	11.0	9	.85	.64	80	Striped
Sugar Baby	9,630	12,150	17,400	8,850	8,140	11,234	9.2	10.8	11	.94	.95	80	Green
Graybelle	10,710	12,170	17,370	11,500	9,450	12,240	11.3	11.5	6	.82	.88	90	Gray
All Sweet	11,880	13,630	18,550	9,600	7,365	12,205	18.2	11.1	5	.48	.84	90	Striped

[1]Average of 5 locations

For Better Fishing in Farm Ponds, Regulate Bass Harvest

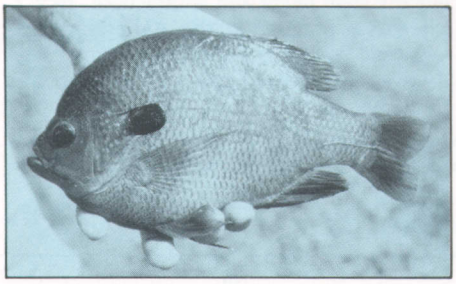
W. D. DAVIES
Department of Fisheries and Allied Aquacultures

LIMITED REMOVAL of bass from a pond can provide excellent bream fishing. Bass in a bass-bluegill-redear stocked farm pond serve two primary functions. They provide exciting fishing, but perhaps just as important they thin bluegill numbers so that those surviving have room to grow.

In new or recently renovated farm ponds, bluegill and redear fingerlings are stocked at 1,000 per acre in October-November; the following spring 100 bass fingerlings per acre are added. Bluegills will begin to spawn and provide food for bass when the surface water temperature reaches 80°F in the spring. During the first summer, bass fingerlings will grow rapidly and should reach 9-12 in. in length within 1 year. No fishing, especially for bass, should be allowed during this first year. Bass this size, not having been exposed to fishing, are easily caught. It is possible for one fisherman in an afternoon to catch the majority of bass from a 1-2 acre pond. If this occurs bluegill become overcrowded and stunted.

No Harvest of Bass

One year after stocking, bass will have spawned, which will provide additional predation on the bluegill population. At this point if no bass fishing occurs, the bass population will tend to increase in total weight. Individual bass will appear thin and generally in poor condition; their average weight will be less than a pound. If this situation persists for several years, bluegill will average approximately 1/2 lb. in the creel.



Bluegills averaging 0.50 lb are readily caught when bass harvest is restricted.

AVERAGE SIZE BLUEGILL DESIRED (POUNDS)

	¼ lb. and numerous in the creel	½ lb.	over ½ lb. but very few in number
Harvest of Bass per acre per year from fertilized pond in pounds.	25	10	None

However if no bass are harvested in subsequent years, but with continued bluegill fishing, the number of bluegills being caught will decline while the average size continues to increase. This is because too few bluegill escape bass predation to replace those adults that are caught.

Restricted Harvest of Bass

On the other extreme, if too many bass are harvested, the average size of bluegill in the creel will decrease often to the point where very few bluegill caught will be of a size usable by fishermen. Ideally bass should be harvested on a "quota" system. Recent research has shown that in fertilized ponds approximately 25 lb. of bass per acre can be harvested in any one fishing season without seriously affecting the number and size of fish in the creel. This weight was calculated assuming that the harvest of bass would be equally allocated over the fishing season. If fishing pressure is concentrated in a relatively short time period (for example, 2 weeks in the spring), then only about 15 lb. of bass per acre can be safely harvested for the year. These harvest rates represent a compromise; the majority of bluegill by weight in the population will be harvestable size (1/4 lb.) while bass growth and reproduction will be adequate. Bass should average 1-2 lb. in the creel.

The other alternative is to restrict bass harvest to not more than 10 lb. per acre per year which is evenly distributed over the fishing season. Bluegill will average somewhat larger than in a "balanced" pond and will be more numerous than in a situation where no bass are removed. Bass will average about 1 lb. in size.

Controlling Weeds in Soybeans with Directed Sprays

DON S. MURRAY, Department of Agronomy and Soils

ANNUAL BROADLEAF WEEDS are costing Alabama soybean producers millions of dollars every year. This cost reflects how a multitude of broadleaves has moved in to take over space left when herbicides practically eliminated annual grasses as soybean weed pests. This switch is well illustrated by the following ranking of the 10 most troublesome weeds in Alabama soybeans, 8 of which are broadleaves:

1. Common cocklebur
2. Sicklepod
3. Redroot pigweed
4. Johnsongrass
5. Morningglories (4-5 species)
6. Prickly sida
7. Showy crotalaria
8. Hemp sesbania
9. Yellow nutsedge
10. Common ragweed

Unlike the grasses, annual broadleaf weeds are difficult to control with preemergence herbicides. Almost ideal conditions are required for preemergence treatments to effectively control sicklepod, redroot pigweed, prickly sida, showy crotalaria, hemp sesbania, and common ragweed. Common cocklebur and the morningglories are beyond control by soil-applied herbicides even under the best conditions.

Postemergence-applied herbicides are required to control weeds which escape the preemergence treatments. Cultivation can be used to control weeds in the row middles if weather conditions permit, but weeds in the drill row cannot be controlled mechanically. Therefore, postemergence herbicides provide a valuable alternative.

The most popular method of applying postemergence herbicides has been over-the-top of both crop and weeds. This treatment is generally more effective when applied within 4 weeks after planting while the soybeans are small and provide little canopy over weed seedlings. Some of the troublesome annual broadleaf weeds can be effectively controlled with over-the-top sprays, especially when the weeds are small and actively growing.

Over-the-top herbicides provide little or no residual control, so a second application is often necessary to control later germinating weeds. When morningglories, showy crotalaria, hemp sesbania, and sicklepod exceed about 3 in. tall, they are no longer controlled with over-the-top sprays. The latter three weeds are legumes, and there are few herbicides selective enough to remove weedy legumes from a legume crop such as soybeans. Since soybeans have little tolerance for the herbicides that will control these weeds, it is necessary to apply these materials as directed sprays.

Requirement for successful directed spray application are (1) special spray equipment to direct the spray away from the crop and onto the weeds, and (2) treated weeds must be smaller than soybeans (and generally under 5 in. tall) at time of herbicide application. Equipment for directing herbicide sprays can be purchased commercially for about $100 per row, the exact amount depending on number of extras purchased. Home built ones cost considerably less.

Experiments were conducted in 1976 and 1977 by Auburn University Agricultural Experiment Station to determine how weed size affects susceptibility to postemergence-applied herbicides. Weed species were selected to represent the most troublesome annual broadleaf weeds in soybeans. Weeds were planted in rows and treated at two different sizes, see table. Each treatment was replicated four times and each plot received only one herbicide application. Basagran®, Premerge®, and Dyanap®, herbicides that are commonly applied over the top, were included for comparison with Lorox® and Butyrac®, which must be applied as directed sprays.

Weed susceptibility to postemergence-applied herbicides decreased as the weeds increased in size, as shown in the table. This was more apparent with over-the-top sprays than with directed sprays. An increase in height of only 1 in. can mean the difference between effective control and no control. Also, smaller weeds can be effectively controlled with a lower herbicide rate, which means a savings in herbicide costs.

Lorox as a postemergence directed spray was consistently better for controlling the leguminous weeds than over-the-top treatments of Basagran, Premerge, or Dyanap. Butyrac did not control these leguminous weeds. In fact, legumes in general are tolerant to Butyrac. As shown by data in the table, the only effective over-the-top treatment was Basagran for control of small hemp sesbania.

Morningglory control is highly dependent on the herbicide used and species involved, results show. It is not unusual to have overall erratic morningglory control with over-the-top sprays, especially with the more resistant species (tall and ivyleaf). It is therefore critical that the morningglory species be identified before using over-the-top sprays. Smallflower morningglory can be controlled with early application of over-the-top sprays. Butyrac as a directed spray controlled all morningglory species at both growth stages.

Postemergence directed sprays are the only effective treatment against some weed species in soybeans. Since only a band (12-14 in. wide) is treated over the drill row, the amount of herbicides per acre is reduced. These directed sprays can be reapplied in 10-14 days if required. There is one labeled tank mix treatment — Lorox (1 lb.) + Butyrac (8/10 pt.) + surfactant (1 pt./25 gal.)—which is applied as a directed spray and can be reapplied if necessary. Most annual broadleaf weeds can be controlled with this treatment when properly applied.

RELATIONSHIP OF WEED SIZE AND SUSCEPTIBILITY TO POSTEMERGENCE-APPLIED HERBICIDES[1]

Herbicide (trade name)[2] and rate per acre	Percent control of weeds when treated at two heights											
	Leguminous weeds						Morninglories					
	Sicklepod		Hemp sesbania		Florida beggarweed		Smallflower		Ivyleaf		Tall	
	1½ in.	3 in.	3½ in.	5 in.	1 in.	2 in.	1 in.	2 in.	2 in.	3 in.	2 in.	3 in.
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Basagran[3], 1 qt.	25	20	92	70	38	25	100	100	62	25	72	33
Premerge, 1 qt.	28	15	50	10	25	5	92	35	60	35	50	33
Dyanap, 2 qt.	25	0	58	33	23	0	92	10	62	5	55	10
Lorox[3], 1 lb.	35	25	92	63	100	100	92	38	38	18	22	0
Lorox, 2 lb.	88	68	100	100	100	100	100	85	48	30	48	40
Butyrac, 1 pt.	60	63	70	45	42	10	78	80	98	93	100	100

[1]Results given were obtained in research. Trade names are used to provide specific identification and no endorsement is implied.

[2]Common names are: Basagran = bentazon; Premerge = dinoseb; Dyanap = dinoseb + naptalam; Lorox = linuron; Butyrac = 2,4-DB.

[3]Surfactant, WK at ½% by volume, used with Basagran and Lorox.

THE FARM DEBT SITUATION

JOE YEAGER
Department of Agricultural Economics
and Rural Sociology

TABLE 2. OUTSTANDING FARM DEBT, JANUARY 1, 1970 AND 1975, ALABAMA.

Item	1970	1975	Increase
	Thous. Dol.		Pct.
Farm Mortgage Debt			
Federal Land Bank	126,857	212,758	68
Life Insurance Companies	47,500	43,300	−9
Commercial Banks	83,478	148,775	78
Farmers Home Administration	24,820	74,813	201
Individuals and Others	79,179	155,210	96
Total	361,834	634,856	75
Non-Real Estate Debt Held by Institutional Lenders			
Production Credit Assoc.	52,937	140,154	165
Farmers Home Administration	11,200	15,159	35
Commercial Banks	79,175	173,042	119
Total	143,312	328,355	129
Grand Total	505,146	963,211	91

Source: Various Statistical Bulletins, Farm Credit Administration

ONE of the most pronounced characteristics of modern agriculture is its high level of capitalization. Modern farms require a lot of capital, not only for establishment but also for operation.

With the major form of farm business organization being the single proprietorship, it is almost impossible for the farmer during his lifetime to have 100% equity in his assets and to operate on a cash basis. Credit is an essential part of farming and, as a result, debt exists with credit use. Farm debt conventionally is classified as farm mortgage debt and non-real estate debt.

Debt Increases

In the U.S., and Alabama, farm liabilities in terms of real estate and non-real estate debt have about doubled since 1970. Total liabilities of U.S. farmers as of January 1, 1977 were $102.2 billion of which $56.4 billion was real estate debt. When viewed against the background of total U.S. farm assets of $670.9 billion as of January 1, 1977, the debt appears in a different light.

In other words, U.S. farmers had more than $6.50 in assets for every $1.00 in liabilities. However, the composition of the assets and liabilities is important in total and on individual farms. Farm real estate accounted for 74% of the value of assets.

As of January 1, 1977, average assets and liabilities per farm in the U.S. were as follows:

	Per farm
Physical Assets	
Real estate	$180,661
Non-real estate	51,104
Financial Assets	12,036
Total assets	$243,801
Real Estate Debt	20,504
Non-Real Estate Debt	16,615
Total debt	$ 37,119
Proprietor's Equity	$206,682
Debt-To-Asset Ratio(%)	15.2

The non-real estate assets include livestock, machinery and equipment, and crops held by farmers on and off the farm. Financial assets include deposits and currency, savings bonds, and investments in cooperatives.

In the 20-year period ending January 1, 1975, farm real estate debt outstanding expanded more than five times. This resulted in part from higher farm real estate values and the increase in average size of farms. Farmers have added additional acreage to their farms in order to increase production and lower per unit costs of production. From 50 to 60% of farm real estate purchases in recent years has been for enlargement purposes. The percentage of purchases of farm real estate that were credit financed went from 58% in 1950 to 88% in 1977 for the U.S.

Lenders

Individuals and others were the major lenders in farm real estate financing in the U.S. in 1975, table 1. Federal Land Banks were also important lenders to farmers to finance farm real estate to the extent of 29% of the total debt outstanding in 1975. Real estate financing by Federal Land Banks increased from 1960 to 1975 while that by life insurance companies was reduced. The percentage of farm real estate debt outstanding for commercial banks and the Farmers Home Administration remained about the same for the 15-year period.

Alabama Farm Debt

As of January 1, 1975 the outstanding farm mortgage debt of Alabama farmers was $634,856,000 and the non-real estate debt held by institutional lenders was $328,355,000 or a total of $963,211,000, table 2. From 1970 to 1975 farm mortgage debt increased 75% while non-real estate debt went up 129%.

Federal Land Banks accounted for 34% of the Alabama farm mortgage debt as of January 1, 1975. Commercial banks were the major lenders to farmers to finance non-real estate items with Production Credit Association financing ranking second in importance. Production Credit Association financing has become increasingly important in Alabama. Since 1950, when 10.5% of the non-real estate debt was accounted for by PCA loans, the proportion grew to 42.7% in 1975. Financing of a dynamic agriculture will continue to be a challenge to farmers and suppliers of credit.

TABLE 1. ESTIMATED TOTAL FARM REAL ESTATE DEBT OUTSTANDING BY LENDERS, AS OF JANUARY 1, U. S. 1960-75.

Year	Total farm real estate debt	Proportion of Total Loans Held				
		Federal Land Banks	Life insurance companies	Commercial banks	Farmers Home Administration	Individuals and others
	Mil. Dol.	Percent of total				
1960	12,082	19	23	13	6	39
1965	18,894	19	23	13	7	38
1970	29,183	23	20	12	8	37
1975	46,288	29	14	13	7	37

Source: Farm Real Estate, North Central Regional Extension Publication No. 51.

Disadvantages of Deep, Sheltered Ponds For Intensive Catfish Culture

M. M. PAMATMAT and VALDIS MEZAINIS, Dept. of Fisheries and Allied Aquacultures

IF YOUR CATFISH POND is chronically and critically low in oxygen, perhaps it is too deep or too sheltered from winds.

Pond water receives oxygen from the photosynthetic activity of phytoplankton (single-celled plants that usually color the water green, but sometimes brown or yellow) and from the air. Photosynthesis will add oxygen to the water at all depths where there is sufficient light for phytoplankton growth. In fertile Alabama ponds this could be from about 2-8 ft. Oxygen from the air, however, can dissolve in the water only at the surface.

In order for oxygenated surface water to reach the pond bottom, water must be mixed vertically. This is accomplished in nature by wind blowing across the surface and causing a net vertical motion of the water, or by cooling of surface water, making it heavier and causing it to sink past warmer water below.

Cooling usually takes place at night and is even more effective when combined with rain in supplying oxygenated water to the bottom. If your pond is deep or sheltered from the wind, there may not be enough force to make the surface water sink to the bottom; therefore, no replenishment of oxygen in the deep waters can take place.

Scientists in Auburn University's Agricultural Experiment Station have made pertinent observations of dissolved oxygen levels in two ponds at Auburn. Pond S-9 is 3.5 acres in surface area, surrounded by woods, except on the dam side to the northeast. Its average depth is 4.9 ft. with a maximum depth near the dam of 8 ft. Pond S-14 is 12.4 acres and more exposed to the wind from the north, east, and west. It also has an average depth of 4.9 ft., but is deeper (10 ft.) at the foot of the dam.

Both ponds were stocked with 3,000 fingerling catfish per acre and fed 6 days a week with sinking pellets in S-14 and with floating pellets in S-9.

Dissolved oxygen and temperature were measured from the surface to the bottom every 3 hours, day and night, approximately once a month from April through November. Both temperature and dissolved oxygen generally decreased with increasing depth of water (fig. 1). S-9 tended to contain less oxygen than S-14. S-9 sometimes had higher oxygen concentrations in the upper layers as a result of higher photosynthetic activity, but the oxygen produced there did not reach the deeper layers.

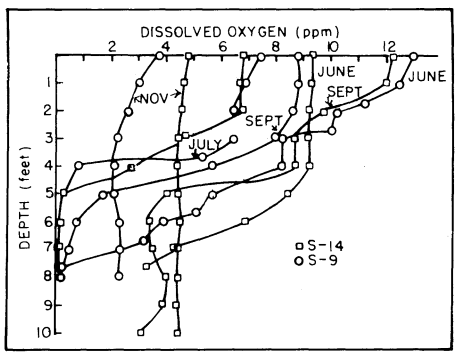


FIG. 1. Vertical profiles of dissolved oxygen in ponds S-9 and S-14 from June to September. S-9, roughly one-fourth the size of S-14, sometimes had higher dissolved oxygen in upper water layers than S-14, but almost invariably contained lower dissolved oxygen in the deep water during any month.

Considering dissolved oxygen in bottom water only (fig. 2), on May 24, oxygen had risen to at least 3.2 p.p.m. (parts per million) in S-14; it decreased during the night to 0.1 p.p.m., and did not rise above 0.2 during the following day. During this same time, the bottom water of S-9 never had more than 0.1 p.p.m. of oxygen. On June 28-29, both ponds had higher oxygen concentration than in May, but S-14 showed much higher concentrations than S-9. Both ponds had 0.1 to 0.2 p.p.m. oxygen in July. In September and November, S-9 again showed consistently lower oxygen than S-14.

Ordinarily, the consistent difference between S-14 and S-9 in dissolved oxygen of bottom water would have been attributed to higher rates of oxygen consumption by the mud and the organisms living in S-9 than in S-14. The rate of oxygen uptake by the mud was measured in both ponds, however, and found that S-14, in fact, had higher rates of oxygen utilization. Therefore, it was concluded that the lower oxygen concentration in the bottom of S-9 was the result of a lower supply of dissolved oxygen by sinking and mixing of surface waters. The results indicate that large, exposed ponds are more easily mixed by wind and surface cooling than are smaller ponds of the same depth.

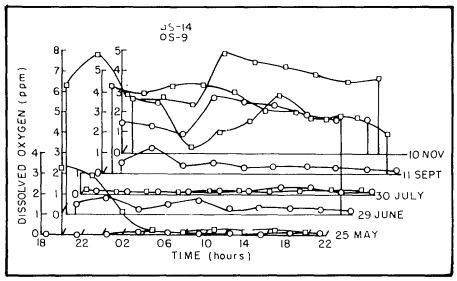
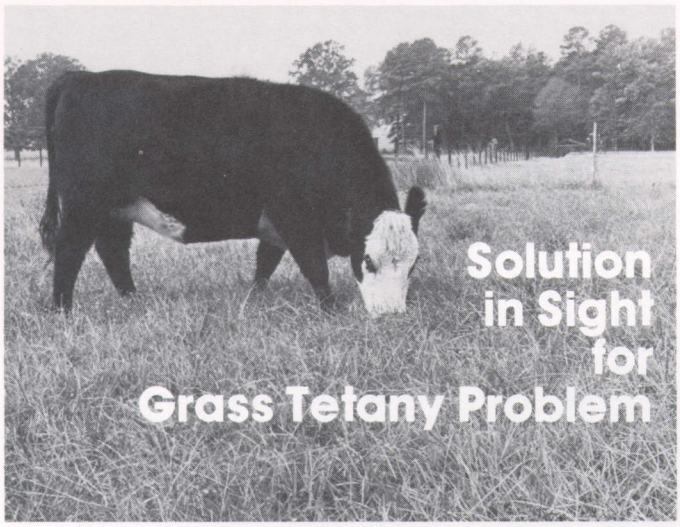


FIG. 2. Twenty-four hour cycles of dissolved oxygen in the bottom water of ponds S-9 and S-14 from May to September. Each month is shown with a separate baseline to minimize overlap; the first and last points of each month are drawn with vertical lines extending to their corresponding baseline to avoid ambiguity. Note that not only does S-9 show lower dissolved oxygen than S-14, but it also shows evidences of at least irregular intrusions of oxygenated water to the bottom.

The larger the volume of oxygen-poor (concentrations less than 3.0 p.p.m.) bottom water in a pond the more undesirable it is for fish production. One obvious reason is that living space for fish is thereby reduced. Another reason is that if this volume of water is much larger than the oxygen-rich layer, mixing could result in dangerously low oxygen throughout the pond. A third important disadvantage is that very low, or zero oxygen in bottom water prohibits the growth of worms and insect larvae that normally live in the mud. Even when catfish derive most of their nutrition from artificial feed, they still feed on worms, larvae, and other natural food organisms. By supplying essential nutrients that are lacking in the feed formulation, these organisms could actually improve feed conversion by catfish. Furthermore, catfish seem to eat continually day and night while the farmer normally feeds his fish only once a day; therefore, it seems desirable that the fish should have the greatest quantity of natural food outside the regular feeding schedule. A fourth important reason is that densely stocked catfish ponds receive, produce, and contain large quantities of organic matter, which settle to the bottom. If the bottom water is without oxygen for long periods, continuing decomposition of organic matter in the absence of oxygen steadily creates a worsening condition in the pond.

At this time no specific guidelines are available concerning how deep a pond should be. But based on Auburn research, deep fertile ponds are predisposed to lower oxygen for longer periods in deep water than are shallower ponds. The ideal depth depends on many other factors besides size and exposure to wind. Regarding S-9 and S-14, the former should probably have had a maximum depth of about 4 ft. while S-14 could have been as deep as 6 ft. maximum. At these depths, their bottom waters would have occasionally contained less than 1 p.p.m. oxygen but not for prolonged periods.



Solution in Sight for Grass Tetany Problem

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A SOLUTION MAY BE IN SIGHT for the grass tetany problem that continues to plague Alabama cattlemen. Findings that wet soils with low oxygen content are involved in occurrence of the deadly cattle disease offer hope for solving the problem.

Grass tetany is a metabolic disorder that affects lactating cows on pasture and may lead quickly to death of the animal. The disorder is also known as hypomagnesemia because it is caused by a low level of blood serum magnesium. It generally occurs during winter and early spring on small grains, tall fescue, or ryegrass pastures in Alabama. Mineral supplement feeding is often done to prevent grass tetany, but certain animals may fail to consume the minerals and are thus susceptible.

Recent Auburn University Agricultural Experiment Station-USDA research discovered that wet soils with low soil oxygen may cause magnesium levels of pasture grass to be seasonally low and insufficient for cattle. The first evidence of this came from growth chamber and greenhouse experiments. Ryegrass, tall fescue, rye, and Yuchi arrowleaf clover were grown in soils in which the amount of soil oxygen was controlled to determine the effect on uptake of magnesium in forage.

Levels of magnesium in ryegrass and tall fescue decreased sharply as the level of oxygen in the soil decreased. Rye forage contained the same level of magnesium regardless of soil oxygen. With clover, the level of magnesium in forage declined slightly as the soil oxygen was decreased, but always remained high enough that grazing animals would get enough magnesium. Uptake of magnesium by all the forage species generally went down with decreasing temperatures.

The level of magnesium needed in a diet to prevent grass tetany depends on the type of animal, its condition, and other individual characteristics. A forage content of 0.20 to 0.25% magnesium is usually considered adequate for livestock. Ryegrass contained only 0.1% magnesium when the soil oxygen level was 2% (poorly drained soil), but with soil oxygen level of 21% (a well drained soil) magnesium increased to 0.4%

In pasture at the Piedmont Substation, Camp Hill, Kentucky 31 tall fescue had magnesium levels of less than 0.2% during spring when grown in poorly drained soil, see graph. On well drained soil in the same pasture, tall fescue had magnesium levels almost 0.3% in April and 0.4% in late June. Tests of the soil showed oxygen levels near zero on the poorly drained sites but 18% or more on well drained sites. All of the test soils had high soil magnesium levels, but the fescue plants were unable to take up adequate magnesium where drainage was poor.

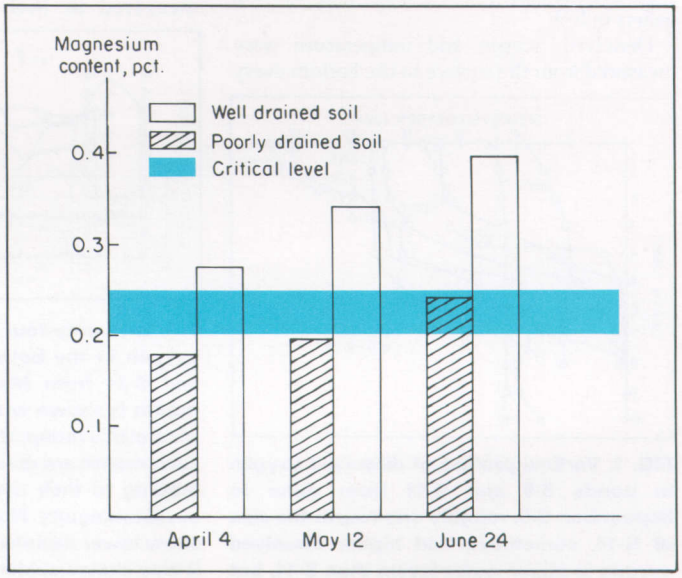
Tetany occurs most frequently in winter and early spring. The absence of tetany in autumn, even under wet soil conditions, is probably related to the availability of older forage to the grazing animals. Older leaves would have sufficient magnesium to prevent tetany development, while new leaves produced under wet, autumn soil conditions would be low in magnesium. By late winter and early spring, however, all the older leaf tissue would have been consumed. Only young leaf tissue would be left for grazing, and this might be low in magnesium if grown under wet conditions.

Improving soil drainage isn't the only way to combat grass tetany, of course. Increasing magnesium levels in cattle by feeding magnesium mineral salts to grazing animals or spraying magnesium slurries on the forage before it is grazed are possible approaches. But a better long term solution is to develop a forage variety that contains adequate magnesium when grown on poorly drained soil. This is the aim of current research at the Auburn Agricultural Experiment Station.

When a large number of tall fescue plants with different genetic backgrounds were grown in a test soil that had a 2% oxygen level, there was a wide variation among the plants in magnesium content. From the same soil, some plants had 0.16% magnesium, while others had as much as 0.4%. This finding offers hope that high magnesium varieties can be bred for wet soil conditions.

Certain steps can be taken to minimize the risk of grass tetany in a cattle herd:

- Rotate cattle away from poorly drained soils, especially when there is prolonged rainfall during late winter and spring when the soil is soggy.
- Carefully observe cattle that are grazing on poorly drained soils. Rapid diagnosis of tetany will permit the use of intravenous injections to save affected animals. If one animal begins to show signs of tetany, it is an indication that the entire herd is not getting enough magnesium.
- Grow legumes in the pasture wherever possible. Legumes have sufficient levels of magnesium regardless of the amount of oxygen in the soil.



Magnesium content of tall fescue forage was considerably lower on poorly drained pastures than on well drained pastures.

Trees spaced 5 ft. apart (left) formed solid fruit wall without training, whereas 10-ft. spacing (right) required tieing of limbs.

Close Spacing, Limb Positioning Boost Apple Yields

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C. C. CARLTON and K. C. SHORT, Chilton Area Horticulture Substation

DWARFING AND SEMI-DWARFING rootstocks have revolutionized apple production in recent years. These rootstocks restrict ultimate tree size so growers can plant more trees per acre. The smaller trees are easier to spray, prune, and harvest, and they begin bearing fruit at an earlier age than trees on non-dwarfing rootstock. The final result is increased yield and better quality of fruit.

Advantage of training tree branches to a fruiting position (65-90 degree angle from the tree trunk) showed up in experiments in which trees on dwarfing rootstock were trained to a trellis. These trees began fruiting earlier and had a higher per tree yield than trees whose branches were allowed to grow in the normal upright position. Branches of apple trees normally develop in an upright position until the weight of fruit pulls them down into the fruiting position.

Effects of tree spacing and training branches of young, free-standing trees to a fruiting position were determined in Auburn University Agricultural Experiment Station research. 'Wellspur' Red Delicious trees on 'MM106' rootstock were planted at the Chilton Area Horticulture Substation in January 1969. Spacings were 5, 7.5, and 10 ft. in rows spaced 22 ft. apart.

Branches of all trees were spread with wire braces during the first three growing seasons to develop the desired branch angles, and the trees were trained to a modified central leader. Conventional cultural practices were used in growing the trees.

In fall 1972, the 7.5- and 10-ft. spaced trees were divided to compare two training treatments: (1) limbs were spread and pruning was done in the conventional manner, and (2) limbs between the trees were pulled down to a horizontal level and tied into position to form a solid wall. The 5-ft. spaced trees were already touching in the row to form a solid fruit wall (see photo), so no limb positioning was done.

INFLUENCE OF LIMB POSITIONING AND TREE SPACING ON YIELD OF 'WELLSPUR' RED DELICIOUS APPLE TREES ON 'MM106' ROOTSTOCK

Row spacing*, limb treatment	Yield per acre				Accumulated yield/acre
	1974	1975	1976	1977	
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*
10-ft. spacing					
Untied	217	275	304	404	1,200
Tied	256	312	364	531	1,463
7.5-ft. spacing					
Untied	261	360	297	404	1,322
Tied	369	428	409	385	1,592
5-ft. spacing					
Untied	464	391	351	800	2,066

*Number of trees per acre equaled 198, 264, and 396, respectively, for 10-, 7.5-, and 5-ft. row spacing.

All trees were topped to a height of 8 ft. with a mechanical pruner in the fall of 1972 and in subsequent years. Supplemental hand pruning was done each year as needed.

A frost on April 11, 1973, injured the crop, so no yield data were available for that year. First yield data were taken in 1974. Both close spacing and limb positioning had a positive influence on yield, as shown by data in the table.

In each of the 4 years, the highest yield on "untied" (no limb positioning done) trees was made by 5-ft. spaced trees. Greatest yield differences were recorded in 1974 and 1977. The 5-ft. spaced trees produced 247 and 203 bu. per acre more than the 10- and 7.5-ft. spaced trees in 1974. In 1977, the difference was 396 bu. in favor of the 5-ft. spacing over the 7.5 and 10-ft. spacing. Yield differences were not as great in 1975 and 1976, but the 5-ft. spacing again was the most productive.

Trees spaced 7.5 ft. apart produced 43 and 86 more bu. of fruit per acre than 10-ft. spaced trees in 1974 and 1975, as shown by comparisons between untied trees. However, the 10-ft. spacing averaged 9 bu. per acre more in 1976 than the 7.5-ft. spacing. They had the same yield in 1977.

Limb positioning (tieing) increased yield with both the 10- and 7.5-ft. spaced trees in each year, with one exception. In 1977, the 7.5-ft. spaced trees with limbs positioned produced 19 bu. less than the trees without the limbs positioned. Limb positioning on trees spaced 7.5 ft. apart resulted in respective increases of 108, 68, and 112 bu. per acre in 1974, 1975, and 1976. With 10-ft. tree spacing, the increase from limb tieing amounted to 39, 38, 60, and 127 bu. per acre in 1974, 1975, 1976, and 1977, respectively.

Accumulated yield figures in the table show amount of total yield increase over the 4 years due to closer tree spacing. Increases of this magnitude would definitely justify the additional cost of establishing higher density orchards. As the trees increase in size, however, the yield differences would be expected to diminish. But the higher early year production with the closer spaced trees would put the orchard on a paying basis sooner.

Photo at left shows citizen being interviewed by researcher, while photo at right shows workers in field laboratory.

Nutrition of the Elderly

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Department of Home Economics Research

THE PROPORTION of persons over 64 years of age has been steadily increasing in American society, and Alabama is no exception.

There is a growing concern for the well-being of this age group, but little precise information, particularly concerning nutritional requirements, is available. Since adequate nutrition is vital for longevity and good health and because nutritional patterns and habits are related to social and economic factors, a study related to these factors was funded through the Agricultural Experiment Station. Investigated were nutritional status, food purchasing, preparation and consumption patterns, and the social, economic, and medical characteristics of older Alabamians residing at home. Although data collection in the major study of 200 subjects is nearing completion but not yet final, an analysis of those interviewed in a preliminary, pilot project has been completed.

Results from the pilot study, involving 40 volunteers ranging in age from 64 to 84 years, indicate that subjects are highly positive about themselves and their life styles. Ninety-five percent were satisfied with their daily routines and although 32% had annual incomes below $1,000, a majority (32 out of 40) were content with their economic position. Only 3 of the 40 interviewed felt that their current health was poor, while 83% noted that they were healthier than others of comparable age. Few indications were found that these older citizens allowed their physical handicaps or conditions to interfere with the business of daily living, yet half of them cited the presence of such conditions.

Thirty-three percent of those interviewed were involved in decisions concerning food purchasing with a majority (67%) spending between $10 and $30 per week for groceries. Approximately one-third used home-grown or preserved food and many utilized a wide variety of spices and seasonings in food preparation. A majority ate three meals per day with some in-between snacks; 60% of the subjects ate a snack before retiring. Most of the volunteers ate with their families, and meal preparation was found to be a family activity with few meals prepared or eaten outside of the home.

Diet analyses revealed that of the essential nutrients measured, only three were significantly inadequate based on the Recommended Dietary Allowances (RDA) as established by the National Academy of Sciences. Inadequate levels of folacin, vitamin A, and iron were found in 68, 35, and 38% of the subjects, respectively. Thirty-eight of the 40 persons studied consumed adequate levels of protein, a finding that is contrary to the popular assumption that the elderly are deficient in this nutrient because of its expense. It is possible that vitamin and mineral supplements were a factor in the generally acceptable levels of nutrient intake observed, since 37% of the subjects did take vitamin or mineral supplements.

The medical data collected and the physical exams administered by a registered nurse indicated that the most serious physical condition was high blood pressure with 55% classified as hypertensive. Thirty-seven percent regularly used laxatives but no significant evidence was found that age was accompanied by physical deterioration. Few reported a history of broken bones, but many were overweight, a common problem among older groups whose physical activity may be limited for various reasons.

The older Alabamians who were the focal point of the pilot study appear to be nutritionally sound, relatively healthy given their ages, and most importantly, generally satisfied with their life styles, their health, and themselves. Perhaps the moral support derived from family living and interaction provides the necessary ingredient for longevity and contentment. However, from the standpoint of the nutritionist and others interested in the problems and quality of life of older citizens, the iron and folacin deficiencies are indeed serious. Attention should be directed towards recommending a higher level of green, leafy vegetables and whole grain cereals in their diets.

SOCIOECONOMIC AND NUTRITIONAL CHARACTERISTICS OF PILOT PROJECT SUBJECTS

Socioeconomic and nutritional characteristics	Total (N=40)	Male (N=19)	Female (N=21)	White (N=18)	Black (N=22)
Average age	75.3	74.9	75.6	74.6	75.8
Marital Status					
married	25	16	9	14	11
not married	15	3	12	4	11
Average household size	2.25				

Nutrient intake*	Number of subjects Adequate	Inadequate
Calories	29	11
Protein	38	2
Calcium	31	9
Iron	25	15
Vitamin A	26	14
Thiamin	32	8
Niacin	35	5
Riboflavin	32	8
Vitamin C	36	4
Folacin	13	27

*Adequate is equal to or greater than 2/3 the RDA and inadequate is less than 2/3 the RDA.

Use of Cash Flow Statements in Enterprise Selection and Financing

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Department of Agricultural Economics and Rural Sociology

A BIG DECISION for the beginning farmer is choosing enterprises for his farming operation. This choice will determine if the farm will be a profitable operation and able to make debt payments or unprofitable and unable to meet obligations.

The beginning farmer must also be aware of the potential cash flows from alternative farm organizations and how they affect the financial stability of the farm.

Enterprises Considered

To illustrate how cash flow statements can be used to analyze financial stability of a beginning farm operation, two different farm organizations and cash flows resulting from each were analyzed with regard to the ability of each to meet intermediate and long-term debt obligations. The two farm organizations were for the same farm, with the basic difference largely being the degree of diversification. The first farm organization considered is a row-crop and stocker farming operation. Enterprises included are soybeans and wheat double cropped on 450 acres, 200 acres of cotton, 310 acres of dallisgrass overseeded with ryegrass, and 525 head of stockers.

The second farm organization considered is a beef and soybean farming operation. Its enterprises are 510 head of brood cows, 153 acres of johnsongrass hay, 488 acres of dallisgrass pasture, and 450 acres of soybeans.

Budgets and cash flow statements are based on prices projected ahead 5 years. The prices are assumed to represent typical price relationships under normal circumstances. Both farming situations require the labor of an operator and two hired men. The operator paid himself a salary of $1,250 per month and paid each hired man a salary of $625 per month.

Financial Environment of Each Organization

Each of these farm organizations is considered for a beginning farmer starting operations and requiring intermediate and long-term financing to acquire machinery, brood stock, and land. Financing is assumed to be through a Production Credit Association (PCA) and Federal Land Bank Association (FLBA). For both farm organizations, a 20% down payment is considered to be made on machinery before farming operations started, with the balance financed over 4 years at 9% interest. The down payment for the row-crop and stocker organization is $22,247 and $17,047 for the beef and soybean organization. Annual payments on the row-crop and stocker machinery are $27,468 and $21,048 for the beef and soybean organization. There is a $300,000 loan for land for 20 years at 8.5% interest. Annual payments on this loan are $31,701 including principal and interest. In addition to machinery and land financing, the beef and soybean farm required financing a loan of $154,904 to acquire a brood cow herd.

Cash Flow Analysis for Row-crop and Stocker Organization

Annual cash flow summaries for the row-crop and stocker organization with the required debt payments made are used as an example. Loan payments are for intermediate-term machinery loan and long-term land mortgage. All short-term operating loans are paid back from cash inflow to the farm during the production period. Net cash income (NCI) is cash available for intermediate and long-term debt repayment and reinvestment.

The first year of operations did not generate sufficient cash to meet minimum debt requirements of the $27,468 machinery loan payment and $25,500 interest on loan mortgage, thus the operator would be required to supply $7,742 from other sources of cash. The cause of this situation is that the expenses for the wheat are incurred for the crop to be harvested the next calendar year. The second year of operations generated $96,879 available for debt payments and reinvestment. Debt payments of $27,468 on machinery and $31,701 on land (principal and interest) are made leaving $31,710 before taxes available for reinvestment to stimulate growth or for alternative investment opportunities. All subsequent years have substantial cash balances after meeting all debt requirements.

Cash Flow Analysis for Beef and Soybean Organization

Annual cash flow summaries for the beef and soybean organization are used as a comparison. These summaries show a drastic difference in the ability of this farm organization to generate enough cash to service minimum debt obligations. As in the previous organization, all operating capital loans were repaid during the year by cash inflows from operations. Net cash income is cash available for repayment of intermediate and long-term debt.

The first year's operations generated $42,974 net cash income. In order to meet the minimum debt requirements of $21,048 principal and interest on the machinery loan, $25,500 interest on the land mortgage, and $13,941 interest on the brood cow loan, the operator had to supply $3,575 from his $15,000 living expense and the brood cow loan was increased by the amount of the interest charge.

It is assumed the operator was able to refinance the brood cow loan including the interest in the first year and also pay only the interest on the land loan. Cash flows in the second year are also inadequate to meet the other debt requirements and pay the interest on the brood cow loan. Cash is available to pay only $5,018 on the interest, leaving $10,178 to be refinanced. Increasing the brood cow loan each year and paying only the interest on the land loan occurred until the fifth year when $23,980 became available for principal and interest payment. At this point it would require 16 years to retire the brood cow loan and release cash for reinvestment.

Further information may be obtained from Station Bulletin 487 which may be obtained by writing Department of Research Information, 110 Comer Hall, Auburn University, Auburn, Alabama 36830.

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NOTHING EVER STAYS the same—not even weed populations. In recent years several weed scientists have noticed shifts or changes in weed populations. One of the more striking has been the increase of large-seeded broadleaf weeds and the decrease of annual grasses where dinitroaniline herbicides, notably Treflan, have been used repeatedly.

An experiment was begun in 1970 by Auburn University Agricultural Experiment Station to determine weed population changes that occur under various cropping and weed control programs. The 1970-74 test was on an Amite sandy loam at the Lower Coastal Plain Substation.

Existing weeds at the beginning of the study were mainly large crabgrass, Florida pusley, yellow nutsedge, sandbur, carpetweed, tall morningglory, and crowfootgrass. Extremely sparse populations of other morningglory species, Carolina horsenettle, goosegrass, prickly sida, common ragweed, redroot pigweed, cudweed, and Florida beggarweed also were present.

Soybeans and corn were planted, cultivated, and fertilized for optimum production. Herbicides were applied with conventional ground equipment. For mechanical weed control, sweep cultivators were set to run 2 to 4 in. deep.

After 3 years of cropping, the entire experimental area was plowed the following spring and weeds allowed to germinate and grow. At the same time, soil samples from each plot were placed in the greenhouse and weed seeds in the soil were allowed to germinate. Weeds were identified, counted, and removed from the flats periodically over a 6-month period.

With only one exception, corn and soybean yields were not affected by any of the treatments. Consequently, observed changes in weed populations are those that could be expected under normal production practices.

Relatively low populations of large crabgrass were associated with continuous application of Treflan and Sutan. Other treatments had relatively high populations of this species. Particularly high populations of common cocklebur were associated with soybeans regardless of the weed control program. Yellow nutsedge populations were lower in treatments receiving a thiocarbamate herbicide (Sutan, Vernam) or mechanical cultivation than in plots not receiving any herbicide or crop treatment.

IDENTIFICATION OF HERBICIDES MENTIONED

Trade name	*Common name*	*Manufacturer*
Treflan	trifluralin	Elanco Products
Tenoran	chloroxuron	Ciba-Geigy
Lasso	alachlor	Monsanto
AAtrex	atrazine	Ciba-Geigy
Lorox	linuron	E. I. DuPont
Vernam	vernolate	Stauffer
Sutan	butylate	Stauffer

Florida pusley numbers were extremely high on the non-crop plot, but sicklepod populations were relatively low. Sicklepod numbers were highest on soybean plots treated with Treflan and Tenoran.

Highest cypressvine morningglory population was associated with the soybean-and corn rotation treatments where weeds were controlled with Vernam, Sutan, and Lorox. Lowest populations occurred on the no-crop plots and on corn-soybeans, or on the soybean-corn rotation treated with Treflan and Lasso, AAtrex, and Lorox. Particularly low cypressvine morningglory populations were also observed on soybean plots where weeds were controlled mechanically. Low populations of tall morningglory were associated with no-cropping, soybeans treated with Treflan, and corn treated with Lasso, Atrazine, and Lorox. Particularly high smallflower morningglory populations were present on corn plots treated with Sutan, Lasso, and Lorox.

Generally high populations of annual sedges were present on all plots. Cudweed population was high in soybean plots treated with Vernam, Lasso, and Lorox.

Generally the results show that both crops and weed control programs substantially influence weed populations. Findings confirm observations made by many farmers that grasses have decreased while many broadleaf weeds have increased where Treflan has been used repeatedly.

INFLUENCE OF CROP AND WEED CONTROL PRACTICE ON WEED POPULATIONS AS MEASURED BY FIELD AND GREENHOUSE BIOASSAY

Treatment		Weeds per square yard							
							Morningglories		
No.-crop*	Method of weed control	Large crabgrass	Common cocklebur	Yellow nutsedge	Florida pusley	Sicklepod	Cypressvine	Tall	Smallflower
		No.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
1—none	none	1,259	78	106	2,780	29	9	38	0
2—S	Treflan, Tenoran	445	1,230	57	9	678	0	38	0
3—C	Lasso, AAtrex, Lorox	2,460	29	145	29	67	0	29	0
4—S&C	Same as 2 and 3	639	1,064	78	29	233	19	29	48
5—C	Mechanical	1,210	0	0	804	19	57	203	48
6—S	Mechanical	2,324	202	0	775	29	0	155	38
7—S&C	Mechanical	1,201	78	57	262	107	155	174	97
8—S	Vernam, Lasso, Lorox	2,334	785	0	116	164	107	136	38
9—C	Sutan, Lasso, Lorox	706	107	0	445	164	164	368	233
10—S&C	Same as 8 and 9	1,698	445	0	145	116	233	174	126

*Crop abbreviations: S = soybeans, C = corn.

Establishing Farm Price FOR CATFISH

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ONE ECONOMIST STATED that even though businessmen and consumers do not always actively make decisions based upon economic theory, they tend to behave in a way that is consistent with the basic philosophies of the science of economics. Economic theory with which most laymen are familiar is that of supply and demand. Available supply is determined by individual producer decisions, while demand is established by consumer decisions. Many consumers realize that prices are affected by changes in supply and demand, whether the product be gasoline or sugar.

Like any agricultural enterprise, production of channel catfish in intensive pond culture is dependent upon the level of inputs provided. Catfish farmers have to pay the market price for these factors of production which include feed, chemicals, fuel, labor, and sometimes aeration. When these prices are applied to the input requirements, the cost structure of a catfish enterprise is determined. The amount of catfish supplied by the individual farmer is determined by how much more it costs to produce additional pounds of catfish. Finally, the total industry supply of catfish is the summation of all the individual farmers' production.

As a result of the above interactions, some initial price is established by sellers of pond raised catfish. Then marketing procedures begin, which involve changing the form of the product and determining the time and places where the catfish will be available to the consumer. During each of these steps, value is added to the product due to various services performed along the marketing chain. Finally, some retail price for catfish is placed on a package in a market outlet.

Market-sized catfish being loaded for processing plant.

Now the consumer makes a decision to purchase or not to purchase the catfish based on the retail price. His decision is determined by such factors as his income, tastes, and preferences, and the prices of alternative products available in the market. As many, many consumers make these decisions, the overall demand for fish changes. Subsequently, changes in catfish supply may adjust in order to maintain price equilibrium. Thus, the consumer and retail price ultimately affect prices along the marketing chain all the way back to the farm. Also, the farm price of channel catfish may change from the initial price established by the individual's cost structure. This new farm price can be computed if retail price and the following factors are known: harvesting costs, transportation costs to the processing plant, dress-out percentage, storage costs, transportation costs to market outlets, and additional storage costs. An equation summarizing these interrelationships follows:

$$RP = \left(\frac{FP + HT}{DP} \right) WV \times RV$$

where: RP = retail price, RV = retail value, WV = wholesale value, FP = farm price, HT = harvesting and transportation costs, and DP = dress-out percentage.

In the equation the initial value of the catfish is the farm price. Additional value is created by adding the costs of harvesting and transportation services. Since the entire catfish is not salable, dividing by the dress-out percentage determines the value of the product at the time processing is completed. This represents the processed value of the fish. Next, packaging and storage services are provided by the processor, so the wholesale value includes the processed value and an additional 30% to account for the added services. At this point wholesale value is 130% of the processed value. Thus, WV equals 1.30. Finally, additional transportation and storage costs account for another 30% increase in value, and RV equals 1.30, or 130% of WV.

As discussed previously, decisions of consumers in fact dictate what ultimate retail price is acceptable. Based on this retail price, a new farm price can be computed from the previous equation. Solving the equation for FP, the relationship is as follows:

$$FP = \left(\frac{RP \times DP}{RV \times WV} \right) - HT$$

Using data from recent market research conducted in the Auburn area, the farm price of market-sized catfish can be computed. If, RP = \$1.89 per lb., DP = 0.63, RV = 1.30, WV = 1.30, and HT = \$0.10 per lb., then,

$$FP = \left(\frac{1.89 \times 0.63}{1.30 \times 1.30} \right) - 0.10$$

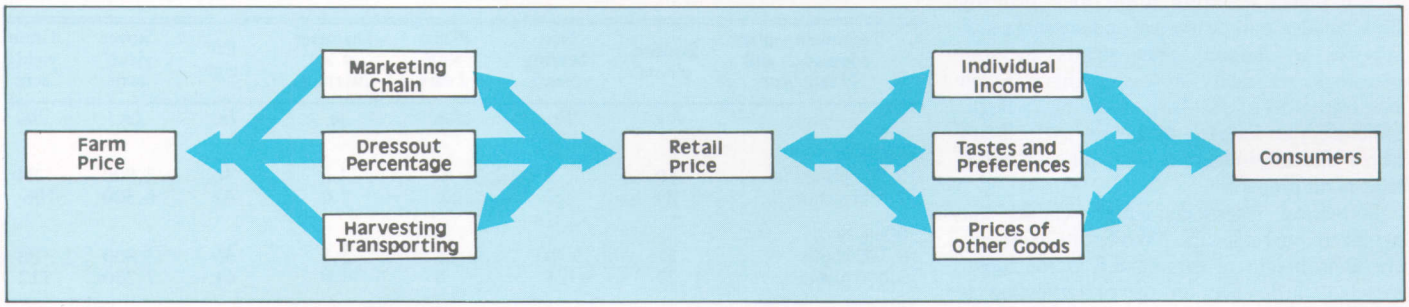
$$= \left(\frac{1.19}{1.69} \right) - 0.10$$

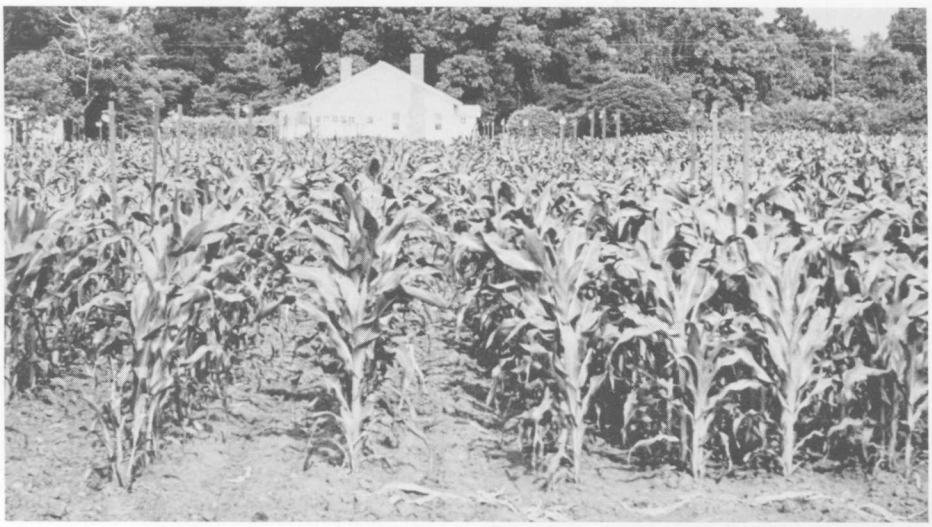
$$= 0.70 - 0.10$$

$$= \$0.60/\text{lb.}$$

Since the current farm price for market sized catfish is \$0.60, this discussion illustrates that consumers do in fact determine the price that catfish farmers ultimately receive.

As a result of these interactions, catfish farmers like most other agricultural producers, find themselves in a buyers market rather than a sellers market. Some catfish farmers can produce fish at a profit, while others are at the break-even point. However, there may be another group, whose production costs are greater than the revenue received from sale of the catfish. These producers must implement efficiency measures to reduce their costs of production, or exit the industry. Subsequently, the aggregate supply of catfish changes. The end result is that price equilibrium is established for catfish according to the law of supply and demand.





Narrow rows (right) outproduced wider rows (left) in Alabama experiments, when production practices followed were adequate to produce corn yields above 125 bu. per acre.

CORN PLANT CHARACTERISTICS *affected by* N RATE AND PLANT POPULATION

C. E. SCARSBROOK, Department of Agronomy and Soils

CHARACTERISTICS OF CORN plants can be altered considerably by such management practices as nitrogen rate and plant population. These plant characteristics, in turn, may affect not only yield but also such factors as weed infestation, lodging, and ease of harvesting.

The findings reported here are from a number of Auburn University Agricultural Experiment Station experiments in various locations in Alabama. None of the experimental variables, such as nitrogen rates or plant populations, should be considered as recommendations unless so stated.

Number of plants per acre is an important management practice since this variable affects plant growth. Thick plantings (32,000 plants per acre) produced plants that were 9-12 in. taller at harvest than thin plantings (10,700 plants per acre). This increased plant height resulted from longer internodes in the thickly planted corn. The number of internodes per stalk is determined by the variety and is not affected by management.

Tall plants resulting from thick planting have smaller stalk diameters and are more susceptible to lodging than plants in thin plantings, see table. Increasing the nitrogen rate from 150 to 300 lb. per acre had a negligible effect on lodging. However, the primary factor affecting lodging is wind velocity rather than plant properties.

Increasing internode length causes ear height to increase also. While the 6-in. increase in height of ears, noted in the table, may have little effect on ease of harvesting, it does make the plant more top heavy and thus more susceptible to lodging.

Low plant populations may produce many stalks with two or more ears, whereas excessively high populations result in a crop having almost no ears. With most modern corn varieties the most profitable stand has some barren plants and few multi-eared plants. What is desired is the maximum amount of grain per acre. The table shows that the highest yields were produced with 32,000 plants per acre, and there were no multi-eared plants at this population. Since about one-fourth of the plants were barren, possibly a few thousand fewer plants would have resulted in fewer barren plants and more yield.

Large stover yields were associated with high grain yields. The stover yield in corn grown for grain has been considered as unimportant in the past. However, this may change in the future. High stover yields may become desirable since stover may be used as a raw material for the production of energy material.

Corn is a relatively efficient user of solar energy when the sunlight strikes directly on the plant. Sunlight which passes through the canopy and strikes the ground is largely lost to the plant. This is a double loss because the sun's energy lost by the plant is captured by weeds, which helps them compete with the crop for nutrients and moisture.

Findings of the Auburn research showed that only about 5% of sunlight passes through the canopy with 32,000 plants per acre, whereas about 25% reached the ground with 16,000 plants and over 50% was lost with 8,000-plant populations. As a result, the weed problem increased in proportion to the amount of light measured at ground level.

Research in Alabama and elsewhere has shown that narrow rows may increase yields provided yields are in excess of 125 bu. per acre. When comparing 40-in. and 20-in. row widths, with populations of about 30,000 plants, up to about 10% more grain is often produced on the narrow rows than on wider rows. Harvesting narrow rows may be a problem since most harvesting equipment is designed for wider rows.

Many experiments have shown that recommended rates of nitrogen (120 lb. per acre in Alabama) are required to produce a profitable corn crop. However, a sure way to lose effectiveness of the nitrogen is to have a sparse stand. How spacing dramatically affects nitrogen efficiency is illustrated by typical results at the Brewton Experiment Field in 1976. With 120 lb. of N applied, per acre yields from populations of 21,000, 17,000, 13,000, and 9,000 plants were 128, 121, 103, and 85 bu., respectively.

These results establish conclusively that certain management practices, such as nitrogen applied and plant populations, have important effects on corn plants and ultimately on profitability of the crop.

CORN PLANT PROPERTIES AS AFFECTED BY NITROGEN AND PLANT POPULATION, THORSBY, ALABAMA, 1974-76

Treatment—plant population and N rate/acre	Lodged plants	Non-bearing plants	Plants with 2 ears	Diameter of 5th internode	Ear height	Stover yield/ acre	Grain yield/ acre
	Pct.	*Pct.*	*Pct.*	*In.*	*In.*	*Lb.*	*Bu.*
150 lb. N							
10,700 plants	10	0	5	1.2	36	3,800	84
32,000 plants	23	27	0	1.0	42	6,300	106
300 lb. N							
10,700 plants	11	0	11	1.3	36	3,800	88
32,000 plants	27	21	0	1.0	41	7,200	112

EFFECTS of HERBICIDES on PATHOGENS and DISEASES of TURFGRASSES

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Department of Botany and Microbiology
RAY DICKENS, Department of Agronomy and Soils

PESTICIDES may affect other organisms besides the pest at which they are aimed. These "non-target" effects can be important, and knowledge of them may contribute toward more wise use of pesticides.

The non-target effects of herbicides on plant pathogens and diseases they cause have received considerable attention. Depending on the herbicide, pathogen, and disease involved, such effects of herbicides reportedly have ranged from inhibition to stimulation of pathogens and/or diseases. Recently, studies were undertaken at the Auburn University Agricultural Experiment Station to determine if some herbicides used for weed control in turfgrasses might also affect pathogens and diseases of the grasses. The pathogens selected for study were fungi that cause some of the most important diseases of turfgrasses in the Southeast. They were: *Rhizoctonia solani*, which causes brown patch; *Sclerotinia homoeocarpa*, which causes dollar spot; and *Pythium aphanidermatum*, which causes pythium blight. The herbicides used were Balan® 1.5 EC and Prefar® 4 EC, both of which are labeled for use in turf, and Nortron® 1.6 EC, which is being tested in turf.[1]

Pathogen Growth Studies

To determine effects on growth of the fungi, the herbicides at rates equal to recommended field rates and also 2X and 10X these rates were added to a standard medium used for growing fungi. The herbicide-containing medium was poured into petri plates and inoculated with a small amount of each fungus. Plates of herbicide-free medium were inoculated with the fungi to serve as controls. The plates were placed in incubators set at 18, 26, or 35° C, and radial growth of the fungi was measured daily.

Generally, growth of all the fungi was inhibited by the herbicides at recommended field rates, and inhibition increased with increasing herbicide concentrations. Five-day-old cultures of *S. homoeocarpa* at 18° C on treated and untreated medium are shown in the photograph. Some exceptions to the general inhibitory effect of the herbicides were noted. At 35° C, growth of *R. solani* was stimulated by one or more rates of both Prefar and Nortron. Growth of the fungus on medium containing the field rate and 2X field rate of Nortron was 140 and 128% greater, respectively, than growth on medium without the herbicide, figure 1.

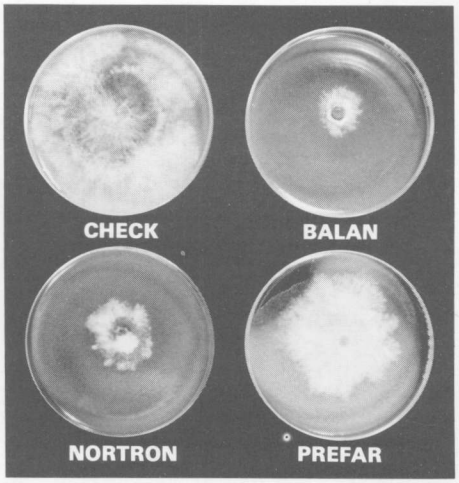


FIG. 1. Five-day-old cultures of *S. homoeocarpa* at 18° C on treated and untreated medium.

Disease Studies

Pots of 'Tifdwarf' bermudagrass were sprayed with the herbicides at recommended field rates and 3X the recommended rates. One week later, the grass in each pot was inoculated with one of the three fungi and the pots were covered with plastic bags to ensure high humidity. The bags were removed after 4 days and the severity of disease in each pot was rated.

DISEASE DEVELOPMENT IN TIFDWARF BERMUDAGRASS TREATED WITH HERBICIDES PRIOR TO INOCULATION WITH FUNGAL PATHOGENS

Herbicide rate/acre	Disease rating[1]		
	Brown patch	Dollar spot	Pythium blight
Balan, 3 lb.	2.44	2.79	1.83
Balan, 9 lb.	1.86	2.25	1.79
Nortron, 3 lb.	1.61	2.18	1.75
Nortron, 9 lb.	1.61	1.77	1.50
Prefar, 12 lb.	1.88	2.62	2.16
Prefar, 36 lb.	2.13	2.31	2.00
Control	1.97	2.31	2.17

[1]Each value is the average for ratings of 18-24 inoculation sites; 1 = no diseased grass apparent beyond point of inoculation, 2 = area of diseased grass to 1.5 cm diameter, 3 = 2.5 cm, 4 = 4.0 cm, 5 = greater than 4 cm.

Both the field rate and the 3X rate of Nortron reduced severity of brown patch, and the higher rate also reduced dollar spot and pythium blight, see table. Prefar had no effect on any disease; however, the severity of brown patch and dollar spot were increased in grass treated with the field rate of Balan.

The effects of the herbicides on diseases did not always parallel effects on growth of the causal fungi. For example, Nortron reduced the severity of brown patch but stimulated growth of the pathogen, *R. solani*, and Balan generally inhibited the growth of all the fungi but increased the severity of brown patch and dollar spot. Differential effects of the herbicides on the pathogens and the diseases could be due to many factors. Susceptibility of the grass and/or other aspects of the pathogen-grass interaction may have been affected by the herbicides.

Conclusions

Results of this study indicate that chemicals used for weed control in turfgrass may have non-target effects on fungal pathogens and diseases of the grasses. Some of these effects may be beneficial in that growth of the fungi and diseases caused by them are reduced. However, the possibility of detrimental effects of some herbicides in enhancing development of some pathogens and diseases is also indicated.

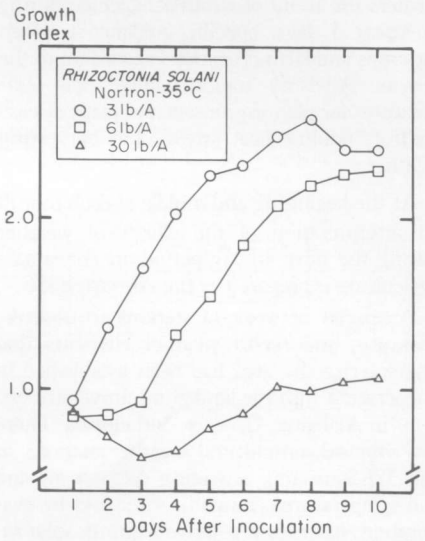


FIG. 2. Growth of *R. solani* on medium containing three concentrations of Nortron. Data are given as an Index obtained by dividing diameter growth for the treatment by that for the control.

[1]Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product, nor does it imply its approval to the exclusion of other products that may also be suitable.

Alabama's Agricultural Weather Service

RODGER GETZ, Environmental Studies Service Center

THE NATIONAL Weather Service, in cooperation with Auburn University, the Agricultural Experiment Station, and the Alabama Cooperative Extension Service, established the nation's first Environmental Studies Service Center (ESSC) in July 1973. The ESSC located in Leach Nuclear Science Center on the Auburn campus, has a staff of four agricultural meteorologists serving the diversified agriculture of Alabama, Georgia, and Florida.

The ESSC has as its basic mission the formulation of interpretative statements relating weather forecasts, meteorological events, and climatological data to the agricultural industry in the service area. The specialized weather services provided by the ESSC allow growers to maximize the advantages of good weather in the production of food and fiber. They can also take those actions necessary to minimize the effects of unfavorable weather.

Daily agricultural weather advisories, based on agricultural weather forecasts issued by Weather Service forecast offices, are prepared each weekday for the farmers of Alabama, Georgia, and Florida. The advisories give farmers the trend of weather expected during the next 5 days. Specific guidance is given for crops and farm operations according to the season. Advisory topics include soil temperatures for planting, insect and plant disease control, poultry heat stress, and harvesting weather.

At the beginning and middle of each month an interpretation of the effects of weather during the next 30-day period on Alabama's agriculture is prepared by the Auburn ESSC.

A special network of stations to observe, measure, and report weather elements that characterize the area has been established in cooperation with the land grant university systems in Alabama, Georgia, and Florida. There are over 40 agricultural weather stations in the Tri-State area providing data on air and soil temperatures, rainfall, water loss by evaporation, hours of vegetative wetting, solar radiation, and other parameters.

All public weather information is available on the National Oceanic and Atmospheric Administration (NOAA) Weather Wire. This is a statewide teletypewriter network that connects weather offices with radio and television stations, and newspapers that choose to receive the service. About 76 Alabama radio and television stations, newspapers and cable TV companies subscribe to the Weather Wire. The news wire services also carry weather information.

Meteorologists now have a direct line to the public in many areas of the country through the facilities of NOAA Weather Radio. Special radio receivers (often called "weather radios" or radios with a "weather band") are required to pick up the broadcasts. The broadcasts are made in about a 40-mile radius of major metropolitan areas. The ESSC advisories are carried on the weather radio during the noontime period.

The preparation of agricultural weather information for the farmer requires that the agricultural meteorologist be well informed on research relating the effects of weather on the production of crops and livestock. Extensive literature reviews are used to compile information on how weather data and forecasts can be used to solve specific agricultural problems.

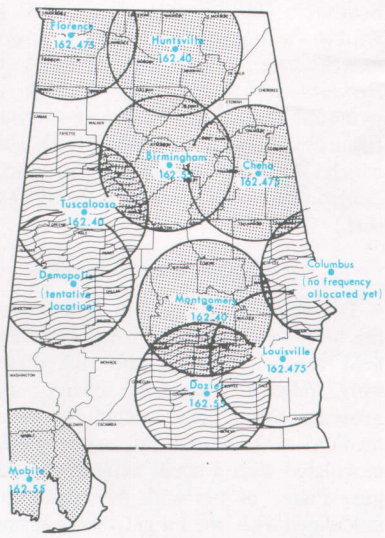
A climatological library and data bank have been established at the ESSC to provide climatological data for locations throughout the southeast. ESSC staff are currently compiling data on freeze probabilities, rainfall probabilities and distributions, soil temperatures, periods of leaf wetness, and a variety of other climatic factors.

The Auburn ESSC staff have cooperated on a number of field studies including the use of satellite data in forecasting freezes, ozone and crop damage, the prediction of potato leaf blight disease, and the use of solar energy in livestock and poultry production.

At the south end of the agronomy farm on the Auburn campus is a micrometeorological weather station operated by the ESSC. Detailed measurements are taken of air and soil temperatures, evaporation, wind, sunshine, solar radiation, rainfall, periods of leaf wetness, and other parameters. An annual publication listing daily observations from the station has been issued since 1963.

The ESSC staff is available to advise researchers on the availability of weather data, to suggest the weather data that should be collected for their research work, advise on weather instrumentation and other weather related studies.

The ESSC at Auburn is dedicated to providing the right weather information to the agricultural community at the right time. The job is made possible through the cooperation of the land grant universities and the agricultural industry. The ESSC concept, first tested at Auburn, will be implemented nationwide in the near future.



NOAA weather radio stations in Alabama.

AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY
AUBURN, ALABAMA 36830

R. Dennis Rouse, Director

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