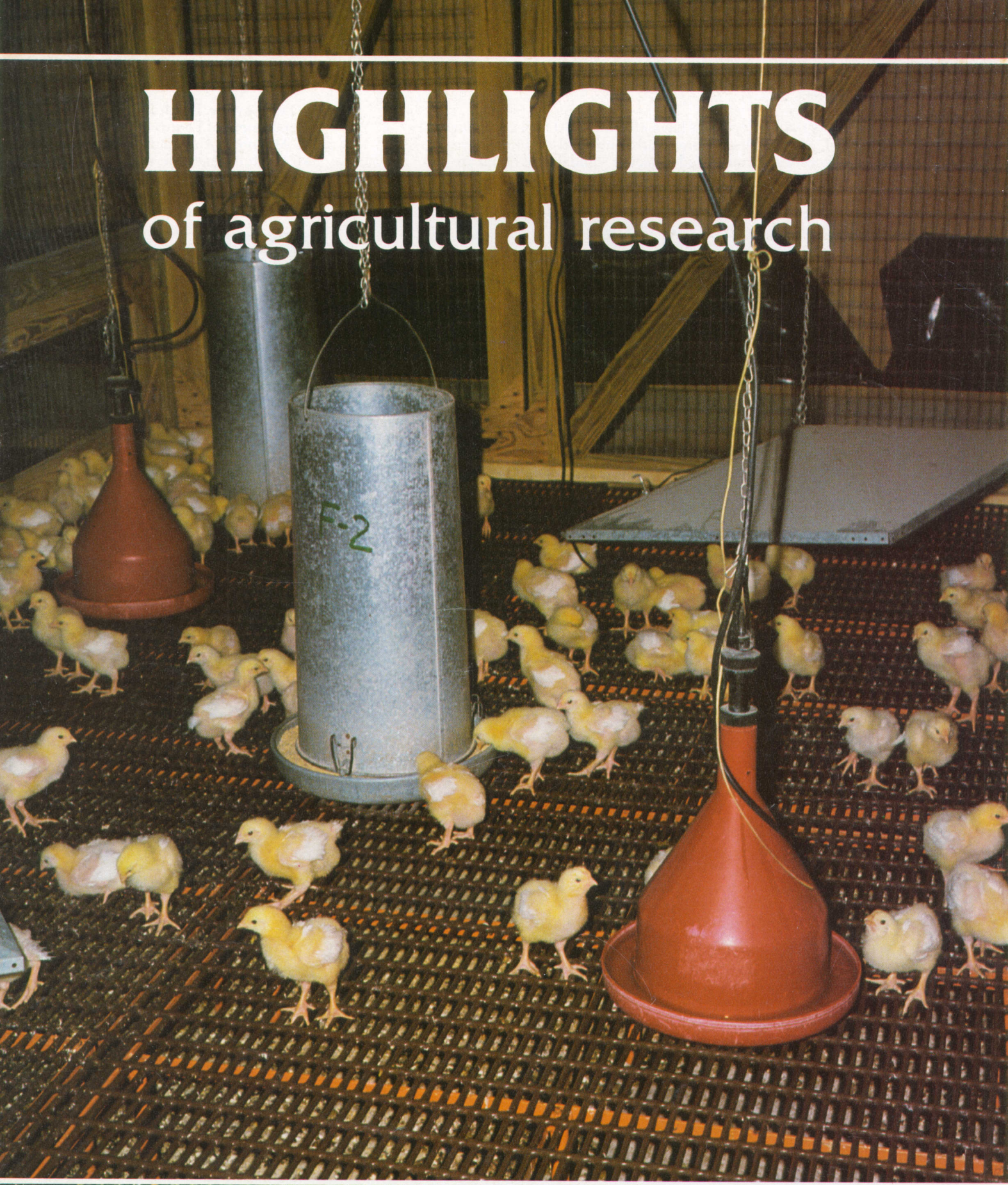
HIGHLIGHTS
of agricultural research



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ALABAMA AGRICULTURAL EXPERIMENT STATION
GALE A. BUCHANAN, DIRECTOR

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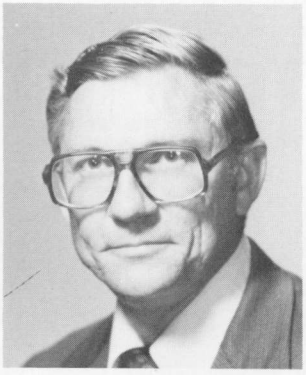
AUBURN UNIVERSITY
AUBURN UNIVERSITY, ALABAMA

DIRECTOR'S COMMENTS

DOWNTURNS IN OUR ECONOMY have affected most aspects of our lives. Indeed, a sluggish economy and continued inflation have produced effects of such magnitude that our standards of living are being altered.



GALE A. BUCHANAN

This has also affected growth of money available for Alabama educational institutions. This disparity versus the cost for education is clearly evident when one considers the increasing cost of agricultural research.

Several reasons account for the expense of agricultural research. First is intensive labor. Almost every aspect of research requires attention to detail. The primary means of providing attention to detail are through individual, personal attention or sophisticated monitoring equipment. Either costs money. Competition for services of scientific personnel is keen. To obtain labor, clerical, and technical support personnel, we must compete with the private sector and other universities.

Much research is energy intensive. Fuel for field experiments, energy for drying crops, cooling and lighting greenhouses and growth chambers, and travel are major areas where cost of energy impacts on the cost of agricultural research.

An effective agricultural research program must have field and laboratory equipment. Sophisticated laboratory equipment is expensive. An amino acid analyzer, necessary in forward-looking animal nutrition research, costs about $100,000. A cottonpicker, just as necessary for field research, costs about $75,000.

If our research is to remain productive, we must keep abreast of new developments in technology. Individual standup unit computers are rapidly becoming a necessary support of certain types of research which simply cannot be accomplished without computers.

From the overall equipment point of view, equipment needs continually accumulate. Failure to purchase, or update, equipment in 1 year simply means that needs have doubled the second year and tripled the third year. Also, costs increase proportionally.

Every effort is made to realize all income practical from sales of products salvaged from experiments. Most laboratory research produces no salable products. Even in greenhouse and field research where there is a potential for sale of resulting livestock or produce, the nature of research ensures only modest productivity. Examples are animals that get poor rations in feeding experiments, corn plots that receive below optimum fertilizer, cotton plots that receive inadequate insect control, soybean plots with no weed control, and peanut plots where diseases and nematodes are allowed to flourish. In experiments where certain non-labeled pesticides are used, resulting crops must be destroyed. In any of these situations, resulting salable products will, indeed, be modest. There are still further losses through experiment evaluation. Meat, eggs, and crops are measured, analyzed, and used in different ways for measuring effects of the research, which leaves the product unfit to market. In summary, the objective of research is increased knowledge, not generation of income from the sale of by-products of research.

While the cost of agricultural research is high, indications are that future costs will continue to escalate. In view of that, and the recognition that the number of problems requiring our attention will not diminish, we need to look for ways of maintaining our research productivity at a minimum cost. Careful attention to the identification of problems and the assignment of priorities are necessary for early consideration in a sound research program. Ways of maintaining research productivity and holding costs down will be the subject of a future column.

may we introduce . . .

Dr. Gayner R. McDaniel, professor, Department of Poultry Science. A native of Millport, Alabama, Lamar County, McDaniel joined the Auburn faculty in January, 1968.

Dr. McDaniel received a B.S. in agricultural education from Auburn in 1953, an M.S. in genetics from Auburn in 1954, and the Ph.D. in genetics-physiology from Kansas State University in 1960. He worked with the Ralston Purina Company as a geneticist for 6 years and with Kansas State as Extension poultryman for 3 years. He also served in the U. S. Army for 1 year. Dr. McDaniel does both teaching and research in physiology. He has published numerous scientific articles and is a member of a number of professional organizations.

Information contained herein is available to all without regard to race, color, sex, or national origin.

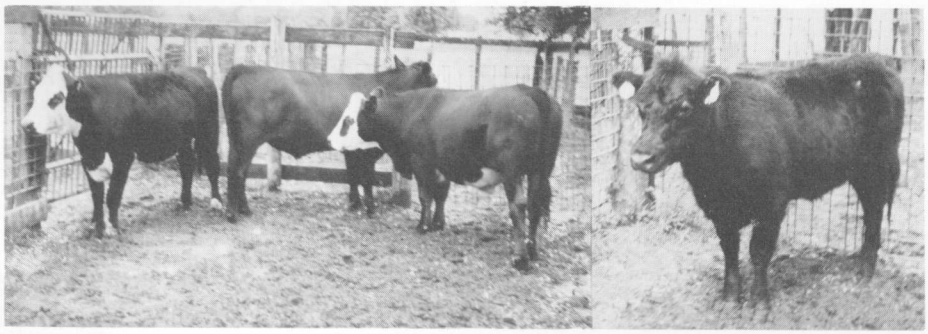
HIGHLIGHTS of Agricultural Research

SUMMER 1981 VOL. 28, NO. 2

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

The title of the article on page 12 of the Spring 1981 issue of Highlights of Agricultural Research (Vol. 28, No. 1) does not accurately express the conclusions drawn by the authors. A more accurate title would be "Responses of Holstein Cows Fed High Levels of Cottonseed and Soybean Meals in Blended Rations."

ON THE COVER: Suspended floors are being tried for rearing broilers (see page 4).



Rough hair and poor condition of steer from fungus-infested fescue pasture (right) contrasts sharply with those from fescue pastures not infested with fungus (left).

Fungus Limits Fescue Pasture Gains

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BEEF GAINS on tall fescue pastures can be doubled by overcoming a single problem—a fungus that infests the grass.

Research underway at the Black Belt Substation indicates that a fungus, present in tall fescue pastures throughout Alabama, may be related to slow daily gains of grazing cattle. Test steers grazing fungus-free pastures have made daily gains nearly double those of steers on fescue infested with the fungus.

The current study is a follow-up to earlier pasture comparisons at the Alabama Agricultural Experiment Station in which gains on some fescue pastures were unexpectedly high. In that study, a fungus was found in fescue pastures where animal gains were poor. In pastures where the high gains were made, however, the fungus was not present in the fescue, or only at low levels. The fungus was originally identified as *Epichloe Typhina*. It is now thought that it may be a new species of *Acremonium*.

The fungus occurs between cell walls of fescue leaves and stems and cannot be seen externally. It does not appear to be transmitted from one plant to another. Fungus-free pastures adjacent to infested pastures have remained "clean" for 5 years. The fungus apparently is transmitted through the seed. A survey of many tall fescue pastures in Alabama showed a heavy infestation of this fungus.

Since the fungus has been implicated as a factor in poor animal performance and is widespread in Alabama, experiments are being conducted at the Black Belt Substation to compare performance on fungus-free and fungus-infested fescue pastures. Three paddocks free of fungus and three infested paddocks were stocked with yearling steers in the autumn of 1978 and 1979. Nitrogen was applied at 100 lb. per acre in September and again in February on all six paddocks in each year.

When grazing was inadequate, during December through mid-February, steers were removed from the paddocks and fed hay plus a protein-mineral-vitamin supplement. The grazing season lasted until approximately mid-July each year.

Fungus-free fescue pastures supported average daily steer gain of 1.48 lb. and per acre beef gain of 395 lb., nearly double that of fungus-infested pastures, table 1. Steers grazing fungus-infested fescue had rough hair coats, and they did not shed their winter coats. They also showed body temperatures 2°F higher than normal, excessive salivation, and nervousness. Hot weather magnified these adverse symptoms. Collectively, these symptoms have become known as "fescue toxicity" or "summer syndrome." No evidence of fescue foot has been seen in these grazing experiments at the Black Belt Substation.

In another experiment, fescue hay and fescue seed from fungus-free and fungus-infested pastures were used in a feeding trail. Crossbred steers weighing 530 lb. were assigned to four diets containing either 60% fungus-free seed, 60% infested seed, 85% chopped fungus-free hay, or 85% chopped infested hay. The test rations were fed during late summer when temperatures reached 94-99°F.

TABLE 1. STEER PERFORMANCE ON TALL FESCUE PASTURES AS AFFECTED BY FUNGUS, BLACK BELT SUBSTATION, 1978-80

Pasture	Beef gain per acre	Av. daily gain	Body temp.	Hair coat rating[1]
	Lb.	*Lb.*	°F	
Free of fungus	395	1.48	102.7	1.3
Fungus present	210	.65	104.8	3.2

[1]Rating: 1 = slick; 5 = rough

Average daily gains of steers fed the fescue rations were typical of those made by steers grazing fungus-free and fungus-infested fescue, but body temperatures were elevated only half as much by the fungus, table 2. Feed intake was lower for steers eating diets containing infested hay and seed. Forage intake of grazed steers was not measured, but higher stocking rates on infested pastures were indicative of reduced forage consumption. Steers fed the fungus-infested seed showed signs of severe heat stress and rapid breathing. All steers eating rations containing infested feed were highly excitable.

TABLE 2. STEER PERFORMANCE AS AFFECTED BY FUNGUS-INFESTED TALL FESCUE SEED OR HAY

Diet	Daily gain	Daily feed	Body temp.
	Lb.	*Lb.*	°F
Fungus-free seed	2.11	14.1	102.3
Infested seed	.44	9.1	103.2
Fungus-free hay	1.45	10.5	102.2
Infested hay	.63	9.2	103.3

Both of the projects reported implicate the fungus in fescue toxicity. Although the actual toxic agent is not known, preliminary results indicate that interaction of the fungus with plant tissue is necessary to produce the syndrome in cattle.

Several research approaches are being taken to solve the problem of this fungus. Systemic fungicides are being tested to see if the fungus can be controlled on established fescue pastures. Since the fungus appears to be transmitted through the seed, methods of seed handling also are being studied. Surface seed treatment is not satisfactory as a means of control because the fungus occurs within the seed.

What can a cattleman do about fescue toxicity now? Clover will offset most of the bad effects of fungus-infested fescue, so overseeding with ladino or red clover will greatly improve animal performance.

Current research indicates great potential for doubling beef gains on tall fescue if a solution to the problem of fescue toxicity can be found.

Plastic-Coated Suspended Floors for Rearing Broilers

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Department of Poultry Science

GROWING BROILERS on wire floors or in batteries was a common practice in the forties when the poultry industry was just getting started. However, when the broiler boom became a reality in the early fifties the problems associated with keeping birds on wire appeared insurmountable. The practice was abandoned by commercial operators in favor of rearing thousands of birds on the floor as housing, litter, and energy sources were cheap.

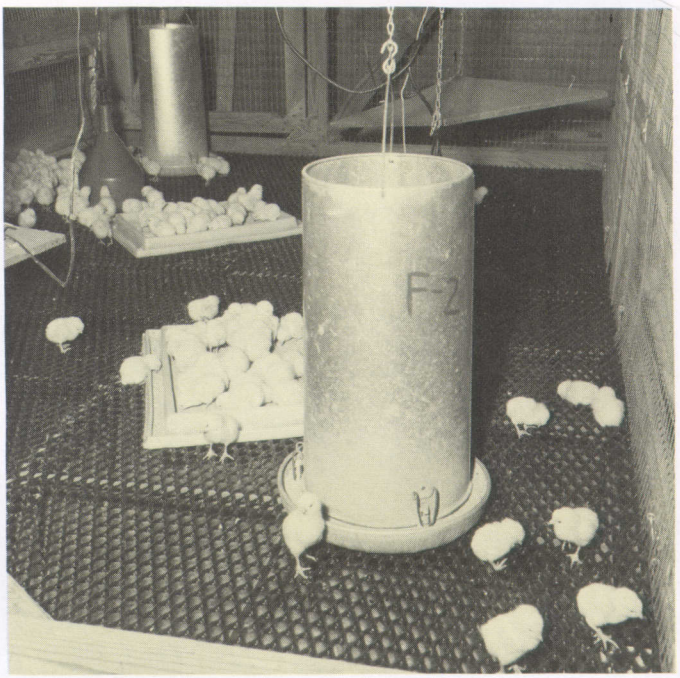
Today, the situation has reversed. Interest in rearing broilers on suspended floors has been gaining momentum in recent months as cost of energy, sources of litter, equipment, and housing construction have become major considerations. Increased density, under current practices, could help alleviate some of the cost problems; however, obtaining good quality litter is a limiting factor, and in some areas obtaining litter of any quality is becoming increasingly difficult.

Scientists in the Department of Poultry Science, Alabama Agricultural Experiment Station, have been working in cooperation with the B. L. Downey Company on revitalizing the suspended floor concept using modern technology to overcome the problems commonly associated with raising broilers on wire. A plastic-coated metal floor, not unlike the principle that has been used successfully in swine production, is being adapted for broiler production. The openings in the floor are designed so chicks from day old through market age can be grown successfully without experiencing foot and leg problems. The floor is rigid enough to allow caretakers to walk on the floor to maintain waterers, brooders, and feeders, and remove dead birds. Testing is still underway, but preliminary results indicate that the advantages for this type system are: (1) More birds per square foot of floor space, (2) increased growth rate, (3) elimination of the need for litter, and (4) elimination of coccidiostats.

Bird density in tests conducted at Auburn was 0.4 sq. ft. per bird; however, a more realistic figure for commercial type operations in large pens would probably be 0.6 sq. ft. per bird. This 0.6 sq. ft. space would allow approximately 25% more birds to be grown in each house than is now being grown on commercial floor operations. One of the primary reasons higher bird density is not feasible in conventional-type houses at present is wet litter problems. The plastic-coated metal floor eliminates this problem.

There is a definite growth advantage to using the suspended floor system. In trials using all males, test birds exhibited a growth rate advantage at 2 and 7 weeks of age, see table. There were no differences in feed conversion, mortality, or incidence of leg problems.

Another advantage of this system over the conventional type system is the amount of "downtime" between broods. The test floors have remained relatively free of manure and have required minimal cleaning after the birds have been removed. Since there is no litter involved, no clean-out time is required, and the only significant labor required would be



the adjustment of feeders and waterers. Built-up manure under the floor should cause no problem, and once-a-year cleanout could be initiated if floor height is sufficient.

The elimination of the use of coccidiostats would result in a saving of approximately 2¢ per bird.

All systems have their drawbacks, but with industry ingenuity, problems associated with catching birds and cleanout can be overcome. Work with the suspended floors is continuing on densities, brooding systems, floor types, and management practices in general.

WEIGHT OF MALE BROILERS GROWN ON A SUSPENDED PLASTIC-COATED METAL FLOOR VS. CONVENTIONAL LITTER

Floor type	Trial 1 age		Trial 2 age
	14 days	50 days	44 days
	Lb.	*Lb.*	*Lb.*
Suspended	0.66*	4.55*	4.19*
Litter	.61	4.37	3.90

*Body weights are significantly different at 14 and 50 days in Trial 1 and at 44 days in Trial 2.

PEANUT IRRIGATION IN A DRY YEAR

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LAST YEAR'S peanut irrigation test at the Wiregrass Substation illustrated the value of irrigation in a dry year. Yield increases from irrigation were much larger than in the previous 4 years of the Alabama Agricultural Experiment Station project.

The 1980 study evaluated the effect of planting dates and irrigation on yield and quality. Florunner peanuts were grown in rotation with corn on Dothan sandy loam plots. Tensiometers were used to measure soil moisture tension at depths of 6, 12, 18, and 30 in. Irrigated plots were watered whenever the 6- or 12-in. tensiometer indicated that soil had dried to 0.4 bar tension. Rainfall and irrigation were monitored with rain gauges in each plot.

Three planting dates were selected to represent a normal planting date and two late planting dates. Both irrigated (I) and nonirrigated (NI) treatments were included for each planting date. Digging dates were determined by the maturity shell-out method.

Since time of maturity was expected to differ for I and NI treatments planted on the same day, a portion of each plot was dug when either treatment reached maturity. Likewise, the remaining portion of these plots was harvested when the other treatment reached maturity. Thus, two yield values resulted from each treatment.

Planting at Recommended Time

The first planting, on May 7, was the only planting date within the recommended time for the Wiregrass area. This treatment was dug 139 and 153 days after planting. The irrigated plots matured first, and the first digging gave the higher yield. In contrast, the nonirrigated plots required longer to mature and produced higher yields at the second digging.

Almost 14 in. of irrigation water were added to the 18 in. of rainfall, providing a total of 32 in. received by the irrigated peanuts, table 1. Application rate of the irrigation water was lower than the intake rate of the soil, which eliminated runoff. This was not true for rainfall, so the total water entering the soil was less than 32 in.

The nonirrigated peanuts received 19 in. of rainfall during the growing season. This included 0.8 in. that fell during the 14 days between first and second diggings.

Irrigation of the May 7 planting increased yield by 2,360 lb. per acre, table 2. This was the largest increase obtained during the 5-year experiment and is attributable to the low yields of nonirrigated peanuts, 2,090 lb., the lowest during the 5 years. Average yield increase from irrigation over the 5 years was 1,320 lb. per acre.

TABLE 1. WATER APPLICATION AND GROWING TIME FOR 1980 FLORUNNER PEANUT EXPERIMENT, WIREGRASS SUBSTATION

Treatment and planting date	Rainfall	Irrig.	Total water applied	Growing[1] period
	In.	*In.*	*In.*	*Days*
May 7				
Irrigated	18.2	13.8	32.0	139
Nonirrigated	19.0	0	19.0	153
June 3				
Irrigated	12.1	16.1	28.2	135
Nonirrigated	12.1	0	12.1	135
June 18				
Irrigated	15.6	12.8	28.4	138[2] to
Nonirrigated	15.6	0	15.6	147

[1]All treatments harvested at two dates, with best yielding date reported.
[2]Because of a digging error, yields from these two growing periods were combined.

TABLE 2. YIELD AND VALUE OF PEANUTS, 1980 EXPERIMENT, WIREGRASS SUBSTATION

Planting dates	Yield per acre			Value per acre[2]		
	Irrigated	Nonirrigated	Difference[1]	Irrigated	Nonirrigated	Difference
	Lb.	*Lb.*	*Lb.*	*Dol.*	*Dol.*	*Dol.*
May 7	4,450	2,090	+2,360	950	430	+520
June 3	4,190	2,050	+2,140	1,000	440	+560
June 18	4,160	930	+3,230	1,010	210	+800

[1]+Indicates higher irrigated compared to nonirrigated yields.
[2]Values are based on the USDA Peanut Loan Schedule and include percentages of sound mature kernels, sound splits, and other kernels. Deductions for damaged kernels have not been made.

Late Plantings

The growing period for the two late plantings was slightly less than for the first, table 1, and there was less rainfall. The second planting had the lowest rainfall total, 12 in., as compared with 19 in. for the first planting. This reduced rainfall resulted in increased irrigation for the second planting, but not for the third planting. Only 13 in. of irrigation water was applied to the third planting, lowest of all.

Late planting reduced yield of nonirrigated peanuts more than it did irrigated treatments. Irrigated yields ranged from a high of 4,450 lb. per acre from the first planting to a low of 4,160 lb. from the third planting. For nonirrigated peanuts, yield remained relatively constant for the first two plantings but plummeted to only 930 lb. per acre for the third planting.

Quality Varied Among Plantings

In the first planting, quality, measured as a dollar value based on the USDA Peanut Loan Schedule, showed no difference because of irrigation. Thus, the difference in gross value, $527 per acre, is attributed to yield increase only.

Although the first planting showed no differences in quality between treatments, significant differences were measured in the second and third plantings. Highest quality nuts were obtained from the third planting.

Considering both yield and quality, table 2, the highest value peanuts were obtained from the third irrigated planting, although there was little difference between plantings. Likewise, there was little difference between first and second nonirrigated plantings, but the third planting had markedly lower value.

MEAT FROM SOWS GOOD FOR RESTRUCTURED CHOPS

DALE L. HUFFMAN, JOSEPH C. CORDRAY, and NOEL OTTAVIANO
Dept. of Animal and Dairy Sciences

EVEN SOW MEAT can be made into a high quality product. An Auburn developed process for producing a restructured pork chop has successfully produced uniform chops with desired weight, size, and chemical and sensory properties from sow meat.

Previous Alabama Agricultural Experiment Station research had established guides for producing a desirable restructured chop using raw materials (hams and boston butts) from market weight hogs. These cuts from market weight hogs are valuable products, either fresh or processed, so the process has now been adapted to using lower cost sow meat to produce the restructured chops.

Sow carcasses are commonly processed into whole hog sausage, making use of the entire carcass. If hams and boston butts from sows could be utilized in a more valuable product, such as restructured pork chops, the value of these animals could be increased. In addition, having a more plentiful supply of raw materials for restructured pork chops could result in improved acceptance of pork in the fast-food industry.

Sow Meat Utilized

Sows for this study were slaughtered at the Auburn University Meats Laboratory. Hams and boston butts were removed and the remainder of the carcass used for fresh pork sausage. The boston butts were deboned, deep chilled, and thin sliced on an automatic slicer. Fresh hams were deboned, defatted, tenderized four times through a reciprocating blade tenderizer, and then cut into 1- to 2-sq.-in. chunks. Mechanical tenderization was done to assure maximum cell disruption and to break down connective tissue, which is essential in formulating the restructured chops. Backfat was finely ground to be used in adjusting the mixture to the desired 15% fat content.

Four treatments of varying salt level—none, 0.5%, 1.0%, and 1.5%—were evaluated on quality attributes of restructured chops by sensory panel and laboratory analysis.

Steps involved in the manufacture of restructured pork chops were as follows: (1) place 25 lb. each of the wafer sliced boston butts and the fresh ham chunks in a horizontal mixer, adjust fat content to 15% by adding the ground backfat, add the amount of salt called for by the treatment, and then mix for 15 minutes; (2) form the meat mixture into cylindrical logs; (3) freeze, then temper the logs to 26°F; (4) press the logs into a pork chop shape, using a hydraulic meat press; (5) slice the log into 5/8-in. thick chops; and (6) package and place chops in freezer.

Evaluation of the experimental products included such measures as appearance and taste appeal, tenderness, rancidity, and cooking loss.

Color was evaluated on four chops from each salt treatment by a six-member trained sensory panel. Chops were prepared for sensory and Instron evaluation by broiling in an electric roto-broiler to medium well done.

Tenderness Measured

As an evaluation of tenderness, the Instron machine provided two measures: (1) the amount of force required to pull a 1.3-cm-square piece of meat in two (tension value), and (2) the force required to push metal plates through a 5-cm-square piece of meat (compression value). Cooking loss was determined by weighing chops before and after cooking.

A test for rancidity (2-thiobarbituric acid determination) was done to determine the effect of salt addition on oxidative rancidity. Rancidity, or flavor deterioration, has been shown to be more of a problem when salt is added to the formulation since salt is a pro-oxidant.

As shown by data in the table, the sensory panel rating of textural properties showed a significant linear increase as the salt level was increased. This finding is in agreement with the Instron tension values, which also showed a linear increase in the force required to pull a piece of meat in two. Previous studies using raw materials from market weight hogs showed that as salt level increases, the binding strength of meat pieces also increases. Differences among the treatments for Instron compression tests were not significant, indicating that although the meat mass held together better, the total impression of tenderness or toughness was not altered by salt treatment.

Adding salt increased the juiciness of the chops, but juiciness did not increase in direct proportion to the amount of added salt. This would indicate that salt concentration between 0.5% and 1.0% is sufficient to assure juiciness.

Results for cooking loss were highly correlated with juiciness and, again, the response to added salt was not linear. Cooking loss of all treatments was higher than shown in previous studies when raw materials from market hogs were used. Since juiciness levels are acceptable (more than 5 on an 8-point scale), it can be concluded that a salt level between 0.5% and 1.0% will significantly reduce cooking loss and assure desired juiciness.

Salt Improved Flavor

Flavor of chops was significantly improved with increasing levels of salt, according to sensory evaluation. The rancidity test indicated that increasing salt levels were accompanied by an increase in off-flavor (rancidity). Therefore, a compromise level of salt, between 0.5% and 1.0%, is recommended to improve flavor intensity without greatly affecting rancidity development.

Raw color scores were better for chops containing no salt or 0.5% salt than for chops containing more salt. Thus, it would be highly desirable to use less than 1.0% salt since raw color is an important indicator of product quality.

These results prove that a satisfactory restructured pork chop can be manufactured from hams and boston butts from sows. Consumer satisfaction will be highest if a salt level between 0.5% and 1.0% is used in the manufacturing process.

RATINGS OF RESTRUCTURED PORK CHOPS

Quality measure	Results, by salt treatment			
	0	0.5%	1.0%	1.5%
Sensory panel[1]				
Textural prop.	4.4	5.3	6.0	6.2
Juiciness	4.3	5.2	6.0	6.1
Flavor	4.6	5.6	6.6	6.2
Color	5.2	5.5	5.0	3.5
Instron values				
Tension[2]	196	254	315	345
Compression[3]	559	479	548	420
Rancidity test[4]	0.18	0.49	0.70	1.03
Cooking loss, pct.	40.8	33.4	32.6	30.4

[1]Rated on a scale of 1 to 8, where 1 = extremely undesirable and 8 = extremely desirable.
[2]Grams of force required to pull a 1.3-cm-square cooked sample of meat in two.
[3]Grams of force required to push metal plates through a 5-cm-square cooked meat sample.
[4]Higher number indicates more rancidity.

Alternate Soybean Marketing Strategies for the Alabama Farmer

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PERSONAL INTERVIEWS with managers of terminal elevators were conducted to determine factors used in price determination procedures and which marketing alternatives were prominently used by soybean producers in Alabama. Knowledge gained from these interviews was used in conjunction with secondary data to describe the characteristics of major soybean marketing alternatives.

Managers of country elevators were also interviewed in order to examine and evaluate marketing alternatives employed by soybean producers in Alabama. This was accomplished by examining signed contracts and check receipts to ascertain time of marketing, volume marketed, marketing method, and prices received at country elevators by producers. The study was made by the Department of Agricultural Economics and Rural Sociology, Alabama Agricultural Experiment Station.

Marketing Alternatives

With increasing capital requirements and decreasing profit margins, producers cannot afford the effects of fluctuating prices or demand. Therefore, to obtain adequate profits, it is important for producers to develop marketing skills that will enable them to take full advantage of available marketing alternatives.

Even before planting, producers should begin to plan for and develop marketing strategies. After deciding how many acres to plant, an acceptable price should be determined by estimating the expected yield and calculating the probable cost of production. By adding a return for management and profit, a reasonable price per bushel can be determined. The next step for developing marketing strategies is to examine and choose one or a combination of available marketing alternatives. Principal marketing alternatives available to Alabama soybean producers are selling through the cash market and forward pricing for future delivery or some variation of these two alternatives.

Markets Used

Data collected in this study permitted an examination of the use of different marketing alternatives for an observed quantity of soybeans:

Type of market	*Percent of soybeans marketed by year*		
	1976	*1977*	*Average*
Spot market	34	23	28.5
Deferred pricing	24	37	30.5
Forward contracting	42	40	41.0

For both 1976 and 1977, forward contracting was the most popular method of marketing soybeans by Alabama producers with an average of 41% sold by this method.

Price data were also collected by each type of market used. Prices received by soybean producers by each type of market are shown below:

Type of market	*Average prices received per bushel by year*		
	1976	*1977*	*Average*
Spot market	$6.41	$5.76	$6.08
Deferred pricing	6.89	5.98	6.43
Forward contracting	6.52	5.80	6.16

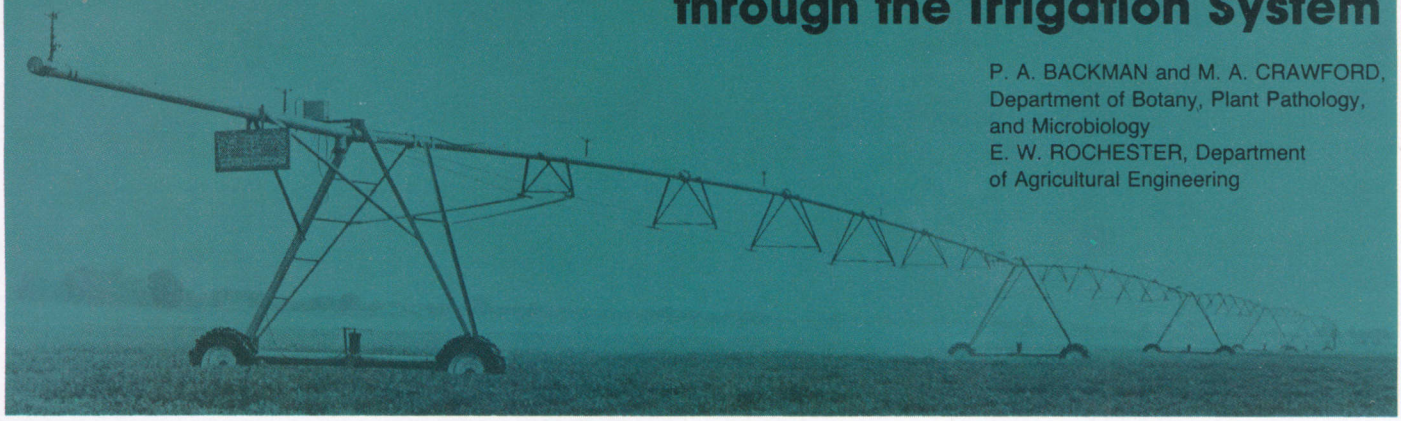
Marketing soybeans after harvest was accomplished by selling from either commercial storage or from farm storage facilities. Both methods were quite costly from the producer's standpoint and made the feasibility of using either one a matter of judgement.

The costs of selling soybeans after harvest from commercial storage by deferred pricing were calculated to be 7¢ per bu. per month of storage. Of this total 3¢ per bu. per month of storage was for commercial storage charges with 4¢ per month being opportunity costs based on $6.00 soybeans with the capability of investing income at an interest rate of 8%.

Total cost figures were calculated for storing soybeans in farm storage facilities of selected capacities. Storage facilities with capacities of 3,735, 7,470, 13,650, and 20,649 bu., respectively, were examined. Total costs, fixed plus variable, per bushel for these storage facilities were 39¢, 32¢, 28¢, and 34¢, respectively. These cost figures were calculated for a storage period of 6 months, but it was estimated that a change in cost due to a change in the length of storage period would be minimal. Again, opportunity costs would be 4¢ per bu. per month of storage, and this would have to be added to the storage costs for facilities for a realistic total cost figure.

No specific marketing decisions can be made by analyzing data for only 2 years. However, from the data collected, it is evident that an awareness of market situations can greatly enhance a producer's ability to market soybeans more profitably.

Application of Fungicides to Peanuts through the Irrigation System



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RECENT DROUGHTS have convinced many farmers to purchase irrigation equipment for their peanut fields. Planning for this expenditure should encompass not only available water supply, pumping capacity, and probable yield increases, but should also include peripheral advantages that can be gained by having an irrigation system.

One of the less obvious advantages of irrigation equipment is the ability to utilize the irrigation system to deliver pesticides along with the irrigation water. Best suited for applying pesticides are systems with uniform application, such as pivots, side-roll, lateral-move, and some solid-set systems. Traveler systems are not as suited for applying pesticides because of irregularities in their watering patterns.

For applying fungicides and other pesticides, the irrigation system should be equipped with a pesticide pump capable of accurately delivering the product and a foot valve to prevent back-flow of these materials into the water source.

Since 1976, experiments have been conducted at the Alabama Agricultural Experiment Station's Wiregrass Substation to determine if fungicides could be injected into irrigation lines to control peanut leafspot and/or white mold (stem rot). Data from the last 3 years are presented in this report.

The fungi causing peanut leafspot are difficult to control and only a few fungicides are recommended. The most difficult to control is late leafspot, primarily because it produces spores in large numbers on the lower leaf surface. It is difficult to apply fungicides to this area even with a well set-up ground sprayer. In table 1, results illustrate leafspot control tests, with comparisons between Bravo 500® applied by ground sprayer, and Bravo 500® applied through-the-line (TTL), both at 2 1/8 pt. per acre. The 1979 and 1980 tests were conducted using a pivot irrigation system; the 1978 test utilized a stationary gun system. For comparison, plots receiving fungicides applied by ground sprayer were always located in an area under the same irrigation system.

Results indicate that leafspot was usually slightly more severe in plots receiving Bravo through the irrigation system; however, yields for TTL Bravo plots were increased. Published information indicates that less than 10% of the Bravo applied TTL is retained on the foliage, the rest is washed to the soil. TTL application of leafspot fungicides does a better job of treating the lower leaf surface because of the huge volume of water applied, resulting in a total wetting of the leaf. This may partially compensate for the low amount of fungicide retained by the leaf. Increased yields from TTL-applied Bravo may result from less equipment damage (eight fewer tractor trips), or from Bravo affecting pod and root diseases.

A similar system was used to apply fungicides for control of white mold, except that only two applications were made. The first application (2½ gal. Terraclor 2EC® or 2½ pt. Vitavax 3F®) was made in mid-July, and the second was made at the same rate 3 weeks later. All plots were also treated with Bravo to control leafspot; in the 1978 and 1979 tests, Bravo was applied TTL. Evaluation of treated plots indicated good control of white mold in all years, with yield increases in 2 of 3 years, table 2.

These data indicate that applying fungicides through the irrigation system is effective in controlling peanut diseases. Further, this method is more economical since it does not require tractors, spray rigs, or their operators. State labels (Alabama 24(c)) have been granted for the application of Bravo TTL for peanut leafspot control and for Terraclor TTL for white mold control. Delivery of some herbicides and Sevin® by this method is also effective.

This research was sponsored in part by the Alabama Peanut Producers Association.

TABLE 1. COMPARISON OF EFFECTS OF FUNGICIDES APPLIED THROUGH THE IRRIGATION SYSTEM (TTL) AND BY GROUND SPRAYER ON PEANUT LEAFSPOT AND YIELD

Bravo applications	Yield (lb. per acre)			Pct. infected leaves			Pct. leaves lost		
	78	79	80	78	79	80	78	79	80
None	3,194	2,392	2,805	57	62	68	20	37	40
Bravo TTL	4,041	4,075	4,268	40	41	38	18	24	30
Bravo ground	3,823	3,853	3,188	21	15	61	12	9	36

TABLE 2. EFFECTS OF FUNGICIDES APPLIED THROUGH THE IRRIGATION SYSTEM ON INCIDENCE OF WHITE MOLD AND YIELDS

White mold fungicide	Yields (lb. per acre)			White mold hits per 100 ft. row		
	78	79	80	78	79	80
None	4,219	4,075	4,268	10.5	14.0	9.9
Terraclor TTL[1]	4,503	4,897	4,290	5.0	2.7	8.2
Vitavax TTL	—	4,679	4,189	—	1.7	5.6

[1]TTL = through the line application technique.

Forestry's Economic Contribution to Alabama

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THE BEST SINGLE MEASURE of an industry's economic contribution to a region is "value added," which is the value an industry adds, through its own operations, to the value of its purchased raw materials. It is also an industry's contribution to the gross national product.

Though long dominated by steel, textiles, and agriculture, Alabama is witnessing the emergence of a new economic leader—forestry and the forest industries. In 1977, the combined value added by the forest industries was $1.38 billion, exceeding both heavy metals ($1.04 billion) and textiles ($0.67 billion) of the State's traditional leaders.

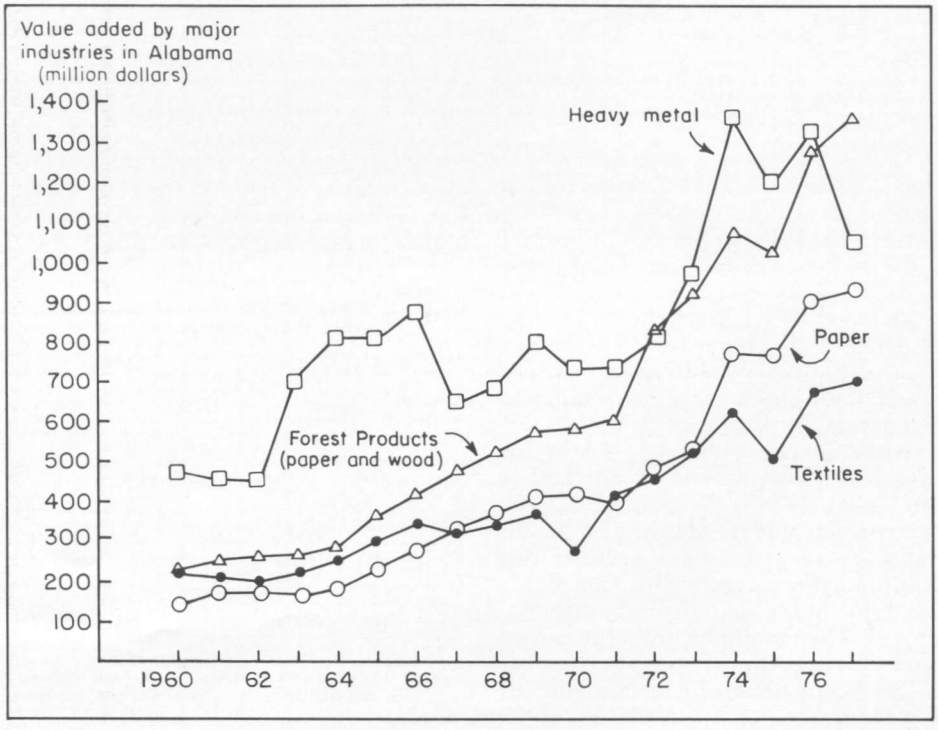
The figure shows the value added by the forest industries (with paper shown separately) compared to heavy metals and textiles. The forest industries have been one of Alabama's growth leaders since 1960, and with recent and planned expansions in the pulp and paper industry, forestry and forest products is sure to maintain its economic leadership in the years ahead.

Even when compared with all of agriculture, forestry appears to be the leader. Since "value added" of agriculture is not routinely estimated by the U. S. government, it can only be approximated from existing data published by the U. S. Department of Agriculture. If the cost of raw materials (feed, livestock, seed, fertilizer and lime, and miscellaneous) are subtracted from gross receipts from farm marketings, the result, which is an approximation of value added by primary agricultural production, is $0.72 billion. Adding the value added by the food processing industry ($0.55 billion) gives a total estimated value of $1.28 billion or about $100 million less than forestry.

In addition to its size, the forest industries can claim some of the largest economic multipliers of any of Alabama's industries. These results are from a recently completed input-output model of Alabama which is based on data gathered in a survey of all of Alabama's manufacturing industries. This work shows that Alabama will have larger increases in business activity, household incomes, and employment from expansions in the forest industries than from comparable expansions in other manufacturing industries. The principal reason for this large multiplier effect is that the forest industries purchase a much larger share of their raw materials in Alabama than most other industries. These in-state purchases stimulate activity in all sectors of Alabama's economy.

One of the most important raw materials of the forest industries is, of course, wood, and this makes the industry dependent on the thousands of forest landowners in Alabama. The forest industry owns less land than many people believe. In Alabama, the forest industry owns about 20% of the State's 21.3 million acres of commercial forestland, while non-industrial private owners own 75%. These data imply that even if industry lands are managed intensively, private landowners will still supply the majority of the industry's raw material. With improved forest management techniques and greater economic incentives, Alabama's land and timber base is capable of supplying even more timber than it does today.

The potential of our forestlands is important because the South will surely become the "wood basket" of the nation in the years ahead. Virtually all public and private forecasts of the forest economy agree the potentials for expanding domestic and international forest products markets are great. Alabama's industry and landowners are well situated to participate in these developments.



An Alternate Marketing System for Feeder Cattle in Alabama

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ALABAMA with approximately 900,000 brood cows has become a major supplier of stocker and feeder cattle because of year-round availability of quality forage.

The traditional marketing channel for these cattle has been through local auction markets. Even though these markets provide a needed service to producers, they can be costly and inefficient. Sales volume and prices can be low, and producers can incur high costs when selling. Cattle can also be resold several times before final shipment to a feedlot which reduces the performance of these animals.

TABLE 1. PRICES AND COSTS FOR FEEDER CATTLE AT MARKET BOARD SALES VERSUS MONTGOMERY AUCTION MARKET, 1979-1980

Revenues	Marketing board	Auction market	Diff.	Std. error of difference in price
	..... *Dol./cwt.*			
Price received	69.25	66.11	3.14**	.9008
Costs				
Marketing charge	.15	1.86	1.71	
Shrink[1]	1.39	3.31	1.92	
Insurance	—	.57	.57	
Transportation[2]	—	.28	.28	
Total	1.54	6.02	4.48	
Net price received	67.71	60.09	7.62**	.8640

[1]Five percent was used to calculate auction market shrink. This is considered a conservative estimate with shrink believed to range from 6-8%. Sellers in the associations take a 2% pencil shrink.
[2]Transportation charge from farm to auction market estimated at $2.00 per head.
**Significance at the 1% level.

An alternative market channel to auction markets has been developed in Alabama. Groups of producers have formed marketing board associations with assistance from the Alabama Cooperative Extension Service. The first marketing board in Alabama was established in 1973 and presently there are six associations which sold 17,000 head of cattle. Sales for all associations occur during April and May at a central location. Cattle are sold by lots based on descriptions provided by the producer. Cattle buyers have the opportunity to visit a farm to inspect cattle before a sale. Immediately following a sale, contracts are signed, the form of payment is agreed on, and time of pickup of cattle is determined.

To evaluate if producers selling through marketing board sales benefit compared to selling through an auction market, information was collected by the Department of Agricultural Economics and Rural Sociology, Alabama Agricultural Experiment Station, for the years 1979 and 1980 for nine board sales. Data on breed, sex, grade, and price received were collected on 224 lots of cattle. Prices received for lots of cattle were compared to the weekly average Montgomery price to determine benefits to producers in board sales compared to auction markets. In addition to this information, 27 lots of cattle were graded on the farm in 1980 to determine if buyers recognized characteristics in cattle not provided in the producers' advertisements.

Results

Price differences between board sales and Montgomery auction markets are illustrated in table 1. The price at board sales exceeded the auction market by $3.14 per cwt. for the period 1979 to 1980, a significant difference. Computing all marketing costs, auction marketing costs were above four times the costs to producers selling through board sales. The net price received by producers selling through board sales was $7.62 per cwt. greater than auction market sales, which was significantly different.

Variations in prices paid by breed and sex of cattle were found between lots for the two markets, table 2. Price comparisons between the two types of markets indicated higher prices for steers than heifers by breed types. The average steer price differential of $3.68 per cwt. was more than three times the heifer price differential of $1.15 per cwt. Using Duncan's statistical test, the price differential for steers of breed type 3 (British breed crosses mixed with their straight British breeds) was significantly different from other breed types with a $5.10 per cwt. differential between the two market channels. The price differential between the two markets for breed type 3 for heifers was also significantly different with a differential of $6.40 per cwt. British crosses were the preferred breed type by feedlots.

Results from grading 27 lots of cattle on the farm indicated that commission buyers at the board sales were more interested in weight of cattle and their finish condition than either frame size or muscling of the cattle. Buyers discounted wasty and moderately fat cattle, $6.37 and $3.12 per cwt., respectively, compared to slightly thin cattle. For this sample of cattle, buyers paid a premium of $3.07 per cwt. for British crosses of Angus and Hereford breeds compared to mixed lots of exotic breeds.

Conclusions

Marketing board associations in Alabama are proving a viable alternative as a marketing channel for feeder cattle. Producers selling through market board associations, based on the data available, received higher prices and paid lower costs in marketing their cattle. Cattle buyers were satisfied with the marketing arrangement receiving "farm fresh" cattle with minimum stress and ready for the feedlot.

TABLE 2. PRICES PER HUNDREDWEIGHT RECEIVED BY BREED TYPE AND SEX OF CATTLE BETWEEN MARKET BOARD SALES AND THE MONTGOMERY AUCTION MARKET, 1979 AND 1980.

Breed type[1]	Marketing board sales				Montgomery auction market				Difference between markets			
	Steers		Heifers		Steers		Heifers		Steers	Duncan[2] test	Heifers	Duncan[2] test
	Lots	Price	Lots	Price	Lots	Price	Lots	Price				
	No.	*Dol.*	*No.*	*Dol.*	*No.*	*Dol.*	*No.*	*Dol.*	*Dol.*		*Dol.*	
1	5	74.15	0	—	5	69.30	0	—	4.85	B	—	
2	13	69.70	1	58.00	13	65.28	1	59.50	4.42	B	−1.50	B
3	66	72.58	12	64.88	66	67.48	11	58.48	5.10	A	6.40	A
4	63	67.69	20	59.35	59	65.13	19	58.26	2.56	B	1.09	B
5	21	65.20	3	55.75	17	63.72	3	57.17	1.48	B	−1.42	B
Average	168	69.86	36	59.50	160	66.18	34	58.35	3.68		1.15	

[1]Breed types are: 1, Angus; 2, Hereford; 3, Angus, Hereford, and Angus x Hereford; 4, types 1, 2, and 3 plus other breeds; 5, other crosses, e.g., Brahman, Charolais.
[2]Duncan Multiple Range Test determines significance among means for classes (A, B) of a variable indicated by different letters.

Hampshire-Landrace Sows Better in Maternal Traits Than Duroc-Landrace and Spot-Landrace

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CROSSBRED SOWS that are one-half Landrace are superior to crossbred sows of other breeds for litter sizes and litter weights at 21 days. Canadian researchers have reported that Yorkshire-Landrace and Hampshire-Landrace crossbred sows were the best of 28 crosses studied for maternal performance, while Duroc-Landrace sows were intermediate. At the Alabama Agricultural Experiment Station, however, Duroc-Landrace crossbred sows were slightly better than Yorkshire-Landrace sows for preweaning performance traits.

Little is known about the performance of Spot-Landrace crossbred sows. Therefore, one objective of this study was to compare the preweaning performance of pigs and litter sizes of Duroc-Landrace, Spot-Landrace, and Hampshire-Landrace sows when mated in all possible combinations to purebred Duroc, Spot, and Hampshire boars. These matings produced either three-breed-cross litters or backcross (crossing sows back to one of the breeds making up the crossbred sow) litters. These matings also were used for another objective of the study—to determine if the three-breed-cross litters would outperform the backcross litters.

A total of 274 litters was farrowed by 106 sows. The traits studied were number born, number born alive, individual pig birth weight, litter birth weight, number alive at 21 days, individual pig 21-day weight, and litter weight at 21 days.

The three sire breeds did not significantly affect litter sizes, litter weights, and pig weights, see table. However, Duroc-sired litters tended to be the largest and heaviest at 21 days, while the Hampshire-sired litters tended to be smallest and lightest.

Litter sizes and weights at birth did not differ significantly among the three sow breeds. By 21 days, however, these differences showed up: (1) litters from Spot-Landrace sows were significantly smaller than litters from Duroc-Landrace and Hampshire-Landrace sows, and (2) pigs out of the Hampshire-Landrace sows were 1 lb. heavier than the pigs out of Duroc-Landrace sows and 0.8 lb. heavier than pigs out of Spot-Landrace sows.

Although not significant, Duroc-Landrace and Hampshire-Landrace sows had the heaviest litters at birth and Spot-Landrace sows had the lightest. At 21 days, litters out of Hampshire-Landrace sows were the heaviest, while litters out of Spot-Landrace sows were the lightest. Litters from Duroc-Landrace sows were intermediate to the other two sow breeds.

Litters by Duroc boars mated to Hampshire-Landrace sows were the largest and the heaviest at 21 days among those studied. This was the only breed combination that had 21-day litter weights in excess of 100 lb. The heaviest pigs at 21 days were by Spot boars mated to Hampshire-Landrace sows.

In comparison with backcross litters, three-breed-cross litters were larger at birth, had more pigs born alive, and more were alive at 21 days, as shown below:

Performance measure	*Difference–three-breed cross over backcross*
Number born	0.83
Number born alive	.60
Number alive at 21 days	.63
Pig birth weight, lb.	−.07
Pig 21-day weight, lb.	.24
Litter birth weight, lb.	2.20
Litter 21-day weight, lb.	8.20

No significant differences were observed between the weight of individual pigs from three-breed crosses and backcrosses at birth and 21 days. The litter size differences noted were reflected in the differences in litter weights at birth and at 21 days, 2.2 and 8.2 lb., respectively, more for the three-breed-cross litters.

Results from this research show that performance differences existed among the three kinds of Landrace crossbred sows. Therefore, the kind of crossbred sow is important for maximizing preweaning performance of swine. The results also showed that backcrossing sows back to one of the breeds making up the crossbred sow did reduce performance of the litters below that of the three breed-cross litters. Breeding for three-breed-cross litters should give a higher level of performance.

LITTER SIZES, PIG WEIGHTS, AND LITTER WEIGHTS AT BIRTH AND 21 DAYS

Breed	Born	Born alive	Alive at 21 days	Pig weight		Litter weight	
				At birth	At 21 days	At birth	At 21 days
	No.	*No.*	*No.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Sire breed							
Duroc	11.2	10.7	8.9	3.24	10.1	36.2	90.4
Spot	10.8	10.3	8.2	3.24	10.3	34.4	84.2
Hampshire	11.5	10.8	7.8	3.28	10.4	37.3	81.4
Dam breed							
Duroc-Landrace	11.4	10.7	8.5	3.22	9.9	36.6	84.7
Spot-Landrace	10.8	10.3	7.7	3.22	10.1	34.6	77.6
Hampshire-Landrace	11.2	10.8	8.7	3.33	10.9	36.8	93.7
Sire breed × dam breed							
Duroc × Duroc-Landrace	10.7	10.1	8.7	3.24	9.9	34.6	86.4
Duroc × Spot-Landrace	11.0	10.4	7.5	3.15	9.8	34.4	72.5
Duroc × Hampshire-Landrace	11.9	11.5	10.6	3.35	10.6	39.7	112.4
Spot × Duroc-Landrace	11.8	11.4	9.2	3.24	9.4	38.1	89.1
Spot × Spot-Landrace	9.9	9.6	7.5	3.26	10.0	31.5	74.1
Spot × Hampshire-Landrace	10.6	9.9	7.8	3.24	11.5	33.5	89.3
Hampshire × Duroc-Landrace	11.7	10.6	7.7	3.20	10.3	36.6	78.7
Hampshire × Spot-Landrace	11.6	11.0	8.2	3.24	10.4	37.9	86.2
Hampshire × Hampshire-Landrace	11.2	10.9	7.6	3.42	10.4	37.5	79.1

Cost and Return for a Small Christmas Tree Operation

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DURING THE PAST FEW YEARS interest in Christmas tree production in Alabama has increased rapidly with thousands of trees in small plantations being planted annually. Production research by the Alabama Agricultural Experiment Station indicates that high quality Christmas trees can be grown in the State. Because of a longer growing season, trees can be grown in the State in less time than in the established production areas in northern states. Also, closer proximity of markets gives locally produced trees a marketing advantage. However, the enterprise is still in the early stage since only a few Alabama growers are producing high quality plantation grown trees.

Before committing resources to the enterprise, farmers should analyze costs of tree production, as well as potential income from trees marketed. To aid farmers in their decisions to grow trees, costs and returns studies were conducted.

Since most people expressing an interest in growing Christmas trees desire small plantations, a budget was developed showing costs of planting 1 acre of Virginia pine trees each year for 5 years. At the end of the fifth year a total of 5 acres of trees had been planted and the first acre of trees planted is ready to be harvested. Trees are spaced at 7-ft. intervals or 900 trees per acre. It is assumed that 800 trees per acre can be harvested. After the fifth year, the enterprise can be continued as a 5-acre operation with 1 acre planted and 1 acre harvested annually.

Equipment and machinery requirements and estimated costs amounting to $7,841 are shown in table 1. The tractor and machinery comprise the major cost items. Specific circumstances allow a broad range of machinery complements to be used in a Christmas tree enterprise. Tree spacing is usually determined by the type of machinery to be used. For example, use of smaller mowing and spraying equipment would reduce machinery investment and permit closer tree spacing. The machinery complement assumed would be adequate for a plantation larger than budgeted here. If the farmer already has a small tractor available, initial costs can be substantially reduced.

Elements of cost of producing 1 acre of trees over a 5-year period amount to $3,044, table 2. Fixed cost derived from machinery and equipment requirements amounted to $1,490, or 48.9% of production costs. Performance of work activities by the operator can reduce cash expenditures by $1,204. Because of the long production period, all costs to be incurred were discounted to a present value. With the use of a 12.5% discount rate the present value of costs amounts to $2,120.

Net returns to land and management anticipated from 1 acre of trees were discounted to present value using three interest costs and three values for trees marketed, table 3. Even though additional labor costs are required for retail sales direct to customers, the greatest potential returns result from this market alternative at an assumed price of $15 per tree. Budgeted net returns are competitive with most specialty field and tree crops if the producer can receive $10 per tree (assumed for sale to a retailer). Returns at low discount rates are positive but less competitive at $5 per tree (assumed for sale to a wholesaler). All alternatives require investment of capital over a 5-year period before recovery. Continuous planting will produce annual returns after the 5-year start-up period.

TABLE 1. EQUIPMENT AND MACHINERY NEEDED FOR A SMALL CHRISTMAS TREE ENTERPRISE, ALABAMA 1981

Item	Unit	Cost
	No.	*Dol.*
Planting dibbles	2	18
Knives	2	26
Leg guards	2	25
Hand pruners	2	12
Backpack sprayer	1	90
Tractor, 14 hp. diesel	1	5,600
Mower (tractor)	1	760
Sprayer, 25 gal. (tractor)	1	810
Additional equipment[1]		500
Total cost		7,841

[1]Cost of tree baler and a fraction of the cost of a tiller, chain saw, and half-ton truck.

TABLE 2. ESTIMATED COST OF PRODUCING ONE ACRE OF CHRISTMAS TREES OVER A FIVE-YEAR PRODUCTION PERIOD, ALABAMA

Item	Unit	Quantity	Price	Value	Discounted value[1]
			Dol.	*Dol.*	*Dol.*
Variable cost					
Trees	bundle	0.9	50.00	45.00	45.00
Herbicide	pound	9.0	4.00	36.00	28.57
Insecticide	quart	5.0	9.00	45.00	30.65
Colorant	gallon	18.0	7.00	125.00	69.93
Tractor and machinery	acre	1.0	77.00	77.00	54.82
Interest on operating capital	dollar	172.00	.125	21.50	15.31
Total variable cost				350.50	244.28
Fixed cost	acre	1.0	1,489.86	1,489.86	1,060.78
Labor	hour	301.0	4.00	1,204.00	814.76
Total cost				3,044.36	2,119.82

[1]Discounted based on time of expenditure. Since tree cost was incurred initially, cost was not discounted.

TABLE 3. DISCOUNTED NET RETURNS TO LAND AND MANAGEMENT FROM ONE ACRE OF CHRISTMAS TREE PRODUCTION OVER A FIVE-YEAR PERIOD, SELECTED TREE PRICES AND CAPITAL COSTS

Cost of capital	Price per tree (dollars)		
	5	10	15[1]
Pct.	*Discounted dollars*		
10	80	577	994
12.5	27	471	844
15	−19	378	712

[1]An additional cost of 160 hours of labor at $4.00 per hour is charged for direct sale to customers.

Pecan Root Growth Reflects Irrigation Treatment

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HURRICANE FREDERIC essentially wiped out the pecan irrigation test orchard at the Gulf Coast Substation in September 1979, the eighth year of the experiment. But a study of the root systems of trees salvaged some value from the research orchard. Trenching around the test trees allowed inspection of the roots, which showed that drip irrigation improved root development just as it increased production.

Six drip irrigation treatments providing a range of water applications had been established by the Alabama Agricultural Experiment Station in 1971 to compare with sprinkler irrigation and no irrigation. Yield of Cape Fear trees after 5 years of treatments ranged from 428 lb. per acre without irrigation to 1,361 lb. per acre from drip irrigation controlled by a tensiometer set at 30 centibars. The treatments, listed in order of highest to lowest yields, were:

Drip—tensiometer @ 30 centibars
Drip—4 gal./tree/day
Drip—tensiometer @ 50 centibars
Drip—1 gal./tree/day
Drip—tensiometer @ 15 centibars
Drip—8 gal./tree/day
Sprinkler—tensiometer @ 30 centibars
No irrigation

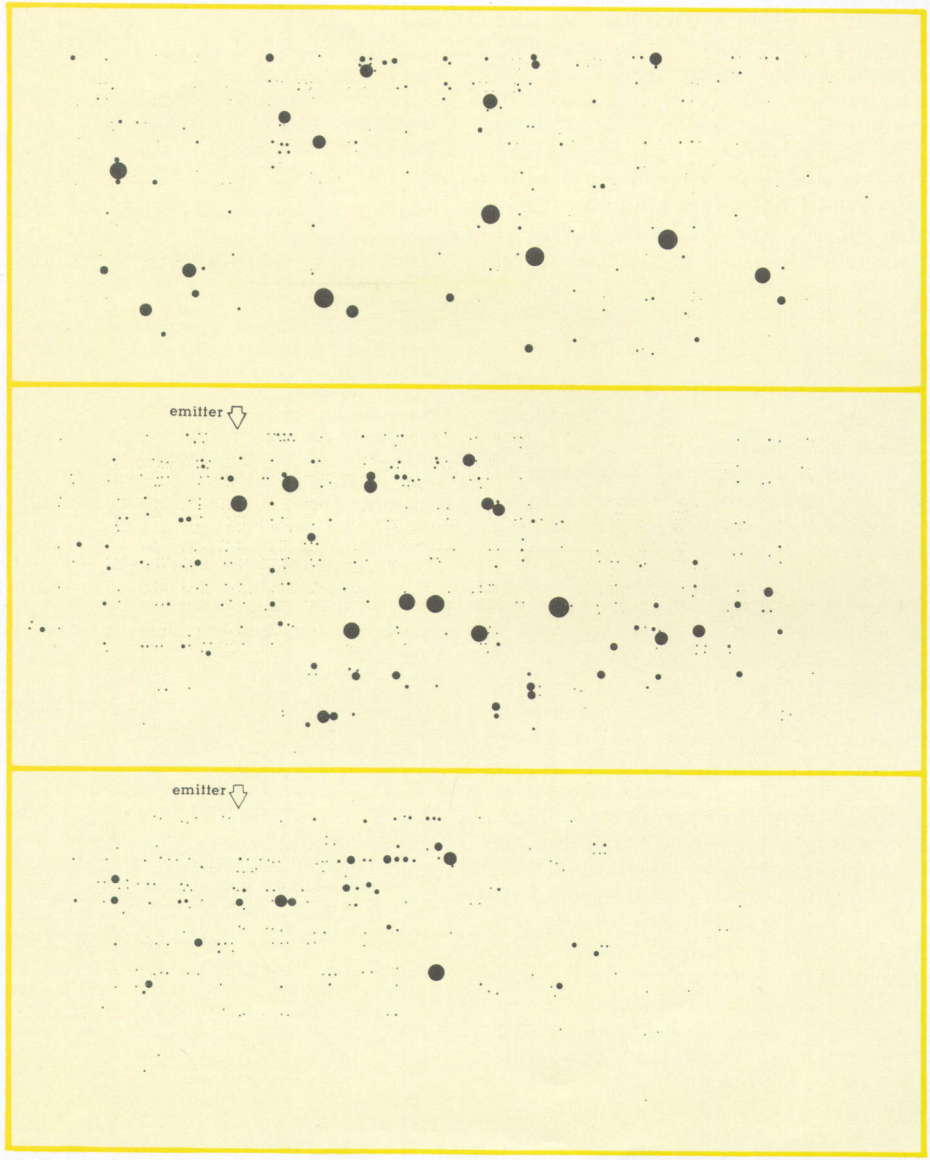
The greatest root density was found under trees that had been irrigated by sprinkler, and the least where there was no irrigation. Even when only 1 gal. of water was applied per day or irrigation was at 50 centibars, root development was improved by irrigation.

Extensive root development was observed under the emitter when pecans were drip irrigated. And this was reflected in productivity of the trees. With a single emitter per tree releasing 8 gal. of water per day, which covered less than 10% of the surface area under the tree canopy, nut size and fill of Shoshoni and Cheyenne trees were equal to that with sprinkler irrigation.

Root development was intensified deep into the B soil horizon under the emitter. Roots growing toward the surface originated from the larger horizontal roots. Development of these upward growing roots appeared to be enhanced when under an emitter.

Most drip irrigated trees had the greatest overall root development on the side of the tree receiving water from an emitter. The increased size and density of root development extended beyond the area immediately below the emitter, as shown by the drawings.

These findings indicate that overall root development increased as amount of water delivered through the drip irrigation system was increased. With the larger volume drip treatments, yield was higher and nut size was equal to that from trees under sprinkler irrigation. Furthermore, drip irrigation resulted in smaller trees, which are better adapted to high density plantings (30 x 35 ft. spacing in this test).



Root systems resulting from different irrigation treatments: top—no irrigation; middle—drip irrigation at 15-centibar control; bottom—drip irrigation at 30-centibar control, on more droughty soil than other two shown.

AUBURN AGRICULTURAL STUDENTS

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ENROLLMENTS in the School of Agriculture, Forestry, and Biological Sciences at Auburn University have followed a striking pattern over the past 10 years.

The story is told graphically in the figure using undergraduate enrollment totals for the winter quarter of each year. Ten years ago there were 12,082 undergraduates at the University with 668 in agriculture. Since then the University has experienced a steady growth to the 1981 level of almost 16,000 undergraduates. Until 1978, enrollments in agriculture grew at an equal or faster pace. The highest winter quarter enrollment occurred in 1977, at 1,387 students—more than twice as many as in 1971. Fall quarter 1977 produced a peak enrollment of 1,436 agricultural students. Declining enrollments have occurred for each winter quarter since then for a net loss of 257 students. Almost half (43%) of this loss occurred in 1981.

At the height of agricultural enrollments in 1977, a survey was conducted among a 15% random sample of Auburn agricultural students. A response rate of 76% was obtained using a mail questionnaire. The table presents a profile of the undergraduate agriculture student at Auburn in 1977.

Fewer than one-third of the fathers had been raised on a farm and fewer than one-fourth was employed in agriculture. The nonrural backgrounds of the students were noted in their high school and work experiences. Although one-fourth had attended small schools having fewer than 100 students in the graduating class, the majority attended schools with more than 200. Most striking was that few students (19%) had completed an agricultural course and few had participated in 4-H or FFA programs. Experiences of these types were thought typical of agricultural students just a few years before.

Many of these students also lacked direct work experience in production agriculture. Fewer than half (42%) had ever worked on a "family" farm, and even fewer (37%) had done hired farm work. Considering both kinds of work experiences, only 55% had done any farm work.

Lacking farm experience in agriculture, what was the motivation for choosing a major in agriculture? Two sources of motivation were considered—people influences and goal influences. Parents, especially fathers, were considered as having helped influence the choice. No other persons were seen to influence any large number. Persons such as the cooperative extension agent, agricultural teacher or veterinarian influenced fewer than 20%. College friends and professors were mentioned by one-fourth.

Goal type motivations for majoring in agriculture were strongly associated with preparation for a career. Virtually all students gave this reason, but 76% also indicated their choice was motivated by a preference for country life and 49% because of successful prior experiences in agriculture. More than half (55%) were motivated by a perception of good incomes available in their major field of agriculture. Since few students (12%) expected to become either a farmer or rancher, the income potentials perceived were not in production agriculture, but rather in the agricultural related occupations that a majority (55%) expected to enter.

Expectations for different adult goals tell something about these students' interest in agriculture. Almost one-third would prefer to live on a farm or ranch if given the opportunity. Moreover, more than two-thirds expected to own a farm or ranch someday. A common way to attain ownership is through inheritance, and 44% expected to become an owner via this route.

Attitudes assessing the potentials of the agricultural industry to provide meaningful and satisfying occupational opportunities for students were positive. Virtually none of the students believed that agriculture was a declining industry. An equally large proportion (86%) indicated that they perceived agriculture as offering good career opportunities.

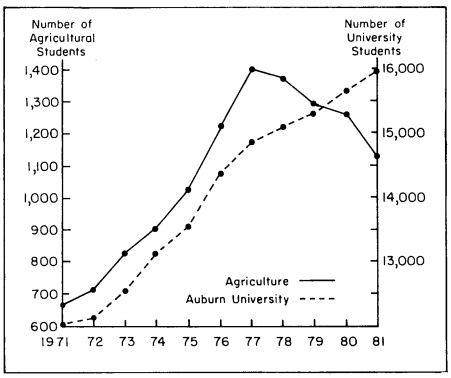
In conclusion, this profile of agricultural students at Auburn University at a time of peak enrollment reveals that these students were not the traditional rural "recruits." This was a varied group of students, a group strongly supportive of the agricultural industry. As enrollments in agriculture decline in the early 1980's, new questions are raised.

Are Auburn agricultural students becoming more homogeneous again, reverting to a more traditional farm and rural profile of an earlier era? Or, is this decline of such a general nature that the variability among agricultural students will remain the same even as the enrollment decreases?

A PROFILE OF THE AUBURN AGRICULTURAL STUDENT IN 1977

Student characteristics	*Percent*
Family background:	
Parents presently own, rent, or lease a farm	32.8
Parents' primary income from farm	8.8
Fathers raised on farm	28.9
Fathers' occupation agricultural related	22.5
School and work experiences:	
Attended small schools (graduation class less than 100)	26.7
Completed agriculture course	19.0
Participated in 4-H	20.3
Participated in FFA	17.8
Worked on family farm	42.3
Employed as hired farm worker	32.1
Factors in choosing major:	
Influenced by father	62.4
Influenced by college teacher (advisor)	26.9
Important to prepare for a career	94.7
Preference for country life	75.6
Because this major ensures a good income	55.3
Successful prior agricultural experiences	48.9
Expectations for adult goals:	
Living on farm	30.9
Owning a farm	70.1
Inheriting a farm	44.4
Becoming a farmer or rancher	12.1
Entering an agricultural related occupation	54.7
Attitudes toward agriculture:	
Agriculture is a declining industry (disagree)	89.0
Good career opportunities exist in agriculture (agree)	86.1

Sample of Auburn agricultural students (137)



Undergraduate enrollment for all Auburn University and for agricultural students, winter quarter, 1971-1981.

The Relationship of
Primary Productivity to Sportfish Production
in a New Southeastern Reservoir

D. R. BAYNE, Department of Fisheries and Allied Acquacultures

FISH PRODUCTION, in large impoundments, usually declines after reaching a peak during early years of impoundment (3-8 years). If, through management, this peak could be maintained or the decline in yield reduced, a fuller utilization of the resource would be realized.

The causes of this "boom and bust" sequence is the subject of a 10-year study now being conducted by fishery scientists at the Alabama Agricultural Experiment Station. The study site, West Point Reservoir (Alabama-Georgia), a 25,888-acre impoundment of the Chattahoochee River, is located 3.2 miles north of West Point, Georgia. Impounded in the fall of 1974 by the U.S. Army Corps of Engineers, the lake provides flood control, hydroelectric power, and outstanding recreational opportunities for visitors. The proximity of this new mainstream reservoir to Auburn University afforded an excellent opportunity to document changes that occur early in the existence of an impoundment.

There are basically two explanations for the "boom and bust" phenomenon. One deals with the dynamics of expanding fish populations and the other with variations in primary productivity of the system. The flooding of a new reservoir provides a vast amount of unoccupied space. As resident river fishes spawn, abundant young prey species are available to support large numbers of young carnivorous sport species resulting in high yields of sport fishes in the early years. Gradually more of the fish biomass is composed of larger adult prey species that are not available to sport fishes as food; production and yield of sport fishes subsequently declines. The other explanation, referred to as the "new land effect," proposes that the leaching of nutrients from rich flood-plain soils and decomposition of inundated organic matter result in initially high primary productivity (formation of new organic matter by plankton algae). With time, these fertile conditions pass, primary productivity declines, and a decrease in sport fish yield results.

Fishery and limnological studies of the West Point Reservoir during the first 4 years (1976-79) have yielded data on water quality, phytoplankton productivity, fish standing crop, and sport fish yield. Results indicate that the lake is mesotrophic (moderately productive) and, when compared to other Southeastern reservoirs, the waters of West Point Reservoir produce high standing crops of fish, tables 1 and 2. Among several similar reservoirs of the Southeast, West Point ranks only fifth in primary productivity, but first in fish standing crop, table 2. There seems to be an efficient transfer of organic materials through the food web resulting in relatively high fish biomass (349 lb. per acre).

Estimated annual primary productivity has increased during the first 4 years. Fish standing crop during this time has also remained high, table 3. The variation in yield of sport fishes, table 3, that has been observed thus far is apparently because of factors inherent in the fish community structure and not because of variations in fertility or production of organic matter within the lake. These findings, though tentative, are encouraging as sport fish yield should respond to proper management of the fishery. Decline in harvest because of decreased productivity would be more difficult to reverse. Further research is needed to corroborate these findings.

TABLE 1. TROPHIC RELATIONSHIPS OF THREE SOUTHEASTERN RESERVOIRS

Trophic type[1]	Mean net primary productivity (mg C/m²/day)	Chlorophyll *a* (ug/l)	Total carbon (mg/l)	Total organic carbon (mg/l)	Total P (ug/l)	Total N (ug/l)
Oligotrophic	50-300	0.3-3	—	1-3	1-5	1-250
Mesotrophic	250-1,000	2-15	—	1-5	5-30	250-1,100
Eutrophic	1,000	10-500	—	5-30	30-5,000	500-15,000
RESERVOIR						
Walter F. George	—	9[2]	11-17	—	34-65[2]	709-939[2]
West Point	684	10	8.5	5.8	270**	1,167*
Beech[3]	1,619	12	—	—	—	800

[1]Wetzel, R. G. 1975. Limnology, W. B. Saunders Co., Philadelphia. 743 pp.
[2]EPA. 1975. Preliminary report on Walter F. George Reservoir. EPA National Eutrophication Survey. NERC, Las Vegas, Nevada.
[3]Taylor, M. P. 1972. Seasonal plankton changes and primary productivity in Beech Reservoir. J. Tenn. Acad. of Sci. 47(3):103-111.
*Inorganic N.
**Includes ortho P + particulate P.

TABLE 2. RELATIONSHIP OF FISH BIOMASS TO PHYTOPLANKTON PRODUCTIVITY (BASED ON ROTENONE SAMPLES) IN SOME SOUTHEASTERN RESERVOIRS

Reservoir	Fish standing crop			Phytoplankton productivity	
	Rank	Lb./acre	Years sampled	*Rank*	*mg C/m²/day*
West Point	1	349*	1976, 77, 78,79	5	684
Walter F. George[1]	2	341	1963, 64, 65, 66, 67	—	——
S. E. Reservoirs (mean). ...	3	252	—	—	——
Kentucky[2]	4	250	1952, 63, 64	2	1,443
Cherokee[2]	5	205	1963	3	1,416
Norris[2]	6	134	1941, 60, 61	6	360
Nottely[2]	7	128	1961, 64, 65	7	208
Douglas[2]	8	112	1961, 65	4	943
Beech[2]	—	—	—	1	1,619

[1]Lawrence, J. M. 1974. Walter F. George Lake. The design memorandum. The master plan. Appendix D. Fish management plan. U.S. Army Engineer District, Mobile. Corps of Engineers, Mobile.
[2]Taylor, M. P. 1971. Phytoplankton productivity response to nutrients correlated with certain environmental factors in six TVA reservoirs. Pages 209-217 *in* G. E. Hall, ed. Reservoir fisheries and limnology. Amer. Fish. Soc.
*Excluding one 1977 cove sample in which approximately 800 lb. of shad per acre were recovered.

TABLE 3. ESTIMATED PRIMARY PRODUCTIVITY, FISH STANDING CROP AND SPORT FISH YIELD (HARVEST) DURING THE FIRST FOUR SAMPLING YEARS FOLLOWING IMPOUNDMENT OF WEST POINT RESERVOIR

Sampling year	Primary productivity/ year	Fish standing crop/ acre	Yield to fishermen		
			Bass	Crappie	Bream
	mg C/m²	*Lb.*	*Tons*	*Tons*	*Tons*
1976 ..	550	325	55	82	65
1977 ..	731	262*	61	62	33
1978 ..	692	254	70	234	16
1979 ..	763	533	42	175	11

*Excluding one 1977 cove sample in which more than 800 lb. of shad per acre were recovered.

Relationship of Body Weight Loss During a Forced Molt of Commercial Layers to Optimum Postmolt Performance

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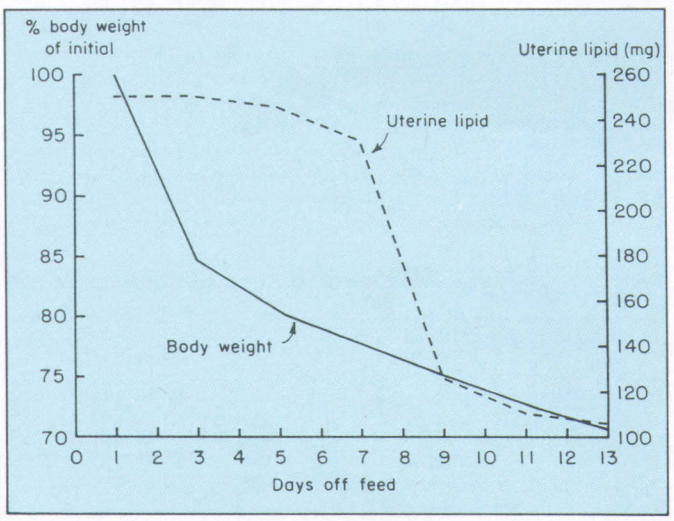
Department of Poultry Science

IN RECENT YEARS, the economic practicality of forced molting has increased, and research endeavors to refine and improve the process have multiplied.

Relationships involving the completeness of the forced molt and postmolt performance have been observed. Egg production has been related to the completeness of the molt as defined by the loss of primary flight feathers. During a normal forced molt, in which adequate feather loss was achieved, hens generally lost 25 to 30% of their body weight. This report describes research conducted to better define this relationship.

Previous work at the Alabama Agricultural Experiment Station has been directed towards defining the mechanism by which egg production and shell quality were improved after a forced molt. This research indicated that the accumulation of fat within the calcium-producing cells of the reproductive tract could be associated with the production of eggs with very poor shell quality, most notably shell-less eggs. Forced molting was found to correct both the lipid accumulation and shell quality problems. By examining daily changes in this fat during the forced molt, the optimum body weight loss was determined where this metabolic defect could be corrected. It was not until a body weight loss greater than 25% was achieved that a significant decrease in the accumulated fat in the oviduct was observed, see figure. It was therefore surmised that a body weight reduction of 25 to 30% was necessary for optimum postmolt performance.



Relationship of body weight loss to loss of lipid from the uterus (egg shell gland) of the laying hen during a forced molt.

To test this hypothesis, a flock of 70-week-old hens was divided into four groups. Feed was removed from the hens to achieve body weight losses of 24, 27, 32, and 35%. Egg production, egg weight, and shell quality were determined for each group for 20 weeks following the molt.

All groups reached 50% hen-day production within 7 weeks of the initiation of feed withdrawal and achieved peak production within 10 to 12 weeks. Hens which lost 27 to 32% of their initial body weight produced significantly more eggs during the 20-week trial period. They possessed slightly higher average egg weights and significantly higher egg shell quality, as evidenced by specific gravity. These data indicated that hens which lost 27-32% of their initial body weight maintained egg shell quality for a more prolonged period.

This improvement in reproductive efficiency was related to the removal of fat from the reproductive tract. Obesity is a common problem in older laying hens and affects both feed conversion and production. Forced molting appears to be a means of reversing these effects.

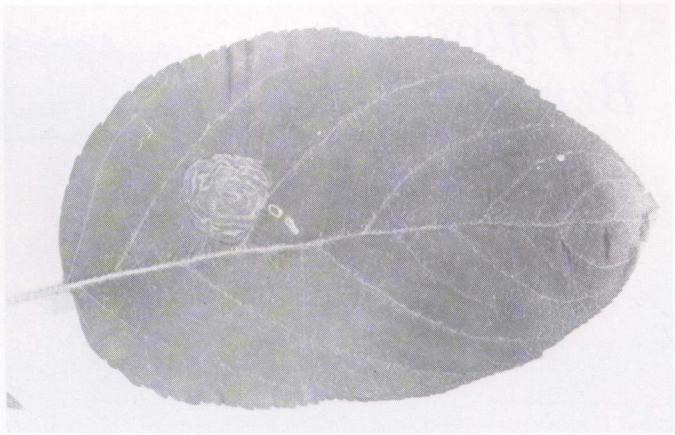
One point of concern which must always be considered is the effect feed removal and weight loss have on the hen. It has been shown that hens respond to various stressful situations by releasing large amounts of adrenal hormones into the circulatory system. However, feed removal does not appear to result in this hormone release, indicating the hen may not consider feed removal as a severe stressor or copes in some undetermined way. It has also recently been shown that certain species of birds in the wild will stop eating during their normal annual molt, giving further indication that feed removal and molting may not be recognized by commercial hens as being different from normal.

These data indicated that the success of a molting program depends heavily on good management of the molt, as well as a proper weight loss of 30%. It is also advisable to avoid force molting during periods of extreme cold or heat or other stressful situations. In this way, the normal physiology of molting that results in rejuvenation can operate optimally.

RELATIONSHIP OF BODY WEIGHT LOSS DURING A FORCED MOLT TO POSTMOLT PERFORMANCE

Body weight loss	Hen housed accumulated eggs (20 wk.)	Final egg weight	Final egg specific gravity
Pct.		*Oz./doz.*	
24	79.9[a]	27.4[ab]	1.075[b]
27	84.3[a]	27.7[ab]	1.079[a]
32	85.9[a]	28.3[a]	1.080[a]
35	79.4[a]	27.1[b]	1.073[b]

Means in a column which possess different superscripts differ significantly ($P \leq .05$).



Leafspots on leaves of potted trees became dry, turned tan to light brown with a banded or zonate pattern, and stopped increasing in size when returned to low humidity conditions in the greenhouse.

High Temperature Speeds Development Of Apple Leafspot Caused by Glomerella cingulata

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Department of Botany, Plant Pathology, and Microbiology

TYPICALLY, THE FUNGUS *Glomerella cingulata* has been known for causing bitter rot of apple fruit in warm wet weather. Recently a strain of the same fungus was found to cause a leafspot on Golden Delicious apples in the Southeastern United States. In response to this finding, investigations were conducted at the Alabama Agricultural Experiment Station to learn how temperature affects pathogenicity and symptom development of the leafspot strain.

A pure culture of the leafspot strain of *G. cingulata* was established on potato dextrose agar. Conidia (spores) of the fungus were collected in sterile distilled water and sprayed onto potted Golden Delicious and Mollie's Delicious apple trees. The trees were placed in incubators programmed for 16 hours of darkness and 8 hours of light, at temperatures ranging from 60° to 90°F, at 7° intervals. Uninoculated plants were included to serve as controls. Beginning at 48 hours incubation, numbers and sizes of lesions were determined daily along with disease symptoms.

Newly emerging inoculated leaves developed rust colored flecks that coalesced to cause a blighting of the entire shoot tip. Blighting of juvenile leaves of Golden Delicious trees occurred 3 days after inoculation and incubation at 82°; blighting of Mollie's Delicious leaves occurred a day later.

Lesions developed both along and within the leaf margins of fully expanded leaves. Within the margins, lesions spread rapidly in a circular to oval configuration, becoming irregular as large leaf veins were affected. Lesions on Golden Delicious and Mollie's Delicious leaves developed in 3 days at 75°, 82°, and 90° and in 4 days at lower temperatures. Generally, the number of lesions and the average size of lesions increased with time at each temperature, see table.

When the disease developed along the mid-vein, the leaf was rapidly killed. Petioles of some leaves also were attacked. The entire blade of many leaves became necrotic from the coalescing of spots. Pale-orange masses of conidia occurred in lesions on upper and lower surfaces of Golden Delicious leaves at 100% relative humidity 3 days after inoculation and within 5 days on Mollie's Delicious leaves. In later stages, lesions disintegrated, leaving ragged leaf margins.

Development of spots stopped when trees were returned to the low humidity of the greenhouse. Lesions that were already present became dry, turned tan to light brown with a banded or zonate pattern, and ceased to increase in size.

EFFECT OF TEMPERATURE ON LEAFSPOT DEVELOPMENT BY A STRAIN OF *GLOMERELLA CINGULATA* AFTER 6 DAYS INCUBATION

Temperature, degree F	Lesion area[1]	
	Golden Delicious	Mollie's Delicious
	Sq. mm	*Sq. mm*
60	26.0	24.2
68	60.5	19.6
75	87.1	73.7
82	142.5	115.8
90	83.7	61.5
Uninoculated	*0*	*0*

[1]Twelve-tree averages.

A bright chlorosis of the larger leaf veins developed on mature basal leaves. The chlorosis spread to the smaller leaf veins, giving the leaf a yellow mottled appearance. Some of the mottled leaves also developed a brown color; these and mottled leaves abscissed within a few days. Yellow mottle occurred on both apple cultivars at 68° to 90° within 5 days and on Golden Delicious at 60°.

Development of leafspots required longer incubation on Mollie's Delicious than on Golden Delicious leaves, which suggests some level of resistance in Mollie's Delicious. This variety's resistance to the leafspot strain of *G. cingulata* also has been reported by other researchers.

Reports of the disease from Georgia state: "When weather conditions are suitable for development throughout the summer months, wave after wave of yellow leaves drop, resulting in almost complete defoliation." Yellow mottle has been observed in Alabama apple orchards after fruit harvest when fungicide applications have been discontinued. The disease was contributing to early defoliation.

Improper selection of fungicides or failure to apply them regularly may permit disease increases in the foliage and fruit, with subsequent heavy fruit losses when weather is warm and hot.

Tifton 44 Bermudagrass

An improved hay and grazing crop

C. S. HOVELAND and M. W. ALISON, JR.
Department of Agronomy and Soils

Excellent winter survival of Tifton 44 bermudagrass (left) and winter-killing of Coastal bermudagrass (right) at the Tennessee Valley Substation, Belle Mina.

TIFTON 44 BERMUDAGRASS looks like a winner, especially in northern Alabama. This improved forage grass variety, a hybrid between a high-quality selection from Coastal bermuda and a cold-hardy plant from Berlin, Germany, was developed by Dr. G. W. Burton, USDA-SEA, Tifton, Georgia. Tifton 44 is more cold-hardy and has higher dry matter digestibility than Coastal bermuda.

Tifton 44 was compared with other bermudagrass varieties in trials at eight locations in Alabama from 1976 to 1978. Each year, nitrogen fertilizer was applied at 100 lb. per acre in April and again after each harvest. Harvesting was done at 4- to 8-week intervals, depending on growth. In-vitro dry matter digestibility was determined on forage from each harvest during 3 years from the test at the Plant Breeding Unit, Tallassee.

Results

Although good stands were obtained on all varieties, Tifton 44 formed a ground cover more slowly than other varieties in the tests. Tifton 44 was outstanding in winter survival as indicated by percent ground cover in spring of the third year, table 1. Stands of this variety had little or no injury at any test location. The cold winters of 1976-77 and 1977-78 resulted in severe stand losses of several varieties, table 1. Callie winter-killed the first year in northern Alabama and at most other locations in succeeding years. Alicia was also non-hardy in northern Alabama. Coastal bermuda stands were damaged in northern Alabama, but complete recovery was obtained by early summer.

The slower establishment of Tifton 44 resulted in somewhat lower first-year production than other varieties. However, in subsequent years it was the highest yielding variety in northern Alabama. Further south, Tifton 44 was generally equal to Coastal or Alicia except at the Wiregrass Substation and Plant Breeding Unit where drought stress was greatest. Results from other experiments suggest that Tifton 44 may not be as drought tolerant as Coastal. Second- and third-year production of Tifton 44, throughout the State, ranged from 4 to 9 tons of dry forage per acre.

Tifton 44 forage was consistently more digestible than Coastal or Alicia bermudagrass, table 2. The higher digestibility of Tifton 44 should result in higher animal performance as shown by grazing trials in Georgia.

Conclusions

Tifton 44 is an improved hybrid bermudagrass with the best winter survival, higher forage digestibility than Coastal or Alicia, and forage yield generally equal or superior to other bermudagrass varieties. Tifton 44 sprigs for planting are available from certified growers. Consult your County Extension Chairman for names of certified growers.

TABLE 1. THIRD-YEAR STANDS AND 3-YEAR AVERAGE DRY FORAGE YIELDS PER ACRE OF BERMUDAGRASS VARIETIES

Location	Percent ground cover in spring of third year				Dry forage yield per acre			
	Tifton 44	Coastal	Alicia	Callie	Tifton 44	Coastal	Alicia	Callie
					Tons	*Tons*	*Tons*	*Tons*
Tennessee Valley Sub.	96	76	0	0	5.1	3.7	—	—
Sand Mountain Sub. .	100	62	3	0	6.1	4.2	2.6	—
Piedmont Sub.	90	72	42	0	3.8	3.8	3.7	—
Plant Breeding Unit .	90	80	85	0	5.9	6.8	6.6	—
Black Belt Sub.	97	70	81	0	5.2	5.6	5.8	—
Lower Coastal Plain Sub.	95	74	64	3	6.6	6.8	6.6	5.2
Wiregrass Sub.	90	90	90	75	6.5	8.0	8.1	8.7
Gulf Coast Sub.	98	90	91	2	6.0	5.7	5.9	3.2

TABLE 2. DRY MATTER DIGESTIBILITY OF BERMUDAGRASS VARIETIES AT PLANT BREEDING UNIT, 3-YEAR AVERAGE

Year	Percentage dry matter digestibility of forage			
	Tifton 44	Coastal	Alicia	Callie
1976	59	57	54	61
1977	54	52	52	56
1978	48	44	43	—
Av.	54	51	50	—

AGRICULTURAL LOAN PROFITABILITY for commercial banks

WILLIAM E. HARDY and MICHAEL W. MOORE
Department of Agricultural Economics and Rural Sociology

THE FUTURE PRODUCTIVITY and structure of the agricultural industry are highly dependent on the ability of farmers to secure adequate amounts of investment and operating capital.

Several factors, such as consolidation of farms into fewer and larger units, high land prices brought about by inflation and increased demand for real estate, and continued increases in the utilization of expensive purchased inputs, have forced farmers to become more aware of the financing alternatives that are available for them. They are acutely concerned with the supply of capital that might be forthcoming.

Lenders are also vitally interested in the agricultural financial markets. Many of the leaders of these financial institutions realize the importance of the agricultural industry and the significant part that they play in maintaining the viability of agriculture. A major problem faced by many lenders who are interested in agriculture is justifying farm loans in comparison with other investment alternatives. Such conflicts among lending alternatives are found primarily in commercial banks since these financial institutions are typically willing to lend to all sectors of the economy.

For commercial bank management to be willing to include agricultural loans in their total loan portfolio, the loans must be perceived as contributing to the attainment of bank objectives. Banks, as other businesses, are concerned with maintaining adequate liquidity, being solvent, and maximizing profits. Therefore, funds committed to agriculture must meet management goals as well as they could in their alternative uses.

Some lenders feel that their bank should not be involved in agricultural lending because of the risks and uncertainties associated with farm production. They indicate the resultant costs of making an agricultural loan are so high that other lending alternatives would likely be more profitable. In order to test the validity of this opinion, data were collected by the Department of Agricultural Economics and Rural Sociology, Alabama Agricultural Experiment Station, from five Alabama commercial banks. The banks were geographically dispersed over Alabama, representing the major agricultural areas—Wiregrass, Lower Coastal Plain, Black Belt, Tennessee Valley, and Piedmont.

Cost data were obtained from the study banks and categories so that the relative expense of making specific types of loans could be determined. The cost information was grouped into two categories—the administrative and clerical expense associated with interviewing the applicant, preparing the necessary paperwork, examining the collateral, and making collections; and the loss realized from loans that become uncollectable. Loan categories included in the data were agricultural, mortgage, commercial, and installment.

The data presented in the table indicate the results of the cost analysis. When the costs of administrative and clerical activities involved in lending were compared to the total loan volume in each category, productivity measures were obtained. Information on loan volume per employee indicated that lending officers and clerical workers were most productive in mortgage lending and least productive in installment loans. The salary cost per dollar loaned data are perhaps the most important. With this measure, mortgage loans are the least expensive, 0.2¢ per dollar loaned, and, as might be expected because of their typically small size, installment loans are the most costly at 1.01%.

From a loan loss viewpoint, the greatest cost to the study banks was the installment category, with an average annual amount of more than $100,000. Agricultural loans had the least amount of average annual net loss, almost $6,000. The net loss per dollar loaned data are important in that they directly relate the actual amount of net loss to total loan volume. On a per dollar loan basis, again mortgage loans are the least expensive, 0.02% and installment loans were the highest, 0.55%.

The final column of data in the table illustrates the total cost in terms of administration and loan loss per dollar loaned for each of the loan categories. Mortgage loans have the lowest cost, 0.22¢ per dollar. Next are agricultural, followed by commercial, and the most expensive, installment. These total cost values may seem to be small and insignificant; however, they take on great importance when one considers that the ratio of net operating profit to total loans for the study banks was only 2.2%.

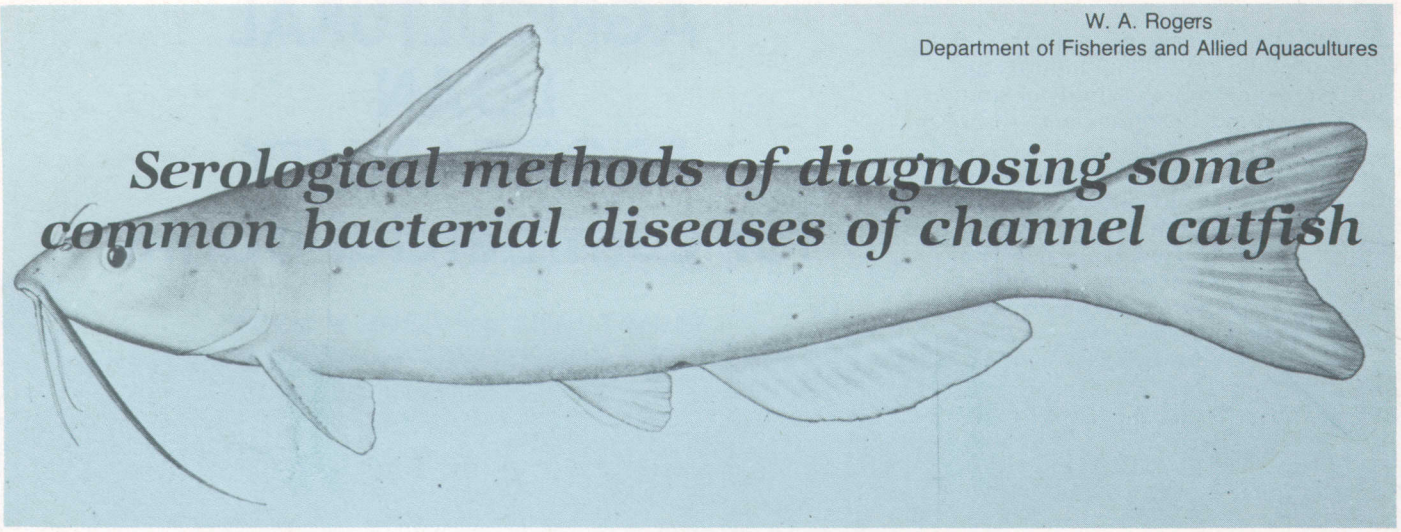
The results of this study justify two important conclusions. First, the data from the study banks indicate that agricultural loans are not costly when compared to other types of loans. In fact, from a loan loss and administrative cost viewpoint, they are cheaper than both commercial and installment loans. Secondly, variations by loan type might permit a bank to differentiate in the interest charged for each type of loan. For example, with the cost data found in this study, the same net return could be obtained from a 14% mortgage loan, a 14.33% agricultural loan, a 14.52% commercial loan, and a 15.34% installment loan.

EMPLOYEE PRODUCTIVITY, LOAN LOSS MEASURES, AND TOTAL COST PER DOLLAR LOANED BY TYPE OF LOAN FOR STUDY BANKS

Loan category	Productivity measures		Loan loss measures		
	Loan volume/ employee	Salary cost/ dollar loaned	Net loan loss	Net loss/ dollar loaned	Total cost/ dollar loaned
	Dol.	*Pct.*	*Dol.*	*Pct.*	*Pct.*
Agricultural	3,236,779	0.45	5,990	0.10	0.55
Commercial	3,923,929	.42	58,457	.32	.74
Installment	1,478,620	1.01	102,623	.55	1.56
Mortgage	5,697,924	.20	7,025	.02	.22

W. A. Rogers
Department of Fisheries and Allied Aquacultures

Serological methods of diagnosing some common bacterial diseases of channel catfish



SEROLOGICAL METHODS are playing an increasing role in diagnosis of diseases. Two of the most common means of serological detection are by the fluorescent antibody technique (FAT) and the enzyme immunoassay (EIA). These two techniques have been employed at the Southeastern Cooperative Fish Disease Laboratory of the Alabama Agricultural Experiment Station for detection of several bacterial pathogens of fish.

Most recently, these two tests have been developed for detecting *Edwardsiella tarda* and a recently discovered new species of *Edwardsiella* causing enteric septicemia of catfish (ESC). ESC has been recognized as a major problem in commercial catfish production. The tests for ESC are especially important since this is a slow-growing bacterium when isolated on bacterial media. Faster growing bacteria that may be present will over-grow and mask colonies of the ESC organism. However, the FAT and EIA will detect the bacteria in infected fish within about 20 minutes as opposed to 24 to 48 hours using the standard diagnostic biochemical tests.

Specific antibody is produced in rabbits by injecting the formalin-killed bacteria mixed with Freund's adjuvant (which enhances antibody production) into the rabbits. Booster injections are given and the serum is collected from the rabbits after 28 days. The anti-serum can be used as is for the indirect FAT or EIA which requires a second antibody against the rabbit serum; or, the rabbit anti-serum can be conjugated with the fluorescein or enzyme for the direct tests.

FAT and EIA work at the Fish Disease Diagnostic Laboratory at Auburn employs the indirect tests at this time. The procedure for FAT is to make smears of tissue, usually kidney or peritoneal fluid from infected fish, on microscope slides and fix the smears with heat. The specific serum has been titered and diluted to a "working solution" depending on the amount of antibody a specific rabbit produced. The working solution of rabbit antibody is placed on the slide with infected material and incubated for 5 minutes. The slide is washed with phosphate buffered saline (PBS), excess PBS is removed, and the slide is then flooded with goat-anti-rabbit antibody that has been conjugated with fluorescein isothiocyanate (FITC). After 5 minutes of incubation the slide is rinsed with PBS and air-dried. A buffered mounting medium is then placed on the slide, a cover slip added, and the slide is examined under a fluorescent microscope. If the slide has fluorescing bacteria, this is a positive indicator of infection by the specific pathogen.

Tests determined there were no cross reactions with other non-specific bacteria. All indications are that the FAT is specific for both *E. tarda* and ESC.

EIA procedures are similar to those for FAT. Infected tissues are placed on a slide, flooded with specific rabbit antibody, rinsed, and then flooded with a goat-anti-rabbit antibody that has been conjugated with the enzyme horseradish peroxidase. After rinsing with PBS, the slides are flooded with a substrate that will give a color change when the enzyme is bound by the goat-anti-rabbit antibody. An advantage of this test is that it is quick, safe, inexpensive, accurate, and can be used with a standard microscope.

An attempt is being made to prepare a simplified field kit so biologists can use the EIA without having sophisticated equipment and techniques. The substrates and antibodies will be freeze-dried in small amounts so only buffer solution, glass slides, and a standard microscope will be needed.

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