highlights
of agricultural research

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AGRICULTURAL EXPERIMENT STATION
R. DENNIS ROUSE, DIRECTOR

AUBURN UNIVERSITY
AUBURN, ALABAMA

DIRECTOR'S COMMENTS

AES IS EVERYBODY'S RESPONSIBILITY!

The Alabama Agricultural Experiment Station (AES) is the only publicly-supported institution in Alabama charged with the mission of providing an information base for the production, processing, and marketing of food and fiber; the management of our renewable resources including wildlife and fish; and other factors that have impact on all areas of rural life. These problems become increasingly complex as the world's population increases, and the need for research on agricultural production and management of our natural resources becomes greater each day.

R. DENNIS ROUSE

The ability of the AES is decreasing rapidly because its funds are not sufficient either to keep up with inflation or for studying new problems. A major reason for this is that people either do not understand the importance of the work of the AES and its funding or they assume it will always be here to work on their problems.

Let me explain first the AES funding and then point out how important it is to you in the agricultural sector as well as to you who are consumers of agricultural products to assume some responsibility for support of this program.

The AES has two major sources of funding. Approximately two-thirds come from Alabama's Special Education Trust Fund (SETF) and one-third from Federal funds. Alabama first provided funds in 1883 for the AES. The Federal Congress accepted a similar responsibility in 1887 by providing funds for State Experiment Stations.

These appropriations are a relatively small part of both the Federal and State budgets and are becoming more so each year. For example, 40% of 1940 Federal research funding related to food and agriculture. Today these areas receive less than 2% of the research and development budget.

This 2% supports both the allocations to the states for their Agricultural Experiment Stations and agricultural research by the Federal Government. The share of Federal agricultural research funds going to the State Agricultural Experiment Stations has decreased much more than the funds going to support research of USDA agencies. The President's recommendations for balancing the 1981 budget called for 80% of the cuts for agricultural research to come from allocations to the State Agricultural Experiment Stations and 20% from USDA research program funds. We recognize the need for a balanced budget but strongly oppose the disparity of the cuts.

State appropriations for the AES come from the SETF as a part of all higher education's total budget. The AES at one time fared about the same as other segments of higher education, but in recent years its share of the total education budget has dropped sharply from about 0.9% in 1952 to 0.5% this year. The AES share in the *higher education* budget dropped from 8.2% in 1952 to its current level of 2.9%. The AES clientele apparently has not been as active in its support of AES funding as have backers of other groups supported by the SETF.

Since AES depends on State and Federal funds, and its responsibility is to both consumers and producers, it is in the interest of both groups to see that adequate funds are provided. Thus, you should be active in indicating your support to your Federal congressmen as well as to members of the State Legislature, both individually and as members of various commodity, consumer, and civic organizations.

Although the 1980-81 State Education Budget has been passed, it is not too early to be talking to your legislators about next year's budget. As far as the Federal appropriation is concerned, there is still time to talk to your congressmen about your Agricultural Experiment Station budget for 1980-81—but the time for doing this is short.

may we introduce . . .

Dr. Paul Anthony Backman, associate professor, Department of Botany, Plant Pathology, and Microbiology. Born in Shrewsbury, England, and reared in California, Dr. Backman came to Auburn in 1971 from Clemson, South Carolina. He attended Yuba College, Marysville, California; received B.S. and Ph.D. degrees in plant pathology from the University of California, Davis, with minors in virology and botanical physiology. He spent several months as a postdoctoral fellow at North Carolina State University, Raleigh. In addition he worked as a research plant pathologist for USDA at Clemson. Dr. Backman teaches courses in plant pathology and does research on peanut and soybean diseases with extensive field work at the Wiregrass Substation, Headland.

Dr. Backman is a member of Sigma Xi, American Phytopathological Society, American Association for the Advancement of Science, New York Academy of Science, Organization of Tropical America Nematologists, and American Peanut Research Education Society. He has authored numerous journal articles and Station research publications.

HIGHLIGHTS of Agricultural Research

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ON THE COVER: Field of AU Lotan sericea, new Auburn released variety, at the Plant Breeding Unit, Tallassee.

New Auburn Sericea Variety

AU LOTAN

Low Tannin, Nutritious Forage

E.D. DONNELLY, Department of Agronomy and Soils
W.B. ANTHONY, Department of Animal and Dairy Sciences (Retired)

A NEW SERICEA variety just released by Auburn University's Agricultural Experiment Station—named AU Lotan—may fill Alabama's need for a high quality perennial summer forage legume. That need is especially great now because of the high cost of nitrogen fertilizer—a necessity for non-legume forage crops—brought on by the energy crisis and inflation.

Sericea has been around for a long time, but Alabama cattlemen have used it only sparingly for pasture and hay because of its relatively low palatability and nutritive value. Because of this, Auburn's sericea breeding program has emphasized forage quality. Research has zeroed in on the role of tannin in the acceptability of sericea by grazing animals and the digestibility of sericea forage. It was determined in a number of experiments that when the tannin content was lowered by breeding, both palatability and digestibility of dry matter and crude protein were greatly increased.

Variety Development

In order to breed low-tannin sericea, a source of this germplasm had to be found. In 1955, seed of Beltsville 23-864 was sent to Auburn by Paul R. Henson, Research Leader, Special Purpose Legumes Investigations, USDA. This line was genetically low in tannin, but undesirable otherwise, being low in vigor, stemmy, and an off-green color.

The first cross, Beltsville 23-864 × Ala. 2193, was made in 1959, and F_1 seed was planted in 1960. In subsequent years, crosses were made to Serala, Ala. 1373, Ala. L11, Ala. L14, and Ala. L15. The latter three are root-knot nematode (*Meloidogyne* spp.) resistant lines developed cooperatively with Norman A. Minton, USDA Nematologist, Tifton, Georgia. During the breeding program, most of the low-tannin plants were severely damaged by a foliar disease caused by *Rhizoctonia* spp. Thus, breeding for resistance to this disease has received the greatest emphasis since 1969. In addition, selection has been made for low tannin, high forage and seed yields, and for persistence. The line variety, AU Lotan, was developed from 73-63-2, a plant selected in 1975.

Forage Quality

The new variety was evaluated in an experiment involving 88 selected low-tannin lines, an elite normal or high-tannin control line, and a disease-susceptible, low-tannin control line. The tannin content of AU Lotan was lower at each of three hay cuttings—an average of 50% lower—than the high-tannin control, table 1. Tannin content also is reflected in the dry matter digestibility, with AU Lotan averaging 27% higher in digestible dry matter for the three hay cuttings.

TABLE 1. HAY[1] QUALITY OF AU LOTAN AND AN ELITE, HIGH-TANNIN LINE, 1978[2]

Variety or line	1st cut, May	2nd cut, June	3rd cut, Aug.	Av.
	Pct.	*Pct.*	*Pct.*	*Pct.*
Digestible dry matter[3]				
High-tannin control	44	29	37	37
AU Lotan	53	44	45	47
Tannin				
High-tannin control	5.1	6.3	6.8	6.1
AU Lotan	2.7	3.3	3.1	3.0
Crude protein				
High-tannin control	15.5	11.6	14.5	13.9
AU Lotan	16.6	12.8	15.5	15.0

[1]Cut when entries were 12-14 in. tall.
[2]Values are averages of three replications.
[3]Each *in vitro* dry matter digestibility was adjusted to a reference forage, Coastal bermudagrass.

TABLE 2. REACTION OF SERICEA TO *RHIZOCTONIA* FOLIAR DISEASE, AUBURN

Variety or line	Disease rating[1]	
	1976	1977
AU Lotan	1.0	1.7
Low-tannin, disease susceptible control	3.3	4.0
High-tannin, disease resistant control	1.0	1.0

[1]1.0 to 5.0 scale where 1.0 = no disease symptoms, 5.0 = severe defoliation; average of three replications.

The crude protein content was higher for AU Lotan than for the high-tannin control in each of the three hay cuttings and averaged about 7.0% higher. Even the high-tannin line had adequate crude protein for grazing animals. However, protein digestibility was lower on high-tannin sericea, as learned in an earlier experiment showing that feces from cattle on low-tannin sericea contained 22% less crude protein than from cattle on high-tannin forage. This should lead to more animal gain per unit of forage consumed on low-tannin than high-tannin sericea.

Disease Reaction

In a comparative test, AU Lotan's level of resistance to *Rhizoctonia* foliar disease was about equal to the high-tannin control and superior to the low-tannin control, table 2. The plant from which AU Lotan was derived remained relatively free of disease symptoms for 3 years in a nursery and for 3 years as a line in broadcast field plots. Thus, AU Lotan appears to have adequate disease resistance.

AU Lotan has yielded about 85% as much hay as Serala. Seed of the former variety are being increased, and should be available commercially after the 1981 seed harvest.

Regional Resource Allocation Model of the United States Beef Industry

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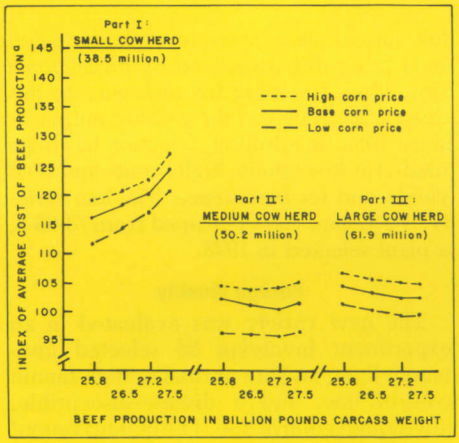
IN THE UNITED STATES, reoccurrence of large cattle inventories and low beef prices followed by fewer cattle and higher prices is well known as the cattle cycle. Beef cow numbers have peaked in years ending in the number five. Since 1975, a liquidation of the cow herd has occurred, and by 1980 the buildup phase was apparently in progress.

The persistence of the cattle cycle has caused concern among producers, consumers, and policy makers. One concern is with resources allocation within the beef industry. Efficient resource allocation may shift among geographical regions and production stages at different phases of the cattle cycle. Therefore, allocation of resources used in beef production needs to be analyzed at various phases of the cycle. Objectives of a recent study at the Auburn University Agricultural Experiment Station in cooperation with the Economics, Statistics, and Cooperative Service, U.S. Department of Agriculture, were to develop a model of the U.S. beef industry and to obtain optimal resource allocation patterns based on production and price levels for the 1980's.

A linear programming model was developed to meet the objectives of the study. Five beef production regions (West, Great Plains, Southwest, North Central, and Southeast) and six consumption regions (Pacific Coast, Mountains and Plains, South Central, Midwest, South Atlantic, and Northeast) are included in the model. Model solutions are neither duplicates of present nor predictions of future industry organizations, but instead serve as reflections of economic pressures on the beef industry. Programming strategy was to optimize the model under an assumed set of conditions and then by modifying key variables, analyze changes in model results. Results describe organizations of the beef industry which minimize all variable and some fixed costs. Variable costs are assessed on all activities in the model. Activity levels exceeding peak output levels during the last cycle are also assessed fixed costs other than interest charges for land which are assumed to be offset by real capital gains on land.



Index of average cost of beef production for specified beef cow herds, corn price and beef production levels, United States.

Key variables for the beef industry during the 1980's include changes in beef consumption, the size of the national cow herd, and feed prices. Three levels of beef production, brood cow inventory, and corn prices used in the model are presented in the table. Average cost per hundredweight of beef produced in 1976 dollars for the optimal model organization was set at 100 and used to index average costs of organizations consistent with the above levels of key variables. Results for the assumption of a small, medium, and large beef cow herd are presented in parts I, II, and III, respectively, in the figure. Solid lines reflect base corn prices and broken lines reflect high and low corn prices. Variations in beef production are read on the horizontal scale and average cost indices are read on the vertical scale.

Model results with the base corn price indicate that the medium cow herd of 50.2 million cows is most consistent with a least cost industry organization. The average cost curve for this beef cow herd assumption is "U-shaped" with a minimum level near 27 billion lb. A large cow herd overshoots the cost effective herd size for beef production levels included in this analysis. And the small herd results indicate substantially higher costs.

Broken lines above and below the solid lines in the figure indicate cost differences for high and low corn price assumptions. Significant output variations were programmed without greatly influencing the minimum cost of production, given an adequate beef cow base. Cattle feeding was indicated at its highest level with the medium beef cow herd, making the cost structure of the model quite responsive to corn price. Increases in costs due to a high corn price were less than cost decreases due to a low corn price.

Results of this analysis illustrate the desirability of avoiding the reoccurring oversized and undersized national beef cow herds that accompany the cattle cycle. A less volatile cattle cycle would benefit beef producers and consumers.

ASSUMPTIONS FOR DEMAND, BEEF COW INVENTORIES, AND CORN PRICE FOR REGIONAL RESOURCE ALLOCATION MODEL OF THE U.S. BEEF INDUSTRY

Item	Units	Low	Base	High
A. Beef demand levels				
Population	mil.	232.9	232.9	232.9
Consumption	lb./cap.	117	124	127
Net imports	mil. lb.	1,497	1,803	2,130
Total carcass wt.	mil. lb.	25,800	27,200	27,500
B. Corn prices (1976 dollars)				
U.S. average	dol./bu.	2.04	2.37	2.86
C. Beef cow inventories		Small	Med.	Large
U.S. total	mil. head	38.5	50.2	61.9

Taste Panel Testing Proves No Difference in Flavor Between Canned Pimiento or Canned Red Bell Pepper

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PIMIENTO PEPPERS have been cultivated in the Southern United States since their introduction from Spain in 1911.

Traditionally the ripe fruits were canned whole in small glass jars without salt. The early process consisted of direct flame peeling; later, lye and steam peeling were utilized. After peeling, the fruit were cored, blanched, and acidified before canning since pimientos are not acid enough to resist the hazard of botulism without adding food acids. The high temperature of pressure cooking required for low acid foods destroys the color and texture of peppers, so pimientos are processed at 212° F.

The canned sweet pepper product has remained popular for use as a garnish and to add color to many prepared food dishes. For most uses, the canned whole peppers are sliced or diced by the consumer before use. In recent years the labor-intensive whole pack pimiento has been replaced for the most part by sliced or diced pimientos. Canners are now producing just enough whole pack to satisfy that portion of the trade that insists on the traditional whole pimiento. The small jars used limit the size of the fruit that can be used for whole pimientos, but now that the bulk of the fruit are canned as sliced or diced pimientos, processors are looking for larger fruited pimiento varieties. Many pimiento canners have resisted changing from pimientos to red bell peppers even though there would be an economic advantage to do so. The idea has persisted that canned red bell peppers are somehow inferior and lack real pimiento flavor.

Bell peppers produce more than pimientos and thus can be produced at lower cost. A 1976 nationwide survey showed that the U.S. average yield for all varieties of bell pepper was 6.1 tons per acre compared to 3.3 tons per acre for all pimientos. The shape of the pimiento, see figure, lends itself better to the coring machinery used for whole pack pimientos, but the bell pepper is more efficiently peeled by modern high pressure steam peelers and with its larger size results in lower peeling and coring losses. Growers have many more varieties of bell peppers to choose from than pimientos, as well as several sources of hybrid seed. In 1976, over 5 times as many acres were devoted to bell pepper production as were used for growing pimientos. Most of the bell peppers were sold in the fresh market as green peppers.

Peppers grown in the 1978 and 1979 growing seasons were processed and examined by a systematic taste panel to determine if there was any difference in flavor or appearance between canned pimientos and canned red bell peppers. Three varieties of bell peppers were grown with three varieties of pimientos in randomized complete block design with four replications. The fruits were hand picked when fully ripe and uniformly red. After lye peeling, the fruits were sorted to eliminate any differences in color before canning by commercial pimiento canning procedures.

RESULTS OF FLAVOR TASTE COMPARISON[1] OF THREE VARIETIES OF CANNED PIMIENTO PEPPERS WITH THREE VARIETIES OF CANNED RED BELL PEPPERS[2]

Comparison	Correct decisions	Incorrect decisions
Pip VS YWL	11	13
Pip VS KRG.....	9	15
Pip VS PL.....	11	13
Pip VS T.....	8	16
Pip VS MH1.....	13	11
YWL VS KRG	12	12
YWL VS PL.....	10	14
YWL VS T	13	11
YWL VS MH1	8	16
KRG VS PL	11	13
KRG VS T	9	15
KRG VS MH1	8	16
PL VS T	9	15
PL VS MH1	6	18
T VS MH1	7	17

[1]Triangular taste panel design for detection of flavor difference, six panelists judging each comparison four times. Significance at 5% level requires 14 correct decisions out of 24.

[2]Bell pepper varieties were Keystone Resistant Giant (KRG), Yolo Wonder L (YWL), and Pip. Pimiento varieties were Truhart (T), Peto L. (PL), and Machine Harvest 1 (MH1).

Six trained panelists made up the taste panel. They were presented at each test with four sets of uniformly diced pepper samples in small containers. Each set of samples, labeled only A, B, or C, was made up of two samples from one variety and one odd sample of another variety. The panelists were asked to identify the odd sample by taste in each of the four sets. Each bell pepper sample was compared with the other bell pepper samples as well as with all of the pimiento samples. The results, see table, showed that there was no significant difference in flavor between any of the samples and color and texture were also indistinguishable.

Roundtable taste-testing as is often conducted in canning plants usually only reinforces prior opinions. Objective systematic taste panel testing can be of great benefit in making decisions such as this in which preconceived opinions are difficult to overcome.

Duroc-Landrace and Yorkshire-Landrace Sows Surpass Pure Landrace in Maternal Performance

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JOE A. LITTLE, Lower Coastal Plain Substation

CROSSBREEDING is known to improve the maternal performance of sows when compared to the average of the pure breeds that make up the crossbred sow. The question facing producers concerns the breed combination that gives best results, and this question is being investigated at the Auburn University Agricultural Experiment Station.

Landrace, Crossbred Sows Compared

The Landrace breed has been shown to excel in reproductive performance and mothering ability. However, specific crosses involving the Landrace sow may be superior to specific crosses involving crossbred sows whose genetic composition includes breeds that do not excel in reproductive performance and mothering ability. One objective of the Auburn project was to compare purebred Landrace sows with crossbred Duroc-Landrace and Yorkshire-Landrace sows.

The Duroc breed excels in growing ability and feed efficiency, while the Hampshire breed has been shown to be superior to other breeds in carcass composition. These breeds are believed to fit on the sire side of a terminal crossing program. The Spot breed has not been studied extensively, but it is also believed to fit best on the sire side of a specific crossing program. Therefore, the second objective was to evaluate the Duroc, Hampshire, and Spot sire breeds when bred to the three female breeds.

Three Boar Breeds Compared

Duroc, Hampshire, and Spot boars were bred to the Landrace, Duroc-Landrace, and Yorkshire-Landrace sows in all possible combinations to produce nine different crosses of pigs. A total of 305 litters was farrowed by the 118 sows. Reproductive traits studied included number born, number born alive, litter birth weight, number alive at 21 and 42 days, and litter weights at 21 and 42 days.

Sire breeds did not significantly affect litter size born, born alive, and alive at 21 and 42 days, see table. Hampshire-sired litters weighed more at birth than did Spot-sired litters. At 21 days, Duroc-sired litters were heavier than the average of the Hampshire and Spot-sired litters, which did not differ significantly. No significant differences were found among the sire breeds for litter weights at 42 days, although Duroc-sired litters were the heaviest and Hampshire-sired litters were the lightest.

Smaller Litters from Landrace

At birth, litters from Landrace sows were smaller than litters from Duroc-Landrace and Yorkshire-Landrace sows, although the difference was not statistically significant. Litters from the crossbred sows averaged 1.5 more pigs per litter at 21 and 42 days than litters from the purebred Landrace sows. Litters from the crossbred sows were of approximately equal size at birth and 21 and 42 days postfarrowing. The dam breeds differed significantly in their effect on litter weights. Litters from Duroc-Landrace and Yorkshire-Landrace sows were heavier at birth, 21 days, and 42 days than litters from purebred Landrace sows.

Litters sired by Hampshire boars and out of Duroc-Landrace sows were slightly larger at 21 days postfarrowing than were litters sired by Duroc boars and out of Yorkshire-Landrace and Duroc-Landrace sows. These same breed combinations had litter weights in excess of 100 lb. at 21 days. Litters sired by Duroc boars and out of Yorkshire-Landrace sows were the heaviest at 21 days.

Crossbred Sows Excel

Of the three sow breeds studied, it appears that Duroc-Landrace and Yorkshire-Landrace sows are superior to purebred Landrace sows in reproductive performance. Preweaning performance appears to be maximized when Hampshire boars are bred to Duroc-Landrace sows or when Duroc boars are bred to either Yorkshire-Landrace or Duroc-Landrace sows.

LITTER SIZES AND WEIGHTS AT BIRTH, 21 DAYS, AND 42 DAYS

Breed	Number born	Number born alive	Number alive at 21 days	Number alive at 42 days	Litter birth weight	Litter 21-day weight	Litter 42-day weight
					Lb.	*Lb.*	*Lb.*
Sire breed							
Duroc	11.3	11.0	9.0	8.9	36.82	101.43	213.96
Spot	10.6	10.2	8.3	8.2	32.76	91.56	201.37
Hampshire	11.5	10.9	7.8	7.5	39.48	86.99	186.03
Dam breed							
Landrace	10.7	10.0	7.3	7.1	34.04	80.89	177.01
Duroc-Landrace	11.5	11.0	8.9	8.7	39.73	100.13	211.38
Yorkshire-Landrace	11.3	10.8	8.7	8.5	34.74	97.18	208.49
Sire breed x dam breed							
Duroc x Landrace	10.6	10.1	8.5	8.4	33.29	94.89	196.37
Duroc x Duroc-Landrace	12.0	11.7	9.1	8.9	36.73	102.07	213.39
Duroc x Yorkshire-Landrace	11.4	11.0	9.3	9.2	36.29	106.92	231.99
Spot x Landrace	10.1	9.5	7.7	7.6	30.00	83.27	185.17
Spot x Duroc-Landrace	10.7	10.4	8.6	8.5	35.32	96.80	211.62
Spot x Yorkshire-Landrace	11.2	10.5	8.5	8.4	32.89	94.58	207.08
Hampshire x Landrace	11.4	10.4	6.0	5.9	39.68	66.87	158.03
Hampshire x Duroc-Landrace	12.1	11.2	9.4	9.0	43.48	105.98	216.65
Hampshire x Yorkshire-Landrace	11.1	11.0	8.0	7.6	35.10	87.21	181.88

[1]Now at Texas A&M University.

Peanuts planted in 32-in. (left), 16-in. (center), and 8-in. (right) rows show effect of row spacing on sicklepod growth.

Peanuts in Narrow Rows Suppress Weeds, Boost Yields

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ELLIS HAUSER, USDA-SEA-AR, Georgia Coastal Plain Experiment Station
JIM STARLING and HENRY IVEY, Wiregrass Substation

TWO DEVELOPMENTS in the past two decades have caused considerable interest in planting peanuts in rows spaced closer than the conventional 30- to 36-in. spacing. These were (1) the introduction of benefin (Balan®), which has provided consistent and excellent control of most grass weeds; and (2) the introduction of the digger-inverter-shaker, which can efficiently dig peanuts planted in close-spaced rows and windrow them in a single operation.

Support for the close row concept resulted from peanut row-spacing research begun in 1975 by the Auburn University Agricultural Experiment Station (at the Wiregrass Substation, Headland) in cooperation with the Georgia Agricultural Experiment Station (at the Southwest Georgia Branch Experiment Station, Plains) and USDA, SEA. Specifically, the project was to determine the effects of row spacing on competitiveness of peanuts with sicklepod and Florida beggarweed and to learn how row spacing affects peanut yield.

Florunner peanuts were planted in 8-, 16-, and 32-in. rows in areas heavily infested with sicklepod and Florida beggarweed. In-row seeding rate, based on 32-in. rows, was constant regardless of row width. Recommended production practices were followed.

Growth of both sicklepod and Florida beggarweed was considerably less in the 8- and 16-in. rows than in the conventional 32-in. rows in all experiments at both locations, table 1. In some experiments, peanuts were more competitive with weeds when planted in 8-in. rows than in 16-in. rows.

In the presence of weeds, peanut yields were higher in 8- and 16-in. rows than in 32-in. rows, table 2. This difference was quite striking in some years and substantial in all years. When averaged across all experiments, peanuts in 8-in. rows produced over 50% more peanuts than in 32-in. rows when weeds were present. In some instances, yields were greater with the 8-in. rows than the 16-in. rows, but generally this difference was not as substantial as between the 32- and 16-in. row spacings. Sicklepod was markedly more competitive with peanuts in 1975 at Plains than in any other experiment.

In the absence of weeds, there was a consistent improvement in peanut yields associated with closer spaced rows. Averaged across all experiments, peanut yields were about 15% higher when planted in 8-in. rows than 32-in. rows and 10% higher in 16-in. than 32-in. rows. In all experiments, peanut yields were higher in 8-in. than 32-in. rows, and in all experiments except one, yields were higher in 16-in. than in 32-in. rows.

Results from this series of experiments clearly show that growing peanuts in close-spaced rows substantially improves their competitiveness with sicklepod and Florida beggarweed. While the opportunity for late season cultivation is lost, increased competitiveness with narrow rows more than compensates for cultivation. Enhanced peanut yields even in the complete absence of weeds is encouraging.

TABLE 1. GREEN WEIGHT OF SICKLEPOD AND FLORIDA BEGGARWEED AS INFLUENCED BY PEANUT ROW SPACING

Row spacing, inches	Weight of sicklepod					Weight of Florida beggarweed at Headland		
	Headland			Plains				
	1975	1976	1977	1975	1976	1975	1976	1977
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
32	8,188	13,851	12,839	28,308	13,345	17,086	7,178	6,595
16	6,571	9,605	12,334	25,680	9,099	10,616	6,066	5,662
8	5,257	7,886	9,807	20,928	9,301	10,009	4,448	5,055

TABLE 2. YIELD OF PEANUTS GROWN WITH AND WITHOUT WEEDS IN CONVENTIONAL AND NARROW ROW SPACINGS

Row spacing, inches	Peanut yield/acre, in presence of weeds							
	Sicklepod					Florida beggarweed at Headland		
	Headland			Plains				
	1975	1976	1977	1975	1976	1975	1976	1977
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
With weeds								
32	2,777	613	718	266	1,722	1,133	1,060	1,224
16	5,328	1,031	1,738	469	2,470	2,326	1,857	2,136
8	5,523	1,787	1,524	602	2,959	2,562	2,521	2,272
Without weeds								
32	6,307	4,373	3,923	5,379	4,288	4,926	4,082	3,806
16	5,542	4,745	4,710	5,521	4,962	6,359	4,848	4,292
8	7,389	5,430	4,642	5,767	5,335	6,042	5,185	4,092

What Does Petiole Nitrogen Tell About Fertilizing Cotton?

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USING THE RIGHT AMOUNT of nitrogen (N) fertilizer at the right time is a major concern of Alabama cotton growers. Too little N means low yields. But too much N also may reduce yield by causing excessive stalk growth, late fruiting, delayed boll opening, increased boll rot, and more difficult insect control. There is no reliable soil test for available N, so N fertilizer recommendations are based on long-term fertilizer experiments conducted by Auburn University at several Agricultural Experiment Station locations.

Probably because of an abundant supply of cheap fertilizers in recent years, many cotton farmers have used higher rates of N than Auburn recommends. During this same period, the crop has tended to mature later and produce lower yields. This has created a strong interest in the Southeast in a technique (tried earlier in the irrigated West) to maintain the optimum N level for cotton by monitoring the N level present in petioles during its growing period.

The petiole is the stem that connects a leaf to the stalk. It is the pipeline through which root-absorbed nitrate, water, and other nutrients pass on their way to the leaves. Leaves convert the nitrate into protein for the building of new leaves, stalks, and bolls. Thus, the amount of nitrate passing through the petioles should be a measure of future growth.

Since the petiole is merely a pipeline, the amount of nitrate it contains at any one time will depend on the amount absorbed by roots and the amount of water carrying it to the leaves. Ideally, petiole nitrate should be quite high when cotton first begins to bloom; then, it should gradually decline to almost nothing by boll-opening time.

Ten field experiments were conducted in 1978 and 1979 in an effort to determine petiole nitrate changes during the season and how they are influenced by fertilizer. Rainfall records were also kept to see how petiole nitrate is affected by the amount of available soil water. The overall objective was to determine if petiole nitrate could accurately predict N fertilizer needs of cotton. Results of these experiments are illustrated by the graphs of 1979 data at the Tennessee Valley Substation and the Prattville Experiment Field.

Five rates of pre-plant N fertilizer were used, with maximum yields being obtained at the 30- or 60-lb. rate in both experiments, as shown below:

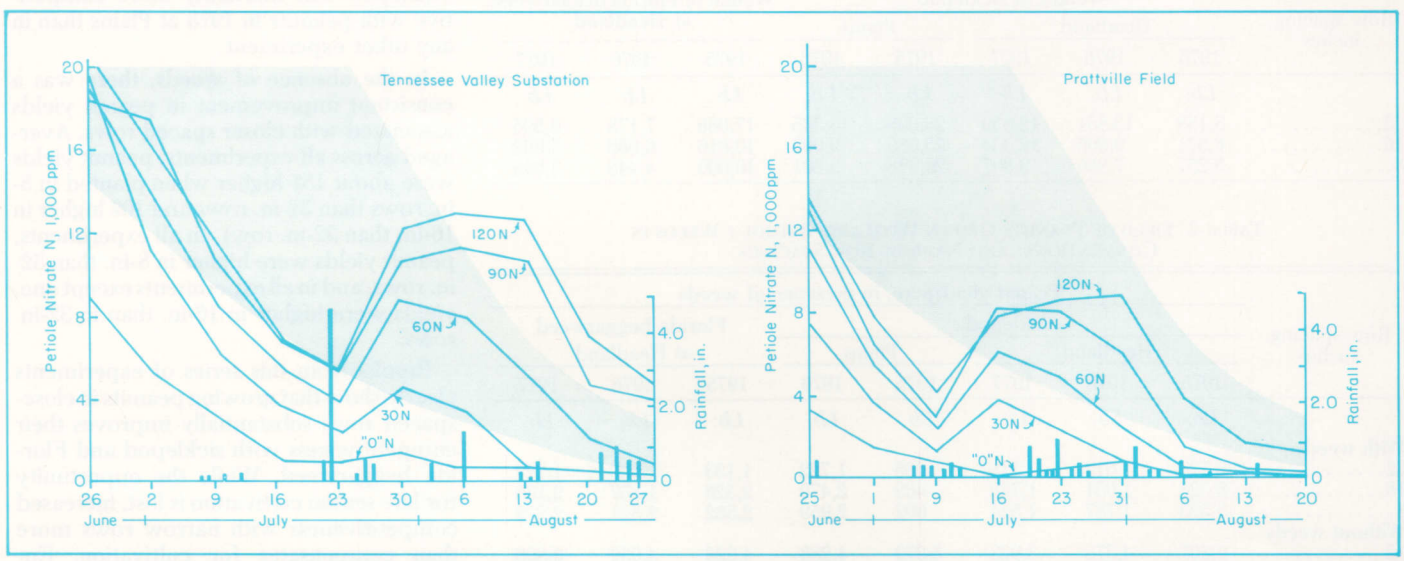
N rate, lb./acre	*Seed cotton yield/acre, lb.*	
	Tennessee Valley Substation	*Prattville Field*
0	1,830	1,160
30	2,890	1,470
60	3,100	1,510
90	2,440	1.510
120	2,680	1,490

The zero N rate provided too little N, while the 90- and 120-lb. rates provided excess N. These yields identify the optimum N fertilizer rate, but the question is: did petiole nitrate also identify the optimum N rate?

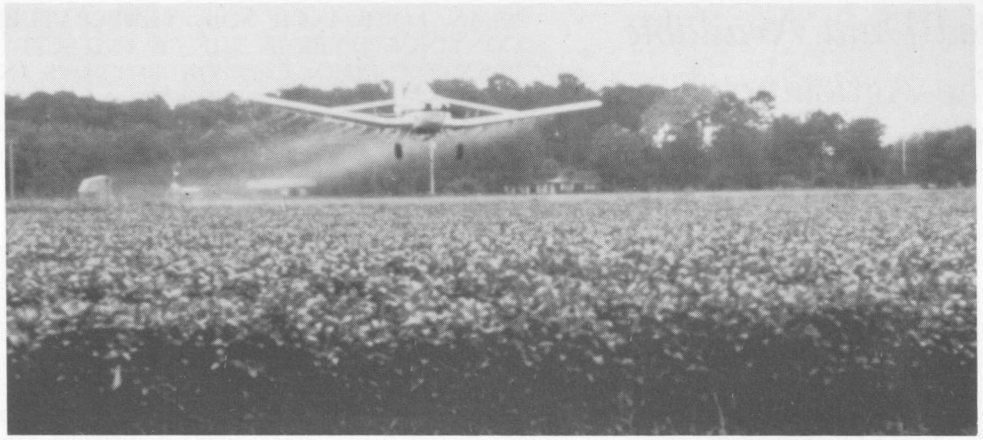
The graphed data show that petiole nitrate was generally higher at the higher N rates at all sampling dates. However, petiole nitrate did not progressively decrease at successive sampling dates throughout the season. Instead, it decreased in the Tennessee Valley experiment until July 23 (during a dry period), then abruptly increased to very high levels (following a heavy rain). In the Prattville experiment (which suffered from drought most of the season), petiole nitrate was consistently lower than in the Tennessee Valley experiment; but it, too, showed a sharp increase in petiole nitrate following showers. Neither experiment showed a continual decrease in petiole nitrate throughout the growing season.

The data in the graphs show that petiole nitrate levels for the optimum N fertilizer rates were below the critical levels reported by University of Arkansas agronomists for much of the season. Clearly the available water supply had as much to do with petiole nitrate levels as did the N supply. In 1978, at the same locations, petiole nitrate was below the so-called critical level at every sampling date because of a season-long drought. Predicting N fertilizer needs by petiole analysis cannot be achieved without correcting for drought effects, a problem that is truly complex, and one that does not appear to have a ready solution.

[1]Now with Tennessee Valley Authority.



Effect of N fertilizer rate on nitrate content of cotton petioles between June 26 and August 30, 1979, at two Alabama locations is illustrated. Vertical bars show date and amount of rainfall. The shaded area represents optimum nitrate levels according to University of Arkansas data.



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Aerial Application of Fungicides to Soybeans: Problems & Progress

ABOUT 50% of the pesticides used in the United States are applied by air. In Alabama, soybeans and cotton are most commonly treated by aerial applicators with aerially-applied treatments for soybeans typically being insecticides. In the last 4 years an increasing acreage has been treated with fungicides for the control of foliage, pod, and stem diseases. Research conducted by the Auburn University Agricultural Experiment Station has indicated that yield increases up to 15% can result following timely applications of fungicides to soybeans.

Results from aerial applications of fungicides to soybeans indicate that this application method is not always as effective as application by ground sprayers. During the past several years, some recurring problems have been observed that contribute to this observation: (1) poor calibration of aircraft, (2) improper distribution of spray nozzles on the aircraft, (3) aerial application of pesticides during suboptimal weather, and (4) incorrect swathing.

Problems one and two are rapidly being corrected by aerial applicators who have attended fly-in workshops held throughout the State. Unfortunately, farmers are also contributing, particularly to the last two problems. The farmer should not ask to see "rooster tails" (curling vortices of spray) at the airplane's wing tips. This spray typically is lost because it dries out before it reaches the crop. Secondly, the farmer should not request that treatments be applied during the heat of the day. During hot dry weather as much as 50% of the pesticide applied may dry out and be lost before it reaches the crop surface.

Growers also should make sure that flagmen, or some other means, are employed to assure accurate swathing. The effectiveness of many pesticides is greatly reduced by skips due to poor swathing, and costs increase if there are overlaps.

Research relating to efficiency of application of aerially-applied fungicides has been conducted at Auburn since 1978[1]. Particularly, there has been much interest in improving the delivery of fungicides to the crop surface. Fungicides applied to soybeans in a water carrier were compared to those in water plus spray oil, and water plus the viscoelastic agent Nalcotrol. The percent of fungicide reaching the foliage was determined. Data in table 1 show that when small droplets were produced by the spray nozzles, Nalcotrol increased deposition. However, when large droplets were produced the benefits of this tank additive were lost. The spray volume per acre in which fungicides should be delivered by airplanes was also evaluated. Results indicated that rates of delivery as low as 2.3 gpa may effectively deliver the fungicide to the crop, table 2. Low volumes were particularly effective under conditions of high humidity (Marion, Alabama test), but higher spray volumes generally improved deposition.

Research evaluating systems for reducing spray volume without sacrificing disease control is continuing. With energy costs increasing rapidly, these efforts could reduce pest control costs for farmers.

TABLE 1. FUNGICIDE DEPOSITION[1] TO SOYBEANS, THREE CARRIERS, 1978-79

Location	Pct. deposition, by carrier		
	Water	Nalcotrol	Oil
	Pct.	*Pct.*	*Pct.*
Foley[2]			
Small droplets	29.5	45.2	33.0
Large droplets	57.4	52.1	42.6
Marion[3]			
Large droplets	87.7	89.3	84.8

[1]All values are averages of three gallonage rates tested.
[2]Condition of low R.H., high temperature, cross-winds 6-7 mph, wing tip vortices.
[3]Conditions of high R.H., moderate temperature, low crosswinds, no wing tip vortices.

TABLE 2. FUNGICIDE DEPOSITION TO SOYBEANS, FOUR DILUENT RATES, 1978-79

Location, tank additive	Pct. deposition, by diluent rate per acre			
	0.7 gpa	2.3 gpa	3.0 gpa	4.0 gpa
	Pct.	*Pct.*	*Pct.*	*Pct.*
Foley, 1978[1]				
None[2]	32.5	46.5	52.2	—
Nalcotrol ..	49.6	45.3	51.4	—
Oil	35.4	21.4	58.4	—
Marion, 1979				
All[3]	78.8	—	89.1	93.9

[1]Average of small and large droplet sizes.
[2]Control = aqueous carrier.
[3]No benefit in deposition was obtained with the addition of oil or Nalcotrol under the conditions of this test.

[1]This research was supported by the Alabama Soybean Producers, E. I. duPont de Nemours, Woolfolk Chemical Co., Nalco Chemical, Gulf Flying Service, Jewel Flying Service, and State and Federal funds.

Weather-Related Data Available Through The Agricultural Experiment Station

W. R. WALLIS, National Weather Service
C. D. BUSCH, Department of Agricultural Engineering

"CLIMATIC INFLUENCES on vegetation are of the greatest importance. The success or failure of crops is due largely to the state of the weather. It is a well-known fact that, not only the warmth of the atmosphere, but also the heat in the soil is necessary to germination of seeds as well as for the development of the plant."

The above quote appeared in Alabama Agricultural Experiment Station Bulletin 4, February 1889. What is perhaps the first state-published climatology was published as Bulletin 18 in August 1890.

Since that time climatic data have been incorporated into agricultural research studies of crop responses, crop management, irrigation, and the animal environment, just to name a few areas.

In cooperation with NOAA National Weather Service, Auburn University Agricultural Experiment Station personnel collect daily weather information at locations shown on the accompanying map. A sample of the information collected at the Wiregrass Substation, Headland, and Brewton Experiment Field is shown in the table. The data have a variety of uses in both short- and long-range time frames.

The information is relayed daily to the National Weather Service, Environmental Studies Service Center (ESSC), located on the Auburn Campus. Agricultural meteorologists at the ESSC combine this information with forecasts of expected weather for the next 5 days and prepare agricultural weather advisories for Alabama farmers. The advisories interpret past and future weather in terms of agricultural operations of current interest.

Radio and television outlets throughout Alabama receive the advisories by National Weather Service teletype or from wire services. Advisories are also included in NOAA weather radio broadcasts from National Weather Service offices serving Alabama.

A sample paragraph from the Alabama Weather Advisory follows:

April 19, 1979
ZONES 8 to 15
CENTRAL AND SOUTH ALABAMA INCLUDING THE WIREGRASS AREA. DRY WEATHER SINCE LAST SATURDAY HAS ALLOWED MOST SOILS TO DRY TO WORKABLE LEVELS. FIELDS NEAR FLOODING RIVERS WILL REMAIN TOO WET FOR FIELD WORK. MEAN FOUR INCH SOIL TEMPERATURES WILL CONTINUE TO BE IN THE 70S AND SUITABLE FOR PLANTING CORN, COTTON, PEANUTS AND VEGETABLES THRU THE WEEKEND. NIGHTTIME TEMPERATURES WILL BE TOO COOL FOR MOST PLANT DISEASES BUT DRY WEATHER WILL ALLOW SOME INSECT POPULATIONS TO INCREASE. IT WILL BE TOO WINDY TO APPLY CHEMICALS THRU FRIDAY.

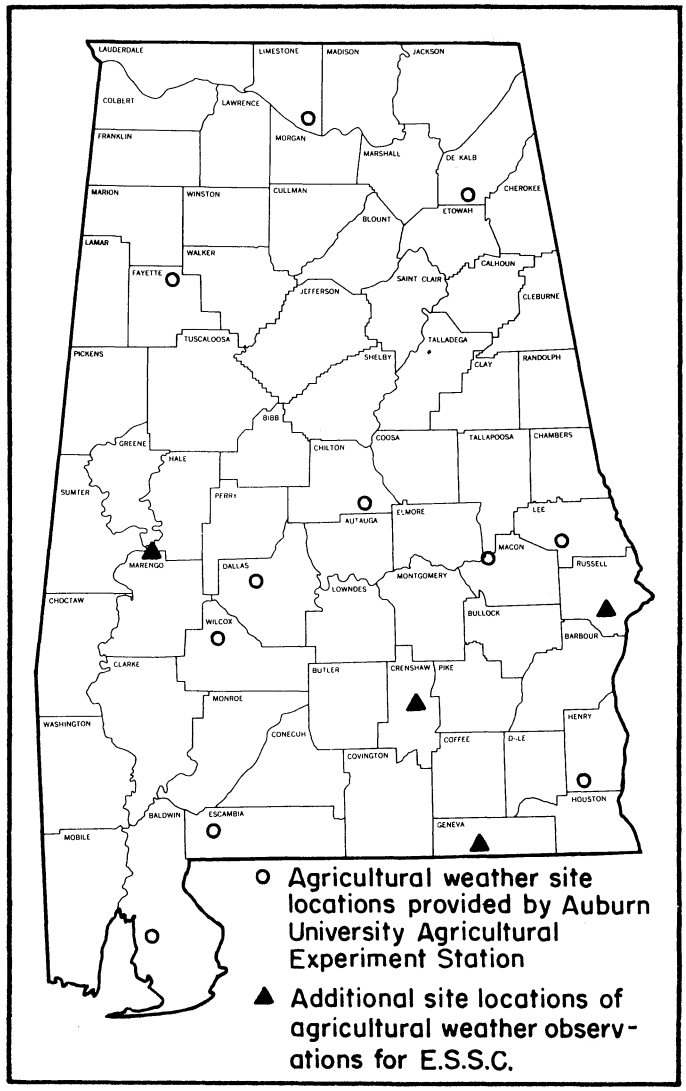
SAMPLE OF WEATHER INFORMATION COLLECTED AT HEADLAND AND BREWTON, APRIL 19, 1979

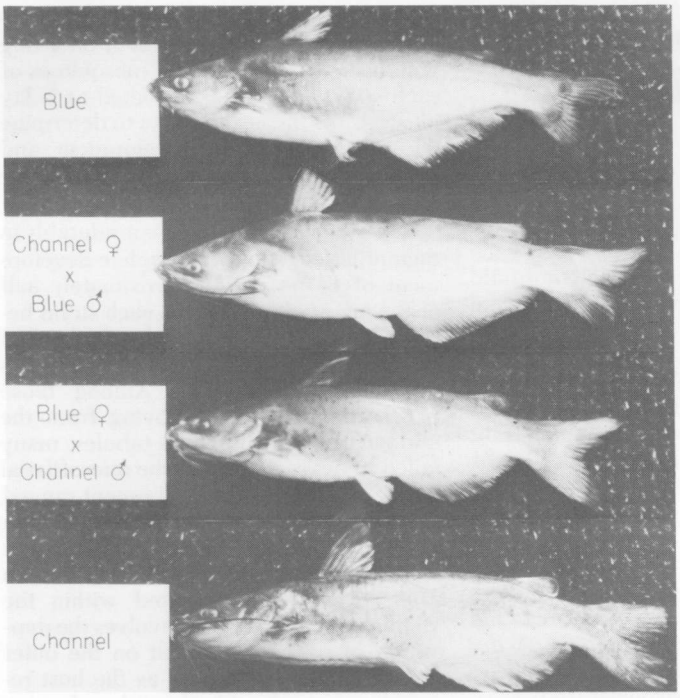
Item	Location	
	Headland	Brewton
Air temperature		
Maximum	79	85
Minimum	55	54
When observed	66	59
Rain	0	0
Soil (4-in. depth)		
Maximum	76	84
Minimum	66	65
Evaporation	0.15 in.	---
Vegetative wetting	0	--

The advisories do not attempt to make decisions for the farmer. They provide added information which will aid in planning and decision making. This information supplements the farmer's knowledge of local conditions and indicates actions which may be needed in light of past or expected weather.

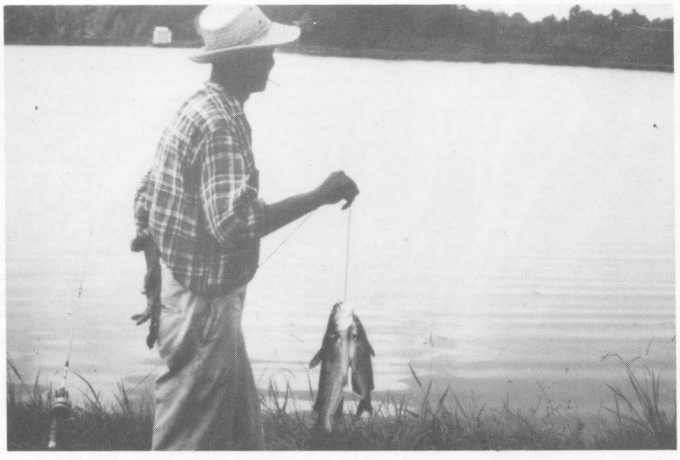
Weather information from the Agricultural Experiment Station also becomes part of the Alabama Climate Series. Weather information from over 150 locations in Alabama is published in monthly and annual summaries by NOAA's Environmental Data and Information Service. Normals and extremes of elements such as temperature and rainfall are also available for many locations with an adequate record length.

Eventually the data become available in a form suitable for computer processing. Recent publications of the Agricultural Experiment Station have made use of the data for precipitation probabilities and statistics, freeze and growing season analysis, and temperature normals for Alabama.





Reciprocal hybrids between blue and channel catfishes and their parent species.



Catches of catfishes from experimental fee-fishing ponds.

Evaluation of Hybrid Catfish for Alabama Fee-Fishing Ponds

DOUGLAS TAVE, ANDREW S. McGINTY
JESSE A. CHAPPELL, and R.O. SMITHERMAN
Department of Fisheries and Allied Aquacultures

FEE-FISHING PONDS are an important part of the catfish industry in Alabama. They provide both a source of income for the pond owner and a source of recreation and protein for the public; therefore, any management program which can increase catch will be beneficial to both parties.

One method of increasing catch is to breed a faster growing, more catchable fish. Crossbreeding is often utilized in a breeding program because it can increase economic traits through hybrid vigor.

Research at Auburn University's Agricultural Experiment Station has shown that channel X blue hybrid catfish grow faster, are more seinable, and have a better food conversion than the parent species. A study was carried out to determine whether hybridization between blue and channel catfishes increases catchability by hook and line.

Catfishes evaluated were: channel catfish; blue catfish; channel ♀ X blue ♂ hybrid catfish; and blue ♀ X channel ♂ hybrid catfish. Ten-month-old fingerlings (68 lb. per 1,000 fish) were heat branded with group marks for identification. After the brands had healed, a random sample of 187 fish from each group was stocked communally in a 0.25-acre earthen pond (3,000 per acre). Fish were fed a pelleted floating ration (36% protein) adjusted to 3% average body weight 6 days per week for 181 days.

Immediately following the growing season, 140 man-hours per acre of fishing pressure were applied. Size 6 hooks were used, and baits were earthworms and chicken livers. Water temperature during fishing was 65°F. Fish not caught were harvested by draining the pond 48 hours later. Total weight harvested was 2,552 lb. per acre; average weight was 1.2 lb. Seventy-five fish (14.5%) were caught by hook and line. Hybrid catfish were more catchable than the parent species ($P < 0.01$). Hybrids comprised 75% of the creel and 81% of its weight. Heterosis (hybrid vigor) for catchability was 159% by number of fish and 204% by weight of fish caught. The hybrids were, respectively, 2.6 and 3 times more catchable than the parent species. Channel ♀ X blue ♂ hybrids were more catchable than the blue ♀ X channel ♂ hybrids ($P < 0.01$). Channel ♀ X blue ♂ hybrids were 57% of the creel and 64% of its weight. There was no difference in catchability between the channel and blue catfishes.

Data from this experiment suggest that catch in fee-fishing ponds could be improved by stocking channel ♀ X blue ♂ hybrid catfish. However, before this improved technology can be exploited, reliable spawning techniques to produce hybrids must be developed. Research at Auburn has shown that hormone injection can increase spawning success in hybrid pairings, but it is not sufficiently dependable to produce the hybrids economically. Other environmental and physiological manipulations will be evaluated in further research in an effort to increase spawning success and make the hybrid catfish more available to the catfish industry.

Dog Heartworm: Transmission by Mosquitoes

GARY R. MULLEN and BONNIE A. BUXTON
Department of Zoology-Entomology

THE DOG HEARTWORM, *Dirofilaria immitis*, when present in appreciable numbers, tends to block the flow of blood and cause circulatory problems in its canine host. If left untreated, it often results in death.

Dirofilaria immitis is a parasitic filarial nematode which lives as an adult in the heart and pulmonary arteries of domestic dogs. Whereas this parasite was once largely restricted to the Southern States, in recent years it has become an increasing veterinary concern in many other parts of the United States as well.

During the past 4 years, research entomologists at Auburn University's Agricultural Experiment Station have been studying the role of mosquitoes as carriers of dog heartworms in Alabama. Their efforts have been directed at determining the principal mosquito species involved and the nature of susceptibility of mosquitoes to infection with this parasite.

Among the 52 species of mosquitoes known to occur in Alabama, only about a dozen are considered significant pests of man and domestic animals. It is still uncertain just which of these species play an important role in the transmission of the heartworm parasite to dogs.

Mosquitoes pick up the immature stage of the parasite, called microfilariae, when they feed on the blood of an infected dog. Once within the mosquito body, the microfilariae move from the midgut to the excretory organs, called Malpighian tubules, where they undergo development to infective larvae. These larvae then make their way to the mouthparts of the mosquito whereby they can be transmitted to another dog when the mosquito feeds again. Development of the parasite to the infective stage in the mosquito requires about 2 weeks.

During 1977 and 1978, mosquitoes were collected from April through September in Lee County at an outdoor hunting-dog kennel with a documented history of chronic heartworm infection. Most collections were made using either New Jersey light traps or battery-operated CDC miniature light traps.

Among the 19 species of mosquitoes collected at this location, three were found to be infected with *D. immitis: Aedes sticticus, Aedes vexans,* and *Anopheles punctipennis.* In this particular study area, *Ae. vexans* was by far the most abundant of the three hosts, whereas *Ae. sticticus* was the least abundant based on light-trap samples. Infection rates, however, were highest in *Ae. sticticus,* with nearly 12% of the blood-fed females being parasitized compared to only 3% in *An. punctipennis* and less than 1% in *Ae. vexans.* Taking into account both infection rates and the relative abundance of each species, *An. punctipennis* and *Ae. sticticus* appeared to be the most important vectors of dog heartworm at this site. All isolations of the parasite from mosquitoes were made in April, May, and June, suggesting that transmission among dogs occurs primarily during the spring and early summer.

Laboratory studies were conducted to assess the development of *D. immitis* in different mosquito strains. Four strains of *Aedes aegypti* (Rock, Vero Beach, Blackeye, and Liverpool) were used for this purpose. All mosquitoes were experimentally infected by feeding them on a dog with heartworms. Infected mosquitoes of each strain were then dissected at 2-day intervals for the next 20 days to determine the rate of parasite development and their success in reaching the infective stage.

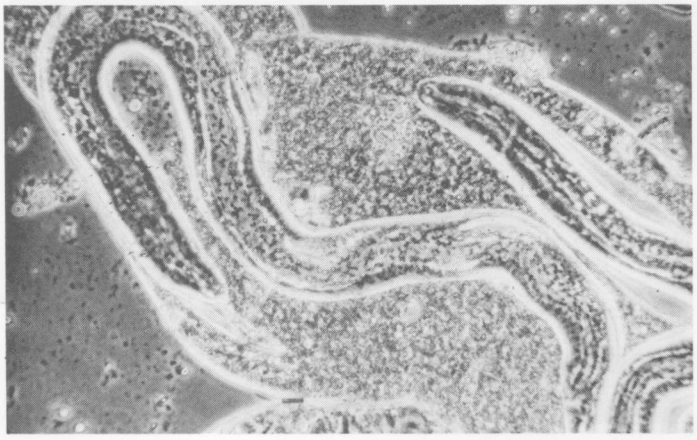
The four strains differed considerably in their ability to support complete development of *D. immitis.* Approximately half of the ingested parasites in each strain became trapped in the coagulated blood of the mosquito midgut, thus failing to reach the Malpighian tubules. Among those which did succeed in moving from the midgut to the Malpighian tubules, many failed to develop beyond the microfilarial stage. Such arrested development ranged from 38% in the Liverpool strain to as high as 96% in the Rock strain. In addition, a small percentage of microfilariae in each strain became encapsulated within the Malpighian tubules. This involves the deposition of melanin pigment on the outer surface of the nematodes as the host responds to invasion of its tissues by a foreign substance. Encapsulated forms fail to develop further and die.

Such differences in the success of parasite development, even among strains of the same host species, help explain why a given species of mosquito may be an effective vector of dog heartworm in one geographic area and of only minor importance in another.

This work has provided previously unavailable field data on species of mosquitoes naturally infected with *D. immitis* in Alabama and the first substantive clues regarding the most likely vectors of dog heartworm in this area.

The laboratory research on comparative development of this nematode in different mosquito strains has also provided insight to the mechanisms underlying the nature of susceptibility and resistance of natural mosquito populations to infection with this important canine parasite.

Examining mosquitoes for infection with dog heartworm parasites.



Dog heartworm larvae developing in excretory organs of mosquito host.

METOLACHLOR: New Herbicide for Peanuts

GALE A. BUCHANAN, R. H. WALKER, and E.R. JOLLEY, Department of Agronomy and Soils
JIM STARLING and HENRY IVEY, Wiregrass Substation

ALTHOUGH metolachlor (Dual®) doesn't outshine all other peanut herbicides, it may have a place in weed control programs on peanut farms. Its consistency and crop safety, proved in Auburn University Agricultural Experiment Station research since 1975, makes it worthy of consideration.

Metolachlor's usefulness for weed control in peanuts was evaluated in experiments at the Wiregrass Substation, Headland. The soil was Dothan sandy loam, heavily infested with crabgrass, goosegrass, and some crowfootgrass, as well as sicklepod, annual morningglories, Florida pusley, and Florida beggarweed. Treatments included metolachlor preplant incorporated and preemergence as well as metolachlor applied with naptalam + dinoseb (Dyanap® or Klean Krop®) at cracking time.

At the rate of 3 lb. per acre, metolachlor consistently controlled annual grass weeds early in the season—4-5 weeks after planting, table 1. The 2-lb. per acre rate was inadequate for acceptable grass control. Even with the higher rate, grass control did not last into late season.

Both preplant incorporated and preemergence applications controlled grasses equally well. Inclusion of naptalam and dinoseb for a cracking time treatment was effective in 1978 but less effective than preemergence metolachlor alone in 1979.

Generally, metolachlor has done a better job of controlling annual grass weeds than broadleaf weeds, particularly sicklepod and annual morningglories. Neither 2 nor 3 lb. per acre applied preplant incorporated controlled broadleaf weeds in 1978 and only at the first rating in 1979. Cracking-time application that included naptalam + dinoseb markedly enhanced broadleaf weed control in 1978 and to some extent in 1979 as reflected by late season ratings.

A point in its favor is that metolachlor also offers the peanut producer additional help with nutsedge control. Most reports show metolachlor provides acceptable control of yellow nutsedge but not purple nutsedge. Although there are no data on nutsedge control in peanuts, metolachlor was evaluated in 1978 and 1979 at the Lower Coastal Plain Substation for nutsedge control in soybeans. The test site, on McLaurin sandy loam, was heavily infested equally with yellow and purple nutsedge.

Metolachlor at 2.0 and 3.0 lb. per acre provided nutsedge control for the 2-year period equivalent to vernolate (Vernam®) applied at the 2.0-lb. rate, which is the labeled rate for that soil. However, metolachlor was less effective than vernolate at 3.0 lb. per acre. Equal results were obtained in 1979 with a tank-mix of metolachlor plus vernolate (2.0 + 1.0 lb. per acre), table 2.

Although metolachlor does have purple nutsedge activity under certain conditions, present recommendations include only yellow nutsedge.

Metolachlor is a particularly safe herbicide when used on peanuts. There have been no noticeable phytotoxic effects on peanuts, and yields of unshelled peanuts have been unaffected by metolachlor treatments as high as 3.0 lb. per acre, table 1.

TABLE 2. HERBICIDAL CONTROL OF A MIXED POPULATION OF YELLOW AND PURPLE NUTSEDGE IN SOYBEANS, LOWER COASTAL PLAIN SUBSTATION 1978-79

Herbicide[1], rate per acre active	Nutsedge control		
	1978		1979, early
	Early	Late	
	Pct.	*Pct.*	*Pct.*
Metolachlor, 2 lb.	91	87	66
Metolachlor, 3 lb.	70	79	80
Vernolate, 2 lb.	54	65	94
Vernolate, 3 lb.	83	90	97
Alachlor[2], 2 lb.	79	58	21
Alachlor, 3 lb.	89	89	61
Metolachlor, 2 lb. + vernolate, 1 lb.	--	--	91
Alachlor, 2 lb. + vernolate, 1 lb.	--	--	90
Check	0	0	0

[1]Incorporated two times with Lely Roterra.
[2]Alachlor = Lasso®.

Metolachlor has consistently controlled most annual grass and small-seeded broadleaf weeds in peanuts. It also has enough yellow nutsedge activity to warrant consideration for this use in peanuts. While it is not markedly superior to some currently available herbicides, it does offer the peanut grower an additional option for his peanut weed control program.

TABLE 1. CONTROL OF ANNUAL GRASSES AND BROADLEAF WEEDS IN PEANUTS WITH METOLACHLOR ALONE AND IN COMBINATION WITH NAPTALAM PLUS DINOSEB, AND RESULTING PEANUT YIELDS, WIREGRASS SUBSTATION, 1978 AND 1979

Herbicide, rate[1] and method of application	Annual grass control				Broadleaf weed control				Yield/acre, unshelled peanuts	
	1978		1979		1978		1979			
	Early	Late	Early	Late	Early	Late	Early	Late	1978	1979
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Lb.*	*Lb.*
Preplant incorporated										
Metolachlor, 2 lb.	73	60	89	33	23	10	81	0	3,230	3,975
Metolachlor, 3 lb.	100	83	98	38	33	10	92	30	2,900	4,329
Preemergence										
Metolachlor, 2 lb.	85	53	89	50	0	0	85	23	3,160	3,939
Metolachlor, 3 lb.	94	80	96	53	32	10	91	13	3,340	4,084
Cracking time										
Metolachlor + naptalam + dinoseb (2.0 + 3.0 + 1.5)	100	99	85	15	90	60	91	38	3,590	4,102
Metolachlor + naptalam + dinoseb (3.0 + 3.0 + 1.5)	100	100	78	0	97	88	81	45	3,520	4,329
Untreated	0	0	0	0	0	0	0	0	3,230	3,412

[1]Rate is pounds of active ingredient per acre.

West Alabama Leader Perspectives on Rural Industrialization

J.J. MOLNAR and D.C. BACHTEL
Department of Agricultural Economics and Rural Sociology

INDUSTRIALIZATION and the growth of employment opportunities are major concerns in many rural areas. Given an area's social and economic resources, the attitude of community leaders toward development is of fundamental importance.

Although the scope of many development issues goes beyond the influence of individual localities, leaders often can mobilize community-based resources to address problems that would otherwise be unresolved. Thus, one contribution of rural development research is to determine the extent of support for particular development options, and to assist community-based efforts to identify and organize resources to promote rural development.

This article reports selected results of a leadership survey taken in eight rural west Alabama counties (Choctaw, Clarke, Greene, Hale, Marengo, Pickens, Sumter, and Washington). Termed the Tennessee-Tombigbee river corridor, considerable potential for economic growth exists in the area due to the projected opening of the Tennessee-Tombigbee waterway and the development it is expected to bring.

Leaders were identified on a positional basis, that is, those holding an elected or appointed position in county or municipal government, as well as Federal and State officials located in the counties. Members of selected development-related advisory groups and committees as well as individuals nominated for their reputation or influence in development decision-making also were included.

In summer 1979, the identified leaders were sent a mail questionnaire that addressed a series of development-related issues. A total of 522 leaders completed the questionnaire, an overall return rate of 66%. Respondents were predominantly white males (84.5%), and nearly a third were college graduates. A majority were between 41 and 60 years of age, and 48.1% reported incomes of $25,000 and above.

The table shows responses to a series of questionnaire items probing favorability to the overall concept of industrialization, as well as potential impacts of new industry on the county.

Item 1 shows that the leaders had extremely positive overall attitudes toward development. They also felt they should be better organized to respond to development needs and opportunities (Item 2). Local social organization is a critical factor in development. The results suggest a readiness for leaders in these counties to continue responding to participation opportunities in development and to intensify and broaden the activities of existing groups.

The remainder of the items refer to the potential impacts of a new industry. Leaders were asked whether they favored recruiting an industry, given a series of hypothetical impacts or characteristics of the industry, other factors being more or less equal.

Leaders were somewhat less favorable to new industry if it would cause the size of their community to double in a few years (Item 3). Too rapid population growth can cause problems of institutional overload, as schools, water systems, and other public services often cannot expand at a sufficient pace to meet new demands. Generally, as population growth rates exceed 10% per year, these problems become severe.

Industry can impose direct costs on a community in terms of the service demands it makes. Items 4, 5, and 6 show that the majority of leaders favored industry that would require road construction, sewage treatment expansion, or exhaust water supply capacity, but a few became undecided about these effects. Apparently leaders recognized the necessity of incurring some costs in the course of development.

Labor unions were a moderate concern for the leaders who responded to this study (Item 7). Nearly 48% were favorable to a new industry that had a labor union, 20.6% were undecided, and 41.6% expressed some level of opposition.

The loss of farmland to industrial use seemed to discourage some leaders, as only 47.9% remained favorable. The cleared, open land of a farmstead is often an attractive plant site and many did not see this as a justifiable loss.

The greatest opposition to new industry was found in relation to negative environmental and health impacts (Items 9, 10, and 11). Leaders objected to unpleasant odors and were strongly opposed to radioactive materials and cancer-causing substances in the manufacturing process. Safety issues struck a fundamental chord in the leaders' perspective on new industry.

RESPONSES OF WEST ALABAMA COUNTY LEADERS TO INDUSTRIALIZATION ISSUES

Item	Favor or oppose*					
	++	+	0	-	--	No answer
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*No.*
1. What do you think in general about bringing new industry to this county?	69.3	29.0	.7	1.0	.0	(11)
2. Do you think the county should be better organized to assist industrial prospects and respond to other development opportunities?	52.4	38.6	7.0	2.0	0	(20)
Do you favor an industry that would:						
3. Cause the size of your community to double in a few years	29.1	50.3	8.8	9.6	2.1	(13)
4. Need major road construction to service the plant	18.3	63.0	15.2	3.1	.4	(9)
5. Require expansion of sewage treatment facilities	18.3	62.3	14.7	4.2	.6	(18)
6. Use a large proportion of your surplus water supply capacity	12.8	44.1	23.8	16.9	2.4	(14)
7. Have a labor union	12.5	35.3	20.6	19.4	12.2	(12)
8. Be built on a large tract of good farm land	8.2	39.7	20.4	22.7	9.0	(11)
9. Produce unpleasant fumes or odors on a regular basis	4.1	16.7	22.2	37.1	19.8	(13)
10. Use radioactive materials in the manufacturing process	1.8	14.9	25.3	27.1	31.0	(12)
11. Use cancer-causing substance in the manufacturing process	.8	2.7	13.1	34.5	48.9	(9)

Number of respondents = 522

*Response categories were: ++ = strongly favor, + = favor, 0 = don't know, - = oppose, -- = strongly oppose.

ZINC

Bioavailability in Selected Foods

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Research

ZINC IS known to be an essential element in animal and human nutrition. Many enzymes needed for a variety of metabolic processes either contain zinc (Zn) or are activated by Zn ions, e.g., carbonic anhydrase, alkaline phosphatase, and carboxypeptidase. A deficiency of Zn in the diet can cause loss of appetite, altered growth rate, impaired wound healing, and skin lesions.

The Zn content of many foods is known. However, there is a lack of information about the actual availability to animals and man (bioavailability) of Zn in these foods under physicochemical conditions occurring in the gastrointestinal (GI) tract. Knowledge concerning bioavailability of Zn in diets is essential to obtain sufficient amounts of dietary Zn for optimal health and performance.

Bioavailability of Zn in selected foods was compared by labeling them intrinsically and extrinsically with a radioisotope of Zn (^{65}Zn). Intrinsic labeling (IL) consists of administration of ^{65}Zn to an animal and allowing sufficient time to elapse to attain distribution of ^{65}Zn in the body tissues. Extrinsic labeling (EL) consists of adding a ^{65}Zn solution to a food and assuming that ^{65}Zn is as biologically available as Zn naturally present in the same food. Bioavailability of Zn in cow's milk, milk-based infant formula (SMA), eggs, and chicken thigh was determined by EL. IL was used for determining Zn bioavailability in eggs and chicken meat.

^{65}Zn was administered to a White Leghorn laying hen. Eggs were collected on days 1-6 and refrigerated until used. On day 7, the hen was killed and breast and thigh muscles were removed from the carcass and frozen for later use.

TABLE 1. BIOAVAILABILITY OF ZN IN EGGS AND CHICKEN MEAT FED TO RATS

Source-treatment	Zn consumed	Bioavailability
	μg	*Pct.*
Egg — uncooked-EL ...	50	28.1
Egg—cooked-EL ..	80	38.9
Egg— uncooked-IL	50	35.8
Egg—cooked-IL...	80	56.7
Egg + cereal[1] — cooked-IL	245	37.2
Thigh — freeze-dried-EL	80	35.6
Thigh — uncooked-IL	40	34.6
Breast — uncooked-IL	14	44.1
Breast—cooked-IL.	36	64.5
Breast + cereal[1] — cooked-IL	179	36.5

[1]Each rat in these groups was fed 1.2 g and 0.7 g of cereal (Froot Loops, Kellogg) before and after the consumption of eggs or meat, respectively. Froot Loops contained added ZnO. Mention of commercial products does not constitute an endorsement of those products.

Cow's milk was either refrigerated, frozen, or boiled, and then used for Zn EL experiments. ^{65}Zn was added to milk, or to whole eggs, and then mixed. SMA and dried chicken thigh were mixed with water containing ^{65}Zn to form a paste. In some experiments, labeled whole eggs and chicken meat were cooked.

Male Sprague-Dawley rats weighing 145-170 g were used in most experiments. After a 16-hour fast, rats were fed labeled foods and killed 16 hours after feeding. The GI tract from stomach to anus was removed from the carcass. Radioactivity from ^{65}Zn in foods, feces, small and large intestine, and the stomach was measured. The absorption of ^{65}Zn in EL or IL food was used to estimate Zn bioavailability which was calculated as follows:

Percent absorption = radioactivity in food minus radioactivity in (small intestine + large intestine + feces)/radioactivity in food X 100.

The Zn content of foods tested was determined from acid digests by atomic absorption spectrophotometry.

Bioavailability of Zn from EL and IL eggs and meat is summarized in table 1. Bioavailability of Zn was higher in IL cooked eggs than in IL uncooked eggs, whereas EL uncooked eggs showed lower bioavailability compared to EL cooked eggs. Less Zn was available for absorption when a combination of cereal and cooked eggs was fed than when IL cooked eggs were fed alone.

Zn available for absorption was increased when rats were fed chicken breast rather than thigh meat. Availability of Zn was improved when the breast meat was cooked. Cereal added to breast meat lowered Zn availability from the cooked meat.

Bioavailability of Zn in milk and SMA is summarized in table 2. Bioavailability of Zn from milk did not increase with the weight gain (age) of the rats. A marked improvement in Zn availability was observed when rats were fed either frozen or boiled milk. Cereal added to boiled milk lowered Zn availability compared to boiled or frozen milk.

Bioavailability values of Zn in selected foods are reported for the first time and values were found to be in the following descending order: meat>eggs>milk> SMA. A high value of Zn availability was expected from eggs, which are of highest biological value. However, eggs are a rich source of copper, calcium, and phosphorus, which are antagonistic to Zn absorption.

Cooking always improved Zn bioavailability probably due to denaturation of proteins which aids in digestibility. Boiling or freezing allows ^{65}Zn to be more tenaciously bound to denatured proteins than to non-denatured proteins in fresh milk. It appears that EL ^{65}Zn binds weakly to some substances in foods which may prevent some ^{65}Zn from entering the common Zn pool in the GI tract or stomach and, hence, low bioavailability values were obtained in EL foods.

Cereal was expected to lower the bioavailability of Zn because of the presence of phytate, fiber, and ZnO. The addition of cereal to different foods has an adverse effect on the availability of zinc in decreasing order as follows: chicken breast (42% decrease), milk (38% decrease), and eggs (35% decrease).

Biosynthetically incorporated ^{65}Zn (IL) is more available than EL ^{65}Zn. Before the EL technique can be used to determine an accurate value of zinc bioavailability, further experimentation on various food products labeled intrinsically and extrinsically have to be done.

TABLE 2. BIOAVAILABILITY OF ZN IN COW'S MILK AND SMA FED TO RATS

Source-treatment	Zn consumed	Bioavailability
	μg	*Pct.*
Cow's milk[1] — refrig.-EL.....	23	6.6
Cow's milk[2] — refrig.-EL.....	82	8.6
Cow's milk — frozen-EL	46	47.2
Cow's milk — boiled-EL	46	39.8
Cow's milk + cereal[3] — boiled-EL....	175	24.5
SMA[4]-EL	42	31.5

[1], [2], [4]Rats in these groups weighed 100, 270, and 50 g, respectively.

[3]Each rat in this group was fed 1.2 g and 0.7 g of cereal (Froot Loops, Kellogg) before and after the consumption of milk, respectively.

FARM REAL ESTATE PRICED LIKE GOLD?

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FARM REAL ESTATE is not gold, but it has become a "precious commodity" to many people.

During the past decade, prices for farm real estate rose 180% and 211% in Alabama and the United States, respectively. More recently, Alabama farm real estate price level changes have fallen behind the U.S. rate but the climb still continues.

As of November 1979, farmland and buildings in Alabama were selling for an average value of $551 per acre. Combined values for the 48 conterminous states reached $609 per acre at the same time. Changes of this magnitude give an appearance that "land is gold." Fortunately, farm real estate has not experienced the wildly fluctuating and speculative panic trading of the world gold market where prices ranged upward from $300+ to nearly $1,000 and downward to $500 in a few months.

A major contrast exists between the gold and the real estate markets. Most gold traders in recent months seem characterized as high risk takers and speculators, whereas land buyers in the farm market have been farmers. Nearly three-fourths of all Alabama farmland bought in 1979 was acquired by active or retired farmers. These buyers are not likely to trade away their acquisitions in a short-run situation as the gold trader would. However, there is no question that the speculative trader is having an influence in the land market. In the U.S., 20% of all acres purchased in 1979 went to absentee landowners. Numerous sales were observed across the Southeast where purchase prices were significantly above the prevailing local market expectations. Many of these were purchases of additional acreages for existing farms where a higher "marginal" price is justifiable. Yet, the amount of activity by absentee buyers is also a contributing factor to "higher than expected" real estate values.

Over the past several years, the Southeastern States seemed to be vying for leadership in the race toward higher prices. In the early 1970's, Alabama and Georgia values increased at a faster rate than those in other surrounding states or the United States. Today Mississippi and Tennessee are ahead. In the 6-month period of February to November, 1979, farmland values rose 24% and 15% in Mississippi and Tennessee, respectively; whereas Alabama values rose only 7%, table 1. In fact, for the first time in many years Alabama and several other states did not have value increases which kept pace with inflation. This is not to say farm real estate values are declining. Alabama farm real estate values have declined in only 5 out of the last 50 years. Rather, the rate of increase in value has slowed. Many observers in the market predict additional slowing of the rise in land values and some are predicting a short-term price decline. However, the long-run strength of the "Sun Belt" leads to the conclusion that demands for land in the Southeast will surge again as soon as national economic adjustments have been completed.

The significant problem facing anyone entering the real estate market today is raising sufficient equity for a down payment and amortizing the debt based on farm earnings. The rapid appreciation in value over time makes land look good as an investment. However, appreciation in value is realized upon sale of the asset. It does not enter the cash flow needed to amortize debts incurred in the initial acquisition. Because net farm earnings after deducting costs of variable inputs, capital, and management may be low, a large equity down payment is necessary. For example, if land is purchased for $800 per acre, a simple interest charge of 15% will require $120 the first year before any payment to principal is made. Few crops can support such payments. Therefore, a large down payment is needed to reduce the annual charges against the income stream. At prevailing interest rates of 12 to 15%, farm earnings available for amortization of say $60 to $80 per acre would be sufficient to support about half the value of farm real estate, table 2. Thus, a down payment of approximately 50% would be needed, or nonfarm income must be used to supplement farm earnings.

Taken together, all conditions in the farm real estate market today make it seem like gold. Inflation is expected to continue for some time, despite the fact that certain segments of the market will experience recession. The need for farmland will not diminish and land prices should reflect that continued need by overall stability in price. A wildly fluctuating price level, such as is seen in the gold market, certainly is not expected.

TABLE 1. PERCENT CHANGE IN PER ACRE FARMLAND VALUES OF SELECTED STATES, 1976-1979

State	Value change, by year			
	1976-77	1977-78	1978-79	1979-79*
	Pct.	*Pct.*	*Pct.*	*Pct.*
Alabama	6.9	4.6	13.9	14.4
Georgia	6.9	10.8	8.0	2.1
Mississippi	6.0	14.9	12.1	24.0
Florida	7.0	7.9	11.0	7.8
Tennessee	10.3	11.6	9.9	15.0
48 States	16.3	8.9	14.3	18.6

*6-month period February to November 1979.

Source: USDA, Farm Real Estate Market Developments.

TABLE 2. LOAN AMOUNTS PER ACRE THAT CAN BE REPAID IN 30 YEARS AT SPECIFIED AMORTIZATION PAYMENTS AND INTEREST RATES

Interest rate	Amount repaid, by annual payments per acre			
	$50	$60	$70	$80
9	$514	$616	$719	$822
10	471	566	660	754
11	435	521	609	696
12	403	483	564	644
13	375	450	535	600
14	350	420	490	560
15	328	394	460	525
16	309	371	432	494

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State Flower Plagued by Numerous Scale Insects

ALABAMA'S STATE FLOWER, the camellia, is subject to attack by numerous species of scale insects. In Alabama alone there are 15 species of scale insects recorded from camellia. Over 35 scale species are known to infest camellia in the Southeastern States.

Scale insects feed by sucking the cell juices from the foliage, twigs, stems, and roots of their host. Their feeding activity reduces plant vitality, which is reflected in impaired flower production, yellowing of leaves, premature defoliation, stunting, twig die-back, or even death of the plant. Plants weakened by scale insects are also more susceptible to attack by other pests.

The three most common scale insect pests of camellia in Alabama are: tea scale, *Fiorinia theae* Green; camellia scale, *Lepidosaphes camelliae* (Hoke); and Indian wax scale, *Ceroplastes ceriferus* (Fabricius). Tea scale is by far the most widely distributed and most damaging pest of camellia in Alabama. Figure 1 presents a distributional map of these three species in Alabama.

Tea scale, figure 2, has been collected from 40 counties in the State. It is a scale insect pest virtually all nurserymen and serious camellia growers in Alabama are familiar with. Tea scale attacks the underside of camellia leaves, often causing the upper leaf surface to turn yellow. When infestations are heavy, cottony masses of wax filaments can be seen hanging from the leaves. Under close observation, individual insects can be seen. The female tea scale is at first thin and light yellow, later hard, brown, elongate-oval or boat-shaped, and about 1/16 in. long. Males are smaller and have an elongate, white, waxy cover. Active infestations can be found throughout the year although activity slows during winter. There are several overlapping generations each year.

Camellia scale also is found on the underside of the leaves. It is not as serious a problem on camellias in Alabama as tea scale. It has been recorded in 12 counties in the State. Camellia scale female covers are light to dark brown, oyster-shaped, and about 1/10 in. long. Male covers are similar, but not as large. This scale is present most often on cuttings and young plants in the greenhouse. Foliage is devitalized but not discolored.

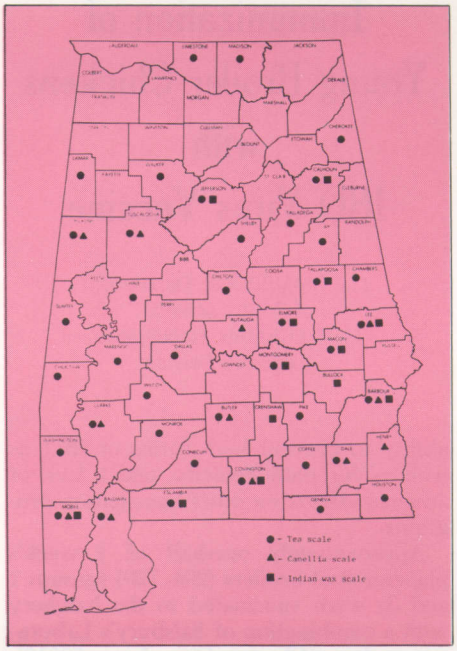

FIG. 1. Distributional map of tea scale, camellia scale, and Indian wax scale in Alabama.

Indian wax scale, figure 3, is a much more obvious scale insect. It is found primarily on the stems and twigs. It has been collected in 13 counties in Alabama. Female Indian wax scale are easily recognized. They have the appearance of large, white or cottony drops of wax. The scales are sticky to the touch, up to ¼ in. long, convex, circular, with an irregular surface. Males are rare. These are prolific producers with each female capable of laying 1,500-3,000 eggs. They overwinter as adult females. Eggs are laid in early spring and hatching continues for 2-3 weeks. There is only one generation per year.

The camphor scale, *Pseudaonidia duplex* (Cockerell), shown in figure 4, attacks both leaves and stems. It has been recorded from Baldwin, Barbour, Lee, and Mobile counties in Alabama. It can be a serious pest, causing die-back of infested twigs. The female cover is circular, moderately convex, dark blackish-brown, about 1/10 in. in diameter. It appears to have a limited distribution in the State and is not often collected. A similar species, the camellia mining scale, *Duplaspidiotus clavigera* (Cockerell), has not been found in Alabama but is causing considerable problems for camellia growers in Florida. This species actually develops under the epidermal cell layer of the stem and can cause severe damage to the plant. It may appear only as a small lump or swelling in the stem. Once the cover is removed, a circular white scar is left on the plant.

Control of these scale insect pests of camellia is difficult because of the protective coverings over the scales' bodies. For best results, sprays should be applied when young scale insects are hatching, before they have settled and formed their waxy covering. Good coverage of the plant is a necessity. The addition of a spreader-sticker or wetting agent to your spray mixture will generally result in better control of scale insects. Two or three applications about 2 weeks apart are generally needed for good control of scale insect pests.

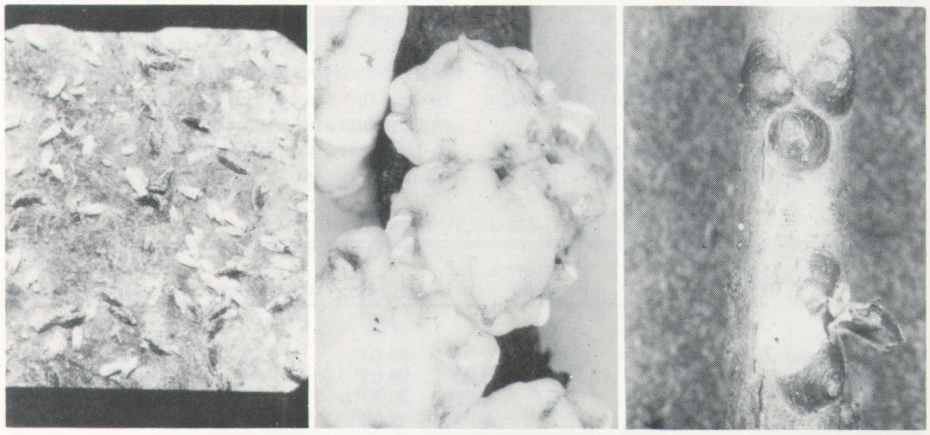

FIG. 2. (left) Tea scale male and female covers on underside of camellia leaf. FIG. 3. (middle) Indian wax scale females on stem of camellia. FIG. 4. (right) Camphor scale females on twig of camellia. Note white scar left after scale cover removed.

Immunization of Young Broiler Chickens with IBD Virus Vaccine

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INFECTIOUS BURSAL DISEASE (IBD) is an acute viral infection that can adversely affect poultry by (1) possibly producing clinical disease which can reduce weight gain and feed efficiency as well as produce morbidity and mortality and (2) by possibly inducing a subclinical immunodepressive disease by adversely affecting the bursa of Fabricius, which is involved in the production of the immune response.

Immunodepression can then result in poor vaccination results and thereby render birds more susceptible to many common poultry pathogens. Poultry pathogens may cause susceptible birds to experience lower livability, poor growth and development, and increased plant condemnations.

Although clinical IBD is relatively uncommon in Alabama, subclinical IBD resulting in immune depression appears quite common, as evidenced by the high incidence of IBDV antibodies in unvaccinated birds, the presence of atrophied (shrunken) bursae in market age broilers, and relatively high condemnations due to infectious causes in many broiler flocks.

Even though the vast majority of breeder flocks in Alabama are passing maternal antibody to their progeny, protection against the immunodepressive effect of an early IBDV infection may not be complete. The problem arises with older breeder flocks (older than 50 weeks of age) which are passing lower levels of protection to their progeny than are younger breeders. Broilers from older breeder flocks are susceptible to IBDV during the first 2 weeks of age. Infection at this early age can produce permanent destruction of the bursa of Fabricius and long-lasting immunodepression. Therefore, vaccination of poultry flocks during the first 2 weeks of life against IBDV seems to warrant further investigation.

The objective of this study was to test the effectiveness of a commercially prepared IBDV vaccine under field conditions. The vaccine was examined for the ability to prevent both forms of IBD, as well as for pathogenicity, and a lack of adverse effects on other vaccination programs.

Approximately one-half of 1 week's placement of broilers (294, 720) (groups 1 and 3) were vaccinated in the hatchery with a combination of Salsbury's Laboratories, Inc. (Charles City, Iowa 50616), broiler dose of cell associated HVT vaccine and one-half the recommended dose of IBDV vaccine (Bursine®). The combination was given subcutaneously behind the neck with an automatic vaccinator. The remaining 233,735 broilers (groups 2 and 4) were vaccinated with HVT alone. All 4 groups of chicks were also vaccinated against Newcastle disease virus and infectious bronchitis virus with a combination vaccine using a commercial Beak-O-Vac system.

Between 10 and 15 days of age, approximately one-half (125,200) of the birds receiving Bursine ® at 1 day (Group 3) and one-half (124,955) of the birds which did not receive Bursine® at 1 day (Group 2) were given a full dose of Bursine® in the drinking water. Group 4 broilers (108,780) did not receive Bursine® during this study and served as controls.

When the broilers were between 52 and 54 days of age, they were shipped to a single processing plant. Data including livability, live weight, feed conversion, and individual condemnation causes were then recorded to arrive at a cost per pound figure. These data were analyzed statistically where possible and compared with the vaccination costs to evaluate the efficacy of Bursine®. Cost figures for vaccinated treatment (1-3) were based on savings (or loss) per pound when compared to controls (Treatment 4).

The key to treatments (IBDV vaccination groups) and date of chicks placement are summarized in table 1. Production results are summarized in table 2.

Production data indicated that birds vaccinated with Bursine® either at 1 day (Group 1) or at 10 or 15 days (Group 2), but not at both times (Group 3), had statistically lower overall percent condemnation and numerically better feed efficiency and average body weight. This resulted in a statistically significant savings in cost per pound when compared to the unvaccinated treatment group (4) and when taking into account the vaccination cost. Even though Group 3 (birds which received a second booster dose of Bursine®) had numerically better livability and lower percent condemnation than the unvaccinated group, these birds had a higher cost per pound figure than the controls. This was entirely due to their lower average weight, which is the most variable of the criteria used because of the differences in the age of birds when sent to the plant.

Based on production data, it is evident the 1-day vaccination with Bursine® produced the best average weight and lowest percent condemnation which resulted in a savings of 0.42¢ per pound over the controls. Since this is the most convenient time to use the vaccine in commercial poultry operations and since the dosage can be cut in half, this would seem to be the recommended program to initiate.

TABLE 1. IBDV TRIAL KEY TO TREATMENT AND CHICK PLACEMENT, 1979

Treatment (No.), farm (ID)	No. chicks placed	IBDV vaccine dosage at: Day-1 (0.5)[2]	Day-10-15 (1.0)[3]
(1) Vaccinated			
A	41,400	+	-
B	30,400	+	-
C	44,630	+	-
D	18,400	+	-
(2) Vaccinated			
A	12,000	-	+
B	15,500	-	+
C	31,000	-	+
D	34,700	-	+
E	30,055	-	+
F	36,400	-	+
(3) Vaccinated			
A	31,600	+	+
B	15,000	+	+
C	38,000	+	+
D	31,600	+	+
E	9,000	+	+
(4) Control			
A	29,525	-	-
B	34,615	-	-
C	12,840	-	-
D	31,800	-	-

[1]Date of placement: (1) 7/17; (2) 7/19; (3) 7/16; (4) 7/20.
[2]Via injection-hatchery.
[3]Via water growout.

TABLE 2. IBDV TRIAL: (SUMMARY-PRODUCTION)

Treatment	Average weight F	Average weight G	Livability	Lb. condemned[1]	Savings cost/lb. over controls
			Pct.	*Pct.*	*Ct.*[2]
(1) Vaccinated	3.91[a]	2.04[a]	95.84[a]	1.36[a]	+.48 (+.42)[a]
(2) Vaccinated	3.87[a]	2.06[a]	96.65[a]	1.41[a]	+.28 (+.15)[a]
(3) Vaccinated	3.59[b]	2.05[a]	96.57[a]	1.78[ab]	−.12 (−.34)[b]
(4) Control	3.71[ab]	2.04[a]	94.52[a]	2.11[b]	—

[1]Figures summarized from condemnation certificates.
[2]Figure in parentheses includes cost of vaccine. Numbers followed by different superscript within the same column differ significantly ($P < 0.05$).

PROBLEMS IN FINANCING THE FARM

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SOMEONE has to farm if we eat.

As each day passes it becomes more difficult for farmers to continue operation and for young farmers to begin farming. Many problems center in financing the farm, in particular farm real estate. Major problems farmers face arise from growing capital investment requirements, higher interest rates, increasing demands on cash flow for debt retirement, and accelerating vulnerability of the farm to outside economic forces.

Growing Investments

The average total investment per farm in the United States was reported as $258,824 in 1979. This has more than doubled since 1973 as a result of inflation, larger farms, higher farm real estate values, and increased amounts of farm machinery and livestock on farms.

Farm real estate accounts for about 79% of the total farm capital investment. Farm real estate investment per farm has increased 138% since 1973. This resulted from increasing size of farms and higher values per acre. In only 2 years since 1940, 1950 and 1954, did the average value of farm real estate per acre decline.

Farm real estate is not only higher priced, but number of sales has declined since 1974. For a new entrant to farming, competition in the farm real estate market is a real problem. USDA statistics show that 63% of farm purchases in recent years have been for farm enlargement purposes. In many cases a higher than normal market value has been paid by farmers for adjoining or nearby tracts of land. Farmers are major purchasers of land, having bought 67% of the acres of farm real estate sold in 1979.

With higher investments required, credit financing has become a critical factor. Ninety percent of the farmland transfers in the United States in 1979 involved credit financing, compared to 80% in 1970 and 67% in 1960. The availability of credit and terms involved are important to both new and existing farmers.

Surprisingly, the ratio of debt-to-assets on farms has not changed greatly in recent years. Although debt has increased, the value of assets, in particular farm real estate, has gone up. Thus, many farmers have been able to finance additional real estate and other items on the basis of equity they have built in their farms over a period of time. This has been advantageous as farm values increased, but complications have come in recent months as real estate values stabilized.

Higher Interest Rates

Interest rates have increased substantially in recent months. Interest costs are considerably more significant as a cost item than they have been in the past. Interest is a cost for the use of capital, and capital has substituted for labor to become a major farm input. In 1950, capital accounted for 25% of all resources used in farming, but by 1977 it had increased to 43%.

Higher interest costs along with accelerating costs for most other farm inputs place a farmer in a vulnerable position if gross income does not increase. As illustrated, in Year 1 a farmer had $80,000 gross receipts, $60,000 in production expenses, and $20,000 net income. In Year 2 his gross income was the same but production costs increased 10%. As a result, his net income declined 30%. Considering the increase in living costs which may come out of net farm income if members of the household are not working off the farm, the drop in debt repayment capacity may be even greater.

	Year 1	*Year 2*	
Gross income	$80,000	$80,000	
Costs	60,000	66,000	(increase 10%)
Net income	$20,000	$14,000	(decline 30%)

The example points up one of the reasons farmers have continued to expand production in the face of increased costs.

High interest rates also present a problem for the farmer who is buying a farm or additional land. For example, the total interest cost to borrow $100,000 at 8% for a 15-year period with annual payments is $75,233. However, for the same loan at 16% interest rate the total interest cost is $169,035, more than double the amount at 8%.

COMPARISON OF ESTIMATED COSTS AND RETURNS FOR SOYBEANS IN ALABAMA AND CORN BELT

Item	Corn Belt	Alabama
Yield per acre, bu.	32	24
Price per bu., dol.	6.00	6.00
Gross return, dol.	192.00	144.00
Costs per acre (variable and fixed costs including management, but excluding land), dol.	95.00	110.00
Net return to land, dol.	97.00	34.00
Assumed average value of land per acre, dol.	2,000.00	500.00
Return on present average value of land, pct.	4.8	6.8
Interest cost at 15% based on average value of land, dol.	300.00	75.00

Total interest costs also increase as the length of a loan increases. If the $100,000 loan at 16% is made for 30 years, the total interest cost is $385,642, compared to $169,035 for the 15-year period.

Other terms of financing a farm, such as the amount of down payment, also affect the amount of interest paid. Terms of financing should be evaluated critically in light of possible income generated and available for debt payment. If this is not done, cash flow problems are likely to arise.

Interest Costs and Land Returns

The present level of interest rates also points up problems faced by farmers in analyzing returns to land and in making decisions about the purchase of land. The table provides an estimate of costs and returns for soybeans in Alabama with average farmland values in the vicinity of $500 per acre and in the Corn Belt with average values approximating $2,000 per acre.

With the assumed yields, prices, and costs, the estimated return on the average value of land is 4.8% in the Corn Belt and 6.8% in Alabama. However, interest on the market value of the land at 15% would be $300 per acre for the Corn Belt and $75 per acre for Alabama. Obviously, this amount of interest, if considered as a cash cost, could not be paid from use of the land for soybeans or most other crops. The implication for a slowing of appreciation in land values adds further complications to the problem.

Farmers face serious problems in farm financing in the 1980's. If they are to survive, the best of farm financial management must be used.

GOOD STEER GAINS MADE on Fescue, Phalaris Pastures

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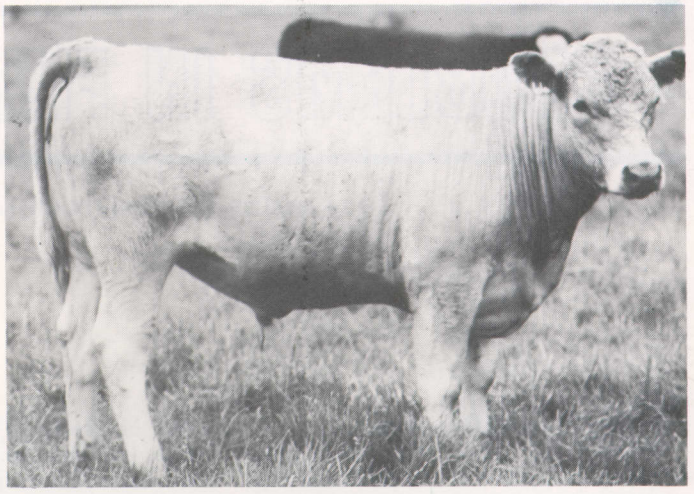

Excellent appearance of this steer coming off fescue grazing illustrates the good steer performance during the 3 test years.

DAILY GAIN of over 1.7 lb. per day by steers grazing perennial pasture sounds almost too good to be true. But such gains were achieved over a 3-year period on both Kentucky 31 tall fescue and AP-2 phalaris grass pastures at the Black Belt Substation.

What makes these results so spectacular is the usual low average grazing gain of growing steers on tall fescue without legume—often 1 lb. per day or less over the season. The other cool season perennial grass in the test was AP-2 phalaris, a variety developed by the Auburn University Agricultural Experiment Station. This grass incorporated phalaris introductions from the Mediterranean area having high digestibility and winter forage production, and was thought to be potentially superior to tall fescue in animal performance.

Three paddocks of each grass, each 3 acres in area, were planted on prepared calcareous soil in October 1974. Nitrogen at 100 lb. per acre was applied in September and again in February on both grasses.

Crossbred steers weighing approximately 500 lb. were purchased each September and grazed during the seasons of 1975-76, 1976-77, and 1977-78. During January and February when sufficient grazing was not available, steers were removed from the paddocks and fed hay and a protein-mineral-vitamin supplement.

Phalaris was more summer dormant than tall fescue, resulting in less forage available throughout the summer and a lower stocking rate. There were more weeds in phalaris pastures than in tall fescue, especially by the third year. Digestibility of both grasses was highest in late winter-early spring, declining in May and June. There was no difference in digestibility between the two grasses.

Average grazing periods for the 3 years were from October 17 to December 26 and March 7 to June 19. Tall fescue had greater carrying capacity than phalaris, which resulted in 87 lb. more beef gain per acre annually, see table. Average daily gain of steers was high and about equal for the two cool season perennial grasses.

Steers on both grasses had excellent appearance from the standpoint of hair coat and degree of finish at the end of the grazing season. No problems were encountered with fescue toxicity during any of the 3 years.

The most interesting finding was that daily gain of steers was nearly double that generally obtained on tall fescue pastures. Steers on both tall fescue and phalaris made gains similar to those obtained on high quality small grain pastures.

The reasons for the good performance on tall fescue are not known, but there are some exciting clues. A fungus, *Epichloe typhina*, which has been found in tall fescue pastures where animal gains are poor, was absent or at very low levels in grass in this experiment.

The fungus occurs between cell walls of the grass leaves and stems and cannot be seen externally. It is possible that the fungus may produce some compound that is toxic to cattle. Research in progress to identify the causes of poor performance of cattle grazing tall fescue is seeking to determine the role of the fungus, and to find ways to eliminate the problem.

Results of this grazing study indicate that tall fescue has the potential for better animal performance than is now being realized. Phalaris pasture also furnished good gains, but had a lower carrying capacity and was less persistent under grazing than tall fescue.

PERFORMANCE OF STEERS ON TALL FESCUE AND PHALARIS PASTURES, BLACK BELT SUBSTATION, 1975-78 AVERAGES

Grass species	Days of grazing	Carrying capacity, steers/acre	Animal days/acre	Beef gain per acre	Average daily gain
	No.	*No.*	*No.*	*Lb.*	*Lb.*
Kentucky 31 tall fescue	182	1.40	246	434	1.78
AP-2 phalaris	173	1.26	202	347	1.73

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