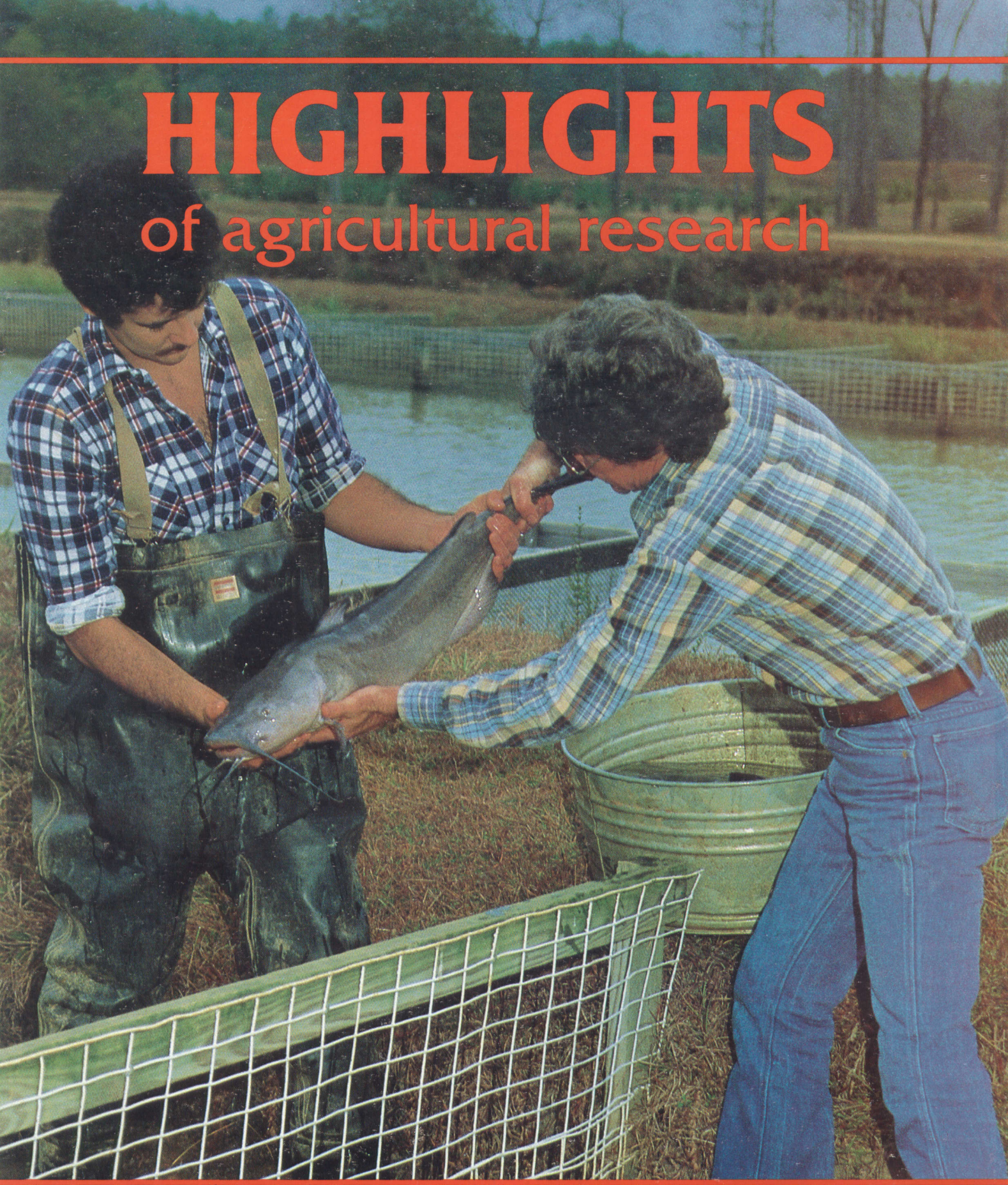
HIGHLIGHTS
of agricultural research



Vol. 29 No. 4
AGRICULTURAL EXPERIMENT STATION
GALE A. BUCHANAN, DIRECTOR

Winter 1982
AUBURN UNIVERSITY
AUBURN UNIVERSITY, ALABAMA

DIRECTOR'S COMMENTS

PRODUCTION OF MOST agricultural commodities throughout the South and, indeed, much of the Nation is at record or near record levels. As a result of this bountiful harvest, we are again hearing the old question, "With surpluses of almost everything, why should we continue investing in agricultural research?" What is particularly frustrating to those of us involved in agriculture is that this question is sometimes raised by people associated with various facets of agriculture.

GALE A. BUCHANAN

There is a good response to this question. First, the need for agricultural research is a long-term proposition, which requires continuing investment. Just as you wouldn't pay for fire insurance for only part of the time, it is unreasonable to consider supporting a research program only in times of poor crops or food and fiber shortages. Research is not like a faucet to be turned on and off at will. It is an investment in the future.

Because of the increasing sophistication of agriculture, the problems that must be addressed by agricultural research are becoming more complex. Such problems are often not solved readily by individual scientists but must be addressed by teams of scientists. Furthermore, such problems often require considerable fundamental research before implementation research can be accomplished.

A second good reason why research must continue, even in the face of mounting surpluses, is that much of our research is not necessarily directed towards increasing production. Obviously, improving yields is a prime objective of research, but increasing production efficiency and improving crop quality can be effective means of increasing profit margins.

Indeed, the latter is a highly desirable approach. Much of the research in controlling pests such as weeds, insects, diseases, and nematodes is concerned with establishing effective control or management with a minimum of input while maintaining yields. Fertility research supported by our soil testing laboratory is directed towards maintaining acceptable levels of crop yields with a minimum expenditure in fertilizers.

Research dealing with biological control of insects is concerned with the establishment of acceptable low levels of insect populations at a minimum input.

Developing new and more effective ways of utilizing agricultural commodities is also a high priority. Use of the Auburn developed restructuring process to enable more efficient utilization of low quality cuts of meat is an effective means of increasing profit margins for beef and swine producers while assuring good quality food at reasonable cost.

Other research in the Alabama Agricultural Experiment Station is directed towards developing more use for low value hardwood species.

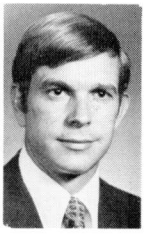
Ongoing research dealing with protecting and improving the quality of our environment and safeguarding our important soil resources is an investment we must make for future generations.

One reason that American agriculture continues to be successful is that research has in many cases had answers ready when trouble arose. For example, not many years ago peanut leafspot disease suddenly developed resistance to the commonly used fungicide and Alabama's peanut crop was threatened. But Auburn research already had the data needed to allow a shift to another effective product. New sericea varieties that fill the need for a productive summer legume are available now because of forward looking Auburn research.

The need for research becomes even more critical as farmers' profit margins continue to shrink, threatening the very existence of our successful agricultural economy. The challenge is to discover means of increasing profits for farmers while maintaining levels of food production needed to sustain a hungry world.

may we introduce . . .

Dr. John Franklyn Pritchett, former Alumni Associate Professor in the Department of Zoology-Entomology, who was promoted to Department Head November 1, 1982. In his new job, a joint appointment in the School of Agriculture, Forestry, and Biological Sciences and the Alabama Agricultural Experiment Station, Pritchett will be responsible for both teaching and research activities of that large and diverse department.



Although he was born in Illinois, Pritchett grew up in southeast Alabama and attended public schools of Geneva and Dothan. He received his B.S. in 1965 and M.S. in 1968 from Auburn University, and the Ph.D. in animal physiology was awarded by Iowa State University in 1972. He joined the Auburn faculty as assistant professor of zoology-entomology in 1973, following teaching experience at Lambuth College, Jackson, Tennessee. His Auburn research has been in the area of endocrine physiology.

Pritchett was recently elected vice president/president elect of the Alabama Academy of Science. He holds membership in several honor societies and professional organizations.

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

ON THE COVER: Mass selection improves body weight of channel catfish. Related story page 7.

BREED EFFECTS AND CARCASS CHARACTERISTICS OF CATTLE FINISHED ON FORAGE AND GRAIN MANAGEMENT SYSTEMS

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N.R. McDANIEL and E.L. CARDEN, Gulf Coast Substation
J.A. LITTLE, Lower Coastal Plain Substation

CONFLICTING RESULTS have been reported on the tenderness of grain-fed versus pasture-fed beef. Some reports indicate no difference in tenderness, but further studies are needed to determine magnitude of the breed effect on the quality of animals fed on the different regimes.

Tests are currently being conducted at the Alabama Agricultural Experiment Station to compare some breeds finished on grain and forage, determining whether the breed or feeding regime effect is more significant on the quality attributes of the beef produced.

In the present study, 26 steers were finished on rye and ryegrass pasture, while 29 steers were finished on a blended high-energy ration (70% corn, 12% hay). The breeds used in this study were Angus, Angus x Hereford, and Santa Gertrudis x Hereford crossbreds. The live weights of the animals ranged from 790 to 1,175 lb. and all were A maturity. Quality grades ranged from high USDA Choice to high USDA Standard. Six 1-in. rib steaks were removed from each animal (from the 10th, 11th, and 12th rib section) and used for subsequent sensory and chemical evaluation.

Eight sensory panelists were selected from the staff of the Department of Animal and Dairy Sciences, Auburn University, to rate the quality attributes of the steaks. Each panelist was asked to rate tenderness, juiciness, connective tissue, and flavor. The Warner-Bratzler Shear test (which measures the force required for a pressure-monitored knife blade to shear a 1-in. cylinder of meat) was used as an objective indication of tenderness. Also, cooking losses were determined for each steak.

Table 1 indicates that yield grade of grain-fed animals was significantly less desirable than pasture finished, regardless of breed. This was because of higher backfat and kidney, pelvic, and heart fat of the grain-fed cattle.

The quality grade attributes shown in table 2 indicate that grain-fed Angus x Hereford crossbred cattle had a higher quality grade than the other comparisons. The lean firmness of the grain-fed cattle was rated more desirable than that of the pasture-fed cattle. Angus x Hereford crossbred cattle finished on pasture were rated the least desirable in all quality grade attributes, while the same breed group was rated most desirable when finished on grain.

The proximate analysis data showed that grain-fed cattle had a higher fat content than pasture-finished cattle, regardless of breed. All other properties were similar for breeds and feeding regimes except tenderness. Sensory panel ratings indicated that grain-fed Angus and Hereford were the most tender, while pasture-fed Angus and Hereford were the least tender. Warner Bratzler Shear values, however, were highest for grain-fed Santa Gertrudis crosses and lowest for pasture-fed Santa Gertrudis crosses.

The major differences between the cattle studied for this project occurred between the forage- and grain-fed cattle rather than between the breeds compared. A major factor contributing to this difference was the additional fat content of the grain-fed cattle. Sensory properties indicated there is not a great deal of difference between the eating quality of any of the four types studied except when tenderness is considered. With further research designed to increase tenderness of pasture-fed beef, many breeds of cattle may produce forage-fed beef equal in quality to grain-fed beef.

TABLE 1. YIELD GRADE VARIABLES

Breeds	Live wt.	Carcass	Dressing	Backfat thickness	Rib eye area	Body cavity fat	Yield grade
	Lb.	*Lb.*	*Pct.*	*In.*	*Sq. in.*		
Grain-fed							
Hereford-Angus x	939	570	60.7	0.7	10.1	2.4	3.6
Santa Gertrudis x	1,020	615	60.3	.6	10.6	2.9	3.4
Pasture-fed							
Hereford-Angus x	1,019	580	57.0	.4	11.1	2.0	2.4
Santa Gertrudis x	1,057	589	55.7	.3	10.3	1.6	2.6

TABLE 2. QUALITY GRADE VARIABLES

Breeds	Marbling	Marbling texture[1]	Lean color[2]	Lean firmness[3]	Lean texture[4]	Quality grade
Grain-fed						
Hereford-Angus x	5.0	1.1	1.5	1.6	1.7	Good+
Santa Gertrudis x	4.3	1.0	1.6	1.8	2.2	Good-
Pasture-fed						
Hereford-Angus x	4.0	1.6	2.0	2.7	3.1	Good-
Santa Gertrudis x	4.1	1.2	1.9	2.5	2.9	Good-

[1]1 = fine, 2 = medium, 3 = coarse.
[2]1 = very light cherry red, 7 = black.
[3]1 = very firm, 7 = very soft.
[4]1 = very fine, 7 = very coarse.

TABLE 3. PROXIMATE ANALYSIS AND SENSORY EVALUATION

Breeds	Moisture	Fat	Tenderness[1]	Juiciness[2]	Connective tissue[3]	Flavor[4]	Cooking loss	Warner Bratzler Shear
	Pct.	*Pct.*					*Pct.*	*Kg*
Grain-fed								
Hereford-Angus x ...	72.2	4.6	5.1	5.8	5.7	5.3	22.2	8.2
Santa Gertrudis x ...	73.6	3.5	4.9	5.3	5.3	5.2	24.0	10.0
Pasture-fed								
Hereford-Angus x ...	74.4	2.6	4.0	5.1	5.3	5.3	24.8	8.3
Santa Gertrudis x ...	74.1	2.5	4.4	5.5	5.7	5.4	23.3	6.7

[1]1 = extremely tough, 8 = extremely tender.
[2]1 = extremely dry, 8 = extremely juicy.
[3]1 = abundant, 8 = none.
[4]1 = extremely bland, 8 = extremely intense.

STEERS MAKE GOOD GAINS GRAZING SERICEA AND ALFALFA

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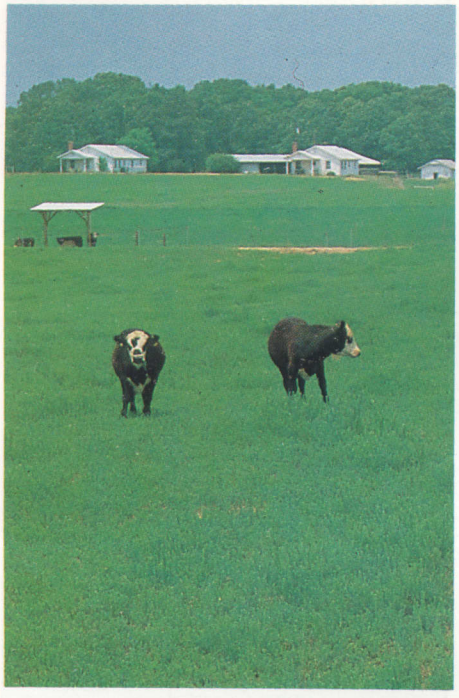
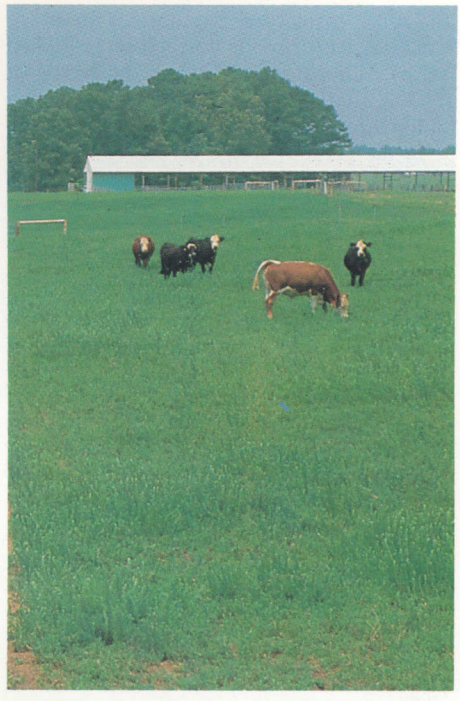
C.S. HOVELAND[1], Department of Agronomy and Soils, R.A. MOORE, Upper Coastal Plain Substation





AU Lotan rotational grazing (left) and Serala rotational grazing (above).

THE INCREASING COST of commercial nitrogen fertilizer for grass pastures has caused a renewed interest in legumes. One of the big needs in the Southeastern States is a high-yielding summer perennial legume, one that will produce forage with sufficiently high quality for good animal gains. First-year results of a grazing experiment at the Upper Coastal Plain Substation indicate that two Auburn developed sericea varieties may fill this need.

Serala and AU Lotan sericea were released in 1962 and 1980, respectively, by the Alabama Agricultural Experiment Station. Both are fine-stemmed, leafy varieties.

Serala is high in tannin content, while AU Lotan contains only about one-half as much tannin. As a result, AU Lotan is 27% higher in digestible dry matter. AU Lotan produces 85% as much hay as does Serala and is 7% higher in crude protein at the hay stage.

In the spring of 1980, three paddocks of Serala sericea and six paddocks of AU Lotan sericea were planted at the Upper Coastal Plain Substation. During the fall of 1980, three paddocks of Cimarron alfalfa were established. All paddocks were 3 acres in size. In addition, 5-acre pastures of alfalfa and Serala sericea were planted to hold extra steers needed to adjust stocking rates to maintain constant grazing pressure on all the experimental paddocks. These additional "put-and-take" steers were used to keep plant height on the paddocks between 4 and 8 in.

The drought of 1980 delayed the grazing test until 1982. All paddocks, except three AU Lotan paddocks, were divided into three 1-acre subpaddocks and were rotationally grazed. Steers were rotated sequentially to the next area each week. The remaining three AU Lotan paddocks were grazed continuously throughout the growing season.

The paddocks were stocked with 500-lb. Angus x Hereford steers. Grazing began March 17 on the alfalfa and April 5 on the two sericeas. Salt, shade, and water were available in all paddocks and, in addition, steers grazing the alfalfa paddocks were provided poloxalene blocks for bloat control.

Alfalfa's reputation as a high quality forage was verified in the 1982 grazing test. The alfalfa provided 184 days of grazing compared to 165 days for the two sericeas, see table. Alfalfa also had the best carrying capacity and the highest average daily gain, resulting in nearly 200 lb. more beef gain per acre than the sericeas.

Even though steer gains on the alfalfa were best, gains on all the sericea paddocks averaged nearly 2 lb. per day, which is also excellent. The apparent low stocking rate of the rotationally grazed AU Lotan was mostly because of a poor stand in one paddock.

Summer perennial grasses commonly used in Alabama, such as bermudagrass and bahiagrass, produce season-long gains of only about 0.8 to 1.2 lb. per day. Daily gains of steers on dallisgrass are generally a little better than bermudagrass or bahiagrass, but the stocking rate is not as high. Thus, with the gains seen in the first year of this study, both sericea and alfalfa appear to offer excellent alternatives to the perennial grasses. They also offer the additional advantage of requiring no nitrogen fertilization.

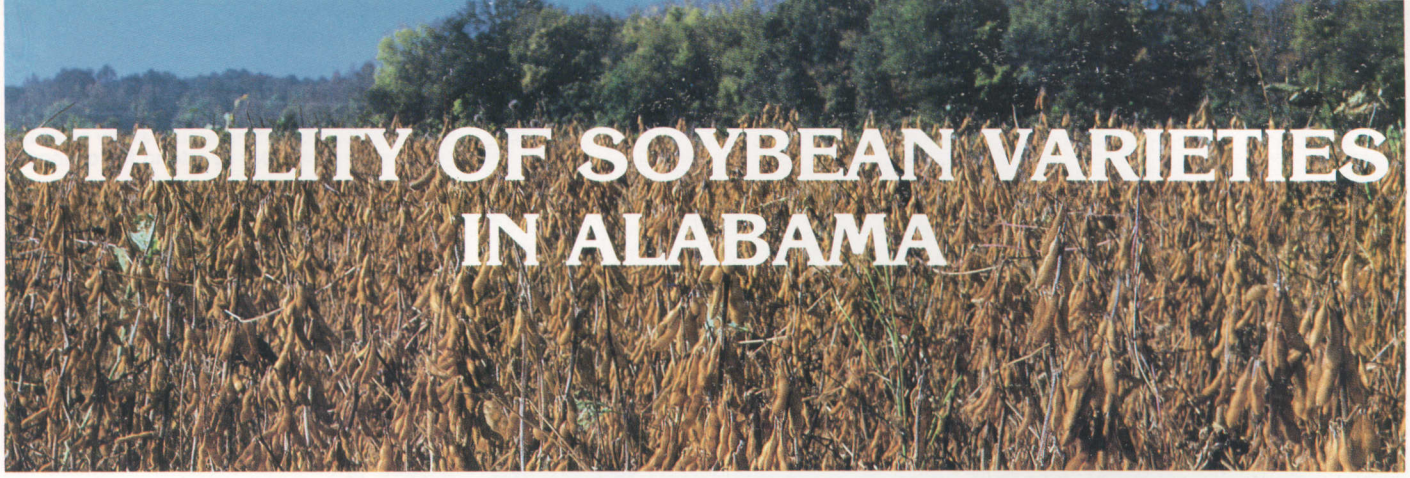
Both Serala and AU Lotan withstand hot weather and are tolerant of acid soils. Alfalfa is not as widely adapted as sericea, but can be grown on well-drained, fertile soils throughout the State.

No conclusions can be drawn after just 1 year of grazing. But the results indicate that sericea and alfalfa can be utilized profitably for summer pastures. If grazing results continue to be satisfactory in this experiment, Alabama cattlemen should be able to develop lower-cost pasture systems to beat the high cost of nitrogen fertilizer.

PERFORMANCE OF STEERS ON ALFALFA AND SERICEA PASTURES, UPPER COASTAL PLAIN SUBSTATION, WINFIELD, 1982

Legume species and grazing method	Days of grazing	Carrying capacity, steers/acre	Animal days/acre	Beef gain per acre	Average daily gain
	No.	*No.*	*No.*	*Lb.*	*Lb.*
Rotational grazing					
Alfalfa	184	1.37	253	597	2.33
Serala sericea	165	1.29	213	419	1.82
AU Lotan sericea	165	1.12	185	385	2.03
Continuous grazing					
AU Lotan sericea	165	1.22	202	403	1.89

[1]Resigned. Now Professor of Agronomy, University of Georgia.



STABILITY OF SOYBEAN VARIETIES IN ALABAMA

D.B. WEAVER, D.L. THURLOW, and G.V. GRANADE
Department of Agronomy and Soils

ONE OF THE MOST important management decisions a soybean grower makes is selection of the proper variety. Many factors can influence the final decision—relative seed costs, pest reaction, herbicide tolerance, maturity date, and others. The decision is further complicated because Alabama soybean variety test results for the past years indicate some varieties perform well in some years and not in others, even at the same location.

The final seed yield of any soybean variety is determined by both the genetic yield potential and the yield potential of the environment. The genetic yield potential is a fixed quantity for any particular variety and cannot be changed or manipulated. The level of productivity of a particular environment can be influenced by moisture availability, soil type, fertility level, temperature, length of growing season, and many other variables. Some of these quantities are fixed and others may change from year to year within a particular location.

The genetic yield potential of each variety reacts differently to different environments. This is called an interaction effect, and explains why cultivars are recommended on a regional basis within the State instead of a statewide basis. Because of this interaction effect, it should be possible to select a variety that would provide maximum yields in a given environment. However, because environments change from year to year in a location, this is not possible. The next best alternative would be to select varieties based on their stability or consistency of performance from one environment to another.

Although two varieties may have the same average seed yield over a series of environments, one variety may be quite variable in yield from one environment to another (extremely high in good years, extremely low in poor years) and the other variety may be less variable, producing more consistent yields (about the same in both good and poor years). Although the example may be somewhat extreme, it is possible through statistical analysis to determine if soybean varieties differ in their stability or consistency of performance.

Published results of the Alabama soybean variety tests, 1976 to 1981, were used to compare relative stability of several of the most widely grown soybean varieties in central and south Alabama. Since all varieties were not grown in all years, the data were divided into two groups for analysis, 1976-1978 and 1979-1981.

A direct measure of a variety's consistency of yield performance across many environments is the deviations mean square, or DMS. A low DMS value in comparison to the other varieties indicates a high degree of stability, or very consistent performance. A high DMS indicates inconsistent yield performance across environments. Forrest, Coker 136, Coker 156, and Cobb had relatively high DMS values, and Centennial, Tracy, Bragg, Braxton, GaSoy 17, Coker 338, and Coker 488 had relatively low values, see table.

Another statistic that helps describe a variety's reaction to changes in the environment is the regression coefficient, or B value. The B value is a measure of the variety's sensitivity to changes in the production level of the environment. A negative B value indicates a variety relatively insensitive to environmental variation, and a positive B value indicates a variety with greater than average sensitivity to changes in the environment. For example, a variety such as Coker 136 with a B value of -0.19, see table, has a tendency to be less influenced by the production level of the environment in the determination of final seed yield. In contrast, a variety such as Coker 237 (B = 0.25) or Hutton (B = 0.10 and 0.09) is more influenced by the production level of the environment, tending to yield better than average in highly productive environments and lower than average in poor environments. Most of the varieties have B values of zero, indicating average response to changes in production level of the environment.

An ideal soybean variety should have a high seed yield, a low DMS, and a B value of zero to be best suited to a wide range of environments. Most growers are familiar with the inherent productive capacity of his individual fields. With this information, these stability performance estimates can serve as additional criteria for selecting the most profitable variety.

AVERAGE SEED YIELDS, DEVIATIONS MEAN SQUARES (DMS), AND REGRESSION COEFFICIENTS (B) FOR SEVERAL SOYBEAN VARIETIES

Variety	Av. seed yield		DMS		Regression coefficient[1]	
	1976-78	1979-81	1976-78	1979-81	1976-78	1979-81
	Bu.	*Bu.*				
Group V						
Forrest	30.8	22.4	21.9	23.9	.00	.00
Group VI						
Davis	34.5	26.2	10.5	13.7	.00	.00
Coker 156	-	26.8	-	18.9	-	.00
Coker 136	29.8	-	21.7	-	-.19	-
Centennial	33.3	26.5	7.3	9.0	.00	-.10
Tracy	33.0	-	9.3	-	.00	-
Group VII						
Bragg	36.6	26.4	9.3	5.9	.00	.00
Braxton	-	28.5	-	7.4	-	.00
Ransom	36.1	26.4	15.4	6.5	.19	.00
Coker 237	-	28.0	-	12.1	-	.25
GaSoy 17	-	27.6	-	7.2	-	.00
Group VIII						
Dowling	-	26.3	-	9.2	-	.00
Cobb	36.0	25.6	19.1	23.3	.00	.00
Hutton	36.2	24.5	8.0	10.3	.10	.09
Coker 338	37.2	-	5.4	-	.00	-
Coker 488	-	27.0	-	6.7	-	.00

[1]Zero regression coefficients are reported where the analysis yielded estimates of B not significantly different from zero.

Synchronized breeding would allow producers to schedule labor to attend farrowings.

Auburn Evaluation of Altrenogest Shows Promise for Swine Estrus Synchronization

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J.R. DIEHL, Department of Animal Sciences, Clemson University

SYNCHRONIZATION OF ESTRUS in replacement gilts to allow for close grouping of breeding and farrowing could greatly increase management and labor efficiency in a swine operation. However, swine producers have been unable to coordinate farrowings by synchronized, scheduled breeding because suitable compounds for swine were not available.

At present, when replacement gilts are added to the breeding herd, the breeding period must last at least 21 days to allow all gilts to cycle or, if using shorter breeding periods, two to three times the number of gilts needed must be available so that a sufficient number will cycle during the breeding period. This represents a large expense for extra gilts, feed, and labor, especially on farms that replace 20 to 50% of their sows each breeding period.

Synchronized breeding would result in farrowing of groups of sows over shorter time periods. This would allow the producer to schedule labor to attend farrowings, which should result in higher pig survival. Other advantages include more precise scheduling of facilities and labor for weaning, moving, ration changes, and herd health practices. The producer could also benefit by selling larger groups of more uniform pigs at market time.

Although researchers have been moderately successful in the synchronization of estrus through the use of rigid injection schemes, these programs are not practical for most swine operations. The producer has wanted a compound that could be added to the feed, fed for a specified number of days, and, upon withdrawal of the feed additive, would cause his gilts to come into estrus in the span of a few days. Results of research at the Alabama Agricultural Experiment Station indicate that a new compound, Altrenogest, may provide effective synchronization of estrus in cycling gilts and sows.

A total of 48 crossbred gilts, divided into six treatment groups, was used in the study. The objective was to determine the effect of feeding different doses of Altrenogest on the number of days to estrus after withdrawal of the feed additive, ovulation rate, length of gestation, litter size, and birth weight of piglets. One group of eight gilts did not receive Altrenogest in their feed and served as a control group. The gilts in each of the other five groups received 10, 12.5, 15, 17.5, or 20 mg of Altrenogest daily. The Altrenogest was mixed with the 4 lb. of feed that each gilt received in individual feeding stalls and was consumed for 18 days. After the eighteenth day of feeding, all gilts continued to receive 4 lb. of complete feed daily through gestation. All gilts consumed their feed readily. The gilts were checked for signs of estrus twice daily, using an intact boar, and were bred by artificial insemination 12 and 24 hours after first being detected in estrus.

All gilts receiving Altrenogest exhibited estrus during the third to the sixth day after withdrawal of the feed additive. The time until estrus was not influenced by the dosage of Altrenogest received. As a result, the 40 treated gilts were bred by artificial insemination in a span of 4 days. The average number of ovulations ranged from 14.2 to 16.5 for the five treatment groups, and this was not influenced by the dosage of Altrenogest. Similarly, the average ovulation rate by gilts in the control group was not different than that by treated gilts. Neither was there any significant effect on the number of cystic follicles or the number of gilts having cystic follicles across all six treatment groups.

Of the 48 gilts bred, 35 were determined to be pregnant 7 weeks after breeding and these farrowed after a normal gestation. The overall conception rate was 90%, which included a 100% conception rate for the controls and 87.5% for the treated gilts. Both of these conception rates are respectable by industry standards for artificial insemination and the differences were not statistically different across all treatments.

The gilts farrowed an average of 8.9 live pigs. The dosage of Altrenogest did not influence the number of pigs born live or the total number of pigs born. Other researchers have indicated that only 60 to 67% of the ova produced result in live pigs at farrowing. Our results were similar in that the overall survival rate was 67.1%, and no significant differences were detected among the treatment groups. Birth weights of pigs, an average of 2.7 lb., were not influenced by the dosage of Altrenogest received prior to breeding.

Results of the Auburn studies suggest that the synthetic progestagen, Altrenogest, is an effective agent for the synchronization of estrus among cycling gilts. As such, it should prove to be a useful tool for swine producers who wish to concentrate their work load in the farrowing house or during the breeding season. The availability of an effective synchronizing agent is expected to enhance the use of artificial insemination since fewer boars will be needed to breed the same number of gilts. With synchronization, the labor needed for detection of estrus and for multiple collections from boars will be reduced since a large number of gilts can be bred in a 3- to 4-day period. Altrenogest is currently being evaluated by the FDA for approval for use by the swine industry. A decision should be forthcoming in the next few years.

Improving Body Weight of Channel Catfish by Mass Selection

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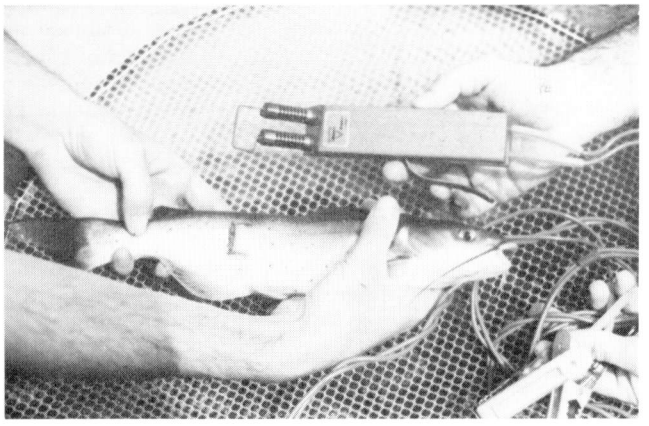
Department of Fisheries and Allied Aquacultures

CHANNEL CATFISH PRODUCTION in the United States during 1980 was approximately 125 million pounds. Even slight improvement in channel catfish body weight would result in millions of pounds of additional production. One method of improving body weight could be realized through mass selection—a potential breeding program accomplished by mating the largest males with the largest females.

Response to selection and realized heritability for body weight were determined for three strains of channel catfish, *Ictalurus punctatus*, grown in earthen ponds at 3,000 per acre. The three populations, Rio Grande (Texas), Marion (Alabama), and Kansas (Kansas), had different histories of domestication—10 years, 20 years, and 60 years, respectively. At a harvest weight of approximately 1.1 lb., the largest 10% of each population was selected. The growth performance of progeny from selected fish was compared to that of progeny from randomly chosen fish.

All three strains responded ($P < 0.001$) to selection, see table. Average increase in body weight was 0.14 lb. (16%), and average realized heritability was 0.34 ± 0.07. Responses to selection of 0.14, 0.16, and 0.12 lb. (17, 18, and 12% increase in body weight) were obtained from Rio Grande, Marion, and Kansas strains, respectively. Response was higher for Marion than for Kansas ($P < 0.001$) and Rio Grande ($P < 0.05$). Generally, the fish with the least amount of domestication had the greatest response.

Realized heritability for Marion, 0.50 ± 0.13, was higher ($P < 0.01$) than that for Rio Grande, 0.24 ± 0.06. Kansas, 0.33 ± 0.10, did not differ ($P>0.05$) from Rio Grande or Marion. Responses for male and female body weights were the same in Marion ($P>0.05$), but response by Kansas males was higher than that for Kansas females ($P<0.05$). There were no significant differences in realized heritabilities for male and female body weights ($P>0.05$). Improved growth of select progeny was a result of food consumption rate, food conversion efficiency, and disease resistance.



ABOVE: Selected brood fish with brand marks. LEFT: Branding gun used for heat branding channel catfish broodstock.

The progress made through one generation of mass selection was similar to that of two alternative breeding programs for channel catfish—crossbreeding and interspecific hybridization. Growth of catfish can be improved 20% by hybridizing (female) channel catfish with (male) blue catfish, *Ictalurus furcatus*. Intraspecific crossbreeding of channel catfish can result in a 10% increase in growth rate.

However, problems in seed fish production for crossbreeding and hybridization may limit immediate usefulness. Since significant responses to selection in all three strains—Rio Grande, Marion, and Kansas—were found, mass selection should be the currently recommended breeding program.

RESPONSE TO SELECTION FOR BODY WEIGHT IN RIO GRANDE, MARION, AND KANSAS CHANNEL CATFISH GROWN IN EARTHEN PONDS AT 3,000 PER ACRE

Population[1]		Mean weight (SD)	N	Response	Selection differential	Realized heritability ± SE
		Lb.		*Lb.*	*Lb.*	
Rio Grande	(S)	0.95 (.30)[2]	1,044	0.14	0.58	0.24 ± 0.06
	(R)	.81 (.24)	1,068			
Marion	(S)	1.07 (.32)[2]	1,674	.16	.32	0.50 ± .13
	(R)	.91 (.22)	1,656			
Kansas	(S)	1.13 (.31)[2]	1,692	.12	.36	0.33 ± .10
	(R)	1.01 (.24)	1,764			
Pooled	(S)	1.05 (.34)[2]	4,410	.14	.42	0.34 ± .07
	(R)	.91 (.26)	4,488			

[1]S = progeny from selected brooders, R = progeny from randomly chosen brooders.
[2]Significantly different ($P < 0.001$).

Choice of Breed Combinations Affects Beef Production Profits

Charolais-Hereford-Angus cow with Limousin-sired calf at Black Belt Substation.

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SELECTING THE RIGHT breed combination offers cattlemen a practical way to increase beef production and maximize profits, a critical need with current high production costs. Success of this approach is indicated by findings of recent Alabama Agricultural Experiment Station research at the Black Belt Substation.

Results of the 5-year test established that (1) breed of sire affected birth weight of calves, and (2) breed of dam affected birth weight, weaning weight, and stocker grade of calves. Thus, breed of dam appears to offer opportunities for significant improvements.

For the experiment, semen was obtained from selected, above average Hereford and Limousin bulls and used to artificially inseminate (AI) cows of four breed compositions: (1) straight Hereford, (2) ¾ Hereford-¼ Angus, (3) ½ Charolais-½ Hereford, and (4) ½ Charolais-¼ Hereford-¼ Angus. Hereford bulls were used for clean up breeding following the AI period.

During the winter months, cows were fed 2 lb. of 41% cottonseed meal or equivalent per head daily plus johnsongrass hay *ad libitum*. Caley (wild winter) peas were grazed for approximately 50 days in late winter and early spring, and permanent pasture of primarily dallisgrass with some white clovers from late spring until late fall.

Creep feed was provided all calves during the winter and in 2 of the 5 years when drought conditions required additional feed during the summer months.

All calves were numbered and male calves castrated within 24 hours after birth. Sex, birth weights, birth dates, and dams' numbers were recorded. Two weaning dates were selected each year so that average weaning age of each group of calves would be approximately 250 days. All calves were weighed and assigned stocker grades at weaning.

Poor conception rates resulted from the use of AI; therefore, many of the calves were by Hereford clean up bulls. In addition, AI delayed conception, which produced an overall low percent calf crop, table 1. There were no differences in percent calf crop born and percent calf crop weaned among the different breeds of cows. Seven of the 10 calves that were born dead or died after birth were sired by Limousin bulls.

The number of calves weaned, birth weights, weaning weights, and stocker grades are shown in table 2 in such a manner that various comparisons are presented.

Calves by the Limousin bulls were heavier at birth than calves by the Hereford bulls. This increase in birth weight probably contributed to the death loss at calving referred to previously. There was no difference in adjusted weaning weight nor in stocker grade at weaning associated with breed of sire. This was surprising because all of the Limousin-sired calves were crossbreds while those by Hereford bulls were either straight Hereford or backcrosses. This would lead one to expect a difference caused by hybrid vigor in favor of the Limousin-sired calves, but this did not occur.

There were significant differences among the breeds of dam for birth weight, adjusted weaning weight, and stocker grade. However, most of these differences showed up in comparisons between straightbred and crossbred cows or between straight British breeding and cows that were half Charolais. Weaning weight differences amounted to 54 lb. per calf for crossbred over straightbred dams and 80 lb. per calf advantage for half Charolais over straight British bred cows.

Since there was no decrease in percent calf crop to offset the advantage of increased weaning weight, these differences became more important. At a market price of $65 per cwt., the crossbred and half Charolais calves are worth $35 and $52 per head more than the straightbred and British bred calves, respectively.

TABLE 1. REPRODUCTIVE PERFORMANCE BY BREED OF DAM

Performance measure	Hereford	¾ Hereford-¼ Angus	½ Charolais-½ Hereford	½ Charolais-¼ Hereford-¼ Angus
No. of cows exposed	62	79	45	95
Calving, pct.	82.2	88.6	84.4	85.3
Died, pct.[1]	2.0	4.3	7.9	3.7
Weaned, pct. of cows exposed	80.6	84.8	77.8	82.1

[1]Seven of 10 calves born dead or that died before weaning were Limousin-sired calves.

TABLE 2. LEAST SQUARES MEANS FOR PRE-WEANING TRAITS OF CALVES

Breed comparison	Number of calves weaned	Birth weight[1]	250-day adjusted weaning wt.	Stocker grade[2]
		Lb.	*Lb.*	
By breed of sire				
Hereford	158	76.3a[3]	556.2	14.0
Limousin	62	82.9b	568.4	14.2
By breed of dam				
Hereford	48	73.4a	518.4a	13.7a
¾ Hereford-¼ Angus	65	72.9a	527.7a	13.9a
½ Charolais-½ Hereford	35	86.3b	607.0b	14.6b
½ Charolais-¼ Hereford-¼ Angus	72	85.8b	596.1b	14.3b
Straightbreds vs. crossbreds				
Straightbreds	48	73.4a	518.4a	13.7a
Crossbreds	172	81.2b	572.5b	14.2b
British vs. ½ Charolais				
British	113	71.8a	518.9a	13.8a
½ Charolais-½ British	107	84.8b	598.9b	14.8b

[1]Includes calves born dead or died before weaning.
[2]Grade code: 13 = average Choice; 14 = high Choice, etc.
[3]Means followed by different letter differ at $P < 0.01$.

Isolation and Infection of Plant Protoplasts with a Virus

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PLANT PROTOPLASTS are isolated cells without the rigid cellulose walls. They are obtained from cells from which the wall has been removed by enzymatic or physical means. In appropriate media, isolated protoplasts remain alive and functioning for long periods of time and may regenerate cell walls, grow, and divide. Isolated protoplast systems hold much promise for physiology, genetics, and many other areas of agricultural research.

In recent years, virologists have begun using protoplasts to study mechanisms involved in virus infections of higher plants. Isolated protoplasts have several advantages over other systems for studying virus infection, the chief of which is that large numbers of cells can be infected synchronously. Some examples of protoplasts successfully infected with viruses include tobacco protoplasts with tobacco mosaic virus, potato virus Y and X, and pea enation mosaic virus; turnip protoplasts with cauliflower mosaic virus; cowpea protoplasts with cowpea mosaic virus; and barley protoplasts with brome mosaic virus.

Investigations into the possibility of using corn protoplasts to study infection by maize dwarf mosaic virus (MDMV) were initiated 2 years ago at the Alabama Agricultural Experiment Station. MDMV is an important pathogen of corn and sorghum in Alabama and most other areas where these crops are grown. To date, procedures for isolation and maintenance of corn mesophyll protoplasts have been developed, and some evidence of successful infection of them with MDMV has been obtained.

To isolate corn mesophyll protoplasts, primary and secondary leaves from 14-day-old corn seedlings are cut into sections 4-5 mm in length and incubated for 2 hours in a solution containing 2% cellulysin and 0.5 M mannitol. The protoplasts, figure 1, are collected by centrifugation and washed with buffer.

For inoculation of protoplasts, a preparation containing 10-60 μg/ml of purified MDMV is added to a suspension of freshly-isolated protoplasts in a mannitol medium containing 2-10 μg/ml poly-L-ornithine. The mixture is incubated at 28°C for approximately 30 minutes. Protoplasts are collected by centrifugation, washed with buffer, placed in an appropriate medium, and maintained at 28°C under continuous light of low intensity.

Portions of the inoculated protoplasts are removed periodically from the maintenance medium and tested to determine if they are infected with MDMV. For this, protoplasts are ruptured and the extract is tested for MDMV infection by inoculating it onto healthy corn seedlings, and for MDMV particles by serologically specific electron microscopy (SSEM). In SSEM, coated electron microscope grids are floated on a drop of antiserum to MDMV, washed in buffer, and then floated on a drop of extract from inoculated protoplasts. MDMV particles in the extract are trapped on the grid by the antiserum where they can be stained and visualized with the electron microscope.

MDMV-like particles have been found in extracts from inoculated protoplasts, figure 2, and the numbers of particles increased with time after inoculation, see graph. Most of these particles were shorter than those typically found in infected plants. Possibly, the particles replicated in protoplasts are defective in some way, or they were broken during extraction and SSEM. Thus far, all bioassays of inoculated protoplasts for MDMV infectivity have been negative. Again, this may be a reflection of defective particles, or the bioassay may not be sensitive enough to detect MDMV in the protoplast preparations.

Results indicate that isolated corn mesophyll protoplasts have potential as a system for studying infection by MDMV. Research aimed at improving the inoculation and assay procedures for this system is continuing.

FIG. 1 (above). Protoplasts isolated from corn leaves; magnified 2,000X.
FIG. 2 (below). Virus-like particles (long, filamentous rods) in an extract from corn protoplasts inoculated with maize dwarf mosaic virus; magnified 77,000X.

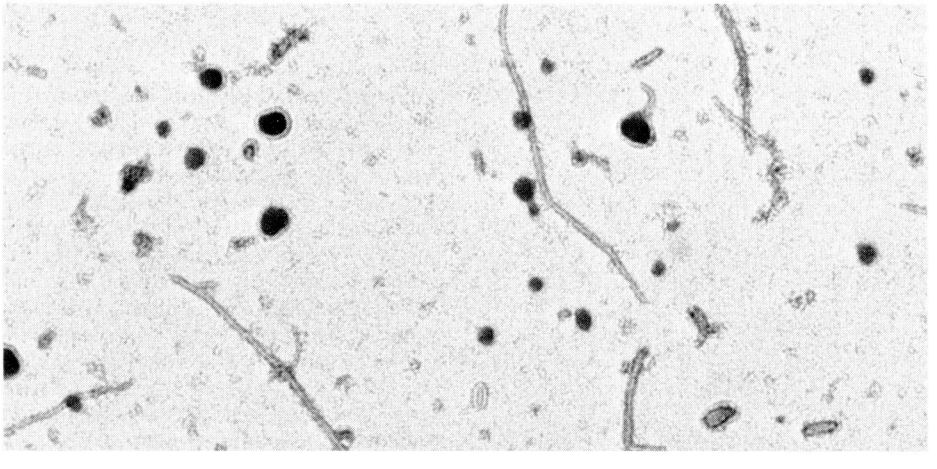
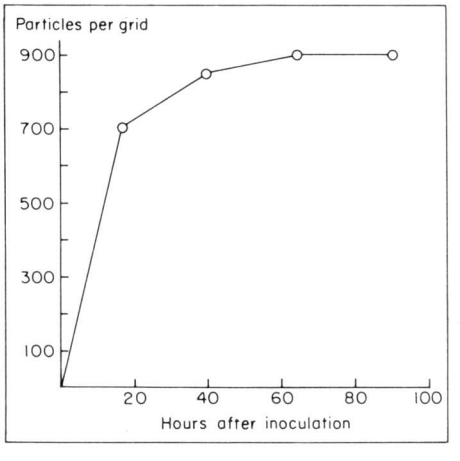


FIG. 3. Numbers of virus-like particles in extracts from corn protoplasts at intervals after inoculation with maize dwarf mosaic virus.



EFFECT OF LEAF SCALD DISEASE VARIES AMONG PLUM VARIETIES

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DISEASE IS A MAJOR FACTOR limiting production of plums, and leaf scald is one of the most serious problems. The organism causing leaf scald on plum trees, a rickettsia bacterium, will also infect peach trees.

Leaf scald has appeared on infected Japanese plums from mid-June until July in Alabama Agricultural Experiment Station research orchards. The first symptom is a slight chlorosis or bronzing along the margin or tip of the leaf. The discoloration intensifies, sometimes appearing water-soaked before turning brown and drying. The affected area becomes delineated from the unaffected area by a chlorotic band. As the dieback gradually progresses, several bands may appear in the necrotic tissue. Leaf scald may appear on one or more areas of an affected leaf and may involve as much as three-quarters of the leaf before abscission occurs.

In early phases of the disease, leaf scald may occur on only a few twigs or large branches; during later phases, however, symptoms may appear on almost all of the foliage. The banded appearance of the necrotic tissue is especially evident during autumn. As a consequence of premature defoliation during September and October, diseased trees may develop new leaves that are malformed, leathery, and rolled; these leaves may also develop the scald appearance. The effects of leaf scald include a reduction in new tree growth and in size, quality, and yield of fruit.

Decline of trees may occur in one season or over 2 or more years. Plum trees planted in 1973 at the Wiregrass Substation have exhibited a uniform infection. Data for 1976 and 1978, before and after disease occurred, are presented in table 1. Yield, weight, and total soluble solids of fruit were reduced by the disease and tolerant trees were less affected than susceptible ones.

Homeside, Mariposa, and Morris cultivars and Methley A-21 and Ozark Premier F-2 seedlings showed least effects from the rickettsia infection. Plant growth appeared to be normal, with little or no discoloration of leaves, in 1977. However, reduced growth was observed on Mariposa and Morris in 1978 and 1979. All trees except Ozark Premier F-2 received disease index ratings of 1 for leaf scald in 1977, table 2. Leaf scald ratings increased to 2 and 3, respectively, for Mariposa and Morris in 1978 and 1979.

Intermediate responses to the disease were found for Crimson, Giant Cherry, Methley, and Ozark Premier cultivars.

The trees appeared to be normal in appearance in 1977; in 1978, however, yield, fruit weight, and total soluble solids were greatly reduced. Leaf scald ratings for these trees were 5 by 1979; trees also were in an advanced state of decline.

The most severe effects of the disease were observed on Frontier, Purple, and Santa Rosa cultivars and Burbank D-1 and Ozark Premier F-1 seedlings. Yield, weight, and total soluble solids of fruit were severely reduced; all trees received a rating of 5 for plum leaf scald. Trees were in an advanced state of decline in 1978.

Results from plantings of plum trees at the Main Station, Chilton Area Horticulture Substation, and the Piedmont Substation were similar to those recorded in the planting at the Wiregrass Substation.

Plum leaf scald ratings, table 2, corresponded to the concentrations of rickettsia bacteria in the twigs, roots, and leaf petioles.

In breeding tests, observations of symptoms of plum leaf scald and monitoring of progeny from interspecific crosses, cultivars, and seedlings indicate that resistance to the rickettsia organism is heritable and present in the Auburn developed material. Uniform infection of seedlings was insured by double budding of 1-year whips with buds from infected trees. Resistance to leaf scald has been incorporated into horticultural types, and seedlings are currently being evaluated for possible release.

TABLE 1. YIELD, WEIGHT, AND TOTAL SOLUBLE SOLIDS OF FRUIT OF PLUM TREES, WIREGRASS SUBSTATION, HEADLAND, 1976 AND 1978

Cultivar or seedling	Yield/tree		Fruit weight		Total soluble solids	
	1976	1978	1976	1978	1976	1978
	Lb.	*Lb.*	*g*	*g*	*Pct.*	*Pct.*
Homeside	130.5	140.9	68.3	62.7	19.3	18.9
Mariposa	73.5	55.7	53.8	48.3	17.9	12.8
Morris	67.3	46.3	46.3	41.9	16.2	15.5
Methley A-21	148.7	154.0	63.7	59.7	19.7	18.4
Ozark Premier F-2	144.3	158.3	47.7	45.7	17.9	16.3
Crimson	107.9	33.8	47.3	38.4	18.3	14.4
Giant Cherry	62.4	27.2	28.6	17.9	19.5	14.5
Methley	94.8	27.2	41.3	29.3	18.8	16.2
Ozark Premier	101.7	21.2	49.9	38.3	16.3	13.6
Burbank D-1	78.8	31.7	39.6	28.3	18.7	16.1
Frontier	71.1	35.5	57.9	42.1	16.6	15.2
Ozark Premier F-1	39.0	0	63.5	45.6	19.9	14.7
Purple	78.5	19.5	61.5	41.8	15.2	13.3
Santa Rosa	57.3	27.5	44.4	20.4	18.7	16.3

TABLE 2. INJURY FROM PLUM LEAF SCALD DISEASE, WIREGRASS SUBSTATION, HEADLAND, 1977, 1978, AND 1979

Cultivar or seedling	Disease index[1]			
	1977	1978	1979	Average
Homeside	1	1	1	1.0
Mariposa	1	2	3	2.0
Morris	1	2	3	2.0
Methley A-21	1	1	1	1.0
Ozark Premier F-2	5	1	1	2.3
Crimson	5	5	5	5.0
Giant Cherry	3	4	5	4.0
Methley	5	5	5	5.0
Ozark Premier	5	5	5	5.0
Burbank D-1	5	5	5	5.0
Frontier	5	5	5	5.0
Ozark Premier F-1	5	5	5	5.0
Purple	5	5	5	5.0
Santa Rosa	5	5	5	5.0

[1]Disease index: 0 = no scald, 1 = 1-20%, 2 = 21-40%, 3 = 41-60%, 4 = 61-80%, and 5 = 81-100% scald leaves.

Quantifying Temperature and Nutrient Dependence in Poikilothermic Organisms and Plants

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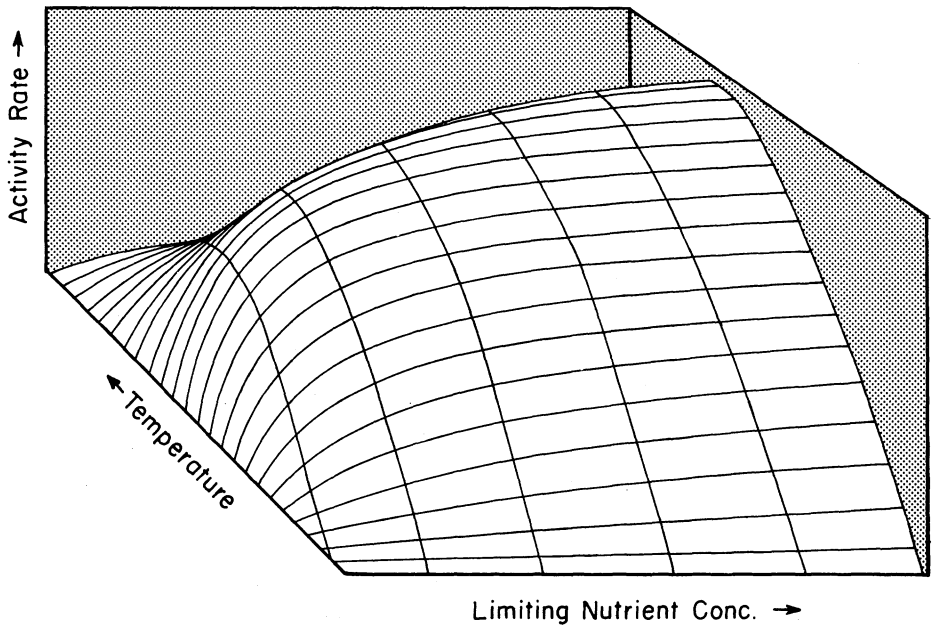

FIG. 1. A temperature-mediated functional response surface.

TEMPERATURE and the supply of a limiting nutrient are probably the most widely recognized factors regulating the activity of plants and poikilotherms (cold-blooded animals). Temperature influences these populations in a density-independent manner—that is, temperature affects all members of a population regardless of the population size.

However, the supply of a limiting nutrient depends on the population size. For example, many plants in a given area will probably use more nitrogen from the soil than only a few plants. Factors acting in this manner are commonly referred to as density-dependent factors.

Ecologists have tried for many years to determine whether density-dependent factors or density-independent factors are the most important in regulating the growth of populations. Current thinking is that density-dependent and density-independent actions are intertwined so at any given moment either type of factor may be limiting. Two years ago an equation was developed by the author at Pennsylvania State University before joining the Alabama Agricultural Experiment Station that quantified the interaction of a limiting nutrient and temperature on poikilothermic activity rates. This equation was named a temperature-mediated functional response equation (TMFRE).

The mathematical components of a TMFRE were tested by fitting the components to data from a wide variety of organisms, covering a broad range of biological processes. The temperature component satisfactorily described the rate change with temperature for two bacteria, a ciliate, two diatoms, a higher plant, many insects, and a fish. The rates this component described included photosynthetic, 0_2 consumption, glucose oxidation, parasitization, feeding, growth, and developmental rates. The limiting nutrient component of a TMFRE was a functional response equation that has been tested by hundreds of researchers and proven applicable. Thus, the foundation of a TMFRE appears to be solid.

A TMFRE, figure 1, is a quantitative answer to whether, at a given moment, a density-independent factor (temperature) or a density-dependent factor (a limiting nutrient) regulates population growth. It also helps to write down these interactions in a mathematical form so they can be incorporated into computer models.

Computer modelling of plant and animal populations is one of the fastest growing areas of the biological sciences. It is an area with the potential for vastly increasing our knowledge of how species interact and ecosystems change. Once a computer model describing the interaction or ecosystem is developed, many years of field observations can be simulated in a few minutes of computer time. A TMFRE can greatly increase the accuracy of certain computer models, figure 2.

The worth of a TMFRE is in its ability to aid in understanding the multiple species interactions occurring every day. For example, the interaction of an insect predator with its prey is temperature and food dependent with a TMFRE. This implies that the impact of the predators on the prey population will change with temperature. This is an important concept, since traditionally predator-prey models in ecology have ignored temperature effects.

A TMFRE also allows for temperature-dependent refuges to exist. For example, a crop may be able to grow in temperatures where certain weeds, pathogens, or other pests cannot. Thus, the damage potential of these pests at that temperature would be zero, even if the pest population was quite high. This too is an important concept, since we almost invariably equate a certain pest population size with an economic injury level. With a TMFRE, the pest may or may not be causing economic damage, depending on the temperature.

Probably the most important concept, though, is that most of the rates we think of in plant or poikilotherm population dynamics are, with a TMFRE, temperature dependent. The egg laying rate of an insect pest, the growth rate of a parasitic organism, and the longevity of a fungus may vary at least partially according to temperature. This allows us to ask interesting questions, such as: does a "common cold" virus replicate faster or slower when we run a fever? Do some insect pests become problems late in the season because that is the time when temperatures favor their development? Like many things, a TMFRE may provoke more questions than it answers.

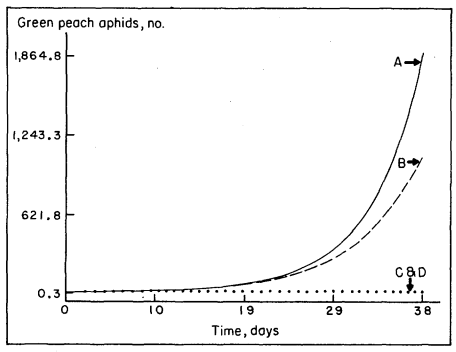

FIG. 2. Computer simulation model results illustrating the effects of a temperature change on green peach aphid population dynamics. A and B are cool temperature regimes for 20 days, and C and D depict hot temperatures for 20 days. Note the large differences in population size at day 38, which would not have occurred in a temperature invariant model.

Effective Tax Management Can Reduce Farm Taxes

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UNTIL THE BEGINNING of the 1970's, income tax management was not crucial for most farmers. However, higher farm incomes, changes in key tax provisions, and increases in self-employment tax rates changed this. Farmers recognized that good tax planning could reduce taxes substantially and, at the same time, provide important incentives to invest in land, machinery, breeding livestock, and other assets.

Because of the need for tax planning information, a study was begun by the Alabama Agricultural Experiment Station. Sufficient farm records were not available from Alabama farmers, so farm record data from 76 commercial farms in another state were obtained and analyzed. Since federal tax laws, production technology, and market forces are similar throughout the United States, the relationships portrayed in the tables are believed to be typical for similar-sized commercial farms in Alabama. Management methods that would reduce taxes in one state should provide the same advantage in another.

Capital gains deductions on livestock saved the small farmers $577 in taxes annually as an average over the 12-year period, table 1. This deduction was the largest component of the $1,413 total tax savings for small farmers. Rapid depreciation (instead of using the straight-line method) saved the large farmers more than either capital gains or investment credit. Medium-sized farmers saved more taxes with use of investment credit ($903). Clearly, average annual tax savings of $1,413-$4,242 are large enough to warrant careful tax management.

Many of the years shown in table 1 (1967-78) were better net return years than more recent ones. Because costs to the farmer have been increasing faster than farm prices, many farmers have recently experienced consecutive years of low income or net farm losses. This is causing economists to re-examine tax management practices in agriculture. For example, investing in a new combine provides large tax deductions for depreciation and loan interest, as well as a 10% investment tax credit. These deductions are only useful if the farmer has taxable income. However, the production cost increases associated with a new combine (or other farm investments) may result in low farm income or increased farm losses. This suggests an appropriate new question. Have tax benefits of farm investments been emphasized at the expense of production cost efficiency?

If more tax deductions and credits have been accumulated than are needed, tax management has been "over-done." Table 2 responds to this question, using the latest 4 years' data to provide a more recent picture.

The first item in table 2 shows that $552, or 24% of the $2,199 available investment credit, was not used because federal income taxes had already been reduced to zero. That is, about $1 of every $4 of investment credit was not needed during 1975-78. Similarly, 18% of available federal tax credits were lost as well as 17% of personal deductions and exemptions. (An unused investment credit can be carried forward to a future year, but personal credits, deductions, and exemptions are permanently lost if not used in the tax year to which they are applicable.) Also, 22% of operating losses (item 4) were not used in the year they were available.

The numbers in table 2 are averages for all 76 farmers. The losses of available tax savings, credits, and deductions are much worse for many of the farmers. For example, the average unused investment credit was $1,651 for the 14 farmers who did not use all available investment credit. It is this group of farmers that truly needs to improve tax management skills.

In sum, table 1 suggests that tax management can save farmers thousands of dollars in taxes. Table 2 shows that many farmers were not able to effectively use available tax savings. Farmers need to consider not only the tax savings effects of farm management, but also whether they will have the income to take advantage of such tax savings. It is economically more sound to pay modestly increased taxes during the years of above-average returns than to increase risk by borrowing heavily to purchase farm assets that increase costs. An advantage of paying above average taxes in years of high net returns is that past tax liabilities become available as a cash refund during low return years that follow.

Finally, the following guidelines for effective farm tax management are presented:

- Estimate your tax bill in the late fall of the year while there is still time to take tax management actions.
- Keep your taxable income high enough to make use of personal deductions and exemptions. For a married family, $1,000 is exempted per family member, and $3,400 is the standard deduction (or a total of $7,400 for a family of 4 under present federal income tax regulations).
- Maintain as steady an income as possible. Plan ahead on use of extra income from sales of timber, small land parcels, breeding cattle, and unneeded machinery. It may be wise to save such income for years of low farm profits.
- Consider seriously the straight-line depreciation option under the tax law. Depreciating a new building or tractor in 5 years may result in tax losses (that are not wanted), followed by relatively high taxes after the 5 years have passed.
- Try to make use of available investment credit in the year received.
- Do not grow in capital investment simply to avoid payment of taxes. Excessive investment (to reduce taxes) may greatly increase risk in farming.

Improved management is the best and safest basis for growth in farming. And tax management can be used to assure that available tax savings are not lost.

TABLE 1. AVERAGE ANNUAL TAX DOLLARS SAVED DURING 1967-78 BY 76 FARM OPERATORS[1]

Item	Small farms	Medium farms	Large farms
Tillable acres	258	269	560
Crop and livestock sales	$61,051	$65,626	$145,271
	Tax dollars saved		
Capital gains on livestock	$ 577	$ 776	$ 783
Accelerated depreciation	452	786	1,940
Investment credit	384	903	1,519
Total savings	$1,413	$2,465	$4,242

[1]Above tax savings are for combined federal income, state income, and federal self-employment taxes. Data are from records of a sample of farmers in Minnesota.

TABLE 2. ANNUAL TAX SAVINGS NOT USED OR LOST BY 76 FARM OPERATORS, 1975-78[1]

Item	Deductions or tax credits	Pct. remaining or lost
1. Investment credit		
Available	$2,199	
Remaining	522	24
2. General tax credit[2]		
Available	152	
Lost	28	18
3. Federal income tax personal deductions and exemptions		
Available	7,092	
Lost	1,163	17
4. Federal income tax net operating losses		
Original	1,610	
Remaining	348	22

[1]Data are from records of a sample of farmers in Minnesota.

[2]The general tax credit no longer applies; however, standard deductions and the earned income credit have been increased since 1975-78.

FIG. 1. This solar collector, made of stacked solid concrete blocks with a surface of two layers of fiberglass material, offers limited storage capabilities.

ADDING STORAGE CAPABILITY EXPANDS SOLAR HEATING VALUE

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COST AND AVAILABILITY of energy for brooding and growing poultry have brought about the need for systems of management having less dependence on fossil fuels. During the past several years, research at the Alabama Agricultural Experiment Station has pointed toward reducing energy requirements by altering brooding practices and making poultry houses more energy efficient. Results indicate good potential for success of such alternatives.

Young poultry requires temperature of approximately 85°F the first few days. This need then gradually drops to a growing temperature of 70°F by 4 weeks of age. Although a high percent of total heating fuel is used during the first 3 weeks, a significant amount is required to maintain house temperature as the birds pass this age and more ventilation air is required.

The practice of limited area brooding (one-third to one-half of house area) for the first 3 weeks, coupled with better insulation and mechanical ventilation, has helped to reduce total energy used by as much as 50%. These lower requirements allow the use of low temperature solar systems to furnish a significant amount of total energy needs.

The system reported here makes use of a vertical wall, stacked concrete block solar collector with limited thermal storage, figure 1. All ventilation air required for the building is pulled through the collector face and block wall. This system, similar to the ventilation air heater developed by Spillman at Kansas State University for swine facilities, becomes more effective as the daily need for ventilation air increases.

The solar energy collector-storage unit was located on the south facing wall of the poultry house. Solid concrete blocks 4 in. x 8 in. x 16 in. were stacked to form a wall 16 in. thick x 7½ ft. high x 12½ ft. long, giving a total collective surface of 93 ¾ sq. ft. These blocks were not mortared, and stacked with ½-in. spaces between blocks. The collector surface consisted of two layers of fiberglass material spaced 3½ in. apart with the inner layer 3½ in. from the surface of the blocks. All ventilation air was pulled through an opening in the outer glazing and allowed to pass through the block wall, then into the house.

Ventilation rates in a livestock shelter are determined by the needs of the animals being housed. Thus, the energy provided by this collection-storage system will depend on ventilation requirements as well as climatic conditions. Figure 2 shows an example of results obtained at the Auburn Solar Poultry Research Unit. During the first week of a 28-day brooding trial, little energy was provided by the vertical wall ventilation air heater because little ventilation air was required. As ventilation rates were increased, beginning with the second week, much of the energy requirements was met with the solar air heater. This reduced the need for supplemental brooding energy. In fact, the ventilation air heater supplied most of the energy used during the last 3 weeks of the 4-week brooding period.

The advantage of a storage system is that heat can be provided during periods when the sun is not shining. This is illustrated in the example of figure 3 which shows that the temperature of air entering the poultry house was about 20°F higher than ambient air for the entire 24-hour period on day 15 of the test shown. If no storage capability had been provided, heating would have been possible only during daylight hours.

Results have shown that it is technically possible to utilize systems such as this under Alabama conditions. Work is continuing on evaluating the economic characteristics and performance capabilities.

FIG. 2. Energy patterns during 4-week trial.

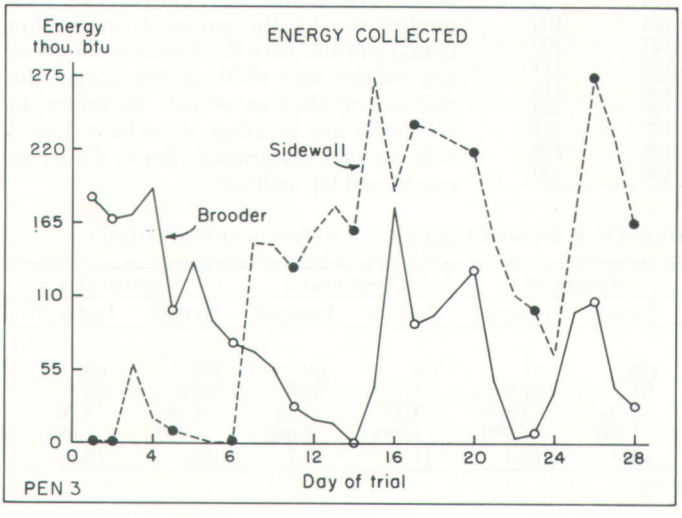
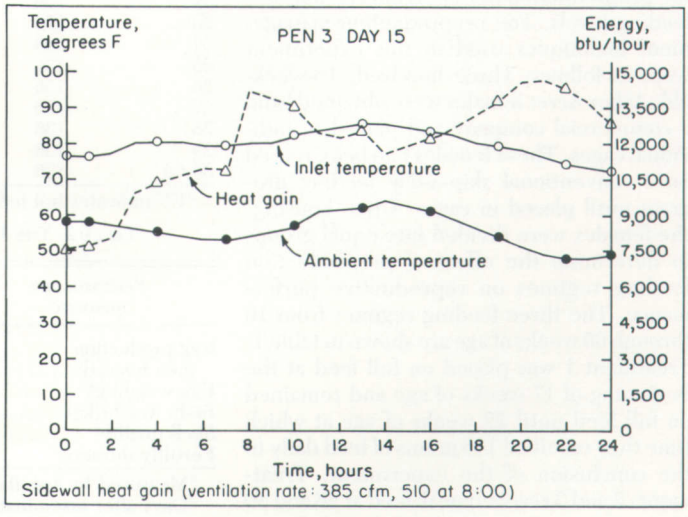
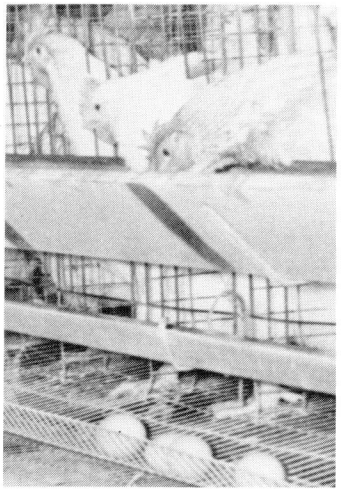


FIG. 3. Temperature rise and energy gain of ventilation air.





The Relationship of Premolt Performance to Postmolt Performance of Broiler Breeder Females

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DEPENDING UPON THE AVAILABILITY of eggs, molting commercial layers has been practiced for several years. The biological basis for molting is that it gives the female a short period of rest resulting in a higher rate of lay and better egg quality than during the latter part of her first laying cycle.

Recently, there has been interest in force molting broiler breeders. The procedure is not expected to be used as extensively as in commercial layers; nevertheless, depending upon the supply and demand of hatching eggs, there is considerable interest in force molting broiler breeders.

The technique of force molting has been well described for both commercial layers and broiler breeders. However, variation in the performance obtained between flocks has been great. Seeking solutions to eliminate the variable results obtained through molting, a study was conducted at the Alabama Agricultural Experiment Station to determine the relationship of premolt performance and postmolt performance.

Three flocks of Arbor Acres females were used in the molting study. Different management techniques had been used during the preproduction period, namely, different feeding levels. The preproduction management techniques used in this experiment were as follows: Three hundred, 16-week-old, Arbor Acres females were obtained from a commercial company and placed in individual cages. These females had been reared on a conventional skip-a-day feeding program until placed in cages. Upon housing, the females were divided into equal groups to determine the effect of preproduction feeding regimes on reproductive performance. The three feeding regimes from 16 through 60 weeks of age are shown in table 1. Treatment 1 was placed on full feed at the beginning of 17 weeks of age and remained on full feed until 22 weeks of age at which time they received 136 grams of feed daily to the conclusion of the experiment. Treatments 2 and 3 reached peak feed at 26 and 30 weeks of age, respectively. All treatments were maintained on a commercial-type grower ration until 22 weeks of age when they were placed on a breeder ration.

Feeding at the onset of production, management, and housing were standardized for all three groups and remained the same through 60 weeks of lay as well as during the postmolt lay period. Standard molting procedures were employed at the end of the first laying cycle. Data were collected on egg production, body weight, egg weight, shell quality, and duration of fertility for all three groups of females during the premolt and postmolt production periods. These results are presented in table 2.

TABLE 1. FEEDING REGIMES FOR TREATMENTS 1, 2, AND 3,

Age in weeks	Grams of feed per bird per day		
	Treatment 1	Treatment 2	Treatment 3
16	68	68	68
17	FF[1]	68	68
18	FF	90	68
19	FF	100	68
20	FF	109	68
21	FF	114	78
22	136	118	90
23	136	122	100
24	136	127	109
25	136	132	114
26	136	136	118
27	136	136	122
28	136	136	127
29	136	136	132
30-60	136	136	136

[1]FF indicates full fed.

Premolt production is based on the number of eggs laid up to 60 weeks of age. Postmolt production is based on the number of eggs laid for 90 days after the onset of postmolt production. Egg weight and shell quality data are the average during the respective production periods. Premolt body weight is the average weight of the females in the respective treatments at 60 weeks of age and postmolt body weight is the average body weight at the onset of production for the postmolt production cycle. Fertility duration is the average number of days females produced 100% fertile eggs after insemination.

As can be seen in table 2, treatment 1 produced significantly less eggs in both the premolt and postmolt production periods. Treatment 2 produced significantly more eggs than did treatment 3 in both the premolt and postmolt production periods. Body weight was significantly greater in treatment 1 in both premolt and postmolt weights, while in treatment 3, body weight was significantly less than the other treatments. In general, egg weight and shell quality were lower in treatment 1 during both the premolt and postmolt periods. Duration of fertility did not appear to be affected either by treatment or production periods.

The overall significance of the results obtained in this experiment indicate that preproduction management procedures can affect overall performance during the laying cycle even though management and housing are identical during the laying period. Furthermore, these data show that preproduction management procedures can significantly affect overall performance during the postmolt production period.

Molting will not rejuvenate the female to the extent that it will correct any mismanagement that has occurred during the growing period. This will hold true for egg production, egg weight, and shell quality. This indicates that the females that have the lowest production, egg weight, and shell quality during the premolt production period will also have the lowest production, egg weight, and shell quality during the postmolt production period. Therefore, in molting broiler breeders, if one has a choice, only the best performance flocks should be considered for molting.

TABLE 2. THE RELATIONSHIP OF PREMOLT PERFORMANCE TO POSTMOLT PERFORMANCE

Performance measure	Treatment 1		Treatment 2		Treatment 3	
	Premolt	Postmolt	Premolt	Postmolt	Premolt	Postmolt
Egg production (hen housed)	148	51	157	66	154	60
Egg weight(g)	61.1	67.9	63.7	69.8	62.0	68.7
Body weight(kg)	3.79	3.36	3.45	3.12	3.38	3.00
Shell quality[1]	1.081	1.080	1.084	1.082	1.082	1.082
Fertility duration[2]	10.0	10.4	11.2	10.7	10.6	10.5

[1]Measured by specific gravity.
[2]Days after insemination.

THE ECONOMIC RECOVERY TAX ACT OF 1981

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THE ECONOMIC RECOVERY TAX ACT of 1981 was enacted August 13, 1981, and involved the largest tax cut in history. One of the purposes of the changes in tax provisions was to stimulate the economy. Taxes for individuals and businesses were cut. Estate tax provisions were changed to cause estate planning to take on a new meaning.

The many changes in income, estate, and gift tax laws are important to farmers as individual taxpayers and as operators of farm businesses. Although, at present, farmers are not as much concerned with taxes as with economic survival, provisions of the 1981 tax act can be of benefit to farmers and will affect the overall structure of agriculture.

Some of the Changes

More than 100 tax changes were made in the new act; only some of the major ones, significant to farmers from an income and estate tax standpoint, can be presented.

Expensing. Under prior law, there was no special provision for farmers to expense (immediately deduct) the cost of certain types of property purchased. Generally, such property, if depreciable, had to be depreciated. In other words, for personal property such as machinery and equipment, under the new law all or part of the income tax basis or cost can currently be deducted. The total amount eligible for expensing in 1982 and 1983 is $5,000 each year. This is increased to $7,500 per year in 1984 and 1985 and $10,000 per year in 1986. In the case of a trade-in, only the cash difference paid can be expensed. Expensed property is not eligible for investment tax credit. Also, expensed property will not be eligible for deferral of gain under an installment sale.

Accelerated Cost Recovery System. Under the old law, cost or other basis of assets used in trade or business, or for the production of income, was depreciable over the estimated useful life of the asset. After useful life was determined, an appropriate method of determining depreciation was selected and used to recover the cost basis of the property over this period of years.

Under the new law, an Accelerated Cost Recovery System is in effect for assets placed in service after 1980. In most cases, the write-off periods under this system are shorter than useful lives under the prior law. Recovery periods are 3 years for breeding hogs, light trucks, and automobiles; 5 years for farm machinery, equipment, fences, single-purpose structures, and breeding and dairy cattle; and 15 years for other farm buildings. Annual percentage depreciation deductions are provided in tables for each of the categories of property. For example, for 3-year property, 25% of the cost basis can be deducted the first year, 38% the second year, and 37% the third year. Slightly different percentages apply to property placed in service in 1985 and after 1985. Salvage value of the property does not have to be deducted from the cost basis in determining the depreciable amount.

To provide more flexibility in depreciation, one of two additional recovery periods may be used for each class of property. Use of these alternate recovery periods would allow a farmer to spread depreciation over an extended period of years rather than recovering the cost basis in a few years.

Investment Tax Credit. Under the old law, an investment tax credit of up to 10% of the purchase price was allowed for qualified investments in certain types of property used in farming. Farm machinery, equipment, livestock, and certain single-purpose agricultural or horticultural structures qualified. Generally, land and land improvements such as farm buildings did not qualify. Amount of the investment eligible for credit varied with the useful life of the property. Both new and used property qualified with $100,000 limitation on the amount of used property. There was also a limit on the credit for a tax year.

Under the new law, the types of property eligible for investment tax credit remain unchanged. However, the investment credit will be increased to 6% for eligible property with a 3-year recovery period and 10% for property with a recovery period of 5, 10, or 15 years. The maximum investment tax credit for any tax year was increased over the old amount and the carryover period was also extended from 7 to 15 years. Recapture provisions were also changed.

Long-term Capital Gains. Under the old law, only 40% of the long-term capital gains was subject to tax. At that time, the top tax bracket was a 70% rate; thus, the maximum amount of tax was 28%. Under the new law, the top tax bracket rate is 50%; thus, only farmers in the highest tax bracket will pay a maximum of 20% on long-term capital gains.

Estate Tax Provisions. Changes in the estate tax provisions provided the first major relief since the early 1940's. The 1976 Act provided for an estate tax credit and the 1981 Act expanded the benefits associated with the tax credit.

Under the Economic Recovery Tax Act of 1981, persons dying in 1982 have a combined estate and gift tax credit of $62,800 which offsets value of property for an estate of $225,000. In other words, the tax credit provides for exemption of an estate with a net value of $225,000 in 1982. The credit is graduated upward each year with the exemption reaching $600,000 in 1987.

Estate tax rates were also changed. Under the old law, rates ranged from 18% on taxable estates of $10,000 or less to 70% on taxable estates exceeding $5 million. Under the new law, estate tax rates are scaled down for estates in tax brackets of $2.5 million or above between 1981 and 1985 with the maximum rate being reduced from 70% to 50%. Tax rates in the lower taxable estate value brackets remain the same with taxable estates not over $10,000 taxed at 18%.

Under the new law, an unlimited marital deduction is allowed for spousal transfers. The rule applies to both estate and gift tax laws. Also, the rules applying to jointly held property were changed. For individuals dying after 1981, the estate of the first spouse to die will include half of the joint interest held with the spouse. The amount of the contribution to the property made by each spouse is no longer important.

Gift Tax Exclusion. Under the new tax law, the annual gift tax exclusion for each individual is $10,000 per recipient and $20,000 per recipient for split gifts made by spouses. This was increased from $3,000 and $6,000, respectively, under the old law.

The results of these and other changes in tax laws can have far-reaching effects on farmers. They call for planning ahead, recognizing the need for assistance in tax and estate matters, and seeking competent help.

PRACTICAL CONTROL METHODS DEVELOPED FOR ENTOMOSPORIUM LEAF SPOT OF PHOTINIA

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PHOTINIA, commonly called red tip or red top, is a popular ornamental shrub in the Southeast. But it is not without its problems. *Entomosporium maculatum* Lev. leaf spot is a fungal disease that has become increasingly difficult to control on photinia.

Numerous dark red blotches (1-10 mm in diameter) typically develop on both the upper and lower leaf surface of affected plants, figure 1. Within each spot, many individual spore masses are produced. Each spore mass contains thousands of spores which are carried to healthy leaves by splashing water and wind. In the presence of moisture, each spore is capable of initiating a new leaf spot. Disease spread is dependent on a humid environment, such as commonly exists during early spring or late fall. A sprinkler irrigation system on closely-spaced nursery plants is especially conducive to disease development and spread.

Several nurseries have reported that the recommended fungicide, benomyl, has become unreliable in its activity against Entomosporium leaf spot on photinia. Because of this problem, research was conducted during spring 1981 by the Alabama Agricultural Experiment Station and Cooperative Extension Service to determine the most effective fungicide(s) available for control of the disease.

During the course of two spray trials, the following fungicides were evaluated: Bordeaux® mixture 6-6-100 (6 lb. copper sulfate-6 lb. hydrated lime-100 gal. water), chlorothalonil (Daconil® 2787 500F), mancozeb (Manzate® 200 80W), benomyl (Benlate® 50W), triadimefon (Bayleton® 50W), and thiophanate methyl plus mancozeb (Zyban® 75W). Fungicides at label recommended rates were applied to run-off at 2-week intervals. Two of the three benomyl spray programs in trial 1 were delayed and reduced in number. All fungicide sprays in trial 2 included the surfactant, Nu-film® 17. Results were expressed as disease incidence (percent diseased leaves) and disease severity (percent total leaf area diseased). In trial 2, percent defoliation was also measured.

Chlorothalonil effectively controlled Entomosporium in both trials, tables 1 and 2 and figure 2. While mancozeb and Bordeaux mixture were not as effective as chlorothalonil in trial 1, these materials performed well in trial 2. The addition of a surfactant in trial 2 may have increased the efficacy of mancozeb and Bordeaux mixture. Delayed benomyl application, in trial 1, resulted in a significant drop in disease control compared with benomyl treatments initiated during early spring.

Chlorothalonil, mancozeb, and Bordeaux mixture control Entomosporium; however, Bordeaux mixture is the most practical fungicide for homeowner use. Small, economical packages of Bordeaux mixture are available in most feed and seed stores. While economical, this fungicide does leave a white residue which may be objectionable to some homeowners. For effective control, spray programs should be initiated in early spring (March 1) and continued at 2-week intervals while growth occurs. The addition of a surfactant is recommended with Bordeaux mixture or mancozeb.

FIG. 1 (above left)—Upper and lower leaf surface of affected leaves; FIG. 2 (below)—good control resulting from Daconil treatment (left), as compared with untreated plant (right).

TABLE 1. EFFECT OF FUNGICIDES ON DEVELOPMENT OF ENTOMOSPORIUM LEAF SPOT ON CONTAINER GROWN PHOTINIA, TRIAL 1

Treatment: fungicide-rate/gal.-no. applications	Pct. diseased leaves	Disease severity[1]
Bordeaux mixture-8 tbsp.-3 applications	55	1.8
Chlorothalonil-2/3 tbsp.-3 applications	11	.6
Mancozeb-1 tbsp.-3 applications	48	1.6
Benomyl-1 1/3 tbsp.-1 application[2]	71	1.8
Benomyl-1 1/3 tbsp.-2 applications[3]	63	1.6
Benomyl-1 1/3 tbsp.-3 applications[4]	51	1.7
Control	91	3.5

[1]0 = no disease; 5 = 81-100% leaf area diseased.
[2]Single application March 24.
[3]Two applications on March 12 and March 24.
[4]Three applications on February 26, March 12, and March 24.

TABLE 2. EFFECT OF FUNGICIDES ON DEVELOPMENT OF ENTOMOSPORIUM LEAF SPOT ON CONTAINER GROWN PHOTINIA, TRIAL 2

Treatment: fungicide-rate/gal.[1]	Pct. diseased leaves	Pct. leaf area diseased	Pct. defoliation
Bordeaux mixture-8 tbsp.	70	7	0
Thiophanate methyl + mancozeb-1/2 tbsp.	91	28	40
Triadimefon-1/3 tsp.	91	48	67
Benomyl-1 1/3 tbsp.	93	58	61
Chlorothalonil-1 tbsp.	46	5	0
Mancozeb-1 tbsp.	70	13	6
Control	99	50	95
Control + Nu-film 17-1/2 tsp.	100	91	81

[1]Fungicides were applied at 2-week intervals from April 7 to June 4.

Effect of Weathering on Six Commercial Species of Plywood Siding Used in Housing

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PLYWOOD SIDING is used in housing primarily because it's less expensive than other siding materials, particularly bricks, it's attractive to many people, and installation is faster and considerably less expensive than brickwork.

There are several species of commercial plywood siding available including redwood, Douglas fir, western red cedar, bald cypress, southern yellow pine, and luan. The heartwood of redwood, red cedar, and bald cypress is known to be highly resistant to decay, while the heartwood of Douglas fir, southern pine, and luan is only moderately resistant to decay. The untreated sapwood of almost all species has low resistance to decay.

Generally, plywood siding is not treated with a preservative by the manufacturer and is often used without staining or painting. Redwood and red cedar plywood siding are used unstained because of their attractive initial color and because they have a natural resistance to decay.

To determine the effect of weathering on the initial color, surface quality, and structural properties of plywood siding, the following six commercial plywood siding panels (5-ply, 5/8 in. thick) were exposed to weathering for 6 years in Auburn: redwood, western red cedar, Douglas fir, bald cypress, southern yellow pine, and luan. Four panels of each species (4 x 8 ft.) were exposed as shown in the figure. One panel of each species was exposed facing north, one east, one south, and one west. After 6 years of exposure, the color of each species was compared to initial control color of unexposed panels. In addition, the quality of surface veneers of each exposed species was examined and evaluated. Finally, each exposed panel was cut up to obtain test specimens for evaluation of the following mechanical properties: flexure, glue line shear strength, and panel shear strength.

Results

Color. Surfaces of exposed panels weathered to various degrees of gray and color uniformity. The weathered color of some species is more attractive than others. Weathered redwood panels were less attractive than other panels because of dark spots caused by mold development. Douglas fir, cypress, and southern pine developed an attractive silver gray color uniformly throughout the panel.

Surface Quality. Surfaces of all species developed splits and cracks. The least affected species was the Douglas fir. In addition to splits and cracks, the luan and southern pine panels developed decay on the surface (deterioration of surface veneer in certain areas) and local delamination of surface veneers.

Mechanical Properties. Results of the mechanical testing are presented in the table. Mechanical properties of southern pine and Douglas fir, after 6 years of exposure, were the best among the group. These were followed by bald cypress with an overall property strength ratio of 91% compared to weathered southern pine. Properties of redwood and red cedar were considerably lower with overall strength ratios of 78% and 77%, respectively, compared to weathered southern pine. Luan had the lowest properties with an overall strength ratio of 55% of the strongest.

Considering the surface quality and the mechanical properties of the exposed untreated and unstained plywood siding species, the Douglas fir plywood ranked best. Redwood lost its most important asset, the attractive initial color. The bald cypress developed some surface checking but had no decay and maintained a high strength ratio. The southern yellow pine developed severe surface checking and decay. The luan was the worst of all with severe checking, decay, and the lowest mechanical properties.

It is suggested that plywood siding in the South and Southeast should be stained or painted as soon as it is installed to minimize degradation of surface quality and loss of mechanical properties.

PROPERTIES OF SIDING PANELS AFTER 6 YEARS OF OUTDOOR SOUTHERN EXPOSURE[1]

Flexure parallel[2]						Glue line shear			Panel shear		
Species[3]	MOE	Pct.[4]	Species	MOR	Pct.	Species	Strength	Pct.	Species	Strength	Pct.
	P.s.i.			*P.s.i.*			*P.s.i.*			*P.s.i.*	
DF	895,590	100	DF	3,840	100	SP	220	100	SP	635	100
SP	863,030	96	SP	3,390	88	DF	199	91	CY	589	93
CY	821,130	92	CY	3,160	82	CY	182	83	RW	517	81
RW	616,010	69	RC	2,770	72	RC	177	81	LN	460	72
RC	554,870	62	RW	2,290	60	RW	154	70	RC	457	72
LN	379,380	42	LN	2,200	57	LN	107	49	DF	446	70

[1]Specimens were obtained and tested from the full thickness of panels. Each value is the average of 12 specimens. Each flexure value is the average of six.
[2]Flexure specimens were tested with face and back veneer grain parallel to span.
[3]DF = Douglas fir; SP = southern pine; CY = cypress; RW = redwood; RC = red cedar; LN = luan.
[4]Percent of strongest panel; MOE = modulus of elasticity; MOR = modulus of rupture.

PROBLEMS AND OPINIONS DIFFER BETWEEN SMALL AND LARGE FARM OPERATORS

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MOST ALABAMA FARMS are small by several definitions. Annual gross sales of $20,000 are frequently employed as an economic criterion of size distinguishing small from large farms. In Alabama, over 78% of the farms would be small by this standard. If the division point were $10,000, 69.7% would be classified as small. A majority of Alabama farms are small even at gross sales of less than $5,000.

If the number of acres is used to judge size, most Alabama farms are still small. Over 74% of Alabama farms are less than 180 acres. When a farm size of 50 acres or less is used to delimit smallness, 36% of Alabama farms report this acreage or less.

Small farms, though great in number, only account for a small part of the total volume of production. Why then are their numbers growing, and why are officials in agriculture giving small farm operators increasing attention? Their opinions and perceptions of public issues often are distinctly different from other segments of agriculture. This difference was apparent in results of an Alabama Agricultural Experiment Station mail survey conducted in the spring of 1981 to learn how small and large farmers see themselves and each other.

The sample was drawn from a master listing of farm operators maintained by various agencies in the State. From an initial mailing to 1,005 farm operators, 705 usable questionnaires were returned and available for analysis.

The amount of gross farm sales in 1980 was used to differentiate the size of the farm. Farms with sales less than $20,000 were considered as small and farms with sales greater than $40,000 were classified as large. The farms with intermediate incomes were classified as medium in size. The table presents crosstabulations of various attitude items by gross farm sales.

Over 80% of the small farmers agreed that there should be special government programs for small farmers, item 1. Less than 57% of the large farm owners agreed, but a majority of respondents, regardless of size, recognized the special needs of small-scale operators.

Item 2 indicates that small farmers may feel slighted with respect to the public services they receive. More than 79% of these farmers, as opposed to less than 44% of the large farm operators, thought that small farmers were not equitably served by public agencies. Regardless of farm size, however, most farmers thought that small farms were deserving of assistance tailored to their particular needs, item 3.

Item 4 asked whether large farms get more than their share of government benefits. More small than large farm operators thought that government benefits were not fairly distributed; nevertheless, each group but the largest tended to agree.

Willingness to take risk was reflected in item 5. More than 74% of the large farm operators, as compared to less than 58% of the small farm respondents, agreed with the item. An aversion to risk, debt, and new practices frequently is an obstacle to improvement for small farm operators. Item 6 suggests that social reasons for farming were not important for a majority of farmers in any economic class, but were important for twice the proportion of small-scale operators (30 versus 15%).

A majority of all respondents agreed that programs should be set up to help farmers directly sell their products to the consumer. The small farm operators were somewhat more likely to agree with this item than were the large farm operators.

Nearly 70% of the big farmers indicated that understanding new technology will help their future in farming. Less than 47% of the small farmers agreed. Also, the larger farmers were more likely to report that their families will be a help in the future. The last item is somewhat at odds with the commonly accepted notion of the family-centered, small-scale farm. Apparently, family involvement plays a more critical role in larger operations.

The widening split among small farms, large operations, and the narrow segment in between is a continuing trend in Alabama agriculture. As the size distribution of farms becomes even more bimodel, the pressure for specialized programs, policies, and research that reflects the segmentation of the industry will increase.

CROSSTABULATION OF SMALL FARM-RELATED QUESTIONNAIRE ITEMS BY GROSS FARM SALES, STATEWIDE SAMPLE OF ALABAMA FARMERS, 1982

Questionnaire item	Gross farm sales: Less than $20,000	$20,000 to $39,999	Greater than $40,000
	Pct.	*Pct.*	*Pct.*
Item 1: Special government programs should focus on the problems of the small farmer.			
Agree	80.7	73.0	56.5
Uncertain	9.2	17.5	19.1
Disagree	10.1	9.5	24.4
Item 2: The small farmer has not received a fair share of public services.			
Agree	79.3	59.4	43.4
Uncertain	11.9	21.9	21.7
Disagree	8.8	18.7	34.9
Item 3: Special help for small farmers is really just another welfare program.			
Agree	21.3	25.0	32.6
Uncertain	13.7	14.1	19.4
Disagree	65.0	60.9	48.0
Item 4: Large farms get more than their share of government benefits.			
Agree	72.2	59.4	49.6
Uncertain	18.5	23.4	26.0
Disagree	9.3	17.2	24.4
Item 5: I regard myself as the kind of person who is willing to take a few more risks than the average farmer.			
Agree	57.3	48.4	74.8
Uncertain	18.7	24.2	6.1
Disagree	24.0	27.4	19.1
Item 6: The recognition I get from my friends and neighbors is one of the main reasons I enjoy farming.			
Agree	30.2	24.2	14.8
Uncertain	11.3	9.7	18.8
Disagree	58.5	66.1	66.4
Item 7: Programs should be set up in the State to help farmers sell their products directly to consumers.			
Agree	86.2	84.4	75.2
Uncertain	9.6	7.8	12.4
Disagree	4.2	7.8	12.4
Item 8: My ability to understand and use new technology:			
Will help my future	46.6	69.8	69.6
Makes no difference	27.6	22.3	15.6
Will hinder my future	25.8	7.9	14.8
Item 9: My family will help or hinder my future in farming.			
Will help my future	67.8	84.7	85.8
Makes no difference	24.9	13.6	11.8
Will hinder my future	7.3	1.7	2.4
Number of respondents	*471*	*64*	*132*

FOLACIN Deficiency widespread among adolescent girls?

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FOLACIN IS NOT a common household word, but maybe it should be. This is the name of one of the essential nutrients of the B-complex vitamins, and something that plays an important role in human health. Because of its importance, folacin is getting major emphasis in human nutrition research at the Alabama Agricultural Experiment Station.

Folacin is a general term used to describe folic acid and chemically related compounds exhibiting biological activity of folic acid. Folacin occurs naturally in many commonly consumed food staples in the form of folate salts. There is no single chemical form with the name folacin. The different chemical forms have similar activity when ingested by man and higher animals. In foods, folacin may be present as folic acid or in conjugated forms of folacin with either two or seven glutamic acid groups per molecule. These conjugated forms, called polyglutamates, serve as the major precursors of the vitamin in the diet.

Folacin is essential to man and it is needed for normal growth and reproduction, for prevention of a blood disorder called macrocytic anemia, and for important biochemical reactions within each cell of the body. In macrocytic anemia, the mature red blood cells are fewer, larger, and contain less hemoglobin than normal. The young red blood cells in the bone marrow fail to mature during dietary folacin deficiency.

An unknown proportion of the population has marginal folacin status and is at moderate risk of developing folacin deficiency. Population groups who may be at risk of developing folacin deficiency include premature infants, adolescents, pregnant and lactating women, alcoholics, and patients with malabsorptive gastrointestinal diseases.

Recently, a cross-sectional study was conducted by the Alabama Agricultural Experiment Station on the folacin status of 103 girls, ages 12, 14, and 16 years. These adolescent females were selected from east-central Alabama; approximately half were black and half were white. About 40% of the girls were 12 years of age, 40% were 14 years old, and 20% were 16.

Fasting blood samples were obtained and analyzed for folacin levels in blood serum and red blood cells. Folacin present in serum and red blood cells was determined by a microbiological assay using *Lactobacillus casei* as the folate-responsive organisms. Dietary folacin intake was determined from 24-hour food recall data and from appropriate food composition tables.

Dietary folacin intake was lower in girls aged 16 years than that observed for the other two age groups, table 1. The Recommended Dietary Allowances (RDA) show that adolescent females should consume 400 μg (micrograms) of folacin per day. Only 11% of the girls exceeded this RDA folacin intake level.

Mean serum folate values did not differ markedly with age or race, table 1, but blacks had lower values than whites in the 14- and 16-year-olds. Similarly, the mean red blood cell folate level did not differ in the girls aged 12 and 14 years but was lower in the 16-year-old group, table 1.

The assay of serum folate levels indicated that 11.7% of the adolescent girls were deficient in folacin, whereas the red blood cell folate levels indicated that 47.7% were deficient, table 2. Serum folate levels are not a reliable indicator of the degree of folate deficiency because low serum folate levels may be a reflection of recent low dietary intakes of the vitamin and provide little information concerning tissue reserves. On the other hand, red blood cell folate level is regarded as a more accurate index of folacin status because it reflects the tissue folacin status at the time the red blood cells were formed.

This report has attempted to describe some of the symptoms of folic acid deficiency in humans and has evaluated folacin status in adolescent females. Many of the girls had low dietary intake of folacin and almost half had red blood cell folate levels that indicated a deficiency. This evidence suggests that a deficient folate status in adolescent females may be widespread and constitute a public health problem.

Next year, the same girls will again be analyzed for their serum and red blood cell folacin levels. This will provide longitudinal evaluation on folacin status of the girls which will allow researchers to see if folacin status changes as the girls become adults.

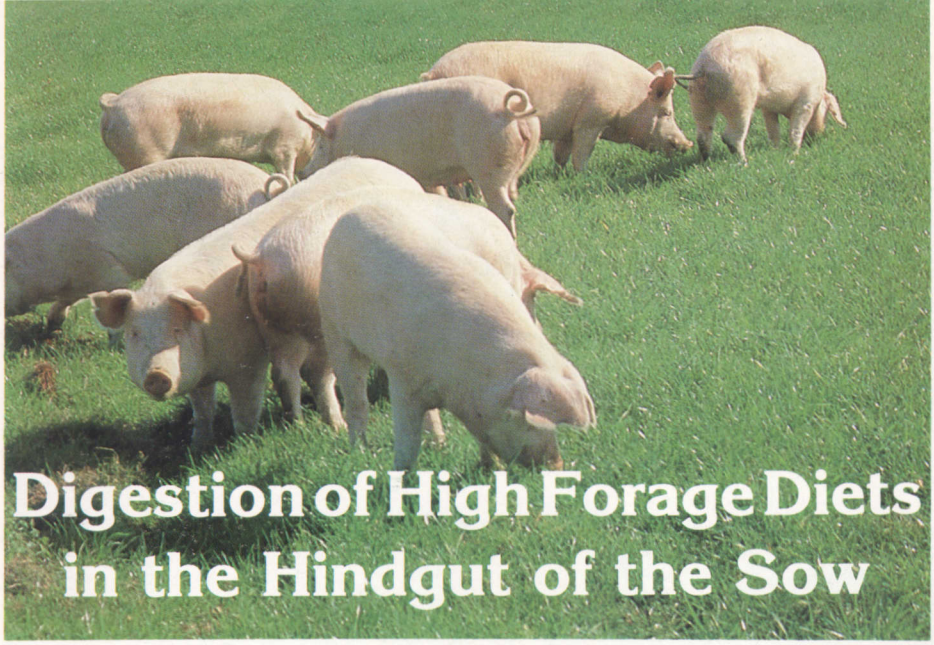
TABLE 1. MEAN DIETARY FOLACIN INTAKE AND MEAN SERUM AND RED BLOOD CELL FOLACIN LEVELS BY AGE AND RACE IN ADOLESCENT FEMALES

Age and race	Serum	Red blood cells	Folacin intake
	ng/ml	*ng/ml*	*μg/day*
12 years			
All	7.6	178	190
Blacks	7.5	185	182
Whites	7.7	172	198
14 years			
All	6.5	177	205
Blacks	5.5	145	198
Whites	7.5	208	212
16 years			
All	5.2	136	156
Blacks	4.8	128	151
Whites	5.7	146	162

TABLE 2. FOLACIN STATUS OF ADOLESCENT FEMALES AS DETERMINED BY SERUM AND RED BLOOD CELL FOLACIN LEVELS[1]

Age and race	Number of subjects	Subjects classified as deficient	
		Serum	Red blood cells
		Pct.	*Pct.*
12 years			
All	39	7.7	38.5
Blacks	19	10.5	21.1
Whites	20	5.0	55.0
14 years			
All	41	12.2	46.3
Blacks	20	15.0	55.0
Whites	21	9.5	38.0
16 years			
All	23	17.4	65.2
Blacks	11	36.5	72.7
Whites	12	0	58.3
All	103	11.7	47.7

[1]Criteria used to determine deficient folacin status were for: serum, less than 3 ng folacin/ml; and red blood cell, less than 140 ng folacin/ml.



Digestion of High Forage Diets in the Hindgut of the Sow

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THE INCREASING COSTS of buying grains and shipping grains to grain deficit areas have generated much interest in the use of forages as alternative feedstuffs, either as grazing, hays, or silage for the swine breeding herd. This is especially true in areas of the country where the land is not suitable for grain production, but can provide excellent year-round forage growth.

Considerable research has been conducted to determine the digestibility of various forages for swine and the contribution of these forages to the energy metabolism of the pig. The results vary and are conflicting, but generally have shown that forages are of limited value as an energy source for swine. However, the majority of these studies have been conducted with the growing pig and are not representative of the potential for forage utilization in the sow.

Several factors are present in the sow which influence the potential for digesting and utilizing forage. The sow has cecal and colonic volumes larger than the growing pig. The majority of fiber digestion occurs in this section of the intestine and is accomplished by the microbial population present. Larger surface areas are associated with these larger volumes, thus allowing for greater potential for absorption of nutrients. Combined with the longer digesta retention times found in limit-fed sows, these characteristics suggest that the sow would be better suited for the digestion and utilization of higher dietary fiber levels than the growing pig.

A number of applied studies have shown that the breeding herd maintains good reproductive performance when primarily utilizing forages. Therefore, it appears that increased fiber digestibility does occur in the sow and is accompanied by a greater production of volatile fatty acids by an active microbial population.

A study was conducted at the Alabama Agricultural Experiment Station to determine the effect of the level of forage fiber in the diet on the digestibility of fiber in the hindgut of the sow. Nine mature sows (three per treatment) were fed three diets varying in fiber level. The diets were a 14% protein, corn-soybean meal diet, a diet containing equal amounts of corn-soybean meal and ground, sun-cured alfalfa hay, and a diet consisting of ground, sun-cured alfalfa hay. All diets were fortified with vitamins and minerals and limit fed at isocaloric intakes of 5,760 kcal of metabolizable energy per sow per day. The sows were fed the diets for 6 weeks, slaughtered, and then the intestinal fluid from the cecum and colon was collected. This intestinal fluid, containing the microbes from the intestine, was then used to determine the dry matter and cellulose digestibility of the three diets using an in-vitro technique.

Results of this study show that the volume of the cecum and colon were greatly increased by feeding the alfalfa diets, indicating greater potential for growth of the microbial population of the large intestine. The microbes contained in intestinal fluid from the sows were capable of digesting substantial amounts of dry matter and cellulose in the alfalfa hay, see table. It was also found that the digestibility was higher if the fluid was collected from sows that had been previously conditioned to the alfalfa diets. This indicates that a period of time is necessary for the microbes in the intestine to adjust to high fiber diets and that additional feeding may be necessary during this period.

Cellulose digestibility was greater on the diet containing a mixture of corn-soy and alfalfa than on the complete alfalfa diet. This suggests that to achieve optimum utilization of diets containing high fiber, it may be necessary to feed diets which will supply a more readily available energy or nitrogen source to the microbial population in the intestine than is present in complete forage diets.

This study shows that large amounts of forage fiber can be utilized by the sow through digestion in the hindgut. These results are being used at Auburn University to determine diet formulations that will optimize the use of forages as a feedstuff for gestating sows.

EFFECT OF DIETARY FIBER LEVEL ON DRY MATTER AND CELLULOSE DIGESTIBILITY (IN VITRO)

Diet fed	In-vitro diet			
	Corn-soy	Corn-alfalfa	Alfalfa	Av.
	Dry matter digestibility, pct.			
Corn-soy	63.6	41.3	12.8	39.2
Corn-alfalfa	74.8	54.7	31.8	53.8
Alfalfa	67.4	58.8	43.5	56.6
Average	68.6	51.6	29.4	
	Cellulose digestibility, pct.			
Corn-soy	37.7	46.4	42.4	42.2
Corn-alfalfa	38.4	50.1	45.3	44.6
Alfalfa	39.7	54.9	46.6	47.1
Average	38.6	50.5	44.8	

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