Vol. 30 No. 4 Winter 1983

HIGHLIGHTS

of Agricultural Research

ALABAMA AGRICULTURAL EXPERIMENT STATION
GALE A. BUCHANAN, DIRECTOR

AUBURN UNIVERSITY
AUBURN UNIVERSITY, ALABAMA

DIRECTOR'S COMMENTS

AGRICULTURAL RESEARCH can be considered from many perspectives, the most common being applied and basic. Obviously, both types of research are important and each contributes to the success of a sound agricultural and forestry industry for Alabama, and both types are given emphasis by the Alabama Agricultural Experiment Station.

GALE A. BUCHANAN

Applied research, sometimes referred to as "production" research, has come under increasingly heavy fire in recent years because of surpluses of certain agricultural commodities. To decry production oriented research, in my opinion, is shortsighted and reflects a basic misunderstanding and lack of appreciation of research.

A certain amount of production oriented research is necessary just to maintain existing levels of production. Newly emerging pest species and the occasional loss of an effective pesticide require constant and ongoing research in the broad area of pest management. New pesticides and crop varieties must be evaluated on a continuing basis in light of current production systems. The evaluation of new feeds and feed additives and new types of equipment is necessary for their integration into production systems applicable to Alabama conditions.

There is also a never-ending list of newly emerging production problems that must be addressed just to maintain existing levels of production. In the past year, the problem of stem canker of soybeans, peanut stripe, and no-blood disease of catfish joined the large list of problems that demand our attention. We must respond as best we can to these problems. Recent cancellation of the registration of ethylene dibromide (EDB) by the Environmental Protection Agency requires a great deal of emphasis in the search for replacement chemicals and/or production systems if we are to produce soybeans and peanuts successfully where nematodes are a major problem.

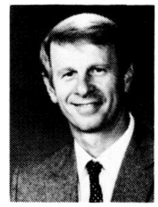
It is impossible to conduct production oriented research without addressing the important aspect of improved efficiency. It is hard to argue with the merits of increased efficiency, even when extra production is not needed for the moment. The result of increased efficiency is greater productivity for inputs expended, and the ultimate beneficiary is the entire public at large.

Finally, the problem of commodity surpluses is often a reflection of agricultural problems, weather, and current markets rather than a basic excess of food, feed, and fiber, especially when considered in the worldwide context. While "surpluses" are temporarily bothersome problems and must be effectively dealt with to ensure reasonable profits for our farmers, agricultural scientists must recognize that production research is an important endeavor and be fully assured there is nothing wrong in "making two blades of grass grow where only one grew before."

While making a case for production or applied research, we also must recognize the importance of basic research in our long-term program of agricultural research, which will be the topic of this column in the next issue.

may we introduce . . .

Dr. M. Keith Causey, professor, Department of Zoology-Entomology. A native of Monroe, Louisiana, Dr. Causey joined the Auburn faculty in February 1968.



At Louisiana State University, Dr. Causey received a B.S. in forestry in 1962, an M.S. in Entomology in 1964, and the Ph.D. in entomology in 1968. While attending L.S.U., he worked as a graduate assistant in both the forestry and wildlife department and the entomology department.

Dr. Causey is involved in teaching and research in wildlife, and has published numerous reports of his results. He is a member of the Wildlife Society, has served as faculty advisor of the Auburn student chapter of the Wildlife Society, and is a member of the Alabama Academy of Science and Division of Forestry Conservation and Geography.

WINTER 1983 VOL. 30, NO. 4

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

ON THE COVER: Simmental-Hereford cross cows are proving superior to Angus-Hereford crosses. (See story, page 3.)

SIMMENTAL-HEREFORD COWS SHOW BETTER MATERNAL TRAITS THAN ANGUS-HEREFORD

T.B. PATTERSON and S.P. SCHMIDT, Department of Animal and Dairy Sciences
L.A. SMITH, H.W. GRIMES, and J.L. HOLLIMAN, Black Belt Substation

FOR YEARS CATTLEMEN have accepted the Angus-Hereford (AH) cross cow, or black baldy, as the standard with which to compare other crossbred cows. In fact, in Alabama research, no other crossbred cow had proven superior to black baldies until a recent Alabama Agricultural Experiment Station study at the Black Belt Substation indicated that calves from Simmental-Hereford (SH) cross cows were heavier at birth and weaning, were taller at the hips, and had a higher stocker grade than calves from AH cows.

The dams for the 3-year study were heifer calves obtained by artificially inseminating (AI) high grade Hereford cows in the G.W. Jones herd, Huntsville, with semen from above average Angus and Simmental bulls. Performance-tested Angus bulls were used to clean up after AI. Over a 2-year period, the heifer calves that resulted from these matings were put into the Auburn study. Since matings were made at random, differences in characteristics contributed by the Hereford cows were minimized in these crossbred AH and SH females.

By the time they were 15 months old, all heifers that weighed 65% of their expected mature weight were bred to calve as 2-year-olds. This amounted to 87% of the total number of heifers. The remaining smaller heifers were held over and bred to calve first as 3-year-olds. The first week in February, excellent performance-tested Angus and Polled Hereford bulls began breeding the heifers by natural service and continued for 90 days.

Data were collected for 3 years to include calves produced from 2-, 3-, and 4-year-old cows. Heifers calving first as 2-year-olds were given extra feed so they would have a better chance to breed back and calve again as 3-year-olds.

The cow herd grazed dallisgrass-tall fescue-white clover pastures March 1-November 15. When pasture was inadequate during the winter, johnsongrass hay and a protein-energy supplement were fed to meet National Research Council requirements. Salt was offered free choice.

During the winter, whole shelled corn was provided as a creep feed for the calves, but was discontinued as spring pasture became available. Within 24 hours of birth, calves were numbered and males were castrated. Calves' sex, weight, hip height, and dam's number were also recorded. Two weaning dates were selected each year so that the average weaning age of each group was approximately 250 days. All calves were weighed, measured, and assigned stocker grades at weaning. Cows weaning calves were also weighed and measured at this time. In the following results, all differences discussed are statistically significant.

Neither the breed of sire, breed of dam, nor age of dam caused any differences in percent cows that calved, percent calves that were born dead or later died, or in percent cows that weaned a calf, table 1. All cows calved equally well as 2-, 3-, and 4-year-olds. This may be attributed to excellent nutrition and management. Death loss was not excessive and in most cases, probably because of smaller birth weights, was not associated with calving difficulties.

TABLE 1. REPRODUCTIVE PERFORMANCE

Comparison	Calving	Born dead or died	Weaned
	Pct.	*Pct.*	*Pct.*
By breed of sire			
Angus (178)[1]	92.7	5.4	87.6
Polled Hereford (172)	96.5	5.4	91.3
By breed of dam			
Angus x Hereford (176)	95.4	6.5	89.2
Simmental x Hereford (174)	93.7	4.3	89.7
By age of dam			
2-yr.-olds (142)	94.4	7.5	87.3
3-yr.-olds (143)	93.7	2.2	91.6
4-yr.-olds (65)	96.9	7.9	89.2
Total or average	94.6	5.4	89.4

[1]Numbers in parenthesis indicate number of cows exposed.

The breed of sire did not cause differences in pre-weaning traits measured, table 2. However, SH cows produced calves that were approximately 4 lb. heavier at birth and 50 lb. heavier at weaning than AH cows. In addition, at weaning, the calves from SH cows had a higher stocker grade and an average hip height 1½ in. taller than those from AH cows.

The breed of calf contributed no differences in performance that could not be explained by differences in breed of dam. It was expected that the three-breed cross calves by Angus bulls from SH cows would have better performance than the backcross calves by Polled Hereford bulls from the same cows. However, this did not occur.

TABLE 2. PRE-WEANING TRAITS

Comparison	No. of calves	Birth weight	250-day adjusted weaning weight	Height at weaning	Stocker grade at weaning
	No.	*Lb.*	*Lb.*	*In.*	
By breed of sire					
Angus	153	61.6	673.4	45.2	14.1
Polled Hereford	157	60.7	668.5	44.7	14.2
By breed of dam					
Angus x Hereford	155	59.2	646.2	44.2	13.9
Simmental x Hereford	155	63.1	695.7	45.7	14.3
Total or average	310	61.2	670.9	45.0	14.1

[1]13 = Choice; 14 = high Choice.

TABLE 3. WEIGHT AND HEIGHT OF COWS WEANING CALVES

Comparison	Cow weight at weaning	Cow height at weaning
	Lb.	*In.*
By breed of cow		
Angus x Hereford (158)[1]	970.6	47.6
Simmental x Hereford (156)	1,043.2	50.8
By age of cow		
2-yr.-olds (125)	928.6	48.9
3-yr.-olds (131)	1,011.1	49.5
4-yr.-olds (58)	1,081.0	49.2

[1]Numbers in parenthesis indicate number of cows tested.

The SH cows were 73 lb. heavier than the AH cows, table 3. However, the extra calf weight was more than enough to offset the extra maintenance cost of the larger cow. The SH calves had an average weaning weight 49 lb. heavier than calves from AH cows. It is accepted that for each 200-lb. increase in mature cow weight, 50 extra lb. of calf are needed at weaning to offset the additional maintenance requirements for the larger cow. Therefore, less than 19 extra lb. of calf were necessary to offset the 73-lb. additional cow weight. The difference in weight due to breed of dam is not likely to increase as these cows mature.

A breeding program such as the one described here should not be attempted unless excellent nutrition and management are available.

Response of White-Tailed Deer to Prescribed Burning

M.K. CAUSEY and
T.L. IVEY, Department
of Zoology-Entomology

SOME 2.5 TO 3 MILLION acres of land are burned each year for forest, range, and wildlife management purposes in the South. The effects of prescribed fire on wildlife habitat have been investigated extensively, and have considered such aspects as forage availability, palatability, nutritional quality, and understory stem density. Few investigators, however, have dealt with immediate and short-term responses of selected wildlife species to prescribed burning within their home ranges.

Although general observations of white-tailed deer response to fire have been reported in other studies, few researchers have studied actual responses of deer to a particular prescribed fire. During an intensive behavioral study of white-tailed deer in Alabama, data were obtained from two radio-marked deer and several unmarked deer before, during, and after prescribed burning of their home ranges. To study the deer, researchers placed collars containing miniature radio transmitters around their necks. This enabled researchers to monitor the location and behavior of the deer.

Each year approximately one-third of the Fred Stimpson Sanctuary in Clarke County is burned. Fires are usually set at the downwind edge of a unit and allowed to creep through the area against the breeze (backfiring).

In February 1976, a prescribed fire was set that ultimately burned the home ranges of two adult female deer that had been monitored telemetrically since November 1975. Locations of the deer were determined throughout the day of the fire and intensive monitoring was continued for the next 2 weeks.

During pre-burn and post-burn periods, the number of times each deer was located by radio within the different habitat cover types was recorded. Using these data and the percentage of each cover type within each deer's home range, a habitat preference index was computed.

The prescribed fire burned approximately 70% of the established home ranges of both radio-tagged deer. Immediate and short-term responses of these deer, and visual observations of other deer during burning, indicate that on the Fred T. Stimpson Sanctuary, where prescribed fire is a regularly used management tool, deer utilize stream beds and other moist sites as refuges from fire.

Several deer were observed during burning; none, however, was observed running in response to the fire. Deer were seen feeding to within 22 yd. of approaching fire with no apparent alarm. These observations strengthen the belief that deer and other large mammals have no innate fear of fire and appear quite calm even in proximity to the flames.

During the pre-burn study period, the proportion of radio locations for each deer in each cover type did not differ greatly from the proportion of each cover type available, see table. Two weeks after burning, however, proportions of total radio locations for both deer indicated a strong preference for the hardwood-pine habitat over the pine type. The former, representing only 8 and 10%, respectively, of each deer's home range, had burned incompletely in a mosaic pattern. In the pine type, the burn was almost complete.

Although litter removal by fire in the hardwood-pine type was patchy, qualitative inspection of the area and visual observations of feeding led to the belief that deer were attracted to this site by the hardwood mast exposed by the prescribed fire.

Even though 70 and 69%, respectively, of each deer's home range were burned, there was no home range shift. However, there was a dramatic change in usage within the home ranges from the pine habitat to the hardwood-pine cover type. Deer, both marked and unmarked, appeared to avoid the areas most severely affected by the fire, at least during the first several ensuing weeks. Observed shifts in habitat preference and avoidance following the fire were probably related to changes in food availability.

In this study, prescribed fire produced, at least temporarily, a reduction in available forage over much of the home ranges of the radio-marked deer. Although the effects of prescribed fires differ widely, certain conclusions may be drawn with respect to their impacts on deer. Careful consideration of timing and size of burn units could minimize most undesirable impacts. Since hardwood mast is not necessarily a component of white-tailed deer habitat, prescribed fire designed to improve deer range should be used as near spring green-up time as possible to ensure quick vegetative regrowth. If burn units are limited to 75 acres or less, sizable portions of the average 200- to 300-acre home range of most southern white-tailed deer will be unaffected by the fire.

EFFECT OF PRESCRIBED BURNING ON RADIO-MARKED WHITE-TAILED DEER'S USE OF DIFFERENT COVER TYPES WITHIN THEIR HOME RANGE

Cover type	Pct. available		Pre-burn pct. use[1]		Post-burn pct. use	
	Deer 1	Deer 2	Deer 1	Deer 2	Deer 1	Deer 2
Pine	55	47	55	67	24	13
Hardwood/pine	8	10	9	15	43	35
Bottomland hardwood	37	43	36	18	33	52

[1]Pct. use = radio locations within cover type/total radio locations.

Colydiid Beetles May Be Natural Enemies of *Ips* Engraver Beetles in Southern Pines

W.M. ROHLFS, III, and L.L. HYCHE, Department of Zoology-Entomology

THE COLYDIID BEETLES (family Colydiidae) constitute a little-known group of small beetles of which the most common species are associated with bark beetles. Some species are known or suspected to be predators of bark beetles, which are serious pine enemies in Alabama. Thus, researchers are interested in colydiid beetles as possible natural control measures for bark beetles.

In the pine forests of Alabama and the South, colydiid beetles have been found on and in standing trees infested with southern pine beetle and *Ips* and felled timber attacked by *Ips*, figure 1. The colydiids associated with *Ips* beetles have recently been studied at the Alabama Agricultural Experiment Station. These studies resulted in the collection and identification of adults of six species, *Lasconotus pusillus, L. referendarius, Aulonium ferrugineum, A. tuberculatum, Colydium nigripenne,* and *Pycnomerus sulicollis.*

FIG. 1. Bark beetle-infested pine where colydiid beetles are typically found.

The two species of *Lasconotus* were the most abundant, making up approximately 90% of the total collection, with adults of each species being collected in about equal numbers. The activity of *Lasconotus* and *Ips* adults in coming to freshly felled uninfested trees consistently followed regular patterns, figure 2. *Lasconotus pusillus* adult activity closely paralleled that of the attacking *Ips* adults; times of initial arrival and peak occurrence of *L. referendarius* adults tended to lag behind those of the *Ips* by about 2 weeks.

The close synchronization of *L. pusillus* adult activity with that of the attacking *Ips* prompted further study of the habits of this species. Inspection of *Ips*-infested material by removal of outer bark revealed *L. pusillus* to occur in tunnels of all three species of *Ips* (*I. avulsus, I. grandicollis,* and *I. calligraphus*) common to Alabama. The adult, figure 3, first appeared in tunnels only after *Ips* attack development had reached the egg-niche stage, but was then present through the *Ips* pupal stage. Eggs of *L. pusillus* were not found in the field, but subsequent observation of early stage larvae indicates that oviposition likely occurred in *Ips* tunnels.

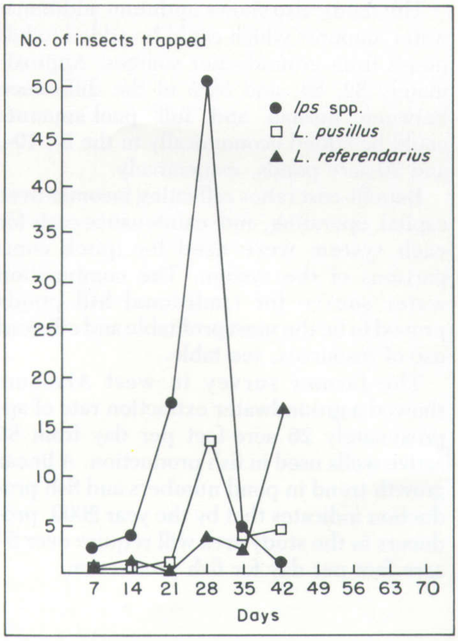


FIG. 2. Patterns of occurrence of adults of *Ips*, *L. pusillus*, and *L. referendarius* at felled pine.

Lasconotus larvae, figure 4, were most abundant under the bark during the *Ips* late-larval, pupal, and new-adult stages of development. Full-grown *Lasconotus* larvae abandoned *Ips* galleries and pupated in the soil. Seasonal activity of *L. pusillus* began in early spring when *Ips* activity increased and ceased in late fall when activity of *Ips* declined.

FIG. 3. *L. pusillus* adult.

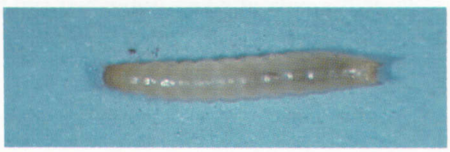


FIG. 4. *L. pusillus* larvae.

Food habits of *L. pusillus* were not discernible in field studies, but results of laboratory studies yielded information on this subject. Under laboratory conditions, field-collected *L. pusillus* adults fed, survived (some for longer than 40 days), and oviposited on an artificial diet medium consisting primarily of ground fresh pine phloem, Brewer's yeast, and distilled water. Eggs hatched and larvae fed and developed to adulthood.

Adults of *L. pusillus* also readily fed on *Ips* eggs and newly hatched larvae. *L. pusillus* larvae fed on pupae and late-stage larvae of *Ips*.

These results indicate that this colydiid species may be both predator and scavenger, feeding on *Ips* eggs, larvae, and pupae when available but capable of surviving in the absence of these forms.

The abundance and regular occurrence of *L. pusillus,* synchronization of its activity with that of *Ips,* and its apparent food habits suggest that this species may have potential as a natural enemy of *Ips* engravers.

Groundwater Use in Catfish Production

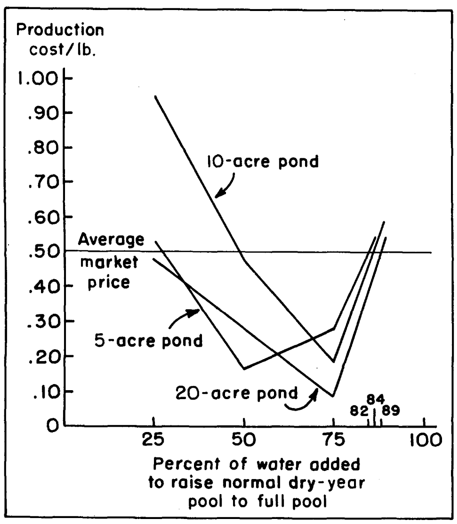
H.A. CLONTS and S.B. WILLIAMS
Department of Agricultural Economics and Rural Sociology

MOST COMMERCIAL FISH PRODUCERS in Alabama utilize watershed runoff as a primary water source. However, in west Alabama where catfish production is concentrated, unique soils, evaporation rates, seepage rates, and rainfall irregularities cause water volume in most ponds to shrink significantly in summer months.

A 1982 fish producer survey revealed that 86% of the producers in west Alabama did not have sufficient surface water year-round to maintain preferred fish production levels. Consequently, in droughty summer months many fish producers are turning to subsurface water sources to maintain adequate pool levels and water quality conditions. In addition, a growing number of producers are building diked ponds with dams on four sides. Diked ponds are easier to manage and harvest than traditional hill ponds.

Alternative strategies for water use in areas deficient in watershed runoff are under investigation by Alabama Agricultural Experiment Station researchers. Water-use models in the study include:

1. Diked ponds requiring 100% of available water to be pumped from subsurface aquifers.
2. Hill ponds utilizing watershed runoff as a primary water source, but requiring supplementary water from subsurface aquifers. To simplify this system, four distinct water additions were analyzed—25, 50, 75, and 100% of the amount of water needed to raise "normal" pool levels to "full-pool" in the driest year expected.
3. Both systems above using a secondary water storage reservoir as an alternative to pumping from subsurface aquifers.
4. Oversized ponds designed to retain a prescribed minimum water volume to satisfy selected stocking rates. The extra water volume is necessary to overcome seepage and evaporation losses.



Water needs for each system were determined by water budgeting. Precipitation, evaporation, seepage, and runoff were incorporated into a model to estimate water needs on a monthly basis.

There were definite economies of size among the pond units in all four models. Equipment necessary to supply water to ponds increased in capacity with pond size, but not linearly. Rather, cost per unit rose as pond size increased from 5 to 10 acres, but dropped significantly with 20-acre ponds. The same equipment, for the most part, could satisfy both 10- and 20-acre pond requirements; thus, the efficiency improved with larger ponds. The figure shows the incremental changes in fish production costs associated with pond size.

The figure also shows optimum additional water amounts which could be added to hill ponds from groundwater sources. Approximately 82, 84, and 89% of the difference between "normal" and "full" pool amounts could be added economically to the 5-, 10-, and 20-acre ponds, respectively.

Benefit-cost ratios reflecting incomes over capital, operating, and maintenance costs for each system were used for quick comparisons of the system. The combination water source for traditional hill ponds proved to be the most profitable and efficient use of resources, see table.

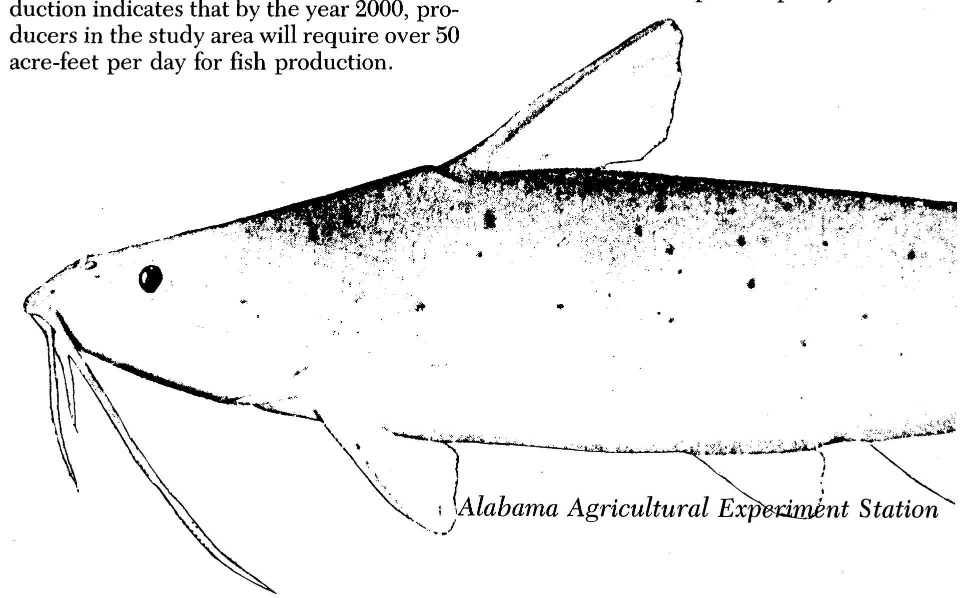
The farmer survey in west Alabama showed a groundwater extraction rate of approximately 26 acre-feet per day from 85 active wells used in fish production. A linear growth trend in pond numbers and fish production indicates that by the year 2000, producers in the study area will require over 50 acre-feet per day for fish production.

SUMMARY OF BENEFIT/COST RATIOS FOR CATFISH PRODUCTION SYSTEMS IN WEST-CENTRAL ALABAMA, 1982

System	Annual gross revenue plus salvage	Annual investment and operating costs	Benefit/cost ratio
	Dol.	*Dol.*	
1. Diked pond, 100% water by pumping			
5-acre unit	11,250	12,749	0.88
10-acre unit	22,500	17,279	1.30
20-acre unit	45,000	30,230	1.49
2. Hill pond, 25, 50, 75, 100% water by pumping			
5-acre unit			
25 pct.	10,743	11,065	.97
50 pct.	10,968	11,118	.99
75 pct.	11,137	11,165	1.00
100 pct.	11,250	11,216	1.00
10-acre unit			
25 pct.	20,925	15,241	1.37
50 pct.	21,825	15,483	1.41
75 pct.	22,275	15,724	1.42
100 pct.	22,500	15,966	1.41
20-acre unit			
25 pct.	42,275	26,937	1.57
50 pct.	43,650	27,291	1.60
75 pct.	44,550	27,451	1.62
100 pct.	45,000	28,582	1.57
3. Hill or diked pond, 100% water by gravity flow			
5-acre unit	11,250	14,020	.80
10-acre unit	22,500	17,540	1.28
20-acre unit	45,000	28,080	1.60
4. Oversized hill or diked pond			
5-acre unit	7,500	11,000	.68
10-acre unit	15,000	15,000	1.00
20-acre unit	30,000	26,000	1.15

Existing aquifers in the study area are capable of supplying 4,800 acre-feet per day from depths of 10 to 1,300 ft. However, this study showed the maximum economic depth of water extraction for fish production to be about 85 ft. At this depth, approximately 10% of the aquifer volume, or about 480 acre-feet per day, are available. Based on historical water use for other purposes, the aquifer is more than adequate for area needs. Thus, the question is not one of water availability, but rather one of the economics of water withdrawal.

At present, the most economical water use system is the hill pond system utilizing watershed runoff supplemented with groundwater additions to maintain pond levels at about 90% of pond capacity.



Alternative Marketing Systems Offer Greater Catfish Profits

D.S. HUNT and G.M. SULLIVAN
Department of Agricultural Economics and Rural Sociology

BECAUSE CATFISH stop growing when water temperature falls below 54°, the easiest way to grow them is to stock in spring, grow out during summer, and harvest in fall. But harvesting according to this schedule produces a seasonal glut in the fall, thereby creating marketing problems. Nevertheless, this was the common production and marketing schedule followed when Alabama's catfish industry was developing in the 1950's and 1960's.

The best way for a catfish processing plant to be profitable is to operate year-round at capacity, with a steady supply of catfish. Processors several years ago began to offer higher prices during winter, spring, and summer, compared to fall, to obtain steadier supplies. The processors' intention was to pay catfish farmers to postpone harvesting in the fall and hold the catfish into the slow-growth winter period for harvest during spring and summer.

Spreading harvesting over a 12-month or 3-month period or harvesting in 1 month only yielded varying degrees of profitability in an Alabama Agricultural Experiment Station study done on a west Alabama catfish farm. The study compared the long-term profitability of this middle-sized operation among three harvest strategies:

Strategy 1: Partial harvesting every month with nets (topping).

Strategy 2: Harvesting only during September, October, and November (figured on basis of same annual weight of fish as actually harvested in Strategy 1).

Stategy 3: Harvesting only in October (same annual weight).

The Texas A&M University Aquaculture Budget Simulator was used to project the economic performance of the farm over a 10-year planning horizon. Primary data were collected for the 12-month period ending June 1982, using a questionnaire which was administered during interviews with the farm manager. The sample farm contained over 200 pond surface acres and produced both fingerlings and market-size catfish.

The net worths of the farm at the end of year 10 under the three harvest stategies are illustrated in the table. Harvest strategy 1's net worth of $1,376,329 in year 10 was the largest of the three net worths. Harvest strategy 2's year 10 net worth of $972,949 was second, while strategy 3 ranked third with 10-year net worth of $833,024.

The three, 10-year net worths translate into annual average equity (net worth) growth rates of 48.2%, 31.1%, and 25.2% for harvest strategies 1, 2, and 3, respectively. These equity (net worth) calculations were based on (1) original owner's equity of $236,589 for all three harvest strategies, and (2) gross revenue for each year before taxes with production costs subtracted. Annual growth rates are also given in the table.

The effects of different harvest timing strategies on the cash flow of the sample farm were as follows: Harvest strategy 1 showed the fewest negative cash flow months with an annual total of four (June-September). Harvest strategy 2 yielded double that number with negative cash flow all months except February, September, October, and November. Harvest strategy 3 (100% harvest in October) showed the most negative cash outflow months with a total of 10 (all months except February and October).

Due to the different seasonal patterns of stocking and harvesting, the flow pattern of farm cash receipts seldom matches the flow of cash expenses. Farmers who can coordinate these income and expense flows to cancel each other out as much as possible can then operate with less short-term borrowing and liquid (cash) reserves. The number of negative net cash flow months during a 12-month period shows how much income and cost cash flows cancel each other out. Harvest strategy 1 offered the fewest negative net cash flow months.

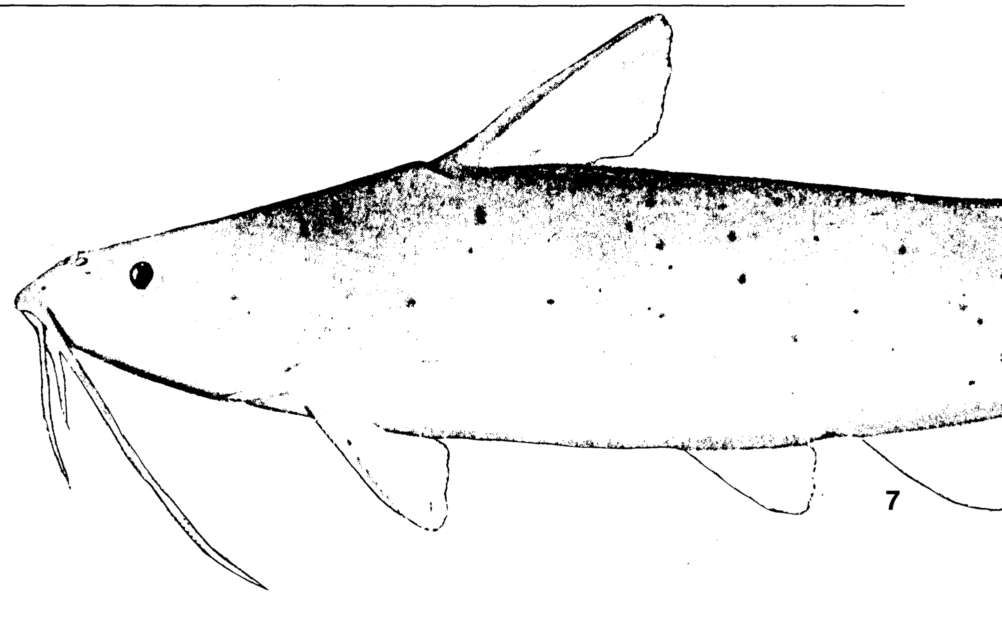
Harvest strategy 3 (October) is believed to represent the traditional harvest pattern dictated by the natural biological catfish growing season. Harvest strategy 2 (September, October, and November) is believed to typify the harvest schedule pursued by a farmer who is beginning to control his harvest to exploit seasonal catfish prices. Harvest strategy 1, the existing schedule of topping the growout ponds every month, is believed to represent the choice of a catfish farm manager who is acutely aware of the extra income he can earn by departing from tradition to take advantage of seasonal prices.

This research marked the first use of a computer simulation model to compare different marketing situations. In this case, the marketing situations took the form of production management (i.e. harvest timing). The whole area of seasonal prices offered by processors gives the catfish farmer a chance to improve his own marketing position, and thus his own long-term financial position, by bringing his catfish to market when they will bring the best possible price.

Assuming any management practice that increases profits also increases growth potential, then harvest strategy 1 offered more opportunities for financial growth of the catfish farm than strategies 2 and 3. Results suggest that such production planning by catfish farmers can be profitable, perhaps more so than the high-density fish stocking and the large economies of scale that have dominated the catfish industry during its recent years of rapid expansion.

COMPARATIVE SUMMARY OF ECONOMIC GROWTH MEASURES FOR THREE HARVEST STRATEGIES FOR A WEST ALABAMA CATFISH FARM OVER 10 YEARS, 1982-91

Measurement	Harvest strategy: 1—harvest all months	2—harvest September, October, November	3—harvest October only
Year 10 net worth (owner's equity)	$1,376,329	$972,949	$833,024
Annual rate of equity growth (average)	48.2%	31.1%	25.2%
Number of negative net cash flow months	4	8	10



TIME OF TOPDRESS NITROGEN APPLICATIONS VITAL FOR WHEAT

J.T. TOUCHTON, D.H. RICKERL, and C.H. BURMESTER
Department of Agronomy and Soils

TIMING OF TOPDRESS nitrogen (N) application for wheat, which often depends on rainfall patterns, ranges from January to April. The N is generally applied in a single application, but it is not uncommon for some growers to use two or more split applications. During the winter, soils in Alabama often remain water saturated for extended periods, which creates conditions favorable for N losses. When soil conditions are favorable for N losses, splitting the N applications can improve fertilizer N efficiency. Splitting applications increases application costs and results in increased soil compaction because of additional trips across the field.

A study by the Alabama Agricultural Experiment Station began in 1981 to determine how wheat grain yields are affected by the time of topdress N applications. The study was established with wheat at three locations in 1981 and expanded to five locations in 1982, table 1.

The N rate used in the study was 80 lb. per acre (prilled ammonium nitrate) at all locations except Belle Mina, where the rate was 60 lb. per acre. Time of N treatments included single applications and 2-, 3-, and 4-way splits, table 2. The N treatments were applied within 4 days of the 15th of each month. A control treatment with no N was also included at all locations.

At Milstead, the previous sorghum crop was grown without N fertilizer. To help ensure a low N soil, the entire sorghum plant was removed at maturity. At the other locations, to be representative of actual farming practices, the summer crops were grown with recommended production methods and harvested for grain. When wheat followed soybeans, a nitrogen-fixing plant, fall N was not applied. However, 20 lb. per acre was applied when wheat followed corn and sorghum.

Splitting the N applications did not result in higher yields than those obtained with the best single N application except in Monroeville in 1981, table 2.

The best time for a single application varied with locations, previous crops, planting dates, and years. The mid-January application was too early for optimum yields except at Fairhope and Belle Mina in 1982, and with the early planted wheat at Monroeville in 1982. Mid-March applications were too late for optimum yields except at Fairhope, Belle Mina, Monroeville with the late planted 1982 wheat, and Crossville when wheat followed soybeans.

Although several treatment combinations resulted in yields as high as those obtained with the single mid-February application, there were only two exceptions when the mid-February application did not result in yields as high or higher than any other treatment combination. The exceptions occurred at Monroeville in 1981 and with the early planted wheat in 1982.

The optimum time of topdress N applications for wheat will obviously vary with varieties, planting dates, previous crops, and other factors that may affect plant growth and development. It appears, however, that a good general recommendation would be to apply the topdress N in a single application in mid-February. Unfortunately, the soils in February are often too wet to support traffic, and delaying N applications until March can severely limit yields if the soils are low in N.

Applying high rates of N in January can, in some years, result in excessive vegetative growth and severe lodging (data not shown). Since split N applications generally did not improve yields, and since they result in extra costs and possible yield reductions from additional soil compaction, it appears that the best time to apply topdress N would be as soon as possible after the first of February.

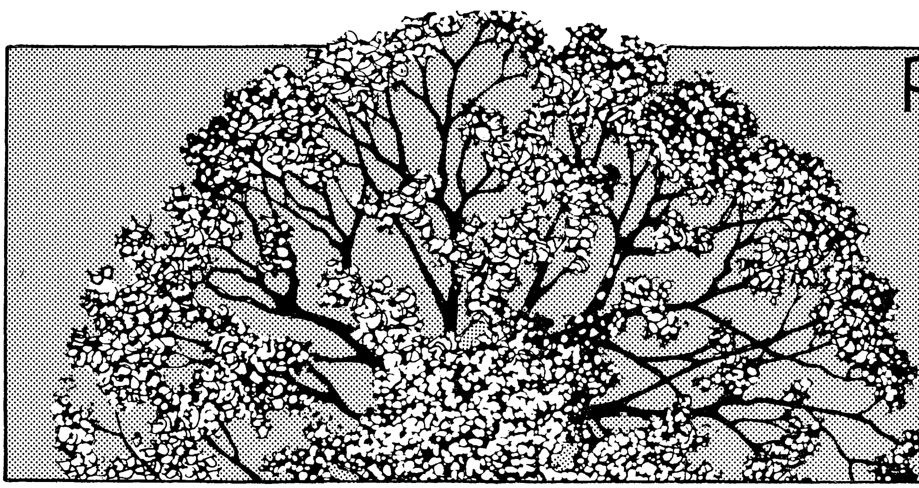
TABLE 1. LOCATION, PREVIOUS CROPS, WHEAT VARIETIES, AND PLANTING DATES

Location	Previous crops	Wheat variety	Planting dates
Fairhope	Soybeans	Coker 762	11-25-81; 11-15-82
Monroeville	Soybeans	Coker 747	11-18-81; 11-12-82
		Florida 301	12-13-82
Milstead	Sorghum	Wakeland	10-29-81; 10-19-82
Crossville	Soybeans	Coker 762	11-10-82
	Sorghum	Coker 762	11-10-82
Belle Mina	Corn	Coker 747	10-27-82

TABLE 2. WHEAT GRAIN YIELD AS AFFECTED BY TIME OF TOPDRESS N APPLICATIONS

Applied N/acre, by time of application				Wheat yield/acre										
				Fairhope		Monroeville			Milstead		Crossville		Belle Mina,	Av.
Jan.	Feb.	Mar.	Apr.	1981	1982	1981	1982A[1]	1982B	1981	1982	1982A[2]	1982B	1982	
Lb.	*Lb.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
0	0	0	0	42	31	7	41	47	15	12	8	8	28	24
20	20	20	20	48	37	32	57	58	39	28	--	--	50	44
27	27	27	0	50	39	34	53	58	39	40	32	38	51	43
0	27	27	27	50	39	29	53	58	39	28	33	44	52	43
40	40	0	0	41	39	29	53	57	39	37	37	43	49	42
0	40	40	0	48	38	26	54	56	41	29	34	44	52	42
0	0	40	40	43	38	13	51	56	24	18	31	36	46	36
80	0	0	0	46	38	24	56	54	35	35	29	35	49	40
0	80	0	0	48	40	29	49	56	38	43	36	43	50	43
0	0	80	0	51	39	15	42	56	29	20	30	44	48	37

[1]For Monroeville, 1982A is early planted wheat and 1982B is late planted wheat.
[2]For Crossville, 1982A is sorghum preceding wheat and 1982B is soybeans preceding wheat.



Propiconazole Controls Pecan Scab After an Infection Period

A.J. LATHAM
Department of Botany, Plant Pathology, and Microbiology

APPLICATION of a protective fungicide at 2- or 3-week intervals has been the prescribed method of controlling pecan scab. When the growing season is relatively dry, scab development may be light and the full spray schedule may not be needed. Nevertheless, protective fungicides must be applied on a regular schedule to obtain effective scab control.

Another approach to disease control is by use of a fungicide after spores that cause scab have been dispersed and infection has occurred. However, this system has not been tested on pecans.

A new product now under test at the Alabama Agricultural Experiment Station—propiconazole (Tilt®)—shows promise as an after-infection treatment for control of scab. Although not registered for use on pecans, propiconazole may prove to be what pecan growers need.

The Experiment Station study was designed to define the time when fungicide treatment is effective following infection. Three-year-old Schley trees growing in 3-gal. pails were used in the study. Conidia of *Cladosporium caryigenum,* which causes scab, were washed from scabby pecan leaves and a uniform concentration sprayed on the Schley pecan leaves. Inoculated trees were placed in a chamber programmed to 76°F and 100% relative humidity for 12 hours for infection to occur. Time of inoculation was used as time zero for subsequent fungicidal applications.

The fourth compound leaf (the oldest) from the top of the shoot of each tree was covered with a plastic bag and sealed around the rachis. This prevented any fungicide from reaching the leaflets. The three younger compound leaves were sprayed with propiconazole at 48, 96, 144, or 192 hours (2, 4, 6, or 8 days) after inoculation. Six trees were used for each incubation time; control trees were sprayed with sterile tap water. Propiconazole applications were sprayed to runoff using a solution containing 0.02 oz. of propiconazole per quart of water. Subsequently, the trees were held for 30 days in the greenhouse and *C. caryigenum* lesions on each leaflet were counted.

Excellent control of the scab fungus was achieved by propiconazole treatment. This is evident by comparing the number of lesions on check leaves and on treated leaves, given in the table. Ratings given untreated leaves indicate severity of scab development. Lesion counts from the fourth leaf, which was enclosed in a plastic bag to prevent fungicide reaching it, indicate the amount of scab that could have occurred without the fungicide.

CONTROL OF CLADOSPORIUM CARYIGENUM BY PROPICONAZOLE APPLIED 2-8 DAYS AFTER INOCULATION

Treatment of inoculated leaf[1]	Leaf number from top of shoot	Number of lesions and lesion ratings of lateral leaflets[2]									
		Untreated check		Treatment after inoculation							
				2 days		4 days		6 days		8 days	
		No.	Rating	No.	Rating	No.	Rating	No.	Rating	No.	Rating
Covered	4	46	2.5	55	2.6	53	2.6	67	2.4	58	2.9
Uncovered	3	57	2.6	0	6.0	22	7.0	51	7.0	58	7.0
Uncovered	2	48	3.0	0	6.0	26	7.0	56	7.0	56	7.0
Uncovered	1	35	2.8	0	6.0	18	7.0	36	7.0	38	7.0

[1]Leaves were inoculated with *C. caryigenum* and either covered or left uncovered when propiconazole was applied.
[2]Numbers are means counted on 42 leaflets. Rating key: 1, stroma discernible by reflected light, no spores; 2, small, pale brown lesions less than 1.0 mm diameter, some spores; 3, lesions moderately developed, brown to black, 1.0-1.5 mm diameter; 4, lesions well developed, purple-black, 1.6-3.0 mm diameter; 5, large spreading lesions, above 3.0 mm diameter; 6, leaves free of disease symptoms resulting from fungicidal activity; 7, leaf fleck collapsed, shiny dark brown.

Leaves treated with propiconazole 2 days after inoculation were free of disease symptoms. These were given ratings of 6. Those treated 4 days after inoculation had a leaf fleck that was discernible only with a stereomicroscope. If treated 6 or 8 days after inoculation, there was a leaf spot or fleck that could be clearly seen. These were rated 7.

Pecan leaflets treated with propiconazole or water were surface sterilized in 0.5% sodium hypochlorite for 5 minutes, rinsed six times with sterile water, and embedded in potato dextrose agar in petri dishes. Leaflets were incubated for 8 days at 74°F, at which time small black colonies of *C. caryigenum* growing from the leaves were recorded. Sporulation of *C. caryigenum* was verified after 6 weeks.

The curative activity of propiconazole was absolute when treatment was made within 2 days after inoculation. There was neither micro- nor macroscopic evidence of infection.

When treatment was delayed 4 days after inoculation, the formation of flecks was approximately 50% of the untreated check. Those lesions, however, could be seen only with the aid of a stereomicroscope. Culture of leaves treated 4 days after inoculation failed to produce colonies.

Delaying treatment 6 or 8 days after inoculation resulted in the appearance of a shiny, dark brown spot or fleck on the leaf, apparently as a result of *C. caryigenum* necrosis. Based on the number of lesions on unsprayed check leaves, only 3% of the infections survived when treatment was made 6 days after inoculation, and 23% survived when treatment was delayed 8 days.

Based on the results reported, use of propiconazole should offer growers the option of treating for pecan scab after trees have been exposed to the fungus that causes the disease. Thus, more effective disease management procedures should be possible when propiconazole is registered for use on pecans.

DAYLIGHT CALVING IN THE SOUTHEAST

D.A. DANILSON and S.C. ABBATTE, Department of Animal and Dairy Sciences

DISCOVERING A DEAD CALF and/or cow on the morning pasture check during calving season is a discouraging and financially damaging event to the cow-calf producer. Also, there are long sleepless nights spent waiting for a heifer to calve or assisting in a difficult delivery.

Recent interest has been focused on the natural stimulation of calving during daylight hours. Daylight calving stimulation was first reported in 1975 by a Canadian named Gus Konefal. Konefal noted that cows fed in the late morning and evening responded by showing an 80% incidence of calving during daylight hours (7 a.m.-7 p.m.). This is in contrast to near even splits of day versus night calvings in traditional management systems. Several studies have been conducted in the northern and mid-western parts of the country which show similar results.

The objective of a recent study by researchers with the Alabama Agricultural Experiment Station was to attempt to stimulate increased daylight calving in a fall-winter calving season in a southern climate and environment. Over a 2-year period, 112 calving episodes were recorded from Angus, Polled Hereford, and Simmental-cross cows ranging in age from 2 to 13 years. The calving seasons were October through February.

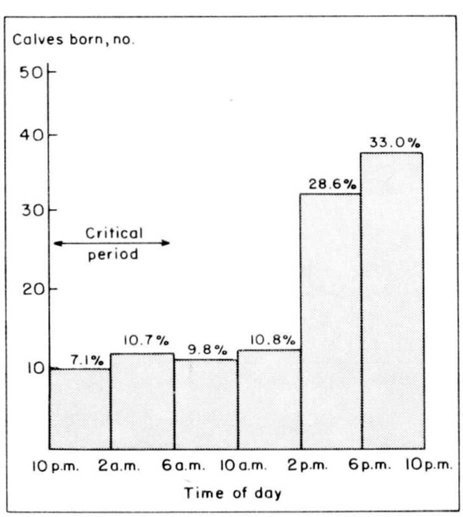
Approximately 2 weeks prior to calving, cows were moved into the calving area. This area was composed of a 5-acre dormant bermudagrass paddock and a small, lighted holding lot next to the calving barn. At 5 p.m. each day, cows were penned in the holding lot and fed 30-40 lb. of corn silage each. Access to Coastal bermudagrass hay, a free choice salt/protein/mineral mix, and water was also allowed throughout the night. At 6:30 a.m. the cows were moved onto the dormant pasture and locked out of the holding pen. Water was also available in the pasture. Cattle were checked at 4-hour intervals and calving times were recorded. Cows were removed from the calving pasture within 12 hours post-calving.

The accompanying figure shows the calving frequencies recorded in the 4-hour observation intervals. The period from 10 p.m. to 6 a.m. was defined as the "critical period" of calving episodes, representing the most difficult and undesirable time frame for routine observation of delivery and unfavorable weather conditions. Previous research has shown that cattle managed in systems of morning feeding or continuous grazing exhibit calving episode patterns which are evenly dispersed throughout the 24-hour period. Consequently, approximately one-third of the calving episodes in a cow herd normally occur during this "critical period." However, only 17.8% of the calving episodes occurred during this "critical period" from 10 p.m. to 6 a.m. Over 80% of the calving episodes occurred in the more desirable time periods.

Direct evidence defining this phenomenon is not available. It is known, however, that the frequency of calving drops for about 9-10 hours after feeding. Therefore, a late evening feeding would result in delaying the initiation of delivery until 2-3 a.m. Since the entire calving process usually takes several hours, the actual birth is more likely to occur during the daytime rather than the early morning period.

It can be noted that over 60% of the calving episodes occurred from 2 p.m. to 10 p.m., see figure. This represents nearly a 50% increase over a normal calving episode distribution. It also describes a somewhat different frequency than observed in similar studies. It was expected that a higher percentage of the cattle would calve in the 6 a.m. to 2 p.m. time period. However, the movement of the cattle from the holding pen to the pasture at 6:30 a.m. possibly resulted in an interruption or delay of the normal delivery process. It was noted that the cows tended to browse the dormant bermudagrass and move around the pasture perimeter when they were turned out. By 8 a.m., the cows had settled down and were resting. Previous studies did not impose this interruption in the resting period following feeding.

The movement of a greater proportion of calving episodes into daylight hours could result in greater calf crop percentages and thus greater net profits for cow-calf producers. The likelihood of calving problems being detected and solved during the daylight hours should result in a greater percentage of live calves from the cow herd. In addition, the reduction in amounts of time and discomfort associated with checking cows and assisting deliveries at all hours of the night could be reduced. This does not mean, however, that nighttime checks on calving cows, especially heifers, should be eliminated. The producer in today's industry must maximize calf crop percentages to achieve greater net profits. Daylight calving stimulation appears to be an additional management technique that allows the producer to improve on the number of live calves born.



FOREIGN AGRICULTURAL TRADE IMPORTANT TO ALABAMA FARMERS

J.L. STALLINGS
Department of Agricultural Economics and Rural Sociology

FOREIGN TRADE in agricultural products is important to Alabama's total economy. Since such trade is especially important to the State's agricultural sector, the Alabama Agricultural Experiment Station continues to give research attention to the impact of foreign trade and the effects of trade policies and issues. A 5-year project now underway is also addressing issues concerning the Port of Mobile and the Tennessee-Tombigbee Waterway.

The evolution of international agricultural trade in the United States and Alabama has been characterized by a tremendous upsurge in agricultural exports since the early 1970's. Since that time, agricultural exports have increased rapidly relative to imports, resulting in an increasing balance of trade surplus for agriculture, see graph. At the same time, non-agricultural trade was showing the exact opposite trend, resulting in a deficit in the balance of non-agricultural trade. The net effect was an overall U.S. trade deficit, but less than would have been the case without the agricultural surplus.

Most of the upsurge in agricultural exports since the early 1970's has been in plants and plant products rather than in livestock and livestock products. During this period, much U.S. acreage was planted that had been in acreage diversion programs. The resulting surplus above domestic needs, along with U.S. prices being more in line with world prices than earlier and an increased world demand, resulted in a peak of $43.8 billion in agricultural exports in fiscal year (FY) 1981. Plants and plant products accounted for $39.7 billion (90.6%) and animals and animal products $4.1 billion (9.4%).

Three categories of commodities led the way in increased U.S. exports of agricultural products beginning in the 1970's. In the peak year of 1981, soybeans and soybean products accounted for $8.0 billion, wheat and wheat products $8.1 billion, and feed grains and products $10.5 billion. These three categories of commodities made up 60.7% of all U.S. agricultural exports in that year.

The evolution of foreign agricultural trade in Alabama is tied to that of the United States as a whole, because most of what U.S. agriculture produces are "fungible" products (i.e.—a bushel of soybeans from Alabama is, with minor exceptions, the same as a bushel from Illinois). Therefore, Alabama's "export share" of agricultural trade can be defined as the percent of the various U.S. agricultural products exported applied to Alabama's production. This is the concept usually used in measuring the importance of trade to any state.

Using the concept of "Alabama's export share" gives an idea of the importance of international agricultural trade to Alabama's economy. The value of Alabama's export share reached a high of $480.9 million in FY 1982, nearly 22% of the value of all agricultural production in the State.

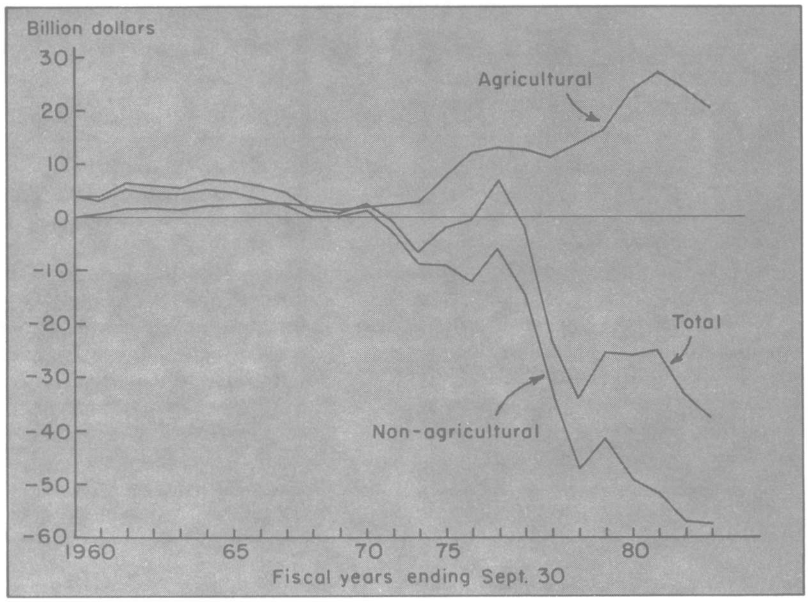
Soybeans and their products contribute most to Alabama's export shares, followed usually by poultry and products and cotton and products. However, wheat made a dramatic increase in FY 1982. From a percentage standpoint, Alabama's export share represents more than 50% of some products, especially wheat, soybeans, and cotton. In other words, more than 1 of every 2 acres of these crops depend upon exports for a market, either directly or indirectly.

Alabama is in good position to take advantage of increased export trade in agricultural products in the future. Its geographic location, well developed river facilities, the Public Grain Elevator at the Port of Mobile, and the Tennessee-Tombigbee Waterway, nearing completion, provide a unique infrastructure for trade.

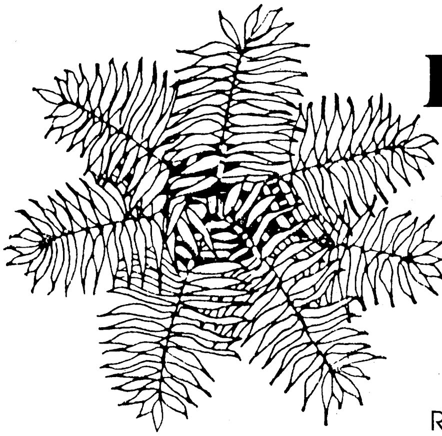
One advantage of the completion of the new waterway will be to give Alabama ports on the Tennessee River in north Alabama a more direct water route to an overseas shipping point and, thus, more access to international trade. For instance, distance from Decatur to New Orleans is 1,275 river miles, compared with a distance of 543 to Mobile when the waterway is completed. This savings of 732 miles, over 57 percent of the distance, will be an important advantage to north Alabama farmers.

Extensive modernization has provided the impetus to make international trade in grain a major activity at Mobile. Several years ago, the Governor and Docks' officials began planning for additional facilities which has resulted, so far, in 14 inland docks on the river system, including seven grain elevators with a capacity of 3,250,000 bu. in addition to the facility at the Port itself.

Since the holding capacity of the facilities at the Public Grain Elevator at Mobile is 3,200,000 bu., this gives a total capacity of 6,450,000 bu. for the whole system. However, the turnover rate at the Port has been from 35 to 40 times storage capacity, making it capable of exporting over 100 million bu. per year. This ranks it number 1 in this statistic in recent years compared with ports of much higher storage capacity.



U.S. balance of international trade: agricultural, non-agricultural, 1960-83.



BOSTON FERN

Effects of Slow-release and Liquid Fertilizers on Growth and Post-production Performance

C.H. GILLIAM, Department of Horticulture
R.L. SHUMACK, Cooperative Extension Service
C.E. EVANS, Department of Agronomy and Soils

MANY COMMERCIAL foliage plant producers use liquid fertilizers in their production programs. Since liquid fertilizers last only a short time in growing media, there has been concern about whether quality of plants can be maintained while plants are awaiting sale in retail outlets.

But this problem did not show up in Alabama Agricultural Experiment Station research with liquid and slow-release fertilizers. Ferns that had been produced under liquid fertilization maintained their green color for 6 weeks in low-light conditions without additional fertilizer applications.

Previous research had shown the benefits of acclimatizing foliage plants before they enter the interior environment. Plants grown under low-light levels during acclimatization reportedly require less fertilizer. Thus, holding ferns in low-light conditions prior to retail sales would potentially benefit both the garden center operator and the consumer.

The objectives of the Alabama Experiment Station study were to determine the effects of a liquid fertilization program and two slow-release fertilizers on Compacta Boston fern. Growth, foliar nutrient content during production, and post-production quality under greenhouse and interior low-light conditions were measured.

Boston Compacta fern liners were potted on September 23, 1981, in 6-in. pots in a medium of 1 peat:1 perlite (by volume), amended with 2 lb. per cu. yd. of gypsum. Seven fertilizer treatments were compared. An experimental, sulfur-coated, slow-release encapsulated fertilizer (SREF) 20-4-10 and Osmocote 19-6-10 were compared at three rates: 1.5, 3.0, and 6.0 lb. nitrogen (N) per cu. yd. To obtain the three N rates, Osmocote was added to the medium at 8, 16, and 32 lb. of product per cu. yd., while SREF was added at 7.5, 15, and 36 lb. per cu. yd. A control treatment of liquid fertilization with 20-2-20 was applied at 150 p.p.m. N twice weekly.

Ferns were grown in a double-layer, polyethylene house with maximum illuminance of about 40 kilolux (klx). Temperatures ranged from 64 to 75°F.

At the end of 16 weeks, half of the ferns were moved to an interior environment, while the others were left in the greenhouse. Interior lighting was provided by Cool-White 40W fluorescent lamps plus natural light through windows. No fertilizer was applied to the control treatment in either environment after January 13.

Commercial production. The greatest fern growth during the 16-week normal production period occurred with either the liquid feed program or incorporation of Osmocote (3 lb. N per cu. yd.), see table. With Osmocote there was no difference in fern dry weight when comparing the higher slow-release N rates.

Simulated holding conditions. Little growth occurred on the ferns moved to the low-light conditions. With one exception, fern dry weight taken after 6 weeks in the interior environment was within 5% of the dry-weight data taken 6 weeks earlier. In contrast, ferns held in the greenhouse environment had dry-weight increases of 20% or more. Ferns grown with the liquid program increased 28% in dry weight, even though no fertilizer was applied during the 6-week holding period. These data indicate that fern growth occurred from stored N or N retained in the medium, since none was applied during the holding period.

The visual condition of the ferns at the end of the two holding periods was determined by the measurements of color difference. At the beginning of the holding period, frond color was similar among all treatments with the exception of fronds grown with 1.5 lb. N per cu. yd. of SREF, which were a lighter green. At the end of the period, all ferns in the greenhouse appeared lighter compared to their color at the beginning of the holding period, although statistical comparisons were not made. However, ferns held in the interior environment appeared greener, including the liquid control treatment which had no added fertilizer during those 6 weeks.

These results have several practical implications. Many retail garden centers have greenhouses to hold and maintain foliage plants prior to sale. Data indicate that ferns actually improve in color under low-light conditions, even when no liquid fertilizer is added, tending to dispute the notion that slow-release fertilizers are superior to liquid fertilizers in maintaining green color following the production period. Ferns previously on the liquid feed program, which were held for 6 weeks with no fertilization, were as green as any fern grown with slow-release fertilizers, regardless of the holding treatment. Thus, it may not be necessary to fertilize ferns held under low-light conditions for at least 6 weeks after commercial production is finished.

Foliar N data further support the fact that ferns grown with liquid fertilization did not become yellow or chlorotic, see table. When sampled at the end of the commercial production period, ferns grown with liquid fertilizer had foliar N content similar to or higher than all other treatments, whether in the greenhouse or in the interior environment.

These results demonstrate that retail outlets may best handle ferns by holding them in a low-light environment without additional fertilization, regardless of the type of fertilizer used during commercial production.

EFFECTS OF ONE LIQUID AND TWO SLOW-RELEASE FERTILIZERS ON COMPACTA BOSTON FERN DRY WEIGHT AND FOLIAR ANALYSIS

Treatment, lb. N/cu. yd.	Dry wt.			Nitrogen			
	Jan. 16	Feb. 25	Feb. 25[2]	Nov. 18	Jan. 16	Feb. 25	Feb. 25[2]
	Oz.	*Oz.*	*Oz.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
SREF[1] 24-4-10							
1.5	1.81	2.31	1.88	2.6	1.5	1.6	1.8
3.0	2.02	2.30	1.98	3.3	2.5	2.6	3.0
6.0	2.06	2.93	2.01	3.5	2.7	2.5	3.1
Osmocote 19-6-10							
1.5	2.16	2.60	2.06	3.2	2.2	1.9	2.5
3.0	2.49	3.38	2.48	3.3	2.5	2.1	3.0
6.0	2.09	3.13	2.37	3.2	2.6	2.2	3.1
Liquid fertilizer 20-2-20							
150 p.p.m. N	2.58	3.59	2.63	3.0	2.9	2.4	3.3

[1]An experimental slow-release encapsulated fertilizer.
[2]Ferns were held in an interior environment January 16-February 25, 1982. All other samples were collected from ferns grown in the greenhouse.

Effect of In-row Chisel at Planting on Yield and Growth of Full Season Soybeans

D.L. THURLOW and C.B. ELKINS[1], Department of Agronomy and Soils

SANDY SURFACE SOILS, such as those in the Coastal Plains of Alabama, are highly susceptible to traffic and tillage compactions. Wheel traffic of tractors and combines often compacts the plow layers, and disks and plows can create severe compaction at the bottom of the tillage zone, which is referred to as a disk, plow, or tillage pan. These compacted layers often prevent proper root development and prevent roots from reaching available moisture in the subsoil horizons. Tillage pans are present in almost all soils, but they do not restrict root development in all soils.

From 1977 through 1981 the Alabama Agricultural Experiment Station conducted studies at nine locations in Alabama to determine if disrupting the tillage pans with an in-row subsoiler at planting, in both conventional and no-tillage cropping systems, would improve soybean growth and yields.

The conventional tillage treatment consisted of either chiseling or turning soils 8-10 in. deep and then disking, rotary tilling, or using a combination seedbed conditioner to prepare a seedbed. The no-tillage treatment was planted into a killed stand of small grain or old crop residue with only a double disk opener planter. The in-row subsoil treatments were planted with a Brown Harden Super Seeder®. Subsoil depth was 12-14 in.

An Essex soybean variety was planted in the three northern Alabama locations and Ransom was planted in the six southern locations. All plantings were made for full season production using a 36-in. row width. The yield and growth of soybeans are reported as relative yield and plant height in relation to the conventional tillage treatment, tables 1 and 2.

When compared to the conventional tillage treatment, no-tillage without subsoiling resulted in reduced soybean yields and plant growth on all Coastal Plain and River Terrace soils. The use of the in-row subsoiler with the conventional tillage system at planting increased yields over the conventional tillage system at Tallassee and Headland. The Tallassee soil had a strong plow pan and the soil at Headland developed a very compact layer in the lower plow layer during the herbicide incorporation with rotary tiller and disk.

Yields of soybeans under the no-tillage system with the in-row subsoiler were equal to those grown on the conventional system with and without the in-row subsoiler except for the Crossville location. At the Crossville location, the highest yields were from conventional tillage. The most noticeable effect of tillage treatments on vegetative growth was reduced plant height in the no-tillage treatment at Tallassee, Prattville, Monroeville, Headland, and Fairhope. At the Belle Mina location, all plots produced good growth and yield with all tillage systems.

Root development of Ransom soybean at Tallassee under no-tillage with subsoiler (left) and no subsoiler (right).

The results of this study suggest that for full season soybeans, yields from no-tillage systems may be comparable to or higher than yields from conventional tillage systems provided an in-row subsoiler is used on Coastal Plain and River Terrace soils.

[1]Coop. USDA.

TABLE 1. RELATIVE PLANT HEIGHT OF SOYBEANS AS AFFECTED BY PREPLANT SOIL PREPARATION AND IN-ROW SUBSOILING ON EIGHT SOILS IN ALABAMA[1]

Tillage treatment	Relative plant height by location						
	Belle Mina 2 yr. (1978-79)	Crossville 2 yr. (1977-78)	Tallassee 5 yr. (1977-81)	Prattville 5 yr. (1977-81)	Monroeville 2 yr. (1977&79)	Headland 1 yr. (1978)	Fairhope 1 yr. (1978)
Conventional tillage	100	100	100	100	100	100	100
Conventional tillage plus in-row subsoiling	100	101	107	100	102	125	103
No-tillage	97	101	82	71	87	71	76
No-tillage plus in-row subsoiling	102	109	107	94	100	118	94
Av. plant height (in.) for conventional tillage	26	25	31	31	33	23	37

[1]Soil types: Belle Mina, Decatur clay; Crossville, Hartsells fine sandy loam; Winfield, Savannah fine sandy loam; Prattville, Lucedale fine sandy loam; Monroeville, Lucedale fine sandy loam; Fairhope, Malbis fine sandy loam; Headland, Dothan fine sandy loam; Tallassee, Cahaba fine sandy loam.

TABLE 2. RELATIVE YIELD OF SOYBEANS AS AFFECTED BY PREPLANT SOIL PREPARATION AND IN-ROW SUBSOILING ON EIGHT SOILS IN ALABAMA

Tillage treatment	Relative yield by location							
	Belle Mina 2 yr. (1978-79)	Crossville 3 yr. (1977-79)	Winfield 2 yr. (1978-79)	Tallassee 4 yr. (1977-78) (1980-81)	Prattville 4 yr. (1978-81)	Monroeville 3 yr. (1977-79)	Headland 3 yr. (1978-80)	Fairhope 2 yr. (1978-79)
Conventional tillage	100	100	100	100	100	100	100	100
Conventional tillage plus in-row subsoiling	113	92	106	115	105	99	156	98
No-tillage	114	71	87	84	66	85	85	79
No-tillage plus in-row subsoiling	116	87	91	100	104	105	152	100
Av. yield (bu./acre) for conventional tillage	37.4	33.9	28.8	28.4	19.5	37.1	15.6	33.9

Relationship Between Dietary Zinc and Polyunsaturated Fat

M.C. CRAIG-SCHMIDT, R.R. GATES, and S.A. FAIRCLOTH, Department of Home Economics Research

As KNOWLEDGE about individual nutrients has increased, nutritional scientists have expressed more interest in how the function of one nutrient is related to other components in the diet. For example, human nutrition researchers with the Alabama Agricultural Experiment Station are studying the relationship between zinc, a mineral that is an essential component of the diet, and a component of polyunsaturated fat called essential fatty acids.

If animals are fed a diet deficient in zinc, they exhibit some of the same symptoms that are seen when the diet is deficient in essential fatty acids. One of the reasons this type of fat is necessary in the diet is that it serves in the body as a building block for a group of hormone-like compounds called prostaglandins. Prostaglandins are involved in the proper function and regulation of many bodily processes including reproduction.

Aspirin inhibits the formation of prostaglandins in the body. When researchers noticed that prolonged pregnancy, difficult delivery, and lowered blood pressure were symptoms common to pregnant rats either fed zinc-deficient diets or treated with toxic doses of aspirin, a relationship between zinc and prostaglandin formation was proposed. Thus, the purpose of the reported experiment was to see how prostaglandin production in two organs of the body was affected by zinc deficiency.

Fifteen male albino rats were randomly divided into three groups. One group was fed a diet complete in all nutrients. The second group was fed a diet deficient in zinc. Zinc-deficient animals are known to have decreased food intake. Therefore, to distinguish between effects caused by zinc deficiency and those caused by depressed appetite, a third group was pair-fed, meaning that these animals were fed the complete diet in the amounts consumed by the deficient group.

Weight gain for each group during the experimental period is shown in the accompanying figure. Animals fed a zinc-deficient diet ate less food which was reflected in reduced weight gain. The weight gain of the pair-fed animals was intermediate between the deficient and the control groups.

At the end of the 5-week experimental period, livers and lungs were removed, and the ability of each organ to produce prostaglandins was determined.

If zinc is necessary in prostaglandin biosynthesis, then one would expect the ability of various organs to produce prostaglandins to be lowered in zinc-deficient animals. In this experiment it was found, however, that prostaglandin levels were not significantly different between zinc-adequate and zinc-deficient animals except for prostaglandin E in lung tissue, see table. In this instance, prostaglandin E was found to be increased, not decreased as expected. When results from the pair-fed group were compared to the control group, there were no differences in prostaglandin production by lung tissue. However, the livers of the animals which were pair-fed exhibited a decrease in prostaglandin production. Restricting food intake appears to affect prostaglandin production in the liver but not in the lung.

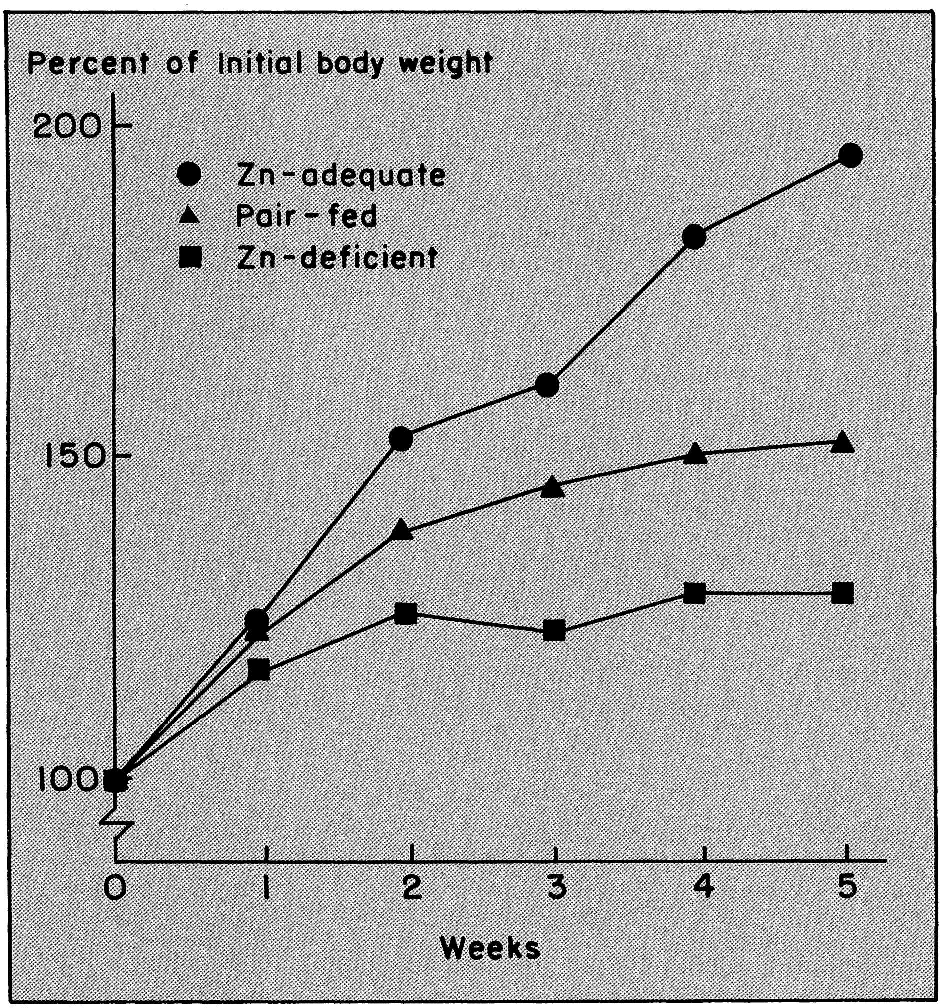
It was concluded from this experiment that zinc-deficient animals did not have decreased levels of prostaglandins as some investigators had proposed.

EFFECT OF ZINC DEFICIENCY ON PROSTAGLANDIN PRODUCTION BY INCUBATED TISSUES[1]

Dietary treatment	Prostaglandin E		Prostaglandin $F_{2\alpha}$	
	Lung tissue	Liver tissue	Lung tissue	Liver tissue
	ng/g	*ng/g*	*ng/g*	*ng/g*
Zn-adequate....	7.7 ± 1.3	14.5 ± 3.0	42.2 ± 5.6	42.1 ± 9.0
Zn-deficient....	12.7 ± 1.5	13.2 ± 2.1	40.3 ± 5.8	51.8 ± 8.5
Pair-fed........	6.6 ± 0.6	7.5 ± 1.5	39.2 ± 3.8	21.7 ± 2.3

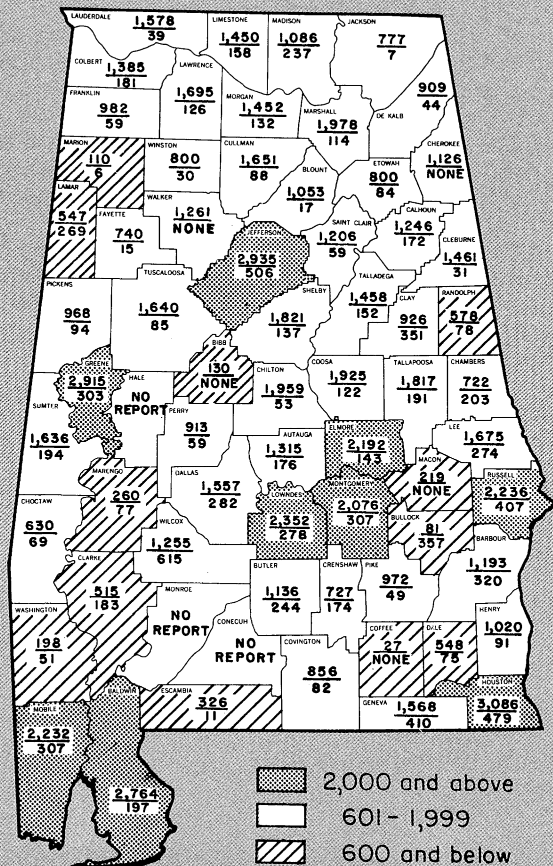
[1]Values are mean ± standard error of the mean.

Growth curves of experimental animals.



Rural Crime Increasing in Alabama

N.C. WAKEFIELD and J.E. DUNKELBERGER
Department of Agricultural Economics and Rural Sociology



1981 rural property and violent crime rates per 100,000 population: upper number is property crime, lower number is violent crime.

IN THE MINDS of most people, rural areas are safe and secure from crime, at least in comparison with metropolitan areas. The infrequent instances of violent crimes, occasional vandalism, and thefts of livestock and crops have never seemed to compare with the amount of crime occurring in cities. The reported crime statistics have tended to support this belief.

But times are changing. Statistical information from a variety of sources indicates that crime is becoming an increasing problem in rural areas. The F.B.I.'s *Uniform Crime Reports*, based on information filed by state investigative agencies, show an upward trend in total crime rates for the rural United States and the rural South. Such crime rates are based on seven major criminal offenses: murder, forcible rape, robbery, aggravated assault, burglary, larceny, and vehicle theft. The first four crimes are considered "violent" and the last three "property" crimes.

Between 1960 and 1980, the total crime rate for the rural United States increased by nearly 450%. The rate of increase for the rural South was somewhat less at 385%. Rural crime rates now equal or exceed the rates for metropolitan areas that so alarmed the nation in the mid-1960's. By 1980, the rural crime rate for the United States was 2,290 per 100,000 people and 2,006 for the rural South.

Alabama enjoys one of the lower crime rates in the region. Comparisons among the 13 Southern States for 1981 show that rural crime rates for the State are next to the lowest at 1,302. Only Mississippi reported fewer. However, Alabama's small cities (less than 50,000 population) ranked 9th in crime rate for the region and metropolitan areas with populations of 50,000 or more ranked 7th. Unfortunately, Alabama's crime rate is increasing for both rural areas and small towns. The increase between 1960 and 1980 was 277% for rural areas, but 624% for small cities, most of which are located in nonmetropolitan counties.

Rural crime rates for Alabama reveal that the vast majority of crime is against property—87% in 1980. Over the 20-year period from 1960 to 1980, rural crime rates for property crimes increased by 377% while violent crimes against persons increased only 20%.

The number of rural property and violent crimes in each Alabama county is recorded on the map. The rates include all crimes reported to county sheriffs and exclude those reported to police in incorporated places. These data do not reflect the considerable fluctuation in the number of crimes that occur each year in small geopolitical units. Such fluctuation is masked when data are aggregated on a state or national basis.

County data collected by the Alabama Criminal Justice Information Center reveal that Houston County had the highest rural property crime rate, 3,086 crimes per 100,000 population, followed closely by Jefferson with 2,935 and Greene with 2,915. The fewest property crimes were reported in rural areas of Bibb, Bullock, Coffee, Marion, and Washington counties, with rates below 200.

Violent crime rates provide a somewhat different ranking of counties. Wilcox reported the highest rate, 615 per 100,000 population, followed by Houston, Jefferson, Geneva, and Russell counties, all with rural rates above 400. No violent crimes were reported in 1981 for rural areas of Bibb, Cherokee, Coffee, Macon, and Winston counties.

A new project at the Alabama Agricultural Experiment Station will take up the issue of crime in rural areas throughout the State. Little information currently exists about who the victims of rural crime are, the practices rural people use in protecting themselves from being victimized, and the extent and cost of unreported rural crime. Lacking such information, it is difficult to develop programs that will effectively reduce crime and preserve the valued rural image of security and safety.

More law enforcement personnel alone will not stem the rural property crime trend, although they are needed in many areas. Sound programs of prevention, based on citizen involvement, provide the best prospects for effective action. This new research will obtain basic information from rural people about their experiences as victims of rural crime, particularly those involving theft and destruction of farm, residential, business, and public properties.

SLOW-GROWING GILTS WEAN LARGER LITTERS

D.L. KUHLERS and S.B. JUNGST, Department of Animal and Dairy Sciences

ANY ADVANTAGE for slow-growing livestock would be unexpected. Therefore, it was a surprise when Auburn research found that slow-growing gilts weaned larger litters than fast-growing gilts or gilts selected for either low or high backfat.

The Alabama Agricultural Experiment Station study was done to determine what happens to reproductive and maternal traits when swine selection is practiced for or against growth rate or backfat thickness. These two traits are generally used in selection programs since reproductive and maternal traits have low heritabilities.

The Auburn study used 52 boars and 76 sows of the Duroc and Landrace breeds which were previously selected either for rapid or slow growth to 230 and 300 lb., or for high or low ultrasonic backfat thicknesses at these same two weights. These boars and sows were mated to produce F_1 crossbred litters. The differences between the slow and rapid growth lines of the selected parents to 230 to 300 lb. were 45 and 59 days, respectively. The differences between the high backfat and low backfat lines were 0.28 and 0.37 in. at 230 and 300 lb., respectively.

The sows and pigs were vaccinated with a *Bordatella bronchiseptica* and *Pasteurella multocida* bacterin. The sows were farrowed in a central farrowing house and then moved to an open-fronted solid floor sow-pig nursery at 7 to 14 days of age. At 35 days, the litters were weaned.

Traits studied included breeding weights of the gilts, farrowing rates (percent farrowing of those bred), total litter size born, litter size born alive, litter size alive at 35 days, litter survival rate at 35 days of those born alive, litter weights at birth, and litter weights at 35 days.

Breeding weights of sows selected for rapid growth were significantly heavier than breeding weights of those from the remaining three selection lines, which did not differ significantly from each other, see table. Although the sows selected for high backfat had lower farrowing rates, the difference was not significant.

Litter size at birth did not differ significantly among the four lines, although the low backfat line sows farrowed approximately one pig per litter less. However, at 35 days, the low backfat gilts had significantly smaller litters than did the rapid or slow growth line gilts. The low backfat line had 1.7 pigs per litter less than the slow growth line. This is also seen in survival rates, which were lowest in the low backfat line and highest in the slow growth line. This implies that selection for low backfat thickness may be detrimental to sow productivity, while selection for slow growth may promote better sow productivity.

Litter weights at birth did not differ significantly among the selection lines. However, at 35 days, the rapid and slow growth line litters were approximately 27 lb. heavier than the low backfat line litters.

The results found in this study may be valid only for the one generation of selection practiced. However, these results indicate that genetically smaller sows may be desirable under some circumstances, provided this small size is not due to disease conditions.

The swine industry of the future may utilize small, slow-growing sows bred to large, rapid-growing boars to produce market hogs more efficiently because feed required for maintenance should be less than for larger, later-maturing sows. Additional work needs to be done to develop a better understanding of the relationships among the reproductive, growth, and carcass traits.

PERFORMANCE OF LITTERS BY SELECTION LINE

Selection line	Breeding weight	Farrowing rate	Litter size			Survival rate	Litter weight	
			Born	Born alive	35 days		Birth	35 days
	Lb.	*Pct.*	*No.*	*No.*	*No.*	*Pct.*	*Lb.*	*Lb.*
Rapid growth . . .	344	85	10.6	10.0	8.7	87	35.3	145.9
Slow growth	304	89	10.6	9.7	9.1	93	33.1	145.1
Low backfat	316	92	9.7	9.1	7.4	82	29.8	118.4
High backfat. . . .	315	74	10.8	9.6	8.4	87	32.6	132.1

Skip-row Planting of Cotton and Soybeans

Soybeans in foreground, planted June 27; in background, planted May 26.

D.L. THURLOW and W.C. JOHNSON, Department of Agronomy and Soils

OF THE VARIOUS ROW patterns which have been used for producing cotton in Alabama, the primary advantage of using "skip row" is increased yield within a restricted acreage allotment. Here, yields are calculated on the area actually planted, not including the fallow area. A frequent pattern for planting cotton is four rows planted and four rows fallow, commonly called 4 x 4 skip-row planting.

The possibility of growing soybeans within the four fallow rows of 4 x 4 skip-row cotton has been investigated at the Alabama Agricultural Experiment Station's Plant Breeding Unit, Tallassee. The cotton variety Coker 413 was planted in a 4 x 4 skip-row pattern. The rows not planted to cotton were either left fallow or planted to soybeans in one of two schemes: (1) planting all four rows to soybeans, or (2) planting only the two center rows to soybeans. Bragg soybeans were planted either early (May 26) or late (June 27) each year in 40-in. rows. Average results for 2 years are given in the table.

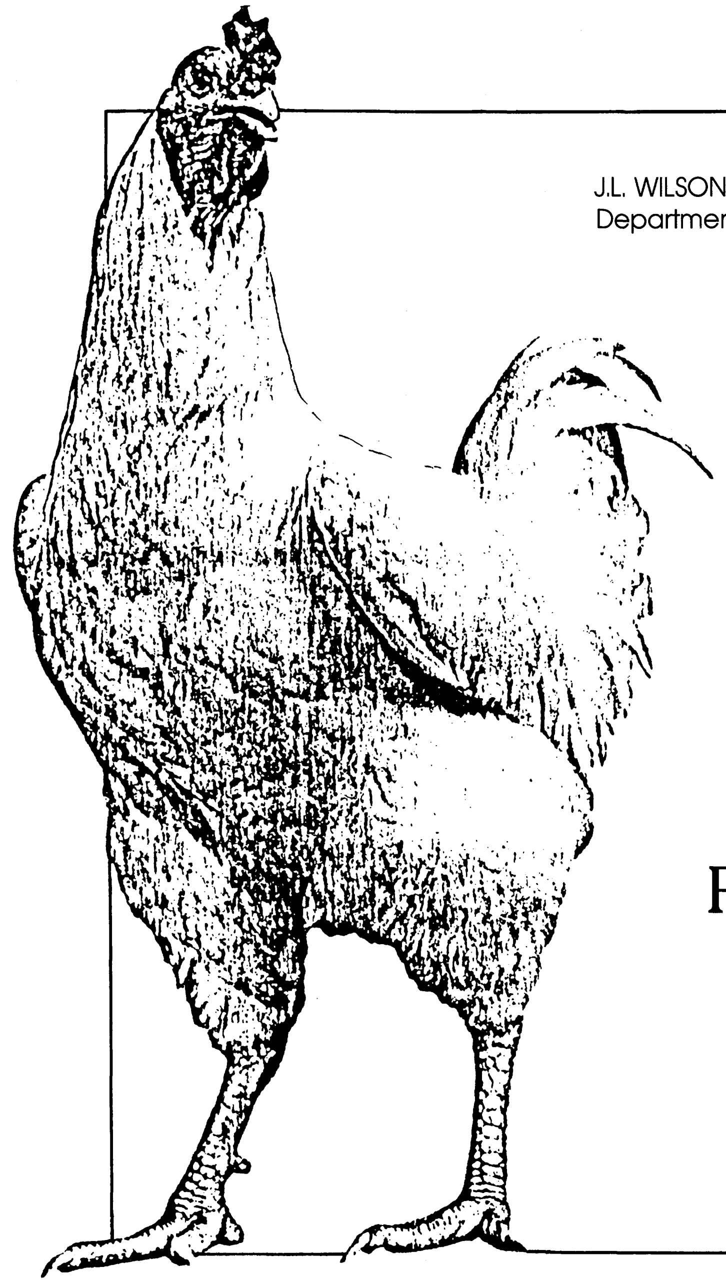
The yield for two inside rows of cotton was essentially the same whether the skip rows were left fallow or planted to soybeans in any scheme. Other experiments have shown that these inside rows yield the same as solid planted cotton. The skip-row effect on cotton does not go beyond one row. When the skip rows were fallow in this experiment, the outside rows yielded 58% more cotton than the inside rows. This is an average increase of 29% in cotton yields for the four planted rows over a solid planted area. When the four skip rows were planted to soybeans early, cotton yields were the same on both inside and outside rows. However, when the four rows were planted with soybeans late, cotton yields on the outside rows were increased 30% over the inside rows. Planting only two rows of the four-row skip to soybeans resulted in a cotton yield increase for the outside rows over the inside rows of 46% both for the early and late planted soybeans.

Soybean yields are not only influenced by skip-row pattern but also by the crop in adjacent rows. Planting all four skip rows to soybeans early resulted in vigorous early soybean growth that competed favorably with cotton in the outside rows and resulted in a slight, 15% increase in yield of soybeans over the inside soybean rows. However, delayed planting until June 27 allowed the cotton to dominate the outside rows. This resulted in the outside soybean rows yielding 13% less than the inside rows. Maximum soybean yield per planted area was attained when only two of the four skip rows were planted. This indicated the feasibility of using soybeans in a 4 x 4 skip where cotton is not being grown to utilize set-aside acreage.

The economics or desirability of intercropping soybeans and cotton depends upon restrictions imposed by the cotton program in effect at the time, the relative prices and production costs of soybeans and cotton, and possible pesticide conflicts for the two crops.

TWO-YEAR AVERAGE YIELD OF COTTON AND SOYBEANS WITH COTTON PLANTED IN A 4 X 4 SKIP-ROW PATTERN AND SOYBEANS PLANTED AT TWO DATES IN TWO AND FOUR ROWS OF THE SKIP, PLANT BREEDING UNIT, TALLASSEE

Treatments		Per acre yield of planted area			
Planting scheme	Date soybeans planted in skip	Soybeans by row	Skip av.	Cotton by row	Plant av.
		Bu.	*Bu.*	*Lb.*	*Lb.*
4 rows cotton—4 rows soybeans					
Outside rows	May 26	38.7	36.2	1,500	1,500
Inside rows	May 26	33.6		1,510	
Outside rows	June 27	20.9	22.4	1,920	1,700
Inside rows	June 27	23.9		1,480	
4 rows cotton—2 rows soybeans—2 rows fallow					
Outside rows	May 26	--	--	2,110	1,780
Inside rows		48.2		1,450	
Outside rows	June 27	--	--	2,200	1,860
Inside rows		27.8		1,510	
4 rows cotton—4 rows fallow					
Outside rows	Not planted	--	--	2,260	1,850
Inside rows	Not planted	--		1,432	



J.L. WILSON and G.R. McDANIEL
Department of Poultry Science

Broiler Breeder Males Maximize Semen Production with Lower Protein Diets

POULTRY PRODUCERS currently report that 30% of broiler breeder male chickens produce insufficient amounts of semen for artificial insemination. These low semen producers increase costs and reduce efficiency in the poultry industry. Existing management systems are not stimulating the males to reach maximum reproductive capabilities. As a matter of necessity, most breeder males are being grown and managed like breeder hens, whose requirements for optimum egg production differ from the breeder males' requirements to maximize semen production.

The objective of this Alabama Agricultural Experiment Station study was to evaluate the protein requirements of breeder males necessary to maximize reproductive capabilities. Approximately 100 males were grown from 1 to 4 weeks on a commerical starter ration. At 29 days of age, 25 males were randomly assigned to either a 12, 14, 16, or 18% protein diet, which was fed for the remainder of the 52-week study. The 16% protein diet, commonly used by industry, served as the control.

Ten males were chosen from each of the treatment groups at 24 weeks and placed in 12 x 18 in. cages. Semen was collected by the abdominal massage method and the following data recorded: semen volume, visual score, sperm cell counts, packed cell volume, and percentage in production. Semen samples were collected weekly during the early and middle production periods and a model Z_B Coulter Counter was used to determine sperm cell numbers. During the late production period, semen samples were collected five times weekly and a photometer was used for the sperm cell counts.

Semen production, measured in billions of cells per ejaculate, was monitored over the 27- to 52-week period. Throughout this time, males given the 12 and 14% protein diets produced greater numbers of spermatozoa per ejaculate than males provided the 16 and 18% protein diets, though the differences were not statistically significant.

A larger percentage of the males fed the 12 and 14% protein diets came into semen production before those given the higher protein diets, table 1. The males maintained similar body weights on treatment diets until the latter weeks of the study. At the end of the experiment, birds on the 14% diet were the heaviest group and had the highest total testis weight per bird, table 2. The males on the 12, 16, and 18% protein diets all had similar body weights and total testis weights per bird. No explanation can be offered for these differences in the 14% group.

The average daily semen production in the last week, like the previous weeks, was highest for males in the 12 and 14% protein groups, and lowest in the males fed the 16% protein diet. Males given the 12% protein diet appeared to be more efficient producers of semen with a ratio of 2.99 billion spermatozoa per oz. of testis.

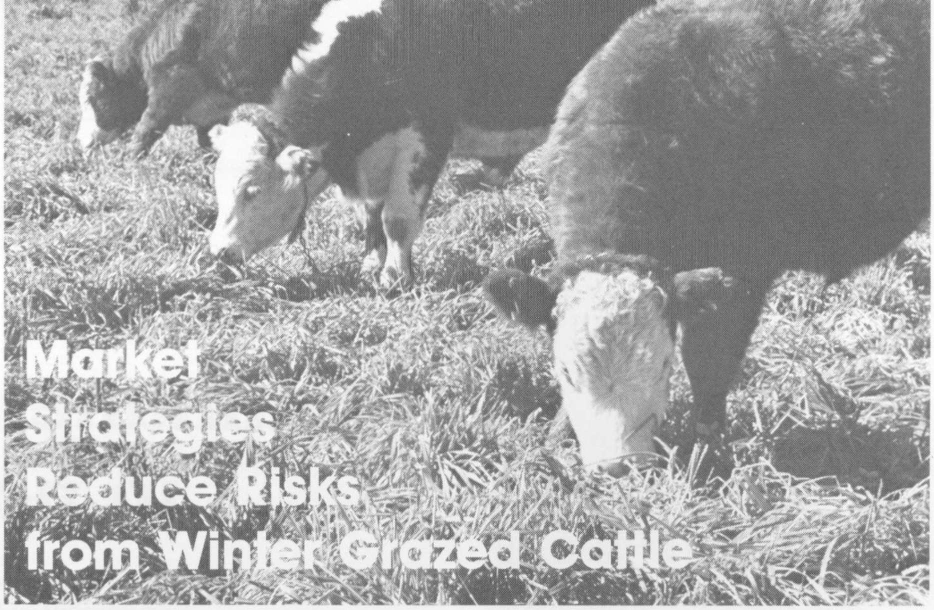
Generally, the broiler breeder males fed the lower protein diets produced more semen than those fed the higher protein diets. Data from this preliminary study are not conclusive, but agree with similar investigations in turkeys. More research must be conducted in this area to determine the optimum protein levels for the efficient reproduction of broiler breeder males, as well as other dietary and environmental needs.

TABLE 1. PERCENTAGE OF MALES IN PRODUCTION

Percent protein diet	In production by weeks of age				
	27	28	29	30	31
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*
12..........	90	100	90	80	78
14..........	56	67	56	67	75
16..........	40	30	40	44	50
18..........	33	44	44	40	56

TABLE 2. BODY WEIGHT, TESTIS WEIGHT, AND SEMEN PRODUCTION AT 52 WEEKS

Measurement	Results by percent protein diet			
	12	14	16	18
Av. body wt., lb.	8.97	9.48	8.54	8.90
Total testis wt., oz..........	1.08	1.38	1.18	1.05
Daily semen prod., billion sperm/ ejaculate........	3.23	2.77	1.02	1.80
Daily semen prod., billion sperm/ oz. testis........	2.99	2.01	.86	1.71



Market Strategies Reduce Risks from Winter Grazed Cattle

G.M. SULLIVAN and H.Y. LEE
Department of Agricultural Economics and Rural Sociology

GROWING OUT stocker cattle on winter grazing has been a popular enterprise in Alabama for several years. Unfortunately, there are price risks associated with this enterprise. Feeder cattle are a non-storable commodity and prices can be highly variable when cattle are ready for sale.

This potential for loss points up the need for a market strategy to combat price drops at marketing time. Use of hedging offers a method to accomplish this, according to results of Alabama Agricultural Experiment Station marketing research.

The Alabama study evaluated five market strategies that can be utilized for cattle on a winter grazing program:

Strategy 1 is for the producer to assume all risks in the market (no hedge).

Strategy 2 is a routine hedge in which the producer sells a futures contract when feeder calves are placed on pasture in October. The hedge is lifted the first week of the contract month in the spring, which is the same month cattle are sold.

Strategy 3 is for a hedge to be placed after a target profit is reached based on the producer's breakeven price.

Strategy 4 is placing and lifting a hedge based on 2-, 3-, and 4-week moving average prices during the production period. A hedge is placed when a top in the market price is signalled by the 2-week average crossing the 3- and 4-week averages from above. The hedge is lifted by buying back the contract when a bottom is indicated by the 2-week average crossing the 3- and 4-week averages from below. Multiple trades are possible during the production period.

Strategy 5 is to use both strategies 3 and 4 simultaneously in placing and lifting the hedge. However, the more often contracts are bought and sold, the higher the brokerage fees and the greater the market risk.

Data on production costs for the period of 1972-81 were collected from the Alabama Cooperative Extension Service. Weekly average Montgomery cash prices and the Chicago Mercantile Exchange futures prices were collected for the same period. The appropriate futures contract months for the winter grazing stocker program were March, April, and May. The months of March and April were in the high price season and May was in the low price season. Three phases of the cattle price cycle occurred during the study period—rising, turning, and falling.

A strategy of not hedging during the production period results in slightly higher (not significant) net returns in the three contract months compared to the routine hedge, see table. The large variances of net returns for the no hedge strategy given in the table for March, April, and May indicate that being not hedged is riskier than being routinely hedged. The producer can reduce price risks without any significant decrease in net returns by routinely hedging when feeder calves are purchased.

More sophisticated hedging by setting a $5 target profit enables producers to do better than the routine hedge in all months, but with slightly more variability in returns. Hedging using 2-, 3-, and 4-week moving averages increases the returns over the routine hedge in all contract months, but the variability also increases. Hedging, using both the moving averages and target profit, has mixed results compared to the moving average alone. For the May contract, net returns are lower for all strategies compared to the months of March and April.

Separation of the cattle price cycle into three phases indicates that the no hedge strategy is best in periods of rising prices. With added sophistication in trading, using moving averages with or without target profits, producers can do almost as well as with the no hedge strategy in the rising phase. In either the turning or falling phases, the producer's best strategy is to be routinely hedged when cattle are placed on pasture. If the producer has any indication into which phase the production will be, appropriate strategies become readily apparent. The more sophisticated trading strategies (3-5) do no better on the average than the routine hedge strategy.

As shown by the Auburn comparisons, marketing strategies using hedging have a potential for reducing deterioration in value of cattle over the production period. The lower prices in May compared to March and April indicate that net returns can be higher if marketings are in early spring for cattle winter grazed in Alabama. A strategy of hedging reduces the risks without significantly lowering net returns. In two of the three phases of the cattle price cycle, a routine hedge outperforms a strategy of being completely exposed to market risks by not being hedged. The producer needs to have some type of market strategy for winter grazed feeder cattle to assure the highest net returns over several years of production.

COMPARISONS OF NET RETURNS (LOSSES) OF SIMULATED MARKETING STRATEGIES FOR FEEDER CATTLE IN ALABAMA FOR HIGH AND LOW PRICE SEASONS AND THREE PHASES OF THE CATTLE PRICE CYCLE, ALABAMA, 1972-81

Strategy	Net return by season						Net return by price cycle					
	High				Low		Rising phase		Turning phase		Falling phase	
	March		April		May							
	Mean	Var.[1]	Mean	Var.[1]	Mean	Var.[1]	Mean	Var.[1]	Mean	Var.[1]	Mean	Var.[1]
	$/cwt.	$	*$/cwt.*	$	*$/cwt.*	$	*$/cwt.*	$	*$/cwt.*	$	*$/cwt.*	$
1. No hedge	7.89	127	8.43	147	5.48	153	16.61	9.4	-2.83	12.0	-1.57	10.5
2. Routine hedge	5.87	12	5.19	36	4.22	40	4.94	5.0	4.02	5.5	6.07	13.8
3. Hedge with target profit = $5	6.95	19	5.91	46	5.17	62	7.54	6.2	3.82	4.7	4.93	35.8
4. Hedge using 2-, 3-, 4-week moving averages	7.33	89	9.29	84	5.77	65	13.51	18.9	-1.37	8.5	3.27	13.6
5. Hedge with moving averages and target profit = $5	8.06	119	8.94	115	4.78	100	15.05	16.2	-2.67	8.1	1.33	14.3

[1]Sample variance for the number of times a contract was sold and bought.

Aflatoxin shown to decrease immune response in poultry

J.J. GIAMBRONE
Department of Poultry Science

Corn naturally contaminated with *Aspergillus flavus*.

AFLATOXIN represents only one of the more than 100 toxins produced by the growth of fungi in grains and other feedstuffs. However, aflatoxin is the most commonly found fungal toxin (mycotoxin) in the Southeast, generally associated with corn when the moisture content exceeds 14% and the temperature exceeds 50°F. It is produced by *Aspergillus flavus* and *A. parasiticus*. These fungi are widespread and are found in grain, feed, feed ingredients, litter, bins, tanks, feed troughs, soil, and air. *Aspergillus* fungi primarily grow in grains after harvesting or milling, see figure; however, the fungi can readily infect and produce aflatoxin on corn damaged by severe drought or insects.

The Food and Drug Administration has set a limit of 20 parts per billion (p.p.b.) and 200 p.p.b. of aflatoxin B_1 (AFB_1) for the interstate sale of corn and cottonseed in animal feeds, respectively. (AFB_1 is the most potent and commonly occurring aflatoxin.) Many poultry and grain producers say these levels should be raised since no scientific evidence has shown toxicity in poultry below 250 p.p.b. of AFB_1. However, recently completed research at the Alabama Agricultural Experiment Station indicates that broiler producers can safely feed only grain containing 100 p.p.b. of AFB_1 or less or risk a lowered immune response in their birds.

As research at the Experiment Station has focused on the growth and performance of poultry, attempts have been made to examine the effects of levels of AFB_1 of 1,000 p.p.b. or less on weight gain, feed efficiency, livability, and the immune response of commercial turkeys and broilers. One Experiment Station study showed that levels of purified AFB_1 as low as 200 p.p.b. of B_1 given daily by gelatin capsule for 5 consecutive weeks significantly affect weight gain, feed efficiency, and some selected immune responses of turkeys and broilers. How well the pure AFB_1 in capsule correlates to the consumption of naturally contaminated corn is as yet unknown.

A similar study was recently completed which examined the consumption of aflatoxin contaminated feed, produced by growing *A. flavus* on corn at levels between 100 and 800 p.p.b. of AFB_1. The study showed that levels of AFB_1 as low as 200 p.p.b. produced a significant decrease in both antibody and cell-mediated immune responses of broilers during a 5-week (consecutive) period. However, there was no significant effect on the weight gain and feed efficiency of these broilers.

It may be that feeding low subclinical levels of AFB_1 (200 p.p.b.) may indirectly affect poultry health by decreasing the immune response. A lowered immune response could decrease vaccine efficacy and render birds more susceptible to potential poultry pathogens.

Further study is being undertaken in turkeys in an attempt to find a no-effect level of AFB_1 consumption on weight gain, feed conversion, and the immune response of this species. This research should provide producers with additional information on levels of AFB_1 that can be safely fed to poultry.

AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY
AUBURN UNIVERSITY, ALABAMA 36849

Gale A. Buchanan, Director
PUBLICATION—Highlights of Agricultural Research 12/83
Penalty for private use, $300

11M

POSTAGE PAID
U.S. DEPARTMENT OF AGRICULTURE
AGR 101
BULK RATE