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ALABAMA AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY

HIGHLIGHTS
OF AGRICULTURAL RESEARCH

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ON THE COVER: Soil compaction, usually considered a problem of large-scale farmers, also can reduce yields in home gardens. An article on page 22 looks at ways home gardeners can overcome this problem.

from the Director

Thanks to those of you who responded to the random survey in the last issue of Highlights. Our survey indicates *Highlights* readers are almost all male, with most being 55 years old or older. These results closely mirror national studies of farm audiences. The survey showed that *Highlights* isn't only a farm magazine, but also a science magazine, reflected by the large number of readers who live in urban areas.

Though this survey provided interesting answers about the profile of our readers, it presented difficult challenges. The major challenge is determining what type *Highlights* articles our audience wants to read. The Alabama Agricultural Experiment Station conducts research on a myriad topics, and given the resources, we could publish magazines on many specific topics. Unfortunately, we only have one *Highlights*, so help us out again, tell us what type articles you would like to see more of in *Highlights*.

I want to stress that *Highlights* is YOUR magazine–it is our attempt to provide an overview of the highlights of research results in the Ag Experiment Station at Auburn. Your comments and your support are valuable to us, and they will be even more critical as we try to navigate through the uncertain economic waters that we face in the next few years. Please forward your comments to: *Highlights*, Office of Research Information, 110 Comer Hall, Auburn University, AL 36849.

Lowell T. Frobish, Director

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Poultry Has $7.5 Billion Economic Impact on Alabama

JUL 24 1995

Harry B. Strawn, James R. Hurst, and Max W. Runge

A recent study spearheaded by Auburn University indicates the poultry industry has a total economic impact in Alabama of over $7.5 billion annually, producing nearly $2 billion in wholesale value, and is directly responsible for providing nearly 24,000 jobs.

The study employed both a survey of poultry firms and secondary data. Using a multiplier model developed by the U.S. Department of Commerce, the study indicated that broilers accounted for over $6.7 billion and eggs for over $800 million in economic activity in 1993. And, including positions in allied industries, poultry provided 54,600 jobs in the state.

Alabama produced nearly four billion pounds of broilers and over 2.5 billion eggs in 1993, with a farm value of $1.57 billion. The state ranks third in broiler production behind Georgia and Arkansas, and accounts for nearly 13 % of the nation's output.

The poultry industry is vertically integrated to a high degree. This means that all production and marketing operations for a poultry complex are joined under a single management through ownership or contracts. With the exception of housing for birds and possibly some transportation equipment, the poultry complex owns all productive assets. Production stages not owned are controlled through contracts. This enables production and marketing to be closely coordinated to better serve markets and efficiently use plants and equipment.

Contracts are utilized for growing broilers, breeder pullets and hatching eggs. The company maintains ownership of the birds, provides feed, medicine, and expert technical advice to the contracting farmers. This arrangement reduces risk for growers, encourages expansion, and ensures that plants will have adequate birds to process.

The broiler complex is the most common type of plant used in the industry. A typical broiler complex consists of a processing plant, feed mill, hatchery, rendering plant and supporting activities. Lines of control are carefully arranged to efficiently provide a predictable flow of birds through all stages of production. Most current broiler processors handle 10,000 to 12,000 birds per hour for two shifts of operation five days per week, accounting for over 1,000 jobs per plant. Under current conditions it would require an investment of $40 million or more by the parent firm to bring a new plant on line. In addition, approximately 550 poultry houses, at a cost of over $75,000 each, owned by 250 to 300 farmers would be required to support the complex.

Alabama's broiler industry in 1993 con-

Continued on page 4

sisted of 13 firms operating 28 basic and/or further processing plants. Seven of the top 10 broiler companies nationally have complexes in Alabama. These complexes operated 25 feed mills that processed over 85,000 tons of feed per week. Alabama hatcheries produced nearly 21 million chicks weekly, about 19 million of which were placed in-state, and two million went to growers in neighboring states.

The economic impact of the poultry industry extends far beyond the direct investment, purchases, and payroll of the plants. So long as the money is circulated through Alabama communities, the impact is multiplied. Thus, it is necessary to examine direct and indirect effects of the industry. Direct economic linkages occur at points where goods and services used by the industry are bought and sold. Indirect or secondary economic linkages occur at all additional transaction points until the money leaves the community. For example, a plant employee or grower may use some of his salary to buy groceries or make a car payment. Such transactions would be secondary economic linkages.

The summary of a survey conducted to determine industry expenditure patterns for broilers and eggs is presented in Table 1. Alabama plants surveyed had nearly $1.7 billion in annual expenditures, of which over $1 billion were spent in Alabama. However, the full effect of the expenditures extend well beyond the direct impact. So long as the funds continue to circulate in the State, they will continue to affect secondary income, investment, and jobs (Table 2).

The input-output model used in this study was developed by the Bureau of Economic Analysis, U.S. Department of Commerce, and is known by its acronym, RIMS II. According to the RIMS II model, each dollar generated directly by the broiler industry generates an additional $2.93 elsewhere in the Alabama economy.

Alabama and the Southeast have a bright future in the poultry industry. The region has a comparative advantage due to its climate, labor supply, cost-effective transportation system, many small farms, and favorable government attitudes for development. Alabama can maintain its share in this future through commitment from firms, workers, growers, and government policy.

Editor's Note: A complete report of this study, entitled, "The Alabama Poultry Industry: An Economic Impact Study," is available upon request to the authors, c/o Highlights, Office of Research Information, 110 Comer Hall, Auburn University, Alabama 36849.

Table 1. Poultry Industry Expenditures[1], Alabama, 1993

Items	Broilers	Eggs	Total
Grain and raw materials	$724,249,865	$88,792,718	$813,042,583
Payroll and benefits	377,443,819	16,381,122	393,825,240
Contract payments	211,927,164	11,502,101	223,429,265
Production supplies	89,009,181	14,855,646	103,864,827
Utilities	40,370,476	4,074,806	44,445,281
Repairs and maintenance	35,949,301	842,989	36,792,290
Construction	27,459,434	1,680,681	29,140,114
Other expenditures	20,281,157	8,879,513	29,160,671
Taxes	6,835,048	12,294,697	19,129,745
Total expenditures[2]	1,533,525,445	159,304,273	1,692,830,016
Alabama expenditures	907,038,543	107,794,851	1,014,833,394

[1] Does not include interest, depreciation, corporate overhead, or Federal income tax expenses.
[2] Includes expenditures made in Alabama and other states.

Table 2. Total Poultry Industry Impact[1], Alabama, 1993

Industries	Total impact on output	Total jobs created	Total impact on earnings
Agriculture, forestry, & fishery service	$1,597,605,522	$6,491	$172,700,756
Food and kin. prod.	3,049,875,293	23,817	379,144,839
Transportation	173,649,738	2,465	69,317,245
Wholesale trade	216,430,696	3,051	89,020,552
Retail trade	118,087,122	3,860	57,500,261
Business services	74,566,573	1,564	38,162,378
Eating and drinking places	62,327,894	2,034	19,440,224
Health services	102,280,626	2,354	61,629,665
Miscellaneous services	57,986,297	1,187	19,672,257
Other	2,079,423,430	7,837	190,988,214
Totals	7,532,233,191	54,660	1,097,576,391

[1] Includes broilers and eggs.

Strawn is a member of the Extension Community Research Development staff and is affiliated with the Department of Agricultural Economics and Rural Sociology; Hurst is an Economist and Runge is an Extension Associate in the Department of Agricultural Economics and Rural Sociology.

RESTORATION OF A 200-YEAR OLD VIRGIN LONGLEAF PINE STAND

John S. Kush and Ralph S. Meldahl

LONGLEAF PINE STANDS maintained by periodic fire once covered an estimated 80-90 million acres along the Coastal Plain and Piedmont from Southern Virginia to East Texas, extending further inland into Alabama. Restoration of these native pine ecosystems is ongoing nationally in an attempt to preserve a part of the heritage of the Southeast.

Exploitation of longleaf pine-dominated forests has led to a steady decline of their acreage to approximately three million acres at present. Of this, it is estimated that less than 1,000 acres of virgin, old-growth longleaf pine remain. Within the city limits of Flomaton is a 60-acre stand of virgin, old-growth longleaf pine owned by Champion International Corporation. This stand is one of four remaining in the U.S. and possibly the last virgin stand of longleaf pine in Alabama.

Table 1. Size Class Distribution (Stems/Acre) for Tree Species in the Flomaton Natural Area

Species	Seedlings	Saplings	Trees
Longleaf pine	0.8	30.4	93.8
Loblolly pine	0.4	3.9	7.5
Shortleaf pine	0.3	2.5	9.1
Southern red oak	33.4	41.3	20.7
Water oak	194.6	134.4	32.0
Laurel oak	78.9	71.2	17.2
Blackjack oak	10.7	3.3	0.4
Southern magnolia	30.9	14.7	3.9
American holly	85.3	40.5	3.4
Black cherry	15.1	41.3	12.0
Sweet bay	15.1	2.9	0.1
Black gum	12.6	13.8	1.8
Dogwood	4.1	21.3	1.1
Others	15.6	22.4	5.0
Total	497.8	443.9	208.0

The Alger-Sullivan Lumber Company, one-time owner, dedicated the stand to preservation in the first half of the century. The stand was regularly control burned until some time in the 1950s when the lumber company was sold. Absence of fire since has permitted a substantial hardwood understory and midstory to develop and allowed for an accumulation of a thick litter layer at the expense of longleaf pine regeneration and herbaceous vegetation. As part of a cooperative agreement among Auburn University's School of Forestry, Champion International Corporation, U.S. Forest Service, Alabama Forestry Commission, The Nature Conservancy, and the Alabama Natural Heritage Trust, efforts are underway to restore, monitor, and manage the stand as an old-growth longleaf pine habitat on what is now being called the Flomaton Natural Area.

Forty-two 0.2 acre plots have been established to monitor stand changes over time. Data recorded for every tree on the plots includes: azimuth and distance from plot center, diameter at breast height (DBH), crown height, total height, and litter depth at the base of the tree. Woody stems less than 0.5 inch DBH but larger than one foot tall have been tallied by one

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INSECT PREDATORS HELP CONTROL BEET ARMYWORMS IN COTTON

Figure 1. Red-imported fire ants attacking beet armyworm larvae

AN AAES STUDY HAS SHOWN that naturally occurring insect predators can significantly reduce populations of beet armyworms, a serious pest in Alabama cotton that cannot always be controlled with insecticides. Understanding the impact of natural enemies on pest populations is a critical part of developing and refining integrated pest management systems.

At the Wiregrass Substation in Headland, two methods were used to exclude beet armyworm enemies from cotton plots. In plots where numbers of natural enemies were reduced, populations of armyworms were drastically higher. This finding provides evidence that armyworm populations were controlled by natural enemies, especially red-imported fire ants and other predators.

Natural enemies were excluded from armyworm infestations using insecticides and cages in July and August. Insecticide treatments were Karate, Dimilin, a combination of Karate and Dimilin, and an nontreated control. Karate, which is commonly used on cotton for bollworm/budworm control, was applied at three- to 10-day intervals to purposely reduce beneficial insects. The other two insecticide treatments were applied according to current cotton insect management guidelines as problems occurred in order to preserve beneficial insects. Dimilin, which is generally used during armyworm outbreaks, has little effect on

RESTORATION OF A 200-YEAR OLD VIRGIN LONGLEAF PINE STAND, *continued from page 5*

foot height classes. Age of longleaf pines larger than three inches DBH is being determined, and ground cover vegetation is being surveyed quarterly by species.

A total of 24 tree species have been recorded on the measurement plots. Longleaf pine remains the dominant tree species accounting for 45% of the trees greater than 4.5 inches DBH. However it comprises less than 7% of the saplings (0.6-4.5 inches DBH) and not even 1% of the seedlings (one foot tall to 0.6 inch DBH). Absence of fire has allowed other pines (loblolly, slash, and shortleaf) and hardwoods to become a major component of the stand. The oaks, specifically water, laurel, and southern red, constitute a majority of the hardwoods. They account for 34% of the trees and are the predominant sapling and seedling species, comprising 57% and 64%, respectively. Other hardwoods of importance include southern magnolia, American holly, black cherry, sweet bay, black gum, and dogwood. Table 1 presents the stems per acre by size class for the Flomaton Natural Area.

Restoration efforts involving the re-introduction of fire after a 40-plus year absence are underway in the Flomaton Natural Area. Fire was re-introduced to approximately half the stand in January 1995 and the other half in April. Initially, winter burns will be used to reduce the fuel load. These will be followed by growing season burns to alter species composition.

Longleaf pine is the major species in a complex of fire-dependent ecosystems that once occupied a major portion of the Southeast. These ecosystems are considered to be among the most species diverse communities outside of the tropics. In the absence of human intervention, hardwoods will replace the longleaf pine and the unique character of the Flomaton Natural Area will be lost.

Kush is a Senior Research Associate and Meldahl is an Assistant Professor of Forestry.

Fudd Graham, Michael J. Gaylor, and Scott D. Stewart

natural enemy populations. Cages excluding different sizes of natural enemies were placed over armyworm egg masses in each of these treatments, and survival was compared to noncaged egg masses. Predator and armyworm population densities were determined by counting the number of larvae on six row-feet of cotton.

Some larvae were returned to the laboratory to determine the importance of other biocontrol agents in controlling armyworms. In the laboratory, researchers monitored the larvae for emergence of parasitoids, death from disease, and other agents harmful to armyworms. Unlike parasites, parasitoids kill their hosts.

During both months, natural mortality of armyworms was greater when predators were present. Conversely, armyworm numbers were higher in plots with low predator populations. Red–imported fire ants made up 48-93% of the predator populations during the early July sampling period (Figure 1). Rates of predation were lowest in the Karate-treated plots, where predators were virtually eliminated (Figure 2).

In July, numbers of medium and large armyworm larvae were almost 50% less in plots not treated with Karate, indicating that the pests were killed by predators. High rates of parasitism in July also were responsible for reducing the density of the armyworm population before larvae reached the large stage. In August, predation caused almost twice as much mortality as any other factor. Both ant and big-eyed bug populations increased rapidly that month in the Dimilin and nontreated plots, subsequently reducing armyworm numbers significantly. Other predators were observed in the field, but were not numerous enough to consider individually. In the plots treated with Dimilin alone, armyworm populations were about the same as the populations in nontreated plots. This indicates that high numbers of natural predators were as effective as the chemical control.

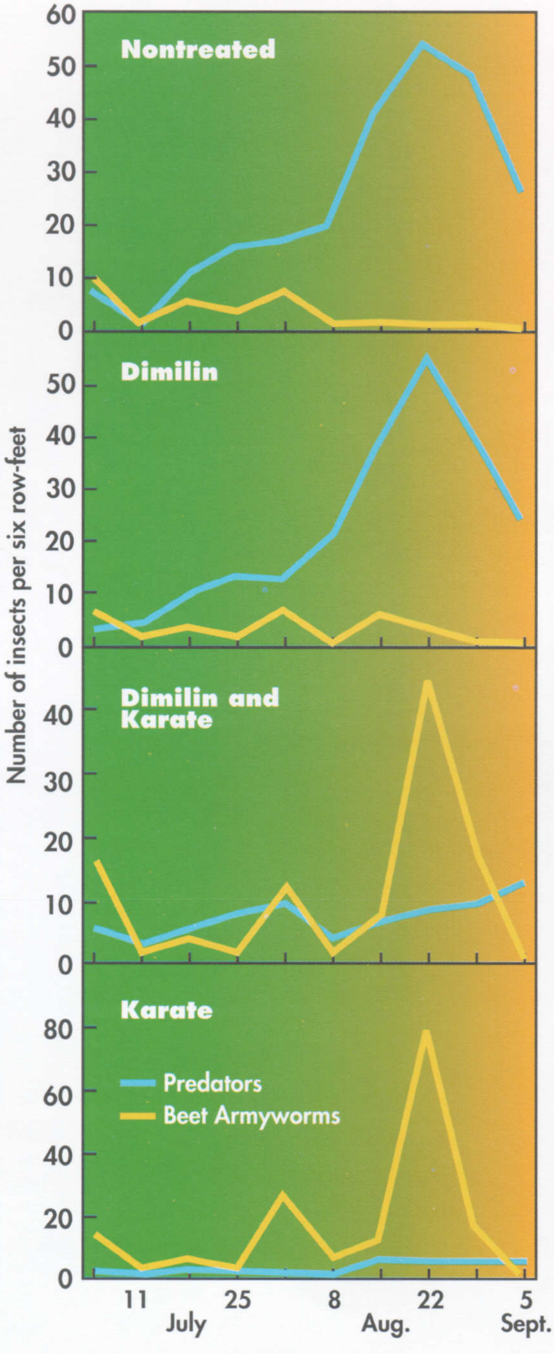

Figure 2. Numbers of beet armyworm larvae and predators in each treatment

The most prevalent parasitoids affecting armyworms were the braconid wasps *Cotesia marginiventris* and *Meteorus rubens* and the tachinid fly *Lespesia aletiae*. Diseases were rated as fungal or bacterial in origin.

Cotesia pupae and adults are known to be susceptible to pyrethroid insecticides, such as Karate. Yet, the recent test detected no difference in rates of parasitization by *Cotesia* in nontreated plots or in those treated with Karate. This lack of difference may be due to the small plot size used or harborage of immature parasitoids inside armyworms and other larvae. When broad-spectrum insecticides, such as pyrethroids or organophosphates, must be applied to cotton to control other pests, parasitoids and disease may be the most important natural mortality factors.

If use of broad-spectrum insecticides can be delayed or substituted with other insecticides that are less toxic to natural enemies, predator numbers can be increased. Conserving beneficial insects in early season and making later sprays on an as-needed basis can aid in increasing numbers of predators and add another weapon to the arsenal for beet armyworm control.

Graham is a Laboratory Supervisor and Gaylor is an Associate Professor in Entomology. Stewart is a Research Scientist at Mississippi State University.

Extra Dietary Nitrogen Produces Leaner Pigs

Lee I. Chiba,
Henry W. Ivey,
Keith A. Cummins,
and Brian E. Gamble

Today's consumers prefer lean meat products. Fat is not only costly to produce, but costly to eliminate in the process of providing lean retail pork. Any efforts to reduce the fat, therefore, would benefit all groups from swine producers to consumers. A recent AAES study demonstrated that feeding diets containing extra protein is one way that producers can improve carcass quality of finisher pigs.

To produce leaner pigs, producers may be able to rely on inexpensive supplements such as urea, thus avoiding an increase in feed costs. Urea is not a protein supplement, but it is a source of nitrogen that microorganisms in the digestive system can use to synthesize amino acids. Nitrogen is a component of amino acids, such as lysine, and amino acids are the building blocks of protein. One pound of urea contains as much nitrogen as 2.81 pounds of protein, and its value is expressed as "protein equivalent."

AAES research was conducted to evaluate the value of urea and soybean meal (SBM) as sources of extra dietary nitrogen to enhance carcass leanness. The study also was designed to determine the effect of amino acid supplementation of diets containing urea on growth performance and leanness of finisher pigs. Three sets of diets were formulated to accomplish these objectives (see table).

Three SBM diets contained low, medium, and high concentrations of lysine. The low diet reflects the current standard recommendation for dietary lysine. Medium and high diets, respectively, contained 21% and 42% more dietary lysine. As lysine content increases, so does the protein concentration.

Two urea diets were formulated to contain the same nitrogen concentrations (Iso-N) as the medium and high SBM diets. To ensure an adequate supply of protein from common feed ingredients for pigs, corn and SBM contributed 13.2% of protein to all urea diets, and urea provided additional protein equivalents.

Two additional urea diets contained the same lysine concentrations (Iso-Lys) as the corresponding medium and high SBM diets. Appropriate amounts of crystalline amino acids were added to these two diets so that all important amino acid contents for the medium and high Iso-Lys diets were at least 21% and 42% greater, respectively, than the low SBM diet.

At an average weight of 120 pounds, pigs housed in individual pens were assigned to one of these seven diets. To assess carcass traits, all pigs were slaughtered when they weighed about 230 pounds.

Medium diets were considered to be the optimum for pigs used in this study. A fundamental assumption of the project design was that providing dietary lysine or protein above the optimum concentration would have no effect on the lean growth rate but would reduce the rate of fat deposition, thus improving leanness of finisher pigs.

Pigs fed the low SBM diet tended to

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grow faster than those fed the medium and high diets — 2.40 pounds per day for the low SBM diet, compared to an average of 2.25 pounds per day for the six medium and high diets. However, they also had thicker carcass backfat (1.30 versus 1.14 inches), smaller loin muscle area (4.79 versus 5.25 square inches), and lower proportion of carcass lean (44.7% versus 47.6%) than those fed the six medium and high diets.

These results indicated that pigs fed medium- or high-nitrogen or lysine diets had a reduced weight gain because of lower rate of fat deposition. This contention was supported by the fact that there was no difference in the rate of lean gain—0.61 and 0.64 pound per day, respectively, for the low diet and the average of other six diets. This slight depression of weight gain in pigs fed the medium and high diets may not be that important considering today's consumer demands for lean meat products.

Simply adding urea to increase dietary nitrogen (Iso-N diets) was almost as effective as the SBM diets or amino acid supplementation of urea diets (Iso-Lys) in improving carcass quality of finisher pigs. Pigs are capable of absorbing amino acids synthesized from urea by intestinal bacteria, and they can incorporate those amino acids into tissue proteins. However, it is generally assumed that anatomical and metabolic limitations prevent the pig from using enough urea or other nonprotein nitrogen to gain substantial growth performance benefits.

The findings of this study were, therefore, surprising because lysine and other important amino acid contents of the two Iso-N diets without amino acid supplementation were essentially the same as those of the low SBM diet. Lysine and some other important amino acids cannot be synthesized from other substances in the animal's body, thus adequate amounts of those amino acids must be provided in the diet to build new proteins such as muscle. Nevertheless, these results are in agreement with an earlier suggestion that the overall utilization of diets may be improved by the inclusion of urea.

Unexpectedly, increasing dietary nitrogen and/or lysine from medium to high had no effects on growth performance or carcass traits of pigs. It is possible that the protein content of the four urea diets (13.2% without urea) was not enough to cause changes in the pig's metabolism, which can lead to a reduction of energy available for excess fat deposition.

In summary, carcass quality of finisher pigs was enhanced by increasing dietary nitrogen and/or amino acid concentrations from the standard recommendation, regardless of the source (SBM or urea and/or amino acids). Furthermore, incorporating urea to increase dietary nitrogen was effective in improving carcass quality regardless of whether the urea was supplemented with amino acids. These results indicate that feeding diets containing extra nitrogen is a viable means to enhance carcass quality of finisher pigs, and providing adequate amounts of extra nitrogen or protein in the diet is more important than the quality of the protein. The benefit of employing this approach to increase leanness of finisher pigs would be even greater if producers can use inexpensive supplements such as urea as a source of extra dietary nitrogen.

Chiba is an Assistant Professor and Cummins is a Professor of Animal and Dairy Sciences. Ivey is Superintendent and Gamble is an Assistant Superintendent of the Wiregrass Substation.

Effects of Dietary Soybean Meal and Urea on Growth Performance and Carcass Traits of Finisher Pigs[1]

Traits	SBM			Urea (Iso-N)		Urea (Iso-Lys)	
	Low	Med.	High	Med.	High	Med.	High
Composition of diets[2]							
Protein (pct.)	13.2	15.0	16.7	15.0	16.7	15.0	16.7
Lysine (pct.)	0.60	0.73	0.85	0.60	0.60	0.73	0.85
Growth performance							
Weight gain (lb./day)	2.40	2.27	2.31	2.22	2.22	2.33	2.13
Gain to feed (lb./lb.)	0.30	0.30	0.30	0.28	0.29	0.33	0.29
Carcass traits							
10th rib backfat (in.)	1.30	1.10	1.07	1.21	1.15	1.14	1.16
LMA (sq. in.)	4.79	5.36	5.30	5.19	5.13	5.38	5.15
Lean containing 5% fat							
Proportion (pct.)	44.7	48.4	48.4	46.6	47.1	47.7	47.1
Accretion (lb./day)	0.61	0.65	0.68	0.62	0.61	0.67	0.61

[1]SBM = soybean meal; Iso-N = the same protein equivalent as corresponding SBM diets; Iso-Lys = the same lysine content as corresponding SBM diets; Med = medium; LMA = loin muscle area.

[2]Corn and SBM provided 13.2% protein to urea diets, and urea supplied additional protein equivalents. The content of all important amino acids in the medium and high Iso-Lys diets was at least 21% and 42% greater, respectively, than the content of the low diet, which was based on standard recommendations. This increase was achieved by adding appropriate amounts of crystalline amino acids.

Mulches Reduce Blackspot Disease Severity on Roses

Concerns focusing on the safety and environmental impact of frequent fungicide use have caused rose growers to consider less chemically dependent methods for disease control. Recent AAES research showed that mulches may reduce the severity of blackspot disease on roses, a finding that could allow growers to reduce the amount of chemicals needed to control this potentially devastating disease.

In particular, oat and pine straw ground covers were shown to lower disease development on roses compared to bare soil or landscape mats. Ground covers provide a sponge-like base that traps spores of the fungus *Diplocarpon rosae*, which causes blackspot disease. Overhead watering or rain can otherwise splash the spores to healthy leaves.

Blackspot disease affects many types of roses, but it appears to be most damaging to the hybrid tea, one of the most common types of roses grown in the southern landscape. Hybrid teas bloom early and produce the largest flowers of all roses, but they can be devastated by blackspot disease. The beauty of a rose bush can be greatly reduced by the circular black spots on plant foliage that characterize this disease. Blackspot can easily be distinguished from other diseases by the darker color and fringed borders of the spots, which can occur on either side of the leaf. Spots are often surrounded by a yellow halo, and infected leaves fall prematurely. This disease may cause severe defoliation, resulting in a weakened plant and reduced flower production.

In the Southeast, prevailing environmental conditions promote fungal pathogen development from March through November. Nighttime temperatures between 59 and 80°F, along with frequent rains and high humidity, allow the blackspot fungus to thrive and continuously reinfect roses. The fungicide chlorothalonil (Daconil) is effective in controlling blackspot by killing the fungal spores that spread the disease. However, optimal disease control with chlorothalonil requires frequent applications to protect newly developing leaves and replace fungicide that is washed off with rain. Control of blackspot on roses, therefore, may require more than 15 fungicide applications, at seven- to 10-day intervals, during the growing season.

AAES studies conducted at the E.V. Smith Research Center in Shorter evaluated the effectiveness of a fungicide alternative and various ground covers in minimizing blackspot disease development. Three varieties of hybrid tea roses were planted with five different ground covers: oat straw, pine straw, pine bark, landscape mat, and bare soil.

The three varieties that were evaluated, Dolly Parton, Princess Monaco, and Cary Grant, showed little differences in susceptibility to blackspot. However, Cary Grant

Kira L. Bowen, Bridget K. Behe,
and Gloria R. Garner

generally was more vigorous, with greater flower production, than the other two varieties

Through the growing seasons of 1992, 1993, and 1994, these plants were left nontreated or treated with weekly applications of chlorothalonil or a solution of baking soda and horticultural oil. Blackspot disease severity, plant vigor, and flower production were rated weekly.

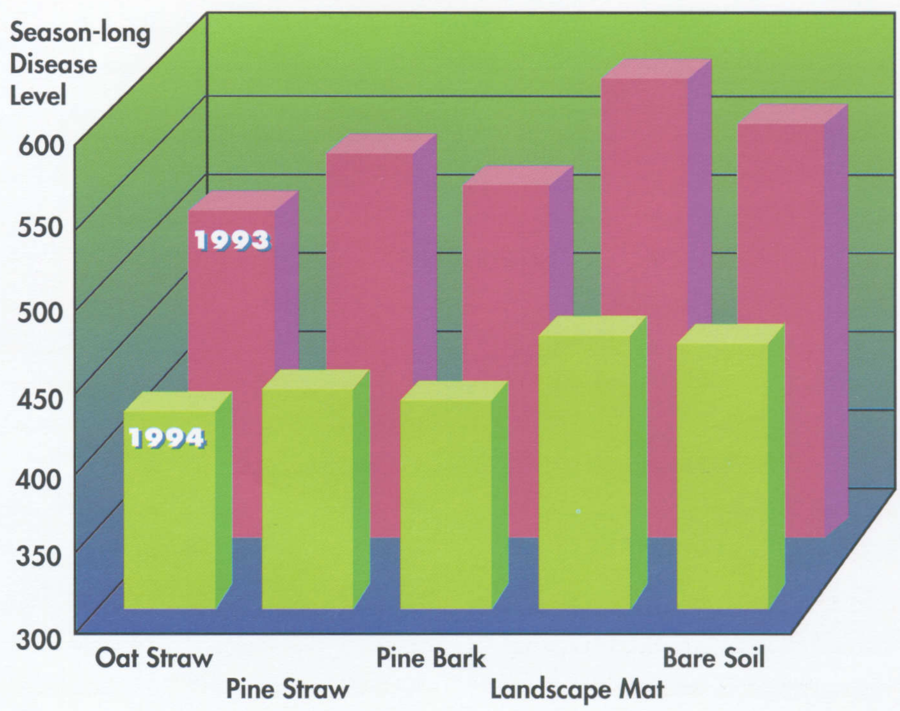
As expected, lowest blackspot disease levels and highest vigor ratings were observed on plants treated weekly with chlorothalonil. The baking soda solution did not effectively reduce disease severity and appeared to cause a decrease in plant vigor. The oil component of this solution seemed to cause phytotoxicity due to daytime temperatures of 92°F or more.

Significant differences in levels of blackspot and plant vigor were observed due to ground cover. Even on the nontreated plants, roses with oat straw, pine bark, and pine straw ground covers had lower blackspot disease levels compared to plants with the landscape mat or plants in bare soil (see figure). Disease development with the straw ground covers was probably reduced because these ground covers reduced water splash that would move spores from the ground to healthy leaves.

Effectiveness of ground cover, relative to fungicide use, was dependent on the prevailing environment. For example, in 1992 and 1993 oat straw reduced disease 10% and 30%, respectively, as compared to bare soil without any fungicide application. In 1992, 17 weekly fungicide applications on plants in oat straw had the same impact as 20 applications on plants in bare soil. A similar rate of disease control was seen in 1993 with 14 fungicide applications on plants in oat straw.

Complete control of blackspot disease may never be attained without the use of fungicides, but less fungicide may be needed if rose plants are properly managed. Proper management of roses includes annual replacement of ground cover, proper pruning and fertilization, and removal of fallen leaves. Pruning and removal of debris are important because the fungus readily survives in fallen leaves, buds, or infected canes. Also, proper fertility will keep a plant in optimal health, making it less susceptible to disease.

Bowen is an Associate Professor of Plant Pathology, Behe is an Associate Professor of Horticulture, and Garner is a Graduate Research Assistant.



Using a 0 - 5 scale, researchers rated disease severity on the plants once a month for five months. To reflect the rating over time, each monthly score was multiplied by the number of days in each month. Thus, plants rated the highest in disease severity throughout the five-month period would have a season-long disease score of 750.

Contract Grazing : A Great Economic Opportunity

Limited capital is the factor that often restricts the size and profitability of stocker operations. For example, if stocker cattle cost $400 each, pasture production cost is $100 per acre, and stockers are grazed at two animals per acre, then the total investment required will be at least $900 per acre. This is several times greater than the investment needed to plant most row crops, and will clearly limit the size and profitability of the operation. However, a recent analysis of AAES stocker research data shows that contract grazing can overcome this problem.

With traditional stocker programs, the landowner buys the animals to graze the pasture. In contrast, contract grazing (sometimes known as custom grazing) involves landowners grazing cattle owned by someone else, for a specified fee. At present, a common fee is 30-35 cents per pound of weight gain. The objective of this study was to compare the profitability of a traditional stocker operation, in which cattle were bought by the landowner, with contract grazing, assuming that only $30,000 was available.

Data for the analysis were obtained from an AAES grazing experiment at the Gulf Coast Substation, Fairhope. In this experiment, crossbred steers grazed Gulf ryegrass planted in a prepared seedbed for a 140–day period in 1993-94 and 1994-95. Initial weights of the steers averaged 483 pounds. Animals were implanted with Synovex S at the start of grazing each fall, and were stocked at two animals per acre. No hay or other supplement was provided.

Pasture costs are presented in an Alabama Cooperative Extension Service budget (Table 1). Total cost and returns for a traditional system (bought cattle) are presented in a similar stocker budget (Table 2). For contract grazing, costs to the landowner were: $108 per acre for the pasture and $10.50 per head (or $21.00 per acre) for veterinary costs, giving a total cost of $129 per acre. Income for contract grazing was obtained as follows:

2.83 pounds [average daily gain (ADG)]
2.00 head per acre
x 140 days
792 pounds per acre
.97 (3% death loss)
x 30 cents per pound of gain
$230 per acre, gross profit
– $129 cost per acre
$101 net profit.

This $101 net profit is only 53% of the $191 profit per acre obtained if animals were bought (Table 2).

Without further examination, this may suggest that buying cattle would be preferred to contract grazing. However, if capital is restricted, this would not be the case. For example, if only $30,000 was available, under contract grazing the landowner could plant 233 acres ($30,000 ÷ $129 cost per acre) and would make a total profit of $23,533 (233 acres x $101 profit per acre). In contrast, if cattle were bought, only 29 acres ($30,000 ÷ $1,020 cost per acre) could be planted and stocked, and total profit would be $5,539 (29 acres x

Jim Green, David I. Bransby, and Malcomb Pegues

$191 profit per acre), which is only 24% of that obtained from contract grazing.

Though these returns look attractive, several points of caution should be emphasized. First, the two winters over which the study was conducted were relatively mild, and animal weight gains were above average. Secondly, the stocking rate of two animals per acre is appropriate for sandy soils in the southern part of the state, but this should be reduced to 1.5 head per acre for clay soils and the northern part of the state. Finally, these levels of production are dependent on establishing ryegrass in a prepared seedbed and will probably not be feasible if it were oversown into a warm-season sod, or if small grains are substituted for ryegrass.

Producers can use the information in this study to project their own risks and returns. For example, using these figures, breakeven animal weight gain per acre for custom grazing would be 430 pounds ($129 cost per acre ÷ 30 cents per pound grazing fee) and the breakeven grazing fee would be 16.8 cents per pound [$129 cost per acre ÷ (792 pounds per acre x 0.97, due to 3% death loss)]. Alternatively, if a stocking rate of 1.5 head per acre and an average daily gain of two pounds per day are assumed, gain per acre would be only 420 pounds and custom grazing would not be profitable.

When calculated on an annual basis, return on capital for contract grazing in this study was 205% ($23,533 ÷ $30,000 x 365 ÷ 40 x 100), while for bought cattle it was only 48% ($5,539 ÷ $30,000 x 365 ÷ 140 x 100). Consequently, if capital is limited and high gain per acre is feasible, contract grazing offers considerably greater profit potential than traditional stocker operations in which cattle are bought by the landowner.

Green is a Graduate Research Assistant and Bransby is a Professor of Agronomy and Soils; Pegues is an Assistant Superintendent of the Gulf Coast Substation.

Table 1. Pasture Budget for Ryegrass Developed from the 1994/95 Alabama Cooperative Extension Service Budgets

Item	Quantity	Price or cost/unit	Total/ acre
/ariable cost			
ieed, lbs.			
Ryegrass	35.00	$ 0.35	$12.25
ertilizer, lbs.			
Nitrogen	160.00	.29	46.40
Phosphate	60.00	.23	13.80
Potash	60.00	.15	9.00
.ime, tons (prorated)	.33	22.00	7.26
Tractors & equipment/acre	1.00	3.36	3.36
nterest on operational capital	$25.41	.085	2.16
Total variable cost/acre			94.23
ixed cost			
Tractors & equipment/acre	1.00	7.31	7.31
General overhead	$94.23	.07	6.60
Total fixed cost/acre			13.91
Total cost of all specified expenses			108.14

Table 2. Stocker–Steer Production Budget for the Early September Planting of Ryegrass[1]

Item	Quantity	Price or Cost/Unit	Value or Cost
Gross receipts			
Feeder calves[2]	73.00	$ 70.78	$45,417
Variable cost			
Stocker calves	362.25	86.54	31,349
Winter grazing	37.50	94.23	3,534
Veterinary and medicine	75.00	10.50	788
Marketing fee	73.00	1.50	109
National promotion fee	73.00	1.00	73
Equipment (repair)			59
Interest on animals	$12,024.27	.09	1,082
Total variable cost			36,994
Income above variable cost			8,423
Fixed cost			
General overhead	1.00	187.50	188
Winter grazing	37.50	13.91	522
Interest (buildings and equipment)	$2,102.13	.10	210
Depreciation (buildings and equipment)			296
Other fixed costs (buildings and equipment)			32
Total fixed cost			1,248
Total cost, all specified expenses			38,242
Net return above specified expenses			7,175
Net return per acre			191

[1]Developed from the 1994/95 Alabama Cooperative Extension Service Budget, based on: 75 head, 483 pounds beginning weight, 140 total days feeding period, 2.83 pounds ADG, 879 pounds ending weight, stocked at two head per acre, and 3% death loss.

[2]Weight of each, 8.79 hundredweights (CWT.).

After Thirty Years of Change, Alabama

DURING THE PAST THREE DECADES, striking change has occurred in both the number and size of Alabama farms, in the nature of farming, and in the tenure of farm operators. An AAES study has tracked those changes.

This study was conducted by comparing U.S. Agricultural Census information from years past to present day. These data show that Alabama reached a peak number of farms in 1935 when the census reported 273,455 farms in the state. The number of farms dropped to fewer than half as many, to 115,788 in 1959 (Figure 1).

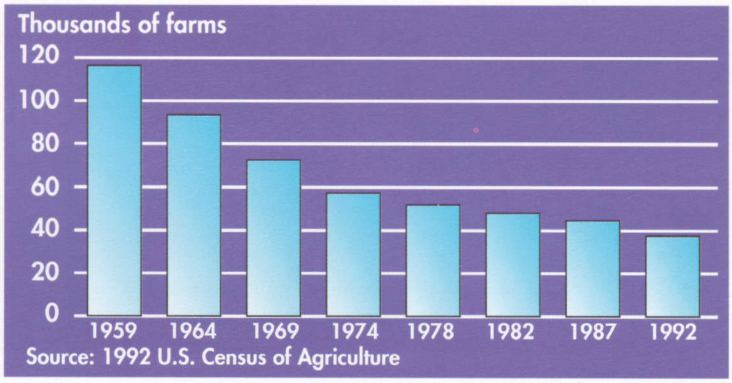


Figure 1. Number of Alabama Farms: 1959-1992.

Two-thirds of Alabama farms existing in 1959 had disappeared by 1992, to 37,905, either because of abandonment of farming as a livelihood, the encroachment of alternative land uses, or the consolidation of farm land into expanding farms. Approximately 5,400 Alabama farms ceased to exist during the five-year census period from 1987 to 1992. One result of this decrease in the number of farms over the past 30 years is that farms have increased in size from 143 to 223 acres.

One assumption about the loss of Alabama farms is that these are small, marginally productive units. This is only partially true since many farms of all sizes have disappeared (Figure 2). A large proportion of Alabama farms still operate with fewer than 50 acres. The proportion of farms of this size decreased by almost one–third, from 44% in 1959 to 32% by 1992. At the same time, the proportion of farms in the 50– to 499–acre range increased 9%, from 51% to almost 60%. Large farms (500 acres or larger) increased 5% (from 4.6% of all farms in 1959 to about 10% by 1992). Of these farms, 4% are 1,000 acres or larger in size. However, there has been a decrease in the number of farms of all sizes through the years.

While the number of farms has decreased, average sales of farm products have increased steadily since 1959 (Figure 3). The dollar value of average sales per farm increased for all reporting periods. The largest increase occurred between 1987 and 1992 when the average value of sales rose by $18,500, from $44,000 to $62,500 per farm. Many factors contributed to this increase, such as inflation, growth in the average size of farm, and loss of small or marginally productive farms. Nevertheless, 31% of Alabama farms reported sales of less than $2,500 in 1992, while 13% of farms reported average sales of $100,00 or more.

Commodities grown by Alabama farmers also have changed. At the beginning of this period, 55% of Alabama farms grew cotton (Figure 6). By 1974 only 12% of farms were in cotton production. The proportion of farms growing cotton dropped to 4% by the 1978 census and, for the next 24 years, remained between 3% and 4% of the shrinking number of farms. Since 1992, cotton acreage appears to be increasing, but it is not clear whether new farms are including cotton enterprises or existing cotton farms are increasing cotton acreage.

Trends for soybean production reveal quite a different history. Fewer than 2% of Alabama farms reported growing soybeans in 1959. During the next 20 years this proportion increased to almost 22%. By 1982 the census revealed that the percentage of soybean-producing farms had decreased and continued to do so through 1992, when only 5% of farms grew soybeans.

Historically, corn has been a staple crop on the vast majority of Alabama farms. In 1959, 72% of the farms grew corn. Since then corn production declined until only 14% of Alabama farms produced corn in 1992. Much of this change is the result of the separation of crop and livestock enterprises on Alabama

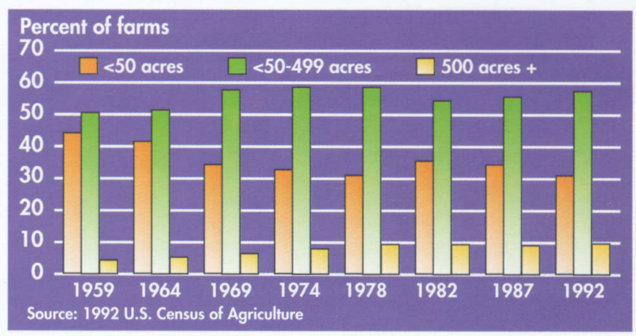


Figure 2. Alabama farms by size: 1959-1992.

Farming Is Not the Same

John Dunkelberger, Noel Thompson, Glenn Howze, and Lavaughn Johnson

farms in favor of enterprise specialization.

Livestock production has undergone marked changes over the past 33 years (Figure 5). Most pronounced was the decrease in the number of farms raising hogs, which is in part linked to the end of corn production on many farms. More than two-thirds of all farms in 1959 produced hogs, compared with only 5% in 1992. Much of this decrease in hog production was caused by the disappearance of many small, diversified farms across the state, which in the past had included a wide variety of small-scale farm enterprises.

Vertical integration of broiler production with the use of grower contracts was already well established by 1959. During the ensuing years, the proportion of Alabama farms growing broilers increased only minimally when adjusted for the shrinking number of farms. The increase was from a little more than 3% at the beginning of the period to 6.5% by 1992. At the same time the number of farms growing broilers actually decreased from 4,496 farms at the peak in 1969 to a 1992 total of only 2,460. If contract specifications call for ever larger broiler operations, the number of farms producing broilers may continue to decrease.

Farms with beef cattle operations existed on half (49%) of all Alabama farms in 1964 (no data are available for 1959 and 1969). By 1992 the proportion of farms raising beef cattle had increased to 63%. Some of this increase may reflect the replacement of beef cattle for soybeans in the Black Belt area as farm operators returned cropland to pasture.

Not only did farms change during this period, the characteristics of the farmers who operate them also changed, especially the average age of Alabama farmers. Except for a slight lowering in the decade of the 1970s, the average age rose from about 51 years in 1959 to almost 55 years by 1992. The magnitude of this change is significant for the future of Alabama agriculture because of the two-generation lag this represents in the influx of young operators into farming.

Over the last 30 years, the proportion of Alabama farms operated by a full–time owner or manager increased from 29% in 1974 (the first time such information was available) to almost 36% in 1992. At the same time the proportion of farm operators who reported working 200 days or more off the farm increased from 27% in 1974 to almost half (48%) in 1987, before decreasing to 43% by 1992.

The majority of farm operators from 1974 through 1987 indicated farming was their primary occupation with the percentages increasing from 54% to 62%. However, in 1992, 20% fewer Alabama farmers (42%) said farming was their main occupation.

Generally, as the number of farms decreased, the proportion of farmers working off the farm and the proportion claiming farming as their main occupation increased until the 1990s. It is unclear whether these changes in operator characteristics between 1987 and 1992 represent the start of new trends or corrections in the long term trends of past years.

The selected trends highlighted here need continued monitoring changes in farming and agriculture affect the economy of Alabama and the nation, especially in rural communities.

Dunkelberger and Howze are Professors, Thompson is a Data Analyst,and Johnson is Head and Professor of Agricultural Economics and Rural Sociology.

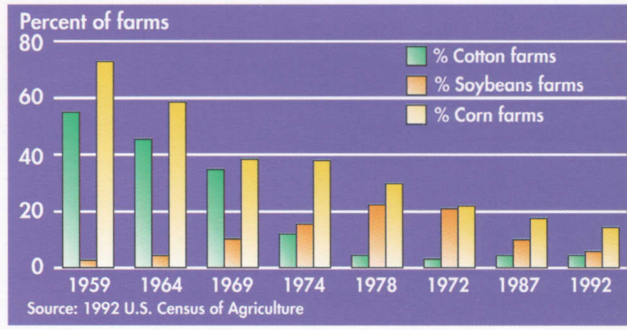


Figure 4. Alabama farms producing selected row crops: 1959-1992.

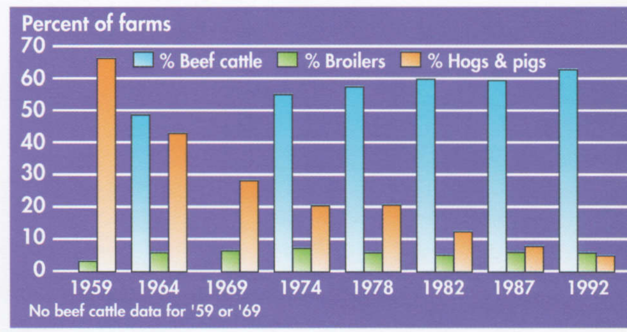


Figure 5. Alabama farms producing selected livestock: 1959-1992.

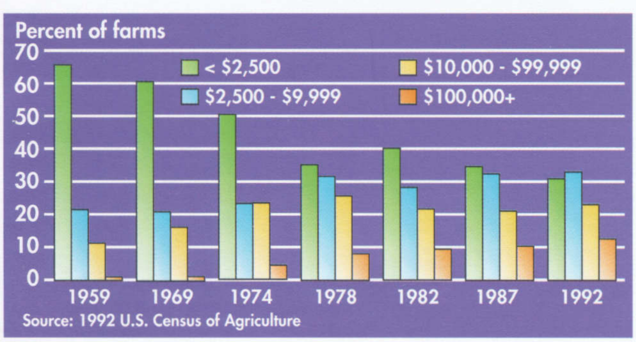


Figure 3. Alabama farms by value of sales: 1964-1992.

Research Exploring Harvest Management for Switchgrass Used as Forage

FARMERS INTERESTED IN DISCOVERING NEW FORAGE CROP OPTIONS ARE EXPLORING THE USE OF NATIVE GRASSES, such as switchgrass, that are indigenous to Alabama. When Desoto and other explorers first arrived in the Southeast, switchgrass and other tall grasses were abundant. Through the generations, switchgrass and other native grass species have virtually vanished in the South because of such activities as farming, logging, overgrazing, fire suppression, and forage plant and weed introductions. However, AAES research indicates these grasses can be utilized as forage here if growers carefully select cultivars and if management practices can be developed.

Though numerous native grasses could be used, switchgrass is a logical first choice for growers. This perennial warm-season grass has many uses as both a forage and an energy crop, can help control soil erosion, and is a useful wildlife food and cover planting. It is commonly used for forage in the Midwest and new varieties have been developed through the years. However, before the potential of switchgrass as a forage crop can be tapped in the Southeast, researchers are trying to determine the best cultivars for use in the region and also how these should be managed and harvested.

One such study began in May 1993 at the E.V. Smith Research Center in Shorter to determine the influence of harvest frequency and cutting height on the hay yields and digestibility of Alamo and Cave-in-Rock switchgrass. Both cultivars have shown potential for forage production in Alabama.

The project was conducted on four-year-old plots of both varieties and included harvesting plots at three-week, six-week, and nine-week intervals from May 10 to October 25. Each plot was cut to one of three stubble heights – two inches, four inches, or six inches – with a Carter flail harvester. All plots received 60 pounds of nitrogen per acre in March and an additional 60 pounds of nitrogen after the first harvest. Soil phosphorus and potassium were maintained at moderate concentrations according to yearly soil tests. Digestible dry matter, which indicates how easily a forage is digested by grazing animals, was estimated using a laboratory procedure that simulated rumen digestion. Total digestible dry matter was calculated and expressed as a percentage of total yield.

Cumulative dry matter yield of Alamo switchgrass was consistently greater than Cave-in-Rock, regardless of harvest frequency or cutting height (Table 1). Harvest frequency and cutting height affected cumulative dry matter yield of both switchgrass cultivars. Highest cumulative yield was obtained during both seasons when the grasses were cut at nine-week intervals (Table 1).

All harvest frequencies reduced 1994 Alamo yields from yields obtained at each interval in 1993. However, even though the highest 1993 yields were obtained at the two-inch cutting height for all harvest frequencies, highest yield reductions occurred in 1994 at the two-inch cutting height. While several factors may influence this reaction, it suggests that closely cutting switchgrass one year may result in greater yields that year, but reduce yields the following year.

Cumulative digestible dry matter also was affected by harvest frequency, and cutting height in 1993 (Table 2). When

Mary Miller, Michele Owsley, Susan Sladden, and David Bransby

digestible dry matter is expressed as a percentage of dry matter yield, quality of both grasses generally appears higher when harvest interval is shortened to three weeks and cutting height is highest (Figure 1). However, because dry matter yield increases so dramatically when longer harvest intervals are used, total tons per acre of digestible dry matter over the season are greatest for both grasses at the nine-week harvest interval (Table 2).

During 1993, crude protein values ranged from 5% to 14% for Alamo, and 5.4% to 16% for Cave-in-Rock, with highest protein percentages occurring at the three-week harvest schedule, and lowest protein percentages occurring at the nine-week harvest frequency.

This study has revealed marked differences in response of improved switchgrass cultivars to climatic and cultural conditions in Alabama environments. Under the same harvest management, Cave-in-Rock, a popular switchgrass cultivar in the Midwest and Mid-Atlantic regions, does not appear to have the yield potential or persistence in central Alabama that Alamo exhibits. However, yield and dry matter digestibility obtained for both switchgrass cultivars at the six-week and nine-week harvest intervals are equal to or exceed yield and digestible dry matter of warm-season perennial grasses, such as bahiagrass and the hybrid bermudagrasses, currently used for pasture and hay in Alabama.

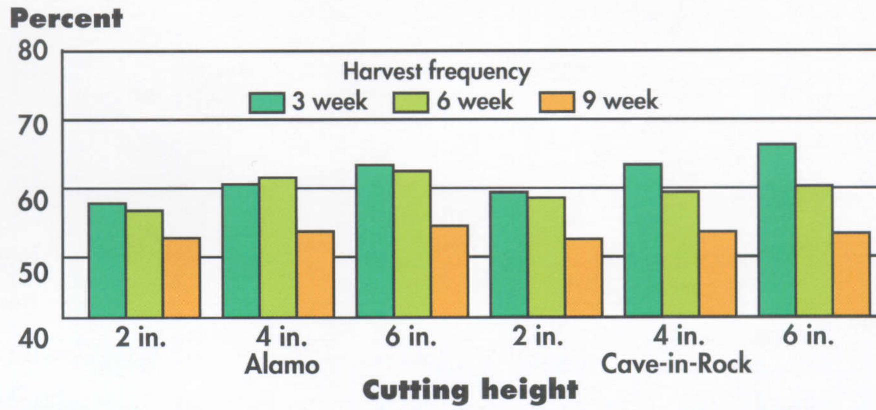


Figure 1. Digestible dry matter as a percentage of total dry matter yield of Alamo and Cave-in-Rock switchgrass, 1993.

Further studies are planned by AAES researchers to obtain a more thorough understanding of how adjustments in harvest management can optimize productivity and quality and enhance stand persistence of switchgrass cultivars grown for pasture and hay in various environments in Alabama.

Miller is an Assistant Professor, Owsley and Sladden are Research Associates, and Bransby is a Professor of Agronomy and Soils.

Table 1. Cumulative Dry Matter Yield for Alamo and Cave-in-Rock Switchgrass, 1993–94

	Harvest frequency								
	Every 3 weeks			Every 6 weeks			Every 9 weeks		
	Cutting height								
	2 in.	4 in.	6 in.	2 in.	4 in.	6 in.	2 in.	4 in.	6 in.
	Tons/acre								
Alamo									
1993	7.2	6.2	5.4	9.8	9.4	7.8	13.8	13.3	13.0
1994	2.4	2.7	3.1	4.9	5.4	5.4	9.7	10.2	10.2
Cave-in-Rock									
1993	5.2	4.4	3.7	8.1	6.6	5.7	11.5	10.4	9.7
1994[1]	1.4	1.5	1.6	4.3	3.9	3.2	7.2	7.5	6.9

[1]Cave-in-Rock stand damaged by mid-season herbicide application.

Table 2. Cumulative Digestible Dry Matter for Alamo and Cave-in-Rock Switchgrass, 1993

	Harvest frequency								
	Every 3 weeks			Every 6 weeks			Every 9 weeks		
	Cutting height								
	2 in.	4 in.	6 in.	2 in.	4 in.	6 in.	2 in.	4 in.	6 in.
	Tons/acre								
Alamo	4.1	3.7	3.4	5.5	5.7	4.8	7.2	7.1	7.0
Cave-in-Rock	3.1	2.8	2.5	4.7	3.9	3.4	6.0	5.5	5.1

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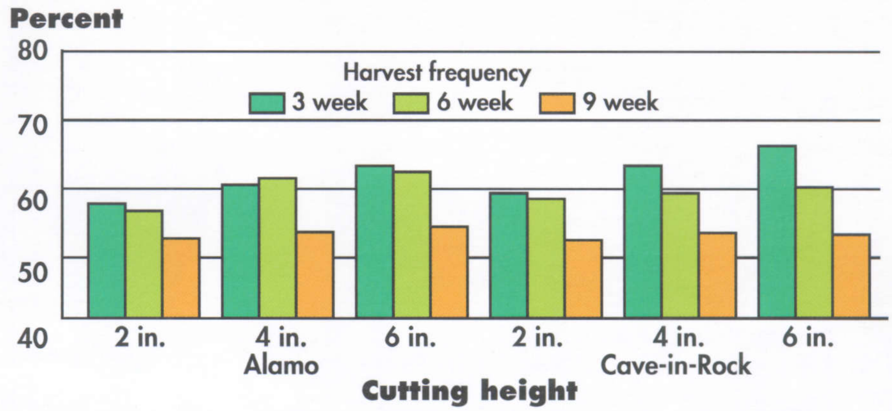

Figure 1. Digestible dry matter as a percentage of total dry matter yield of Alamo and Cave-in-Rock switchgrass, 1993.

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	Every 3 weeks			Every 6 weeks			Every 9 weeks		
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	2 in.	4 in.	6 in.	2 in.	4 in.	6 in.	2 in.	4 in.	6 in.
	Tons/acre								
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1993	7.2	6.2	5.4	9.8	9.4	7.8	13.8	13.3	13.0
1994	2.4	2.7	3.1	4.9	5.4	5.4	9.7	10.2	10.2
Cave-in-Rock									
1993	5.2	4.4	3.7	8.1	6.6	5.7	11.5	10.4	9.7
1994[1]	1.4	1.5	1.6	4.3	3.9	3.2	7.2	7.5	6.9

[1] Cave-in-Rock stand damaged by mid-season herbicide application.

Table 2. Cumulative Digestible Dry Matter for Alamo and Cave-in-Rock Switchgrass, 1993

	Harvest frequency								
	Every 3 weeks			Every 6 weeks			Every 9 weeks		
	Cutting height								
	2 in.	4 in.	6 in.	2 in.	4 in.	6 in.	2 in.	4 in.	6 in.
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Steve E. Taylor, Michael D. Spruce, and John H. Wilhoit

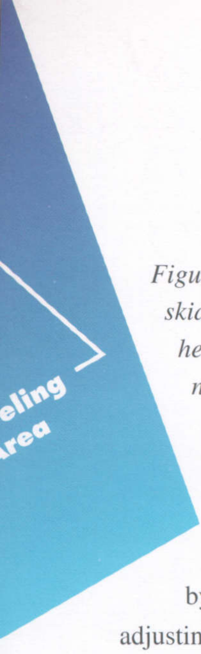

Figure 1. Site preparation skidder movement during herbicide spraying operations near Springhill, Ala.

introduces errors into the GPS satellite signals. While GPS receivers used by the military are capable of adjusting for these errors to give accurate location data, the common GPS receivers available to civilians cannot directly adjust for these errors.

Additional efforts are needed to correct the location data collected by civilian GPS receivers. This is when DGPS is employed. Differential correction is a process where two GPS receivers are used: one is the field GPS receiver collecting the mapping or tracking data, and the other is a base station GPS receiver collecting latitude, longitude, and elevation data at a known location. The data collected at the base station are compared with the known location, and a correction factor is developed to make the GPS data agree with the known location. Then, the same correction factor can be applied to the data collected by the field unit.

After performing the differential correction procedure, GPS location data are generally reported to be accurate to within 10-16 feet (horizontally) of the true location. All GPS data collected in this study were corrected using DGPS techniques.

The study also showed that location data collected under the open sky conditions were more accurate than those collected under the forest canopy. A rectangular grid of points was set up in two conditions: an open field and under the canopy of a 14-year-old pine plantation. The GPS receiver was then positioned over these grid points in a stationary mode for several minutes so that their locations and the distances between points could be determined. Next, the GPS receiver was mounted on a tractor and used to record tractor movement back and forth over these rectangular grid courses.

Figure 2. Hand held GPS receiver used to collect stationary and mobile GPS field data.

Tests results showed that, when using DGPS, average stationary GPS positions collected in the open field were accurate to within five feet horizontally. Under the forest canopy, stationary GPS positions were accurate to within 16 feet. The mobile GPS data accurately depicted the movement of the tractor in the open field; however, it was difficult to track machine movement under the canopy. This was probably due to the canopy blocking or deflecting the signals coming from the satellites.

The same grid locations were used to test how well GPS could determine the speed of a moving tractor in the different sky conditions. The results of these tests indicated that GPS can measure speed significantly more accurately under the open sky conditions than under the forest canopy. However, even under the forest canopy, the average speeds determined by GPS were within 5% of the true tractor speed.

One practical application of using GPS for forestry vehicle tracking is in recording the travel patterns of a skidder applying herbicides in site preparation operations. It is often difficult to determine the effectiveness of a spraying operation in a forestry setting. By using GPS to record the movement of the sprayer, maps can be drawn to indicate which areas were covered by the sprayer. Figure 1 shows such a plot of skidder movement during a herbicide spraying operation. This plot shows areas where the spray patterns may have overlapped. It also shows areas that may have been missed by the sprayer and need a reapplication.

From the results of this study, it appears that DGPS is capable of tracking forestry machines in open sky conditions with suitable accuracy for management and engineering studies.

Using information on vehicle travel paths and speeds, researchers can collect more detailed information on forestry machine performance and, in turn, further improve the design of these machines. Also, foresters are using GPS data to make more accurate management decisions and improve the efficiency with which herbicides and fertilizers are applied. These research results will improve our ability to accomplish many forestry and agricultural activities in an environmentally sensitive and cost-effective manner.

Taylor and Wilhoit are Associate Professors of Agricultural Engineering; Spruce is a Design Engineer with Agricultural Engineering Associates in Union, Kan.

Chlorothalonil and Paraquat– Can They Be Tank Mixed To Control Peanut Pests?

James Choate, Glenn Wehtje, Kira Bowen, and Larry Wells

WEEDS AND LEAF SPOT ARE COMMON PROBLEMS FOR PEANUT GROWERS, AND TAKING CARE OF BOTH PESTS AT ONE TIME MAY BE BOTH PRACTICAL AND ECONOMICAL, ACCORDING TO RECENT AUBURN RESEARCH.

Paraquat (marketed under the name Starfire) is a contact–type herbicide that can provide control of various broadleaf and grass weeds found in peanuts. It is commonly tank–mixed with basagran and/ or 2,4-DB to minimize peanut injury and enhance the overall weed control. According to the label, paraquat can be applied at any time between when the weeds are small, and 28 days after cracking (when peanut plants emerge from the soil).

Chlorothalonil (marketed under the name Bravo and others) is a protectant-type fungicide that controls early and late leaf spot. Repeat applications of chlorothalonil are necessary during the growing season so that newly formed foliage is protected. Applications should begin 30-40 days after planting. The typical time interval between planting and cracking is 10 days, thus the latest time that paraquat can be applied is 38 days after planting. The latest that paraquat can be applied, and the desired start of the chlorothalonil applications, typically overlap by at least one week.

Paraquat does result in foliar injury and a slight amount of defoliation to the peanut. However, this injury quickly dissipates in about a week as the plant continues to grow and produce new foliage. Some growers believe the first chlorothalonil application should be delayed if paraquat is applied, because paraquat-injured foliage does not warrant fungicidal protection. Although herbicide-injured foliage may not be contributing much to the growth of the plant, it is still susceptible to pathogen infection, and if not protected, disease build up can get ahead of fungicide control.

In the Auburn study, a tank mixture of paraquat and chlorothalonil was used as an alternative to separate pesticide applications. The objective of the two-year study at the Wiregrass Substation in Headland was to evaluate chlorothalonil-based leaf spot control when the first application was a tank mixture of chlorothalonil and herbicides. A series of treatments were applied at a common time that corresponds to the overlap in the acceptable timing of both products.

Two formulations of chlorothalonil were used, Bravo 720 (the well-established liquid formulation) and Bravo Ultrex (a dry flowable). After this one-time application of various herbicide-fungicide tank mixtures, the appropriate fungicides were reapplied in a standard season-long program. Standard application rates were used with all pesticides. Since the primary object was to determine if the addition of a herbicide

Peanut Performance as Influenced by Herbicide–Fungicide Combinations, 1993 and 1994, at the Wiregrass Substation

Pesticide applications			Crop Response		
Tank mixture components of first application			Injury[1]	Defoliation	Yield
Herbicide	Chloro-thalonil	Remaining chlorothalonil applications	*Pct.*	*Pct.*	*Lb./a*
None	None	None	0	54	2,886
None	720	720	0	22	3,140
Paraquat	720	720	8	29	3,490
Paraquat +bentazon +2,4–DB	720	720	4	22	3,367
None	Ultrex	Ultrex	0	22	3,303
Paraquat	Ultrex	Ultrex	7	29	3,458
Paraquat +bentazon +2,4–DB	Ultrex	Ultrex	2	24	3,612

[1]Injury below 10 is still nominal.

affected the ability of chlorothalonil to control leaf spot, weeds were removed by hand. Peanut injury was noted 10 days after the first application, and peanut defoliation and yield were evaluated at the close of the season.

With no fungicide applied at any time during the production season, maximum defoliation and lowest yields were obtained: a two–year average of 54% and 2,886 pounds per acre, respectively (see table). Defoliation was substantially reduced with season-long applications of chlorothalonil, which in turn increased yield. Average defoliation and yield with Bravo-liquid was 22% and 3,114 pounds per acre, respectively. Results with Bravo-ultress were similar. Thus, no indications were evident that one Bravo formulation was superior to the other. More interestingly, the ability of chlorothalonil to control leaf spot and in turn improve yield was not influenced by including a herbicide with the first application as a tank mixture. Among the herbicide treatments used, paraquat alone caused injury (7%), and it appears to have contributed to the overall level of defoliation. This was not evident when the herbicide components were a combination of paraquat, bentazon, and 2,4–DB.

In separate studies, it was established that herbicide-chlorothalonil tank mixtures are just as effective in controlling weeds as the herbicides applied alone. This study supports the long-known fact that a season- long fungicide program is needed for optimum production. Furthermore, if necessary, chlorothalonil can be tank mixed with paraquat-based herbicide treatments without loss of performance. This would be more desirable than delaying the start of fungicide applications.

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Yard Debris Used as Mulch Improved Growth of Young Pecan Trees

William Goff and Wheeler Foshee

Elected officials worried about the shrinking availability of landfill space and pecan growers seeking ways to spur tree growth and improve productivity may be helped by research ongoing at the E. V. Smith Research Center in Shorter.

Begun as an effort to find ways of reducing the rising stress on landfills by diverting limbs, leaves, pine straw, and other common yard debris, the experiments have yielded data which indicate such debris could be used effectively as mulch. Early data indicate that mulch applied in a 10x10-foot area around young pecan trees can increase growth rate by 30 % when compared to unmulched trees.

Twelve inches of chipped limb mulch around young pecan tree.

Young pecan trees were mulched with five materials –leaves (mixed from various hardwoods), grass clipping, chipped limbs (mixed from pines and various hardwoods), pine straw, or pine bark nuggets. These were applied to a depth of 0-12 inches around each tree. Two checks were established–one having no mulch but with weeds controlled by herbicides, and a second with sod allowed to grow to the tree trunk.

Effects of Yard Waste Mulch on Growth of Young Pecan Trees[1]

Treatment	TCSA[2]	% Increase
Unmulched, weed–free	18.1	520.0
4-inch yard waste	22.0	647.8
8-inch yard waste	23.7	705.1
12-inch yard waste	23.6	649.0
Sod	17.7	488.0

[1]Trees were planted Oct. 1991; mulch was applied Jan.–Sept. 1992, 1993, 1994, and trees were measured March 9, 1992 and April 4, 1995.
[2]TCSA stands for trunk cross sectional area in cm^2.

The mulched trees on average were 30% larger in trunk cross–sectional area than those without a mulch after three years of growth in the orchard (see table). Results indicated that any of the yard waste mulches increased the growth of the young pecan trees when compared to the unmulched checks. The use of these yard wastes as a mulch for young pecan trees can be good news to growers. They increase growth of young trees, which other research suggests will bring trees into production up to three years sooner, and may increase yields in early years substantially.

By using yard waste as mulch for trees around homes, in parks, and at other locations, the demand on landfills could be further reduced. Mulch can also be a welcome addition to residential areas. Properly used mulch adds beauty and promotes healthier trees.

Goff is an Extension Horticulturist and Professor, and Foshee is a Graduate Research Assistant in Horticulture.

Correcting Soil Compaction in the

ROW CROP FARMERS know that the movement of farm equipment, people, and livestock can cause hard layers, or pans, of earth to form in the subsoil. These pans limit production by causing drainage and root growth problems for crops. This problem also can exist in home vegetable gardens, even when heavy equipment is not used. However, an AAES study suggests small-scale producers can combat this problem by using specialized tillage equipment.

Traffic or plow pans are a thin layer (two to four inches) of compacted soil resulting from the downward force of tillage equipment and other pressures on the soil just beneath the plowed soil. The problem is particularly serious on soils with a sandy topsoil just above a finer textured subsoil. This situation is common on the sandy soils of the Coastal Plain and Appalachian Plateau, such as soils found in the Sand Mountain area of Alabama.

These pans limit production by blocking root growth into the subsoil, where plants could reach moisture during times of limited rainfall, and also by inhibiting drainage of the soil during wet weather, which can promote disease.

Small tractors with disks and garden tillers, which are often used by home gardeners and small-scale fruit and vegetable producers, may create traffic pans that are as serious or worse than those created by field-cropping practices. In fact, estimates of soil compaction by common activities rank tillers among the most serious (see table). The faster the tines of a tiller rotate, the more energy is transferred into the soil just beneath the tines. This rapid rotation of a rear-tined tiller has the potential to create traffic pans more severe than a large tractor and disk.

Farmers use subsoilers, chisels, and plows to break these pans, but small-scale producers and gardeners rarely have access to this kind of equipment. To learn more about ways that gardeners can overcome traffic pans, an AAES study evaluated the effectiveness of common and modified mechanical garden tillage techniques on traffic pans beneath typical garden crops.

The three-year study was conducted on the campus of Auburn University on a Marvyn loamy sand, a typically sandy, Coastal Plain soil with a sandy clay loam

Charles Mitchell and Charles Elkins

A front-tined tiller with a drag bar equipped with a blade to cut a slit though the traffic pan seemed to enhance sweet corn growth during a dry year (right) compared to a front-tined tiller without the slit attachment (left).

subsoil located approximately 8–10 inches deep. Garden crops used in the study were sweet corn, okra, and southern peas. All fertilizers and lime were applied to the crop based upon annual soil tests.

Soil was prepared just prior to spring planting using one the following tillage treatments:

1) Front-tined. Soil was prepared with multiple passes of a five-horsepower front-tined garden tiller just prior to planting; tillage depth was approximately six inches.

2) Slit tillage. The same five–horsepower, front-tined, garden tiller was adapted with a modified drag bar to cut a slit 12 inches beneath the row. Soil was prepared as in Treatment 1 as the slit was being cut directly beneath the row. Slit-tillage attachments for garden tillers are not commercially available at this time. The one used in this experiment was made in a shop, but the same effect may be obtained if small-scale gardeners force a garden spade through the traffic pan underneath the row prior to planting.

3) Rear-tined. A 10-horsepower, BCS rear-tined garden tiller was used to prepare soil to a depth of six inches with multiple passes just prior to planting.

4) In-row subsoiled. Soil was subsoiled beneath the row to a depth of 14 inches using a small tractor and a conventional subsoil shank. Final seedbed preparation was made with one pass of the rear-tined tiller, as in Treatment 3, to a depth of four inches.

Soil Compaction from Various Activities

Source of compaction	Compaction pressure, lb./sq. in.
People	6
Crawler-type tractor	12
Wheel-type tractor	20
Cattle	23
Horse	40
Rototiller	107 - 750

During the three-year experiment, sweet corn (Silver Queen) was planted each year;

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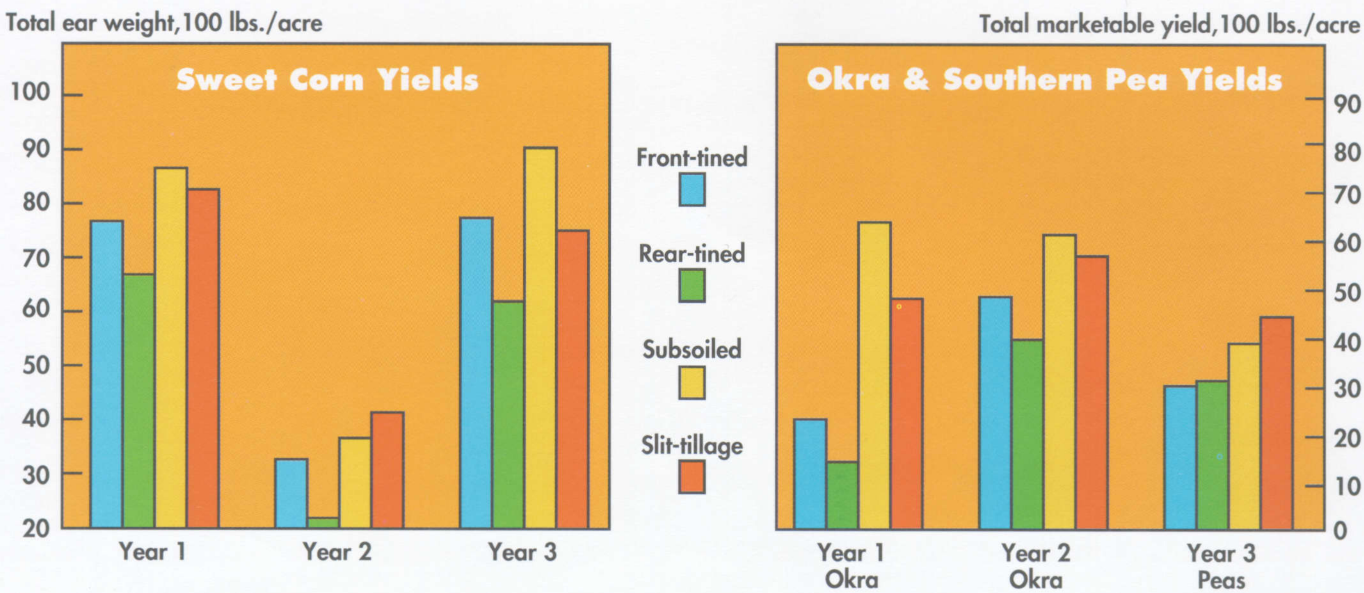

Marketable yields of sweet corn, okra, and southern peas as affected by the type of tillage system used.

Correcting Soil Compaction in the Garden, *continued from page 23*

okra (Clemson spineless) was planted the first and second years; and southern peas (Pinkeye Purplehull) were planted the third year. No irrigation was used on the crops.

Each crop was planted in a separate, randomized block experiment with four replications. Seedling disease during the third year of the study resulted in such a poor stand of okra that the plots were replanted in southern peas. All plots consisted of three, 36-inch rows 15 to 20 feet long. Marketable yield was measured by harvesting the center row in each plot. Sweet corn was picked twice. Okra was picked twice weekly for a total of 15 to 20 harvests. Southern peas were harvested twice as mature, green pods. A device known as a soil penetrometer was used to determine relative compaction of the soil. These measurements were taken after the first and third cropping years.

Crops that were suffering from moisture stress showed dramatic, visual growth responses to the four tillage practices . The degree of stress was dependent on soil moisture. Total marketable yields (see figure) reflect rainfall distribution and tillage practice.

Slit tillage increased total marketable yield of all three crops during all three years of the study. The plots prepared with the rear-tined tiller produced the lowest yields, presumably because soil compaction caused more moisture stress during short-term droughts. In general, yields were best in plots that had been subsoiled, but the slit tillage treatment provided comparable yields.

Soil compaction measurements, taken with a soil penetrometer from the rows at the end of the cropping season, showed that the rear-tined tiller and the front-tined tiller treatments created significant soil compaction problems. Subsoiling and slit tillage effectively disrupted the traffic pan at 8-12 inches.

Slit tillage disrupted traffic pans, reduced in-row soil compaction, and resulted in yields as high or higher than traditional subsoiling. As home gardeners and small farmers prepare to plant fall crops or plan for next spring, slit tillage may offer them a low-cost solution to a soil compaction problem created by conventional tillage practices.

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