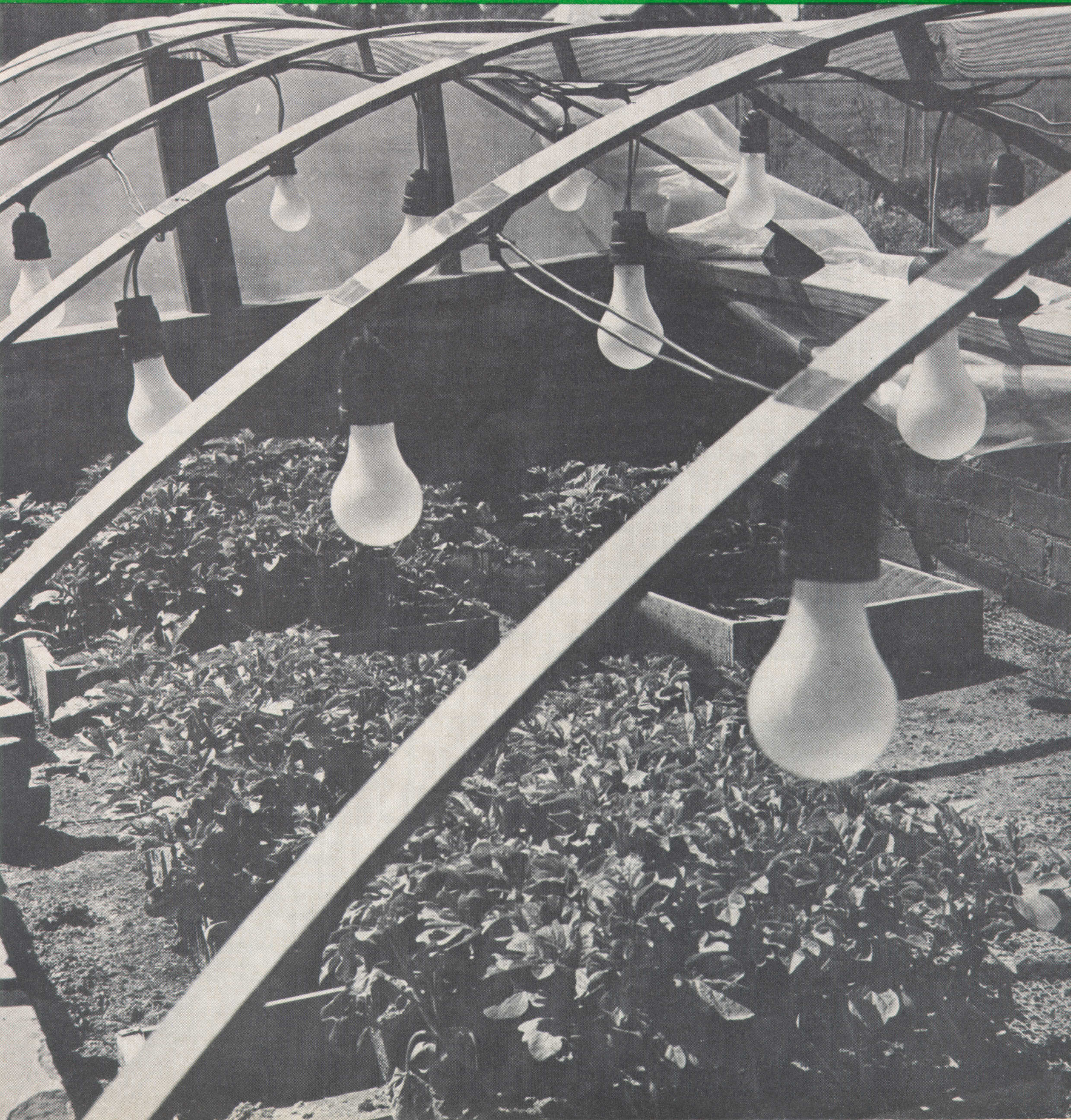
HIGHLIGHTS

of agricultural research

VOL. 16, NO. 1/SPRING 1969

Agricultural Experiment Station
AUBURN UNIVERSITY



DIRECTOR'S COMMENTS

E. V. Smith

COINCIDENT WITH THE FIRST WEEK OF SPRING, the Nation will observe National Lawn and Garden Week under the slogan "Growing with America." It is significant that a people that has become predominantly urban should observe the age-old reawakening of life in this manner much as its forebearers did centuries ago. No doubt a youngster in a city slum will be moved by the sprouting of a patch of spring grass just as was his ancestor who knew that the grass ultimately meant food and a better chance for life.

Thus, the cultivation of lawns, shrubs, flowers, and vegetable gardens in the city and suburb can satisfy one hunger of the people just as the bounteous production of crops in the country satisfies another. Interestingly, agricultural research serves the needs of the city hobbyist as well as the commercial farmer.

Nobody ever accused Dr. Sturkie, Auburn's professor emeritus of agronomy, of being an impractical dreamer nor of being insensitive to the research needs of the farmer. During the 1930's, he conducted a screening test of grasses introduced by the USDA from foreign countries, hoping to discover improved kinds for pastures. One introduction obviously had no value as a pasture grass, but Dr. Sturkie's discerning eye recognized characteristics that might make it far superior to the common bermuda then generally used for lawns. His discovery, *zoysia matrella*, was widely accepted and paved the way for other zoysias, and for the fine-leaf bermudas principally developed by USDA scientist, Dr. Glen Burton. Even if artificial turfs should ultimately replace grass for lawns, the pleasure that these grasses have afforded a generation will handsomely repay all public funds expended on turf research.

Once again the Federal Government will emphasize the importance of home gardens, especially among the poor. No doubt the value of including a few tomato plants will again be stressed. In the past, the homeowner's anticipation of garden-ripe tomatoes has often been dashed by the tomato vines wilting and dying, caused by nematodes or a wilt-inducing fungus.

Home gardeners will have a better chance in 1969, however, as the result of research by Auburn plant breeder, Dr. Walter Greenleaf. Actually, Dr. Greenleaf's objective has been to develop high-yielding, disease-resistant tomatoes for commercial production. However, one result has been the development of the variety Atkinson, highly resistant to the nematode-wilt complex and adapted to the home garden.

These are but two examples of the innumerable ways in which agricultural research serves non-farm as well as farm people.

look for these articles

may we introduce . . .

Dr. Joseph H. Yeager, author of the article on page 11, became head of the Department of Agricultural Economics and Rural Sociology in 1964, after working as a teacher and researcher in the Department since 1951.

Yeager is a native of Cullman County and received both the B.S. and M.S. degrees from Auburn University and the Ph.D. from Purdue. He has taught courses in agricultural economics, farm records, farm management, research methods, land economics, and farm appraisal. He has also served as project leader and researcher on numerous research problems concerning peanut storage, fertilizer use, housing needs and financing, farm records, land ownership, and beef cattle potential in Alabama. He is the author of numerous articles and several bulletins and circulars. He is the coauthor of two books: *Farm Business Management* and *Farm Management Concepts and Principles.*

He is a member of numerous honorary and professional organizations. He is also a member and chairman of several important campus committees.

HIGHLIGHTS of Agricultural Research

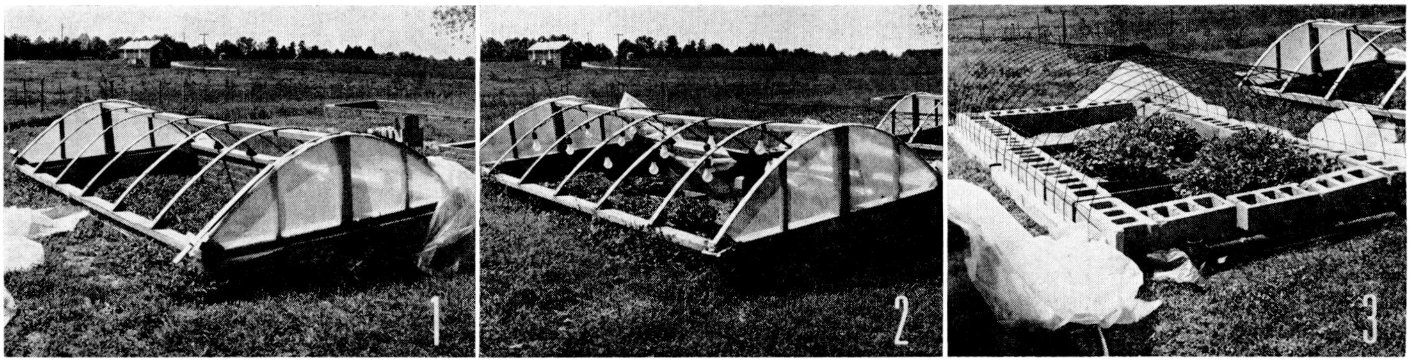
SPRING 1969 VOL. 16, NO. 1

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

E. V. SMITH .... *Director*
R. D. ROUSE .... *Associate Director*
CHAS. F. SIMMONS .... *Assistant Director*
T. E. CORLEY .... *Assistant Director*
E. L. MCGRAW .... *Editor*
R. E. STEVENSON .... *Associate Editor*
J. D. HARWOOD .... *Assistant Editor*

Editorial Advisory Committee: R. D. ROUSE; MORRIS WHITE, *Professor of Agricultural Economics;* W. T. DUMAS, *Associate Professor of Agricultural Engineering;* L. L. HYCHE, *Associate Professor of Zoology-Entomology;* AND E. L. MCGRAW.

COVER PHOTO. This bed with wooden frame for plastic cover, heated by light bulbs, is suited for early spring plant growing.



Growing Vegetables in Transplantable Pots

SAM T. JONES, *Department of Horticulture*

GROWING VEGETABLE plants in transplantable pots can be profitable, whether produced for home use or for sale.

Tomatoes, peppers, watermelons, and cantaloupes gave best results in Auburn tests when grown and transplanted in pots that do not have to be removed. Advantages were marked increases in earliness, early yield, and livability. Growing plants in transplantable pots is a precision operation, however, and careful attention to detail is necessary for success.

Available under many trade names, most transplantable pots are made from peat. Some are made from bagasse, a pulp obtained from sugar cane. Discarded containers like milk cartons and cold drink cups are suitable for use by home gardeners. Such containers must have holes punched in the bottom to provide for drainage.

Procedures for growing tomato plants in peat pots were worked out in several years of research at Auburn. A mixture of equal parts sandy loam soil and organic matter was used. A commercially available organic material called "Bet-R-Growth" was used, although peat, processed garbage, sheep or cattle manure, or other organic materials are suitable.

The soil and organic material was screened to break clods and remove stones and trash. The two components were well mixed and steam sterilized. Soil tests indicated the need for 2½ lb. each of lime and superphosphate per wheelbarrowful (4½ cu. ft.) of soil mix.

Tomatoes were seeded in flats containing the mix on February 16, 1966, using 3-4 seed per in. in rows 2 in. apart. They were transplanted to 2¼-in. peat pots on March 1 and transplanted to the field March 29 – 6 weeks after seeding.

Plants were watered at weekly intervals with a solution made by mixing 3 lb. of 20-20-20 fertilizer in 100 gal. of water. Additional watering was done as needed. Plants were sprayed every 7 days with maneb to control diseases, but no insecticide was needed.

As shown by data in the table, costs of materials other than greenhouse or hotbed averaged 1.7¢ per plant. Labor added 1.9¢, making a total of 3.6¢ per plant.

Beds can be built of concrete blocks, with plastic covers supported by concrete reinforcing wire. A 6- x 30-ft. bed that can be heated with four 60-ft. cables will hold about 5,000 of the 2¼- x 2¼-in. pots. This size bed can be built for less than $100 (4 heating cables, $54.00; thermostat, $7.85; 72 concrete blocks, $10.80; 300 sq. ft. of wire, $15.00; and 300 sq. ft. of 4-mil plastic, $3.00, for total of $90.65).

COSTS OF GROWING 6,000 TOMATO PLANTS IN POTS

Cost item	Total cost
Materials	
Sandy soil, 1 cu. yd.	$ 3.00
Organic matter, 1 cu. yd.	21.60
Superphosphate, 30 lb.	.60
Limestone, 30 lb.	.30
Peat pots (2¼ in.), 6,000	60.00
Flats (reusable 3 years), 120	12.00
Seed, 2 oz.	2.00
Fertilizer (20-20-20), 8 lb.	2.16
Maneb (80%), ½ lb.	.50
Total for materials	$102.16
Labor	
Soil mixing, 6 hours	$ 7.50
Seeding, 4 hours	5.00
Potting, 48 hours	60.00
Maintenance, 35 hours	43.75
Total for labor	$116.25
TOTAL	$218.41

Shown in the photographs are: (1) bed with wooden frame for cover support, heated with soil heating cables; (2) similar bed heated with light bulbs; and (3) temporary type coldframe that can be used for plant growth in early spring.

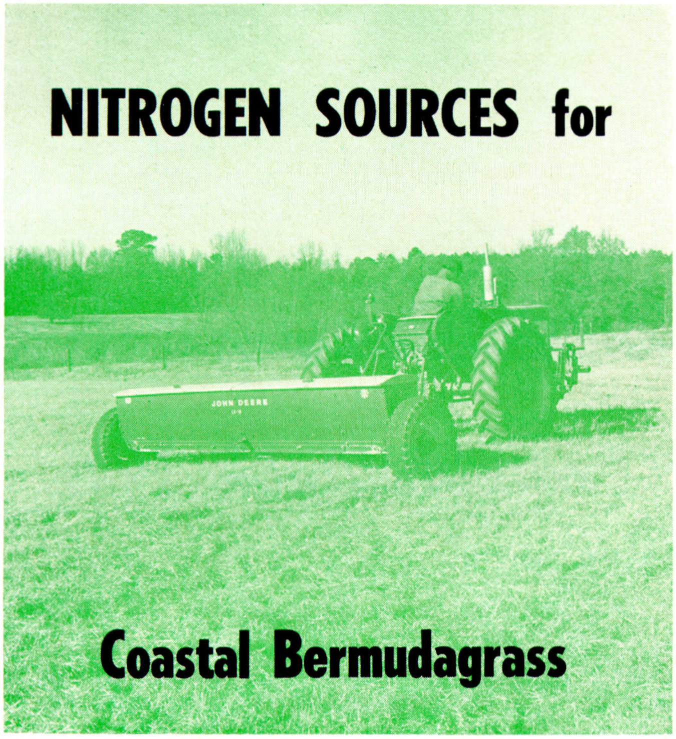
Auburn results show that other vegetable plants can be grown with only minor changes from procedures used with tomatoes. Peppers, eggplants, watermelons, cantaloupes, and cucumbers were grown with the same soil mixes, fertilizers, and procedures as for tomatoes, with slight variations.

Tomato plants can be grown in either 2¼- or 3-in. pots, but those in the smaller size must be transplanted to the field when they are not more than 4-6 in. tall. Watermelons, cantaloupes, and cucumbers require a 3-in. pot if transplanted early, or a 4-in. size if held longer. Using smaller pots results in considerable savings in initial cost and in space required, as shown below:

Size of pot, in.	*Pots per 100 sq. ft.*	*Cost per 100*
2¼ × 2¼	2,850	$ 9.50
3 × 3	1,600	17.65
4 × 4	900	32.40

With close attention given to all steps and procedures, excellent quality vegetable plants of all types can be produced in containers that make transplanting easier.

NITROGEN SOURCES for Coastal Bermudagrass



E. M. EVANS, *Dept. of Agronomy and Soils*

"A POUND OF NITROGEN is a pound of nitrogen provided factors such as soil acidity are corrected" – true or false? According to results obtained from experiments at Auburn University, it is false when topdress applications to summer grasses are concerned. These results show sources and forms differ in their effectiveness.

Loss of nitrogen into the atmosphere from sources containing urea has been reported as the use of liquid nitrogen increased. To evaluate this loss, an experiment was started in March 1963, on a well established Coastal sod on a Norfolk sandy loam soil. The soil was limed initially according to soil test and adequate mineral fertilizers were applied annually. Twenty treatments involving different sources and rates of nitrogen were applied in 4 replications to plots 5 by 20 ft. Nitrogen was applied in 3 equal applications at 6-week intervals. The first was added as growth began in the spring, and the others immediately after the first and second harvests. The pelleted solid materials were applied by hand. The liquid fertilizer was made by mixing the appropriate amount of the solid material in 1½ gal. of water and was applied to the plot with a sprinkling can. The rate was carefully regulated to assure uniform application of all materials.

Harvests were made with a sickle bar mower. The green forage was raked and weighed immediately. A sub-sample was dried in an oven at 150°F., then ground and analyzed for nitrogen.

Results were consistent from year to year so only the 3-year averages are reported in the table. Nitrate of soda and ammonium nitrate were superior to other sources and about equal to each other in yield and nitrogen recovery at the 100-lb. rate. Solid (pelleted) forms were superior to liquids at this rate. Urea was inferior in both the solid and liquid forms. "Solution 32," which is composed of equal amounts of N from ammonium nitrate and urea, was intermediate in response.

Trends in yields and uptake were the same for the 200-lb. rate as for the lower rate. Uptake efficiency was equal to or better than that at the lower rate except for solid urea. Yields increased in proportion to nitrogen recovery. Nitrogen efficiency was equally good at the 100- and 200-lb. rates, but it declined at the 400-lb. rate. Results at the 400-lb. rate again reflected a higher efficiency for the solid form of ammonium nitrate over the solution form and the relatively poorer performance of urea. In terms of relative yield increases, urea was only 75% as good as ammonium nitrate. Almost 75% of applied nitrogen from ammonium nitrate was recovered in the forage, whereas less than 50% of nitrogen applied as urea was recovered.

The nitrogen source and form applied each definitely affected its efficiency as a topdressed fertilizer. The grower should take this into account and make certain the savings in cost of material and labor offset the loss in effectiveness when he chooses the source and form of nitrogen to use on Coastal bermudagrass.

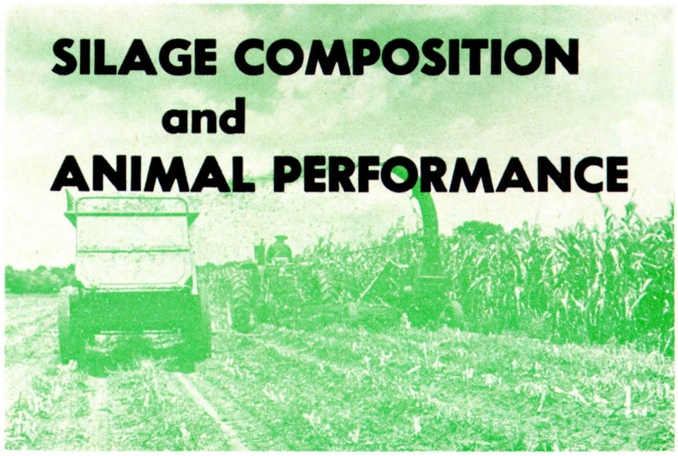
RESPONSE OF COASTAL BERMUDAGRASS TO SOURCES AND FORMS OF NITROGEN IN TERMS OF YIELD AND RECOVERY OF NITROGEN, MAIN STATION, 1963-65

Source and form of nitrogen applied	Response at 100 lb. per acre			Response at 200 lb. per acre			Response at 400 lb. per acre		
	Dry forage yield	Relative increase[1]	N recovery[2]	Dry forage yield	Relative increase	N recovery	Dry forage yield	Relative increase	N recovery
	Lb./A.	*Pct.*	*Pct.*	*Lb./A.*	*Pct.*	*Pct.*	*Lb./A.*	*Pct.*	*Pct.*
No nitrogen	3,055	------	------	---------	------	------	---------	------	------
Solid (pelleted)									
Nitrate of soda	8,339	101	76.4	12,004	101	78.4	---------	------	------
Ammonium nitrate	8,283	100	76.0	11,947	100	76.0	15,665	100	66.9
Ammonium sulfate	7,843	92	66.3	11,278	92	70.9	---------	------	------
A.N.L. (Ammonium nitrate limestone)	7,568	86	64.5	10,811	87	66.1	---------	------	------
Urea	7,100	77	57.4	9,505	73	53.9	---------	------	------
Liquids									
Ammonium nitrate	7,655	88	59.7	11,529	95	68.3	15,129	96	63.7
Solution 32	7,180	79	55.8	11,036	90	63.7	---------	------	------
Urea	6,371	63	46.8	9,371	71	50.0	12,751	77	45.4

[1] Relative yield increase was calculated by subtracting the yield of the no-nitrogen plot from that of the treated plots and dividing by the yield of the solid ammonium nitrate plot at the same rate of nitrogen.

[2] N recovery was determined by subtracting uptake on the no-nitrogen plot from that on the treated plot and dividing by the rate applied.

SILAGE COMPOSITION and ANIMAL PERFORMANCE



R. R. HARRIS and W. B. ANTHONY, *Dept. of Animal Science*
J. K. BOSECK, *Tennessee Valley Substation*

BEING ABLE TO ACCURATELY predict animal performance on a particular feedstuff – based on chemical composition data – would greatly benefit the livestock industry. This would allow livestock producers to properly balance, by supplementation, rations judged to be inadequate.

The need for correlating feedstuff data with animal performance was the basis for research begun several years ago by Auburn University Agricultural Experiment Station. Corn and sorghum silages were studied with the idea of predicting animal response from certain chemical data and physical characteristics of the silages.

Characterizing Silages

Silages were characterized by a physical "sorting" technique with 75 stalks of the crop selected at random from the field. Corn plants were separated into stalk, leaf, ear, husk, and tassel, and sorghum plants into head, stalk, and leaf. The parts were oven dried and corn was shelled. Sorghum heads were not threshed.

Dried plant parts were weighed and certain chemical analyses were made. Data obtained were used to calculate the portion of total plant chemical components in the parts.

A full-season hybrid corn variety (PAG-488) and a relatively tall sweet sorghum with a small head (Tracy) – popular as silage varieties during the 1958-60 study period – were grown at the Tennessee Valley Substation.

The two most desirable parts of the corn plant (grain and leaves) together made up about half of total weight and contributed over half of total energy. These two parts collectively contributed about 71% of total crude protein. Grain alone accounted for 88% of the starch and 62% of crude fat.

The corn stalk contained about one-fourth of total plant energy, over 31% of plant cellulose, and approximately 35% of reducing sugar in the plant. Greatest contribution of the corn husk, which was still green at harvest, was in plant sugar (38% of the total).

Nearly two-thirds of the minerals studied came from either grain or leaves. Vegetative plant parts (leaves and stalk) contributed about 78% of total calcium. Grain alone accounted for slightly less than half (47%) of total phosphorus in the corn plant. Magnesium was fairly uniform among all plant parts.

In sorghum, the stalk had 64% of the plant's dry matter and the head only 11%. The stalk also provided nearly two-thirds of total energy available, but only about one-third of the plant's crude protein. As would be expected, the stalk also contributed a large portion (57%) of total cellulose and practically all (80%) of the sugar. As is true of most plants, sorghum grain was relatively richer in phorphorus, with vegetative parts having most of the calcium and magnesium.

CHEMICAL COMPOSITION[1] OF CORN AND SORGHUM CUT FOR SILAGE, TENNESSEE VALLEY SUBSTATION, 1958-60

Nutrient measured	Content of each crop	
	Corn	Sorghum
	Pct.	*Pct.*
Dry matter at harvest	26.94	24.10
Crude protein	8.45	6.43
Crude fat	2.11	1.82
Cellulose	26.24	28.22
Sugar[2]	11.65	38.89
Starch	22.57	3.89
Ash	4.39	3.62
Calcium	.43	.64
Phosphorus	.27	.22
Magnesium	.21	.26
Energy, K calories/g.	*4.25*	*4.31*
Green wt. yield/acre, tons	*13.65*	*13.96*

[1] Components reported on dry matter basis.
[2] Total reducing sugar.

Chemical Composition

Some chemical composition data of silage plants studied are reported in the table.

Gross energy values reported are not useful for predicting animal response because they do not indicate digestible energy. Crude protein content of the corn plant is greater than that of sorghum (8.45 vs. 6.43%), and other results show that protein in corn is also more digestible (53 vs. 46%).

The corn plant contained 23% starch and a relatively small sugar content (12%). The reverse was true of Tracy sweet sorghum, which had 4% starch and 39% sugar.

Animal Performance

Weanling beef calves weighing about 400 lb. were full-fed the test corn and sorghum silages (with supplement) during each of the 3 years. The supplement was 2 lb. ground snapped corn and 1½ lb. cottonseed meal (41%) per animal daily. Grain content of the silages averaged 32.6% for corn and 11.08% for sorghum, dry matter basis, during the 3 study years.

Calves fed the corn silage gained an average of 1.49 lb. daily, as compared with 1.17 lb. for those on sorghum silage. Daily silage consumption was about 25 lb. per calf. However, the calves gained more efficiently on corn silage, requiring 16.6 lb. silage per lb. of gain. Those on sorghum silage used 22.4 lb. for each lb. gain.

Results of the Tennessee Valley research indicate that certain physical and chemical measures of silage are helpful in predicting animal response. These results point to greater animal performance when the silage fed has a high grain content. In other silage utilization studies, however, dry matter intake was as accurate as plant grain content for predicting animal performance.

Promising NEW HERBICIDES for WEED CONTROL In CORN

GALE A. BUCHANAN
Department of Agronomy and Soils

This is the difference that may be expected in a corn crop when chemical weed control measures are applied. Plot on left was not treated and plot on right was treated.

Chemical weed control in corn has not become an accepted practice in the South as in other parts of the United States.

Frequent poor performance of herbicides on southern weeds and soil conditions is one reason for the small use of herbicides for weed control in corn. Also, gross returns per acre are relatively low in corn and mechanical weed control is still effective in many cases. Recent research indicates that some new herbicides offer promise of either increasing herbicidal consistency or improving spectrum of weeds controlled.

Butylate (Sutan 6E) has been evaluated at several locations in Alabama for weed control in corn for the past 3 years. Butylate is applied preplant and incorporated with some type of incorporating device such as a disk harrow. In 1967 and 1968 at the Upper Coastal Plain Substation, butylate gave essentially complete control of annual grasses at rates of 3 lb. per acre or more. Control of broadleaf weeds (primarily prickly sida) was poor, however. The addition of 1 lb. of 2,4-D or 1-2 lb. per acre of atrazine improved broadleaf weed control. At Auburn in 1967, butylate alone or in combination with 2,4-D or atrazine gave acceptable grass control but poor broadleaf control. At the Wiregrass Substation in 1968, butylate exhibited considerable control of nutsedge, crabgrass, and goosegrass. Activity against nutsedge is a desirable feature. As observed elsewhere, grass control was complete, but broadleaf weeds such as Florida beggarweed and morningglory escaped. In experiments where yields were taken, no damaging effects have been noted at rates of butylate up to twice those required for weed control.

Another herbicide that has performed well is CP-50144 (Lasso). This herbicide has given acceptable control of annual grasses at rates as low as 1 lb. per acre, however, 2 lb. are required for season-long control. CP-50144 does not control broadleaf weeds such as morningglory, prickly sida, Florida beggarweed, and sicklepod. Yields of corn have not been reduced by applications of CP-50144 up to 3 lb. per acre.

While C-6313 (Maloran) performed poorly at both Gulf Coast Substation and at Auburn in 1967, this herbicide gave excellent control of both annual grasses and broadleaf weeds in 1968 at the Upper Coastal Plain Substation. Various soil and weather conditions, as well as prominent weed species differences, require additional evaluation of C-6313.

Although none of these herbicides is perfect, they do offer promise of being useful herbicides for the corn farmer.

Table 1. Control of Weeds in Corn with Butylate and Butylate in Combination with Atrazine or 2,4-D

Treatment		Stand count (plants per 160 feet of row)		
Herbicide	Lb./acre	Corn	Grasses	Broadleaf
		No.	*No.*	*No.*
Upper Coastal Plain—1967				
Butylate	3	186	5	1,172
Butylate + 2,4-D	3 + 1	179	0	521
Butylate + atrazine	3 + 1	180	5	729
Check	...	184	107	692
Upper Coastal Plain—1968				
Butylate	3	140	16	860
Butylate	4	138	16	1,212
Butylate	5	140	12	880
Butylate + atrazine	3 + 1	114	0	32
Butylate + atrazine	3 + 2	116	0	10
Check	...	180	104	2,580
Auburn—1967				
Butylate	3	225	34	544
Butylate	4	260	34	708
Butylate + 2,4-D	3 + 1	264	46	432
Butylate + atrazine	3 + 1	244	53	578
Check	...	250	187	705

Table 2. Control of Weeds in Corn with CP-50144 in 1967 and 1968

Treatment		Stand count (plants per 160 feet of row)		
Herbicide	Lb./acre	Corn	Grasses	Broadleaf
		No.	*No.*	*No.*
Upper Coastal Plain—1967				
CP-50144	1	188	2	71
CP-50144	2	192	0	95
Check	...	184	107	692
Auburn—1967				
CP-50144	2	275	26	303
Check	...	250	187	705
Gulf Coast—1967				
CP-50144	1	...	2,470	600
CP-50144	1.5	...	1,240	530
CP-50144	2	...	1,070	380
Check	...	...	4,470	1,010
Gulf Coast—1968				
CP-50144	1.5	170	372	668
CP-50144	2	184	272	620
CP-50144	3	172	94	764
Check	...	168	1,660	1,474

SCRUB HARDWOOD CONTROL in RUNDOWN WOODLOTS

GEORGE I. GARIN
Department of Forestry

MOST VIRGIN FORESTS on the Upper Coastal Plain of Alabama were dominated by open stands of longleaf pines. Loblolly and shortleaf pines were also present but in smaller numbers. Beneath the pines was an understory of scrub oaks.

The virgin forest stands were cut for sawlogs near the beginning of this century and much of the land was converted to agricultural uses. Areas on steeper slopes were not cultivated but became farm woodlots. Frequent cutting of what was left of the better trees contributed to the further deterioration of these woodlots, and fires also prevented natural regeneration of productive forest stands. As a result, woodlots became scrub hardwood stands having only occasional pine trees. Most of the scrub oaks suffered fire damage and consequently were infected with rotting organisms.

A woodlot area typifying these conditions was used as part of an experiment to determine how rapidly such an area can be rehabilitated into a productive forest stand. Fires were kept out of all plots and scrub hardwoods were controlled on some of the plots to reduce competition for pines that might become established. The entire area was divided into half-acre plots, and the existing forest cover was inventoried. Plots having 50% or more pines were classified as pine stands; those with pines constituting 25% to 50% of the inventory were classified as mixed stands; and those where pines constituted less than 25% of the inventory were classified as scrub hardwood stands.

In each of the three types of forest stands some plots were cleared of all hardwoods. Fifteen years later, other plots were cleared of hardwoods in the 4-in. and larger diameter class by applying silvicides in frills. In each case, though hardwoods were effectively eliminated, they sprouted immediately. This sprouting was more prolific where hardwoods were cut than where silvicides were used. The inventory shown in the second part of the table was made 25 years after the experiment was begun. On plots not subjected to hardwood control, very little change took place with respect to hardwoods. Mortality and ingrowth of hardwoods were balanced. Where hardwoods were cut they had made some comeback after 25 years, but this comeback was progressively smaller as the pine component of the original stand increased. Ten years after scrub hardwoods were killed with silvicides they had not reestablished themselves to any degree.

On plots originally classified as pine stands, pines showed a considerable increase in 25 years. This was equally true for the plots where hardwoods were not treated and the plots that were treated 15 years later. Clearing hardwoods at the beginning of the experiment resulted in the largest 25-year gain for pines.

On plots with mixed stands at the beginning of the experiment, only a moderate increase in the pine component occurred where hardwoods were not controlled. Cutting and treating hardwoods with silvicides resulted in sufficient increase in pines so that mixed stands would become pine stands. Loblolly pine made the most substantial gains in response to elimination of fires and control of hardwoods.

On scrub hardwood plots not subjected to hardwood control, pines gained ground in spite of hardwood competition. The resulting new stands would now be classified as mixed stands. This indicates there was slow progress toward the virgin stand condition. Elimination of fires, alone, was apparently a factor in changing the stand composition. On plots where hardwoods were cut, pines made sufficient gains to change former scrub hardwood stands to pine stands. However, the pine stands were very lightly stocked. Scrub hardwood on these plots showed considerable comeback. Also, on plots where hardwoods were controlled with silvicides, pines made considerable gains but hardwood made only sufficient recovery in 10 years to account for a small part of the new stand.

In summary, in a rundown woodlot dominated by scrub hardwoods on the Upper Coastal Plain of Alabama, effective control was accomplished by killing the scrub hardwoods with silvicides. Hardwoods were controlled less effectively by cutting. All attempts to control scrub hardwoods resulted in the conversion of mixed and scrub hardwood stands to either pine stands or mixed stands. Loblolly pine made the most substantial gains, although it remained second in numbers to longleaf pine. Where hardwoods were not treated they did not show a noticeable change in numbers in 25 years, but they lost substantially in their position relative to pines. This was due to the fact that pines substantially increased, indicating progress toward the virgin forest stand conditions. This progress was slow, particularly where only a scattering of pines existed in the predominantly scrub hardwood stands.

EFFECT OF HARDWOOD TREATMENTS ON STAND COMPOSITION OF A RUNDOWN WOODLOT ON THE UPPER COASTAL PLAIN OF ALABAMA

Initial stand type	Initial hardwood treatment	Hardwood treatment 15 years later	Longleaf pine		Loblolly and other pines		Scrub hardwoods	
			Trees	B.A.	Trees	B.A.	Trees	B.A.
			No.	*Sq. ft.*	*No.*	*Sq. ft.*	*No.*	*Sq. ft.*
Initial Stand Inventory								
Pine	----------	----------	19	8.4	5	2.0	48	10.6
Mixed	----------	----------	18	9.6	2	0.8	89	21.5
Scrub Hrdw.	----------	----------	5	2.4	----	0.2	110	26.6
Stand Inventory 25 years later								
Pine	None	None	45	25.5	20	6.5	42	9.7
Pine	Hrdw. cut	None	80	39.2	6	1.6	7	0.7
Pine	None	Silvicide	47	25.2	19	3.0	6	0.8
Mixed	None	None	30	15.4	9	1.4	90	16.9
Mixed	Hrdw. cut	None	48	18.8	35	12.4	27	2.8
Mixed	None	Silvicide	46	28.3	33	7.2	12	1.0
Scrub Hrdw.	None	None	17	8.2	12	2.3	130	24.0
Scrub Hrdw.	Hrdw. cut	None	19	5.1	6	1.4	52	5.8
Scrub Hrdw.	None	Silvicide	22	6.7	28	5.3	6	0.8

Soil Herbicides Affect Oxalic Acid Production in Southern Blight Fungus

R. RODRIGUEZ-KABANA and E. A. CURL
Department of Botany and Plant Pathology

ANY ORGANIC MATERIALS applied to field soil may, in some way, affect a portion of the microbial population living there.

Some organic herbicides, while effectively controlling weeds, may also cause changes in the physiological activities of individual organisms such as soil-borne root-disease fungi. These changes may be viewed as good or bad, depending on the reaction of the fungus.

Except for the investigations currently underway at Auburn University, very little work has been done on the interactions of herbicides and soil microorganisms. Generally, commercial field rates do not significantly change whole microbial populations of the soil. However, several instances have been reported in which certain herbicides increased disease severity in plants while other herbicides suppressed disease development. The reasons for such results are not yet understood.

There are several ways in which organic herbicides or other pesticides applied to soil may influence a plant-parasitic fungus. Physiological processes of the fungus may be directly inhibited or directly stimulated by the chemical. This may also lead to suppression or stimulation of reproduction (sporulation) by the fungus. A specific herbicide may also cause changes in the activity of the general microbial population, which in turn may influence behavior of the parasitic fungus.

During the past 5 years the interactions of several herbicides and plant pathogens have been studied at Auburn University. Included in this program was a study of the effects of trifluralin and atrazine on production of oxalic acid in soil by the Southern Blight fungus (*Sclerotium rolfsii*). This organism, which is primarily a destroyer of leguminous crops, depends on production of oxalic acid for host infection. The acid, along with other factors, functions to break down cell walls in advance of the attacking fungus. Thus, any interference with this process may conceivably influence disease incidence.

Experiments were conducted in flasks of sterilized soil. The fungus was established in the soil, then trifluralin was applied at concentrations of 6.25 to 100 p.p.m., or atrazine was applied at 8 to 80 p.p.m. The lowest concentrations tested are about equal to recommended field rates if we consider that most of the material is usually incorporated in the upper 3 in. of soil. Concentrations higher than field rates were purposely used to determine maximum tolerance of the fungus, to test the effect of overdose, and to simulate residual build-up that might occur in soil from year to year. Respiratory activity of the pathogenic fungus was measured during incubation periods of 19-21 days, and total acid production was determined at the end of the growth period.

Effects of the two herbicides on growth of the fungus, as indicated by respiratory activity, were somewhat similar. At the lowest concentrations used, both compounds stimulated growth of the fungus and caused an increase in nitrate-nitrogen utilization. Higher concentrations inhibited growth.

Greatest acid production by *S. rolfsii* can usually be expected to occur under conditions favoring most growth activity. This did occur in the case of trifluralin, Figure 1, at 6.25 p.p.m. as compared to no herbicide or to concentrations higher than 6.25 p.p.m. For atrazine, Figure 2, which stimulated growth of the pathogen at 8 p.p.m., there was a steady decline in acid production at all concentrations as compared to the no-herbicide check. For both herbicides, very high rates caused drastic reductions in acid production.

There is much that we do not yet know about effects of herbicides on the growth processes of parasitic fungi. While most herbicides that we have studied tend to inhibit both growth and acid production by the Southern Blight fungus, occasionally a compound such as trifluralin may increase acid production if used at rates slightly above recommended field application.

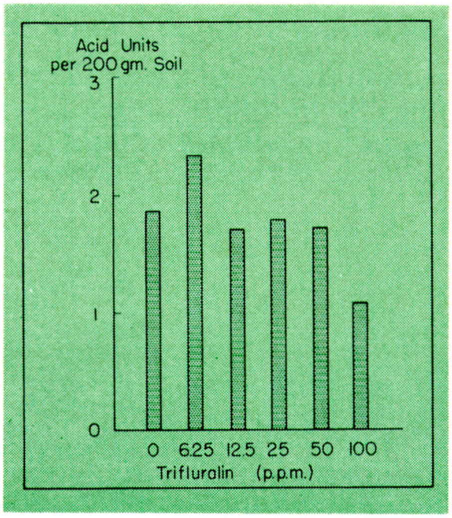


FIG. 1. Effect of different concentrations of trifluralin in soil on oxalic acid production by Southern Blight fungus.

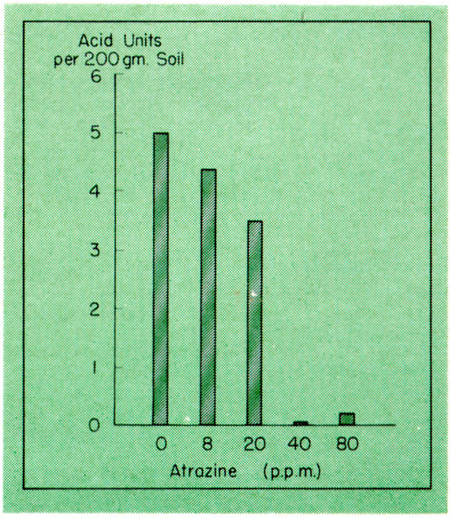


FIG. 2. Effect of different concentrations of atrazine in soil on oxalic acid production by Southern Blight fungus.

Effect of chemical pinching is illustrated here: left—extra branching of chemically pinched azalea (left) is contrasted with non-pinched branch; right — chrysanthemum sprayed with Offshoot-0 (center) is compared with hand pinched plant (left) and others sprayed with Emgard 2077.

CHEMICAL PINCHING *saves* TIME AND LABOR

KENNETH C. SANDERSON and
WILLIS C. MARTIN, JR.
Dept. of Horticulture

CHEMICAL PINCHING or pruning may make pruning shears as obsolete as high-button shoes!

Now available are chemicals that, when sprayed on a plant, selectively kill the terminal apex without damaging the axillary buds, immature side branches, foliage, or stem tissue. This results in pinching or pruning.

Pinching produces more shoots, reduces height, improves plant shape, and affects flowering. It has traditionally been done by manually or mechanically cutting out the plant top. But timely applications of chemical pinching agents may free the homeowner and commercial grower from the task of manipulating pruning shears and following other cultural practices to tailor a plant to specific needs. Effectiveness of the chemicals on certain herbaceous woody ornamentals has been proved in research by Auburn University Agricultural Experiment Station.

What Chemicals Work?

Many chemical compounds have been evaluated, but only a few materials belonging to a group called "fatty acids" proved successful. Two chemical pinching agents are available commercially, known by these trade names: Offshoot-0 (Proctor and Gamble) and Emgard 2077 (Emery Industries). Both are designed for pruning azaleas.

Offshoot-0 is primarily methyl-octonate and deconate. Emgard 2077 is essentially methyl nononoate. Both contain wetting agents and are diluted with water to produce an emulsion suitable for foliar spraying.

Marked Growth Effects

At Auburn, chemical pinching has been effective on azaleas, chrysanthemums, coleuses, Japanese hollies, petunias, and tomatoes. The terminal of these plants is killed within minutes after spraying.

Number of shoots developing after chemical pinching often exceeds that from manual pinching. Height of the plant also is reduced. Results with the chrysanthemum, Golden Yellow Princess Anne, are typical:

Type of pinch	*Shoots per plant, No.*	*Height, in.*
Tip, less than ½ in.	2.9	16.0
Soft, ½ in.	3.1	14.7
Hard, 2 in. +	2.4	13.8
Chemical, 2% mist	3.5	14.6

Shoots develop slower from a chemical pinch than a manual pinch, and this may partially account for the height reduction. Distortion of the first few leaves developing after chemical pinching has been observed in some plants.

Many Factors Affect Pinching

Many factors influence effectiveness of chemical pinching agents. Kind of plant is important. No effect other than burning of foliage was observed on some species. Varieties of a given plant species also vary in response, as shown by the following results on azaleas:

Variety	*Shoots per stem, No.*	
	Chemical pinch	*Manual pinch*
Alaska	1.8	4.2
Coral Bells	6.0	2.1
Hinodegiri	6.2	4.8
Red Wing	2.1	4.5

Type of sprayer and spray concentration is important. A high pressure, low volume mist blower that applied a 2% concentration pinched Golden Yellow Princess Anne chrysanthemums better than a low pressure, high volume sprayer (1% concentration).

Mixtures of the two commercial materials produced more shoots than one chemical alone. Spraying chrysanthemums with a mixture resulted in 3.8 shoots per plant, as compared with 3.6 for Emgard 2077 and 3.5 from Offshoot-0 spraying. All chemicals were most effective when applied to healthy, turgid plants with dry foliage.

Length of time the material is on the plant influences effectiveness on herbaceous plants. Leaving it on too long causes excessive damage, and washing off too soon makes it ineffective. Golden Yellow Princess Anne chrysanthemum yielded 2.2 and 3.2 shoots per plant for 10- and 15-minute treatments, respectively.

Humidity, temperature, plant nutrition, age, and growth stage also influence effectiveness.

There is still much to be learned about pinching agents, but they are helping to usher in the chemical age of horticulture.

Temperature, Humidity Related to Aflatoxin in Peanuts

URBAN L. DIENER and NORMAN D. DAVIS, *Department of Botany and Plant Pathology*

CONTAMINATION of food and feedstuffs by molds (fungi) causes spoilage, reduces quality and nutritive value, and lowers price. This has been a recurring problem for farmers and distributors of agricultural products throughout history.

Some fungi produce substances called mycotoxins (myco means fungus) that harm poultry and livestock. Aflatoxin produced by the fungus *Aspergillus flavus* is one such mycotoxin. It is a liver carcinogen (cancer producing agent) that is acutely toxic at high levels (1 p.p.m.) and chronically toxic at low levels (0.02-0.05 p.p.m.) to poultry and other animals.

The *A. flavus* fungus is present worldwide in both air and soil. It is found as part of the microflora on the seed or pod of most economic crops. Aflatoxin has been found in many agricultural products throughout the world whenever conditions have been favorable for mold growth. In Alabama and Georgia, aflatoxin has occurred occasionally in improperly dried and stored corn and has caused mortality in swine. Aflatoxin has also been associated with the hemorrhagic syndrome and mycotoxicoses in poultry.

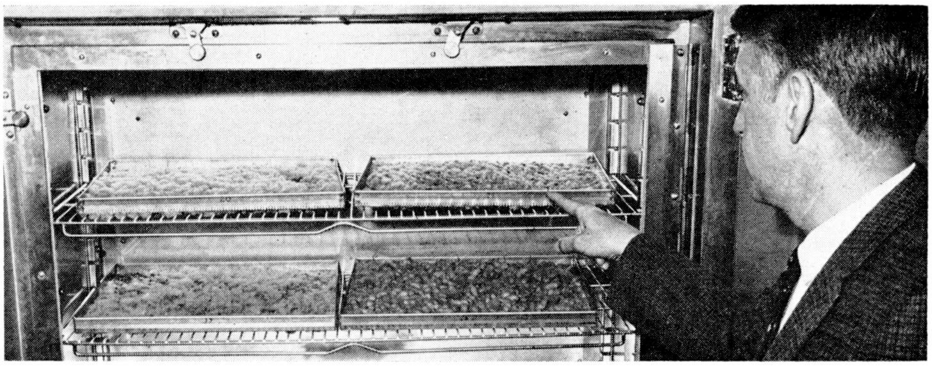
Scientists at Auburn University Agricultural Experiment Station were already investigating mold deterioration in peanuts when they became aware of the aflatoxin problem in 1962. Research on environmental conditions essential for aflatoxin formation and prevention in peanuts has been greatly expanded, supported by U.S. Public Health Service, U.S. Department of Agriculture, and the Auburn Station.

Investigations have been conducted in large environmental chambers that precisely control temperature and relative humidity. Experimental material consisted of cured peanuts (heat treated for 12-14 hours with wet heat of 185°F.), freshly dug peanuts that were surface sterilized with a 1:2 Clorox solution, and unsterile cured peanuts direct from storage. Chemical analyses for aflatoxin and free fatty acids were conducted and reported.

A summary of data from several detailed reports is presented in the table. Data are for 21-day incubation periods unless otherwise indicated. The limiting relative humidity at 86°F. was 84-85%. The lower limiting temperature at high humidity (98%) was 55°F., whereas the upper limiting temperature was 106°F.

Data has been similarly obtained on the limiting conditions for growth and aflatoxin production by *A. flavus* on shelled peanuts of three types: (1) sound mature kernels, (2) broken mature kernels simulating demaged and/or loose shelled kernels, and (3) immature kernels or pegs. The limiting relative humidity for shelled peanuts of all three types was generally lower for kernels in the shell, approximately 83% ± 1% at 86°F. for 21 or 84 days storage. The lower limiting temperature was slightly lower, especially in damaged kernels, when aflatoxin was formed at 54°F. but not at 50°. This indicated a limiting temperature of 52°F. ± 2°. The upper limiting temperature was similar to that for unshelled peanuts, 105°F. ± 1°.

The fact that peanuts stored in the shell are less likely to be invaded by *A. flavus* has been attributed to the physical and biochemical barrier of the intact shell and the testa (skin) of the living peanut kernel. Physical and biological damage to pod and testa has been correlated repeatedly with *A. flavus* invasion and aflatoxin formation in the field by researchers in the United States, Northern Nigeria, and South Africa.



Aspergillus flavus mold developed on these peanuts in 7 days in experimental chamber maintained at 86° F. and 92.5% humidity.

Control of aflatoxin is dependent on the prevention of favorable conditions for growth of the mold, *Aspergillus flavus*. Reducing humidity and seed moisture as rapidly as possible during curing, and storing only at "safe storage" moisture contents for kernels (7-8%) are essential elements of control. These procedures are doubly important when temperature control is not possible. Storage at reduced temperatures of 50-69°F. in combination with 70-75% relative humidity is recommended for shelled peanuts, especially in food processing.

Damage to shell and testa in harvesting and handling must be kept to a minimum. Improved techniques for rapid curing, harvesting, drying, and storing farmers stock peanuts should be incorporated into practice as rapidly as possible to prevent mold invasion and to maintain high quality peanuts. Current information indicates that several other animal diseases may be caused by mold products formed in agricultural commodities. Therefore, one should avoid consuming or marketing moldy seeds or food products that may go into feeds or foodstuffs.

LIMITING ENVIRONMENTS FOR AFLATOXIN PRODUCTION BY ASPERGILLUS FLAVUS IN KERNELS FROM UNSHELLED EARLY RUNNER PEANUTS

Type of peanuts	Limiting environment			
	Relative humidity		Temperature at 98% humidity	
	At 86°F.	At 68°F.	Low limit	High limit
	Pct.	*Pct.*	*Degrees F.*	*Degrees F.*
Heat-killed, cured	86.5 ± 0.5		55 ± 2	104 ± 3
Freshly dug[1]	84.0 ± 1.0		64 ± 5	100 ± 5
Unsterile, cured	85.5 ± 0.5[2]	95.0 ± 3.0[2]	63 ± 2[2]	105 ± 1

[1] Freshly dug, surface disinfested pods.
[2] Incubated 84 days.

A History of Agricultural Economics at Auburn University

J. H. YEAGER, *Department of Agricultural Economics and Rural Sociology*

THE DEPARTMENT OF AGRICULTURAL ECONOMICS, having its origin in 1928, was not among the first to be organized in the School of Agriculture and Agricultural Experiment Station.

Prior to that time farm management was taught in the Department of Agronomy and Soils for 1 year and in the Department of Rural Organization and Farm Management for 7 years. The department was organized initially with two staff members who taught three courses and conducted research. These courses were Agricultural Economics, Marketing and Rural Organization, and Farm Management.

Agricultural economics in the United States is a relatively young field of endeavor. It was not until the early 1900's that attention was paid to farm management and cost studies. In 1907 Congress made a definite appropriation for work in farm management. The bill carried the phraseology: "To investigate and encourage the adoption of appropriate methods in farm management and practice." As a result of this appropriation, the Office of Farm Management was set up in the Bureau of Plant Industry. Research in marketing had its beginning somewhat later and was given a boost by the Research and Marketing Act of 1946.

Teaching of courses in the Department of Agricultural Economics at Auburn University in early years was primarily as a service to other departments. The curriculum first administered by the department in 1931 was known as Agricultural Administration. Reason for such a curriculum in the School of Agriculture was to provide broad basic training for young men in basic agriculture, economics, and business in addition to providing essentials in the sciences and liberal and communicative arts. In 1966 the curriculum was revised and the name was changed to Agricultural Business and Economics. The growing demand for young men trained in agribusiness and economics was recognized. Approximately 80 undergraduate students are now enrolled in this curriculum.

The first Agricultural Economics Department Head in 1928 was J. D. Pope. Research work on three projects was conducted in fiscal year 1928-29. These concerned relationship of quality of cotton to prices paid farmers, economic study of poultry in Marshall County, Alabama, and an economic study of farm organization in southeast Alabama with special reference to hog production.

The cotton study pointed up wide variations in prices paid for cotton. For example, on October 6, 1926, for 25 bales of middling ⅞-in. cotton sold in six different towns in Alabama the price varied from 8.25¢ to 13¢ per lb. One conclusion from the study was that considerable opportunity existed for more exact use of government grade and staple standards in marketing cotton.

A study of farm organization on 97 Sand Mountain farms in Marshall and DeKalb counties in 1929 had one of its five practical recommendations as follows: "Men with small businesses may increase the size of their business profitably by a good sideline in poultry." Little did C. G. Garmon as principal researcher on this study know of the mammoth poultry industry that would exist in the Sand Mountain Area of Alabama in the 1960's.

Possibly one of the first agricultural economics studies conducted in Alabama that included some survey work was in 1924. This work was conducted by J. D. Pope, Specialist in Farm Management and Agricultural Economics. The study concerned egg marketing in Alabama. The fact that small egg producers received the lowest prices for their eggs, that grading of eggs was of little value without consumer education, and that producers who had established direct marketing connections were ahead of others was pointed out in the 1924 egg study.

In 1935, Professor B. F. Alvord became head of the department. From 1929 when he came to Auburn to 1935 he taught all agricultural economics courses offered. With overall emphasis on production research and teaching, growth of the department was limited. However, agriculture began to change and agribusiness began to grow. Farming changed from a way of life to a commercial business operation in which most of the inputs come from off the farm. Scientific and technological improvements were made and there was a need to determine whether these improvements were economically feasible. Consumer incomes increased and the result was increased demands for services such as processing and packaging of food and other products. So-called surpluses developed and the need for emphasis on economic studies became apparent.

In the late 1940's and early 1950's emphasis shifted from production to marketing research and considerable growth in the department occurred. In 1950 there were nine full-time staff members and a cooperative USDA employee. Reports were filed for 11 major research projects, 9 of which concerned marketing. Marketing research studies concerned cooperatives, livestock, milk, cotton, potatoes, eggs, and new sweetpotato products for food use. Staff members in the department published 11 Station bulletins, circulars, leaflets, or progress reports and contributed to the publication of two regional research reports in 1950.

In 1956, B. T. Lanham, now Vice-President for Research, became head of the department and served as head until July 1, 1964. On that date Dr. Lanham became Associate Director of the Agricultural Experiment Station and Dr. J. H. Yeager was appointed head of the department. In 1965 the name of the department was changed to Agricultural Economics and Rural Sociology. Presently there are two rural sociologists on the staff. Two research projects are classified primarily in the field of rural sociology and five courses are offered in rural sociology.

In addition to research and teaching in the area of rural sociology, there are 23 formal active research projects in production, resource, and consumer economics as well as marketing. Ten of these projects are being conducted as a part of regional research endeavors. Present professional staff of the department includes 13 persons, 8 of whom hold the Ph.D. degree.

Time of Planting Crownvetch in Alabama

D. G. STURKIE, *Dept. of Agronomy and Soils*

TRIAL PLANTINGS of crownvetch (*Coronilla varia* L.) were made in Alabama in the early 1930's. At that time this crop was considered mainly for use as an annual for soil improvement, like the use made of hairy vetch, crimson clover, or other winter annuals. These early trials showed crownvetch to be unsuited for this purpose under Alabama conditions.

After discovery that it could be used as a perennial for highway vegetation, crownvetch testing was resumed in the State in 1962. First plantings were made that year in May at Auburn and March at Horseshoe Bend National Park. Additional areas have been planted annually since that date at various locations in Alabama.

Since no information about date of planting was available, a test was begun at Auburn to study effect of planting date on crownvetch stands. The test area was a Chesterfield sandy loam that had been in cultivation for many years. Plantings were made approximately on the first day of each month for 4 years, beginning March 1, 1964, and continuing through February 1, 1968.

Inoculated seed (20 lb. per acre) were drilled in 12-in. rows and covered with a roller. Immediately after rolling, the area was mulched with a ½-in. layer of pine needles (about 2 tons per acre).

Penngift variety was planted in 1964 and 1965 and Emerald the other years. Neither weed control nor watering was done.

Each year in February, 4,000 lb. of basic slag and 200 lb. muriate of potash per acre were broadcast over the area to be planted that year. Fertilizers were disked into the soil and the area smoothed for seeding. Plots were kept fallow until planted.

Stand counts and estimates of percentage ground cover by crownvetch were made at various intervals throughout the tests.

Soil tests showed an approximate analysis of pH 6.9, P content of 125 lb., and K content of 120 lb. at beginning of each year of planting – adequate for growth of crownvetch.

Best stands resulted from August to December plantings, but there were no complete failures. Data in the table indicate that crownvetch can be planted any month of the year in Alabama with a good chance of success. In some instances the seed did not germinate for a month or longer because of unfavorable weather. But they germinated when conditions became favorable, and a stand was obtained.

There may be some disagreement as to what constitutes a stand of crownvetch. Since the plant spreads by underground rootstocks, one plant will cover several sq. ft. in a year. Perhaps one plant every 5 or 6 sq. ft. is sufficient to eventually result in a stand.

Stand counts on March 26, 1968, given in the table, show only small differences. Only a few of the plantings made in each of the 12 months during the 4 years were considered failures at the end of the tests.

EFFECT OF DATE OF PLANTING ON CROWNVETCH STAND, AUBURN

Planting date[1]	Crownvetch plants per square foot	
	1 year after planting	March 26, 1968
	Number	*Number*
January	1.4	3.4
February	1.4	4.4
March	1.0	2.2
April	1.6	3.4
May	1.2	2.9
June	.8	2.4
July	1.3	3.3
August	2.3	3.3
September	2.6	3.2
October	3.4	4.6
November	3.8	3.8
December	2.6	2.9

[1] Planted as near as possible to first day of month.

This stand of crownvetch, photographed June 11, 1966, at Adamsville, Alabama, was from a planting made April 17, 1964.

Effects of

DEEP TILLAGE

on Cotton Production

JAMES G. HENDRICK and WILLIAM T. DUMAS, JR.[1]
Department of Agricultural Engineering

THE QUESTION of whether or not deep plowing and subsoiling are desirable as compared with disk harrowing as the primary tillage treatment has been investigated from time to time with varying results. As modern machines are developed and as farming techniques improve, however, basic cultural practices need to be continually re-evaluated.

Research has shown that cotton plant roots cannot grow well through very strong soil layers such as traffic soles or hard pans. When such hard layers exist, rooting seems to be severely restricted to the soil area above those layers. If a layer can be broken up, deeper rooting should occur. This deeper rooting would mean a greater amount of soil water should be available to the plant, and the crop would be more drouth resistant. Irrigations could also be scheduled further apart.

There is another problem involved, however. Experiments have shown that cotton roots do not grow well in a subsoil, even if it is loose, in which the chemical conditions are unfavorable. So chemical problems may stop root growth much the same as high soil strength.

Three primary tillage techniques were studied in tests at Auburn University. These were disk harrowing 4-6 in. deep; chiseling directly under the row, frequently called "precision tillage"; and deep turning 12-14 in. with a moldboard plow. The tests were made in a sandy loam soil having a compacted layer at a depth of 5-6 in. and a subsoil pH of 5.0.

All traffic and harrowing were kept to a minimum on the deep-plowed plots to prevent soil recompaction. Harrowing was required in some instances to incorporate fertilizer and herbicides and for final seedbed preparation where deep plowing resulted in a cloddy surface. Also, wheel traffic was kept to the same middles wherever possible to reduce recompaction, and the rows were put in the same locations each year.

To find if deep-turning or subsoiling was necessary each year, tests were made in which deep tillage treatments were used the first year only and the plots were disk harrowed the following years. These treatments are designated as T_2R, T_3R, (where R indicates residual effects of deep tillage) etc., in the table.

EFFECT OF TILLAGE ON YIELD OF SEED COTTON ON A SANDY LOAM SOIL

Tillage treatment	Yield of seed cotton				
	1965[1]	1966	1967	1968	Av.[1]
	Lb./A.	*Lb./A.*	*Lb./A.*	*Lb./A.*	*Lb./A.*
Disk harrow only (T_1)	2,463	1,705	2,251	1,019	1,658
Deep turn 12-14 in. with moldboard plow (T_2)	2,802	1,983	2,096	1,122	1,734
Treat. T_2 in 1965, harrowed later (T_2R)	......	1,777	2,292	1,050	1,706
Chisel 10 in., rotary-till 5 in., plant in one trip (T_3)	2,515	1,846	2,191	1,204	1,747
Treat. T_3 in 1965, harrowed later (T_3R)	......	1,733	2,260	1,166	1,720
Subsoil 18-20 in., cultivate, plant in one trip (T_4)	2,322	1,858	2,417	1,160	1,812
Treat. T_4 in 1965, harrowed later (T_4R)	......	1,743	2,329	1,037	1,703
$T_2 + T_4$ (T_5)	2,787	2,138	2,241	1,180	1,853
Treat. T_5 in 1965, harrowed later (T_5R)	......	1,808	2,350	1,099	1,753
Average	2,579	1,843	2,270	1,115	1,743

[1] The tests were started in 1965, but since no residual effects could be tested that year, the 1965 data are not presented in the averages in this table.

Fertilizer rates used in these tests were based on soil test recommendations, and sufficient fertilizer was applied to prevent its being a limiting factor in normal years.

Lime application was that recommended by the soil testing laboratory. The normal soil testing laboratory recommendation is based on liming the upper 6 in. of soil, the soil depth usually thoroughly mixed by conventional tillage. Since the deep-turned tests were thoroughly mixed to 12 in. or more, sufficient lime was added to those plots to adjust the pH to that depth.

The table shows the per acre seed cotton yields for 4 years, 1965-68. All deep tillage treatments (T_2, T_3, T_4, T_5) showed increased yields as compared to shallow tillage (T_1) in 3 of 4 years. For instance, the average increase in yield in the deep-plowed plots over the harrowed plots for the 4 years was 140 lb. per year. Also, it can be seen that in 2 out of 3 years, all plots which received harrowing after having been deep tilled had reduced yields.

To gain some knowledge of the soil strength resulting from the different tillage treatments, the force needed to push a penetrometer (a pointed steel probe) into the soil was measured. This information is especially useful since previous research has indicated that cotton root penetration is severely restricted in soils having a penetrometer resistance in excess of 350-400 p.s.i. In the treatment T_1 (disk harrowed only), a penetrometer resistance of 600 p.s.i. was encountered less than 6 in. deep all over the plot. In plots that had been deep turned each year, the soil under the row was very loose, less than 200 p.s.i., to a depth of 12 in., but was quickly recompacted in the traffic furrow to a penetrometer resistance of over 600 p.s.i. at 2.4 in. deep. Where the plot was deep turned the first year and then harrowed for 3 years (treatment T_2R), the soil under the row had been recompacted to a strength of more than 400 p.s.i. at a depth of 8-10 in.

[1] The authors gratefully recognize the contributions made to this project by the staff of the Soil & Water Conservation Research Division and the National Tillage Machinery Laboratory, AERD, ARS, USDA.

Burford Chinese holly plantings near Auburn showing weed infestation (L) before treatment and weed control (R) obtained with ammonium sulfamate.

Weed Control in Highway Plantings of Woody Ornamentals

HARRISON BRYCE and HENRY P. ORR
Department of Horticulture

THOUSANDS OF TOURISTS are becoming aware of highway beautification efforts as more of the Interstate System is completed. This program of beautification began several years ago as a joint effort between the federal and state governments to make our highways safer and more pleasant avenues of travel.

Trees and shrubs have been planted, primarily at interchanges, to provide year-round beauty and serve several useful functions. Some of these functions include conserving the land, screening off unsightly areas, reducing headlight glare, and providing crash barriers.

Along with the many obvious benefits derived from these plantings there have also been some problems. In areas where large numbers of plants are concentrated, weeds and grasses have been difficult to control because power mowers cannot be used. Hand labor is costly and often not available.

In the spring of 1967, the Auburn University Agricultural Experiment Station working in conjunction with the State Highway Department tested four post-emergence herbicides as possible solutions to the problem. The herbicides tested were ammonium sulfamate, aminotriazole + simazine, dalapon, and MSMA-norea.

Three species of evergreen shrubs were selected to study any adverse effects of the herbicides. They were yaupon holly (*Ilex vomitoria*), burford Chinese holly, (*Ilex cornuta*), and wintergreen barberry (*Berberis julianae*).

A randomized block design was used with three replications of each treatment per species. Plots were sprayed May 17-19, and all treatments, with the exception of the higher rates of aminotriazole + simazine and dalapon, were repeated June 1-5. All herbicides except aminotriazole + simazine were used in combination with a wetting agent.

A weed cover rating was given each plot approximately 2 weeks after each spraying. A final evaluation was made July 14. Results are shown in the table. Application rates are given in terms of concentration per 50 gallons of water. This was used because variation and density of the weed cover in each plot made it impossible to spray each plot with a given amount of material and still cover all foliage thoroughly.

Ammonium sulfamate, at 50 lb./50 gal. water, gave the best overall weed control following the initial spraying. Most broadleaf weeds, such as ragweed, goldenrod, and horsenettle, were eliminated. Perennial grasses were burned back after each spraying, but new growth soon occurred. Occasional burning of the leaves was noted where the ornamental was contacted by the spray. The lower rate of ammonium sulfamate was less effective but generally controlled most broadleaf weeds after a second spraying.

Dalapon gave no control on broadleaf weeds at either rate tested. However, two applications at the lower rate gave good control of perennial grasses.

Aminotriazole + simazine gave similar results with both rates after the initial spraying. Weeds and grasses appeared chlorotic with some weeds turning a variety of colors. A second application at the lower rate killed most perennial grasses and some of the smaller broadleaf weeds. Slight plant phytotoxicity in the form of chlorotic-appearing leaves was evident in wintergreen barberry at the last evaluation.

MSMA-norea killed most broadleaf weeds after one spraying. Perennial grasses were burned down but grew back even after a second spraying. Occasional burning of the lower leaves occurred when contacted by the spray. MSMA-norea at the lower rate gave only partial control over broadleaf weeds and grasses for a relatively short time.

The weed cover in the check plots increased an average of 38% during the experiment.

Many problems are encountered in the use of spray-type herbicides on the roadsides. Water, other materials, and sprayers must be moved into relatively inaccessible places. Sprays must be directed to the soil areas around the plants. Winds on the roadsides seem to be constant and often strong, so it is difficult to prevent drifting of the spray. Many of the herbicides do not move effectively through the mulches. Suitable granular materials that could be placed under the mulch material would be easier to apply. The mulches are often spread around the ornamentals at planting, however, and herbicides might be damaging to initial root growth of unestablished plants. The use of many plant species further complicates the herbicidal picture. Continued research is needed to test various chemicals for phytotoxicity and weed control.

WEED CONTROL TREATMENTS AND RATING

Herbicide	Units per 50 gal. of water	First rating[1]	Second rating[1]	Final rating[1]
Ammon. sulfa.	25 lb.	1.8	2.6	1.2
Ammon. sulfa.	50 lb.	4.5	5.7	3.9
Dalapon	3 lb.	.6	2.7	3.7
Dalapon[2]	6 lb.	.8	2.3	.1
Aminotri. + simaz.	5 gal.	2.1	5.5	6.9
Aminotri. + simaz.[2]	10 gal.	1.9	4.2	3.6
MSMA-norea	.625 gal.	1.6	2.7	.7
MSMA-norea	1.25 gal.	2.7	6.9	3.5

[1] 10.0 = complete control of existing weeds and grasses; 0 = no control.
[2] Sprayed only once.

Index to Articles Published in

HIGHLIGHTS of Agricultural Research

1968

HIGHLIGHTS with this issue enters its 16th year of publication. It was established in 1954 for the purpose of reporting results of research by the Agricultural Experiment Station to Alabama farm families, agriculturally based business, and industry.

If you keep a file of Highlights, you may obtain limited issues for the past four or five years by writing the Station. Listed below are the articles published in last year's four issues.

EDUCATIONAL PLANS of FARM YOUTH

J. E. DUNKELBERGER, L. S. DRISCOLL, and S. S. THAXTON
Department of Agricultural Economics and Rural Sociology

GREAT VALUE is placed on education in the United States.

Many Americans believe social and economic success is possible to everyone with ability and motivation to scale the "educational ladder" extending from kindergarten through trade school or college. Regardless of training, the goals are the acquisition of the knowledge and skills needed by society, and the achievement of the money, prestige, and satisfaction awarded persons with varying amounts and types of education.

A Study in Northeast Alabama

Boys and girls attending the 10th and 12th grades in 19 randomly selected high schools in Cherokee, DeKalb, Jackson, and Marshall counties completed special questionnaires during the spring of 1966. Of the almost 2,100 students participating, approximately 600 reported living on farms. A total of 185 youth of those questioned indicated the primary occupation of the major breadwinner in the family was that of farm operator. A large proportion of the breadwinners were part-time farmers.

Desired Educational Goals

The farm youth participating in this study were highly oriented toward the goal of a college education, see table. Practically none desired or expected to quit high school. The fact that no 12th graders anticipated quitting during the spring of their senior year was not surprising, but it was surprising that no 10th graders desired or expected to quit school prior to high school graduation. This finding suggests that unanticipated factors other than personal desire play an important part in dropping out of school.

Almost half of these farm youth desired to continue their schooling in either a junior or senior college. Fifty-six per cent of boys and about 40% of girls aspired to attend college. At every educational level from junior college to specialized graduate training beyond college the proportion of boys was greater than for girls. Apparently, farm boys are more likely to desire a college education than farm girls, while the girls have a greater desire than boys for specialized vocational training in preparation for specific occupations. This probably results from too much emphasis on college training for boys with a corresponding devaluation of vocational training, whereas, vocational training for girls is considered a more acceptable pursuit.

EDUCATIONAL PLANS OF FARM YOUTH

Amount of schooling	Boys		Girls	
	Desire	Expect	Desire	Expect
	Pct.	*Pct.*	*Pct.*	*Pct.*
Quit high school	1.9	1.2	3.7	3.3
High school graduate	12.4	20.6	12.8	21.9
Vocational training	30.1	32.0	43.4	42.3
Junior college	11.8	14.2	6.9	4.8
Senior college	28.6	25.2	20.4	21.5
Graduate school	15.2	6.8	12.8	6.2
Number of respondents	322	325	274	274

Expected Educational Goals

A number of these teenagers indicated the belief that their desired educational goals were higher than their ability or opportunity to achieve. Only about half of those aspiring to professional graduate training actually expected to obtain this goal. For many farm youth there was a clear distinction made between their desired and expected educational goals. This downward adjustment was reflected primarily at the high school level, where nearly twice as many youth expected to terminate their education as desired to do so.

A considerable portion of these farm youth, 32%, were uncertain about their ability to achieve even their expected educational goals. Uncertainty prevailed among youth at all educational goal levels – even among those merely expecting to complete high school. However, the proportion of young people indicating uncertainty in obtaining their goals was most pronounced among those expecting to continue their education at a trade school or college. Moreover, when youth expecting to attend college were asked to respond to the statement "Nothing will prevent me from getting a college education," only 37% of the boys and 45% of the girls responded with positive answers.

AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY
AUBURN, ALABAMA 36830
E. V. Smith, Director
PUBLICATION—Highlights of Agricultural Research 2/69 10M

POSTAGE PAID
U.S. DEPARTMENT OF AGRICULTURE