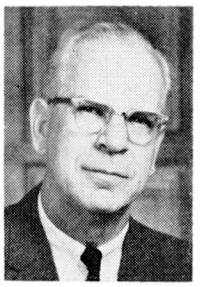
HIGHLIGHTS

of agricultural research

VOL. 15, NO. 4/WINTER 1968

Agricultural Experiment Station
AUBURN UNIVERSITY

DIRECTOR'S COMMENTS



E. V. Smith

AGRICULTURAL research benefits all people, urban as well as rural. This is a strong statement, but it is easily documented. It is true that Federal legislation that established the USDA a century ago and the agricultural experiment stations 80 years ago was concerned principally with the improvement of farming.

It is true that the producer is generally the first beneficiary of discoveries resulting from agricultural research. The benefits soon flow to the consumer, however, in terms of improved quality, lower cost, or other values. A good example is the post-war evolution of the broiler industry. Research on nutrition, breeding, diseases, and management created a dynamic new farm enterprise which proved a boon to thousands of small Alabama farmers. Feed mills, hatcheries, and poultry dressing plants provided economic stimulation for industry-hungry communities. The consumer has been the greatest beneficiary of the research-based broiler revolution, however. The industry has used research results effectively and has become so efficient that broiler meat is an economical source of nutritious, high quality animal protein.

Vision was required for Professor L. M. Ware to establish the Auburn forestry plots and expand forestry research at the Experiment Station in 1927. The Southern timber industry was still in "the cut out and move on" stage. Dr. Herty was still experimenting with methods of making paper from Southern pine. Today, approximately 2 out of 3 acres of land in Alabama are producing a crop of trees. The pulp and paper and pine plywood industries account for a large percentage of the State's industrial expansion during the last decade. Establishment of these land-based industries has revolutionized the economies of more than one Alabama community.

The Agricultural Experiment Station has long held to a broad definition for "agriculture" and has done research on problems of natural resource development as well as on those strictly farm oriented. Viewed with some public skepticism when initiated, results of research on fish pond and wildlife management are contributing immensely to the average Alabamian's enjoyment of the out-of-doors. Fisheries research, furthermore, has formed the basis for a new and growing agri-industry, catfish farming.

The broadened concept of agriculture involves many facets of outdoor recreation, turf management, and ornamental horticulture. Coincidentally, agricultural research designed to solve technical problems of these industries ultimately benefits the golfer, the outdoorsman, and the flower hobbyist.

look for these articles

may we introduce . . .

Dr. James A. Lyle, author of the article on page 11, has been Head of the Department of Botany and Plant Pathology since July 1, 1954. During this time he has picked up quite a bit of departmental history, much of which he relates in the article.

Lyle is a native of Lexington, Kentucky, graduated *cum laude* from University of Kentucky, and was elected to Phi Beta Kappa. He received the M.S. degree from North Carolina State, and the Ph.D. from University of Minnesota. He joined the AU faculty in 1947.

The department has undergone its greatest expansion during Lyle's tenure. In addition to the 21 senior faculty members mentioned in his article, there are now 3 instructors, 36 graduate students, 10 lab technicians, 16 undergraduate assistants, and a USDA scientist. The number of research projects has also expanded greatly.

Lyle not only has administrative responsibility for the department, he also conducts research on the causes and control of peanut leafspot diseases.

HIGHLIGHTS of Agricultural Research

WINTER 1968 VOL. 15, NO. 4

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COVER PHOTO. Sicklepod is a strong competitor with crops as this photo of a cotton-weed research field at Auburn shows.

SICKLEPOD—

Success Story of a Weed

J. M. CREEL, C. S. HOVELAND,
and G. A. BUCHANAN
Department of Agronomy and Soils

Sicklepod is also called coffeeweed and indigo in some areas.

SUCCESS STORIES are usually received with applause, but that of sicklepod has meant nothing but trouble for Alabama farmers.

Sicklepod *(Cassia obtusifolia)*, also known as coffeeweed or indigo, is an annual, warm-season, non-nodulating legume that often infests cotton, corn, peanuts, and soybeans throughout the Southeast. Because it is a serious weed pest in many crops, research was initiated at Auburn to help discover why this weed is so persistent and competitive with crop plants.

Germination

Seed of sicklepod germinate at temperatures between 64 and 97°F, but seedling growth is very slow below 75°F. Germination of mature seed is usually low because sicklepod has a hard, wax-like seed coat or covering that prevents water from entering. If the seed coat is scarified or punctured in some fashion, such as by pricking with a needle or by abrasion, germination is usually above 90%. Scarification can also result from plowing or heavy rainfall. When mature sicklepod seed were planted in soil and maintained moist, about 10% of the seed germinated after 30 days. However, only 15% had germinated after 12 months. This indicates that once a supply of sicklepod seed has built up in the soil, a potential weed problem exists for a number of years. Sicklepod seed yields of over 900 lb. per acre have been harvested from heavily infested cotton fields.

Extracts of fresh sicklepod leaves and stems reduced germination of cotton to only 2% and oats to 61% when compared to germination in pure water. Germination of corn and ball clover seed was delayed, but sicklepod, wheat, and sericea seed were not affected by the sicklepod extract. When sicklepod leaves and stems were mixed in soil, cotton seed germination was reduced. The toxic effect did not persist in moist soil beyond 3 weeks, however.

Water extracts of sicklepod leaves and stems exhibited fungicidal properties. When mixed in agar, the extracts reduced growth of *Rhizoctonia*, a serious seedling disease organism. Survival of sericea lespedeza seedlings was increased from 57% with no residue in the soil to 100% with 1% sicklepod leaves and stems mixed in the soil. Survival of crimson clover was increased by 50% with 1% sicklepod residue and by 100% with 2% residue in the soil.

Sicklepod may release a compound which is toxic to crop plants. When cotton and sicklepod plants were grown together in the same container of nutrient solution, the seedling growth of cotton was 34% below that of cotton grown alone. Soybeans, grown similarly with sicklepod, were not affected.

Competition for nutrients by the sicklepod could account for the reduced growth of the cotton plants. To answer this, six crocks containing cotton plants were connected by rubber tubing in series so that a nutrient solution added daily to the first crock would flow through the system and the excess drain from the sixth crock. In a similar system, sicklepod plants were used in the first crock of the series. Results of this experiment showed a 26% reduction in growth of cotton plants in the crock nearest the sicklepod. Any competition for nutrients sufficient to cause a reduction in growth rate should reduce growth of the cotton at the end of the series the most. In this case, it appears a toxic substance causing a reduction in growth of cotton is exuded from sicklepod roots.

Sicklepod grew well over a soil pH range of from 4 to 7. The capacity to make satisfactory growth on acid soil may give sicklepod a competitive advantage over many crop species. The growth response of sicklepod to phosphorus and potassium was similar to that for cotton. Therefore, changing the level of fertility at which the seedlings are grown is not likely to change the relative competitiveness of these two species. Soybean seedlings were less responsive to fertility than sicklepod.

Summary

Several factors make sicklepod a successful weed. High seed yields and a high percentage of hard seed that can lie dormant in the soil until conditions are favorable give the plant great reproduction potential. Toxic substances in leaves and stems may reduce germination and seedling growth of competing crop species. The toxic effects of residues on certain soil-borne organisms help protect the plant. Exudates from sicklepod roots which may be toxic to crop plants lessen competition. The ability to grow over a wide range of soil pH also gives the plant a competitive advantage.

BROADCAST . . . DRILL . . . SIDEDRESS
which is best for fertilizing cotton?

C. E. SCARSBROOK and C. E. EVANS, *Department of Agronomy and Soils*

More and more plant nutrients are being applied ahead of planting as Alabama farmers attempt to overcome the labor shortage and cash in on the low cost of broadcasting fertilizers.

New types of fertilizers now available are well adapted for pre-plant application. Among the new formulations are fluid types, which are either clear liquid mixtures or suspensions. Bulk blends of solid fertilizers are also increasing in use, as is direct application of nitrogen solutions and anhydrous ammonia.

Most of the newer fertilizers require special equipment for application of some N and all P and K at planting with the remainder of the N sidedressed. But all fertilizers are suitable for broadcasting, although some require incorporation into the soil when applied.

Adaptibility of broadcasting fertilizer was pointed up in a series of experiments by Auburn University Agricultural Experiment Station. One series compared cotton yields from N rates of 0, 30, 60, and 90 lb. per acre from ammonium nitrate, with (1) all N broadcast; (2) part of N broadcast, remainder put in row at planting; and (3) part of N put in row at planting and the remainder sidedressed. Adequate amounts of P and K were applied at all locations.

These test fields had been well fertilized for row crops for many years and fertility level on all was relatively high. This is evidenced by cotton yields of 1 to 1½ bales without N addition, as reported in the table. If method of application had caused differences, the effect should have been most pronounced at the 30-lb. rate of N, lowest in the tests. However, the results show little or no effect of method of application, regardless of N rate.

Other rates of N were tried with the same application methods in an experiment at the Sand Mountain Substation. Again, method of applying N had no effect on yield.

As shown by the graph, there was a yield response to 90 lb. of N at Prattville, 60 lb. at Brewton, but to only 30 lb. at Monroeville. These results indicate that N can be effectively used by cotton whether all is broadcast, part is placed in the row and part broadcast, or part is placed in the row and remainder sidedressed. On extremely sandy soils, however, broadcasting all N prior to planting may be risky because of the chance that heavy rainfall may occur and cause large leaching losses.

Two-year results of experiments comparing broadcasting and side placing of P and K, reported in Agricultural Experiment Station Bulletin 375, show no differences between methods of application. There was no advantage to using a starter fertilizer in the drill on these soils testing medium or high for P and K. Additional data have been accumulated on these experiments, but the conclusions have not changed.

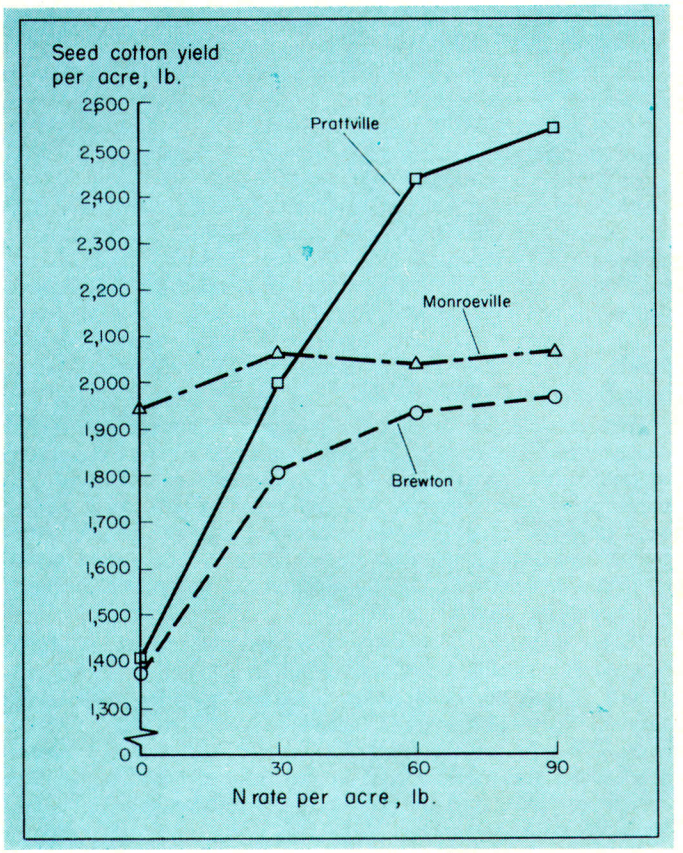
Soils tested either medium or high at all locations of the P and K test. Recommended rates of P and K were used, based on soil test values. N was used at recommended rates for all treatments.

Yields were 1½ to 2 bales per acre at all locations, with little or no response to P and K showing on these fertile soils.

Based on the Auburn Station findings, it is concluded that method of applying N, P, and K to soils of medium to high fertility has no measurable effect on yield of cotton. It is emphasized that these results may not apply to soils of low fertility.

Yields of Cotton from Different Nitrogen Rates and Methods of Application, 1964-67

Nitrogen added, lb./acre			Per acre yield of seed cotton			
In drill	Broadcast	Sidedressed	Brewton Field	Monroeville Field	Prattville Field	Average
			Lb.	*Lb.*	*Lb.*	*Lb.*
30 lb. total						
0	30	0	1,909	2,088	1,939	1,979
15	15	0	1,809	2,045	1,957	1,937
15	0	15	1,701	2,056	2,102	1,953
60 lb. total						
0	60	0	1,829	2,111	2,458	2,133
15	45	0	2,020	1,942	2,358	2,107
15	0	45	1,956	2,055	2,498	2,170
90 lb. total						
0	90	0	1,952	2,112	2,639	2,234
15	75	0	1,924	2,066	2,473	2,154
15	0	75	2,060	2,045	2,636	2,247



Effect of rate of N on yield of seed cotton is shown by these results, which are averages of all application methods tried.

Soil Fertility and

Cottontail Rabbit Litter Size

EDWARD P. HILL III, *Alabama*
Cooperative Wildlife Research Unit

THE COTTONTAIL RABBIT *(Sylvilagus floridanus)* has been the subject of a life history study in Alabama since 1960.

One of the objectives of this study was to determine cottontail litter size trends that may occur on varied soil types, at different latitudes, and as the reproductive season progresses. This involved the comparison of cottontail litter size means from several regions of Alabama and a penned experiment in which comparisons were made of litter size means on plots receiving three levels of fertilizer.

Research Procedures

Cottontail rabbits were collected from the following five major soil regions: Limestone (Tennessee) Valleys, Upper Coastal Plains, Piedmont Plateau, Black Belt, and Lower Coastal Plains. The female reproductive tracts in these samples were examined to determine the ovulation rates or litter size or both in first, second, and third litters of the year from each soil region. In addition, data from 3,533 soil samples were compared with the litter size trends occuring among the soil regions.

After a preliminary analysis of these data showed different litter size means occurred on the different soil regions, a penned experiment was conducted to explore the possibilities that a significant effect on the reproductive physiology occurred as a result of varied soil fertilities. Six 200′ × 200′ rabbit-proof pens were constructed and the soil inside treated with three levels of lime and fertilizer. Each pen was stocked with ten female and five male cottontail rabbits. After the start of the breeding season, weekly searches for nests were made in each pen to determine the mean litter size for each fertilizer level.

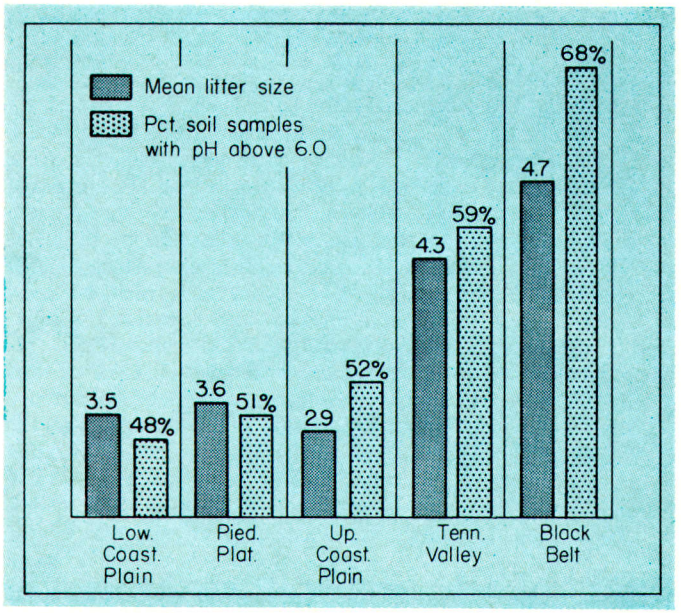


FIG. 1. Mean size of second cottontail rabbit litters with per cent of soil samples having pH above 6.0 for 5 major Alabama soil regions. Litter sizes are based on ovulation rates, fetus counts, and uterine scars. Number of soil sample from each soil area (l to r) was 680, 616, 433, 432, and 1,372, respectively.

Results

Mean litter sizes were calculated for first, second, and third litters for each of the five soil regions. Within each soil region the means of second litters were, without exception, larger than the means of first litters. Means for third litters were intermediate in size between the means of first and second litters. There was also a pattern of litter size differences as the soil regions were considered. The largest litters occurred on the Black Belt soils. The second-largest litters occurred on the Tennessee Valley soils, while the Piedmont, Upper Coastal Plains, and Lower Coastal Plains produced the smallest litters, none of which was significantly different from the other two. The Black Belt is bordered on both the north and south by soils associated with medium size litters. This relationship tends to eliminate latitude as a factor affecting litter size.

Soil analyses data from the various soil regions revealed a close correlation between litter size and the percentage of soil samples with pH above 6.0, Figure 1.

Weekly searches for rabbit nests in the 6 pens from February through mid-August yielded 169 nests, 81 of which contained litters during some period that they were observed. In addition, data were obtained on 13 unborn litters when the rabbits were sacrificed in mid-August. The mean size of litters from the penned experiment showed a definite trend toward larger litters from the more heavily fertilized pens. The difference between litter sizes from the heaviest and non-fertilized pens was significant at the 0.85 level.

The results of these studies indicate that litter size in cottontail rabbits is correlated with soil fertility, and suggest that calcium or other elements influencing pH may limit litter size.

AUBURN'S SWINE EVALUATION PROGRAM

JAMES C. COLLINS, *Department of Animal Science*

SWINE EVALUATION is now possible through a program inaugurated in 1965 on the campus of Auburn University.

Facilities were made possible by the coordinated efforts of the Agricultural Experiment Station and Cooperative Extension Service along with various State farm organizations, and progressive swine producers throughout the State.

The need and demand for such a facility was brought about by a decline in consumer acceptance of fat pork and an increase in demand for muscular, meat-type hogs. It is economically important that the Alabama swine industry breed swine that will produce large litters, grow rapidly and efficiently, and produce high-quality, meaty carcasses.

The identification and selection of breeding stock that will meet these requirements is a basic problem for the commercial and purebred producer. The Auburn Swine Evaluation Station is operated for the purpose of achieving these goals.

Through a uniform testing program it is possible to:

1. Identify individuals that have the genetic ability to meet the needs of both producer and consumer.

2. Provide a known source of these individuals as breeding stock for both the commercial and purebred producer.

The following are minimum requirements for entry and qualification through the Evaluation Station:

At least 8 live pigs per litter at weaning; boars must weigh at least 112 lb. at 112 days; boars must weigh at least 200 lb. at 154 days of age; feed efficiency of 3.5 or less; ham and loin per cent of 35% or more; and boars must probe less than 1.4 in. of backfat. Any boar that does not meet the minimum standards is castrated and sold on the market.

Table 1 gives a summary of all litters tested during the period 1965-1968 and the reasons for failure to meet qualification standards. Poor growth rate that results in light weights at 112 and 154 days of age has been the greatest reason for failure to meet qualification standards. Only a small percentage of litters failed to meet the feed efficiency and per cent ham and loin requirements. This would suggest that these requirements are low and a stronger selection pressure is needed in order to make more rapid improvement in this area.

Table 2 shows the average and the high and low results obtained during the period reported. The average results are within an acceptable range; however, the poorest results for each requirement show that some breeders are producing swine which do not meet standards for economical production.

Beginning with the fall test of 1965, a sale has been held at the end of each test period with the exception of the spring test of 1968.

Season	*Number boars sold*	*Average price*
Spring 1965	22	no sale
Fall 1965	29	$211.55
Spring 1966	31	226.13
Fall 1966	22	212.27
Spring 1967	28	251.61
Fall 1967	38	242.28
Spring 1968	38	no sale

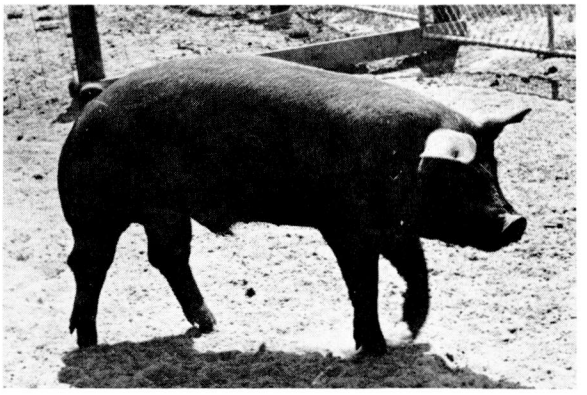
The informal table shows the average sale price and number of boars sold at the end of each test period. The average sale price indicates an excellent acceptance of the testing program by the commercial producer. It is interesting to note that all boars have been purchased by Alabama breeders and also that the highest price paid for a boar was $605.

Seven groups of pigs, a total of 199 litters, have been tested in the Auburn Swine Evaluation Station starting in the spring of 1965. The program has been supported well by purebred producers in submitting litters for testing, and by the commercial producer as evidence by the average price of boars sold.

Results during this period indicate the following trends: improvement in feed efficiency; improvement in carcass characteristics; very little change in growth rate; and increase in the index of boars tested.

TABLE 2. AVERAGE RESULTS OF ALL LITTERS TESTED, 1965-1968

Standard	Best	Poorest	Average
Feed efficiency, lb.	2.79	3.97	3.21
112-day wt., lb.	173	90	130.00
Age at 200 lb., days	125	179	145.00
Daily gain, lb.	2.39	1.56	1.85
Backfat probe, in.	.70	1.37	1.00
Per cent ham and loin	42.40	29.30	37.40



The average sale price of animals on sale indicates an excellent acceptance of the testing program by the commercial producer. All boars have been purchased by Alabama breeders.

TABLE 1. SUMMARY OF LITTERS TESTED AND REASON FOR NON-QUALIFICATION, 1965-1968

Breed	Tested	Qualified	Not qualifying, for stated reason			
			Feed eff.[1]	Ham loin[1]	112-day wt.[2]	154-day wt.[2]
			No.	*No.*	*No.*	*No.*
Duroc	53	45	1	8	9	11
Hampshire	60	53	7	0	16	21
Landrace	24	23	0	1	1	5
Poland	7	6	1	1	1	1
Spotted	15	12	3	3	1	2
Yorkshire	40	38	0	2	8	9
TOTAL	199	177	12	15	36	49

[1] Some litters failed to meet qualification standards for both feed efficiency and per cent ham and loin.

[2] Refers to individual boars only.

PREDICTING MACHINE CAPACITY

E. S. RENOLL, *Department of Agricultural Engineering*

PREDICTING MACHINE CAPACITY has always been a goal of machine operators and users.

This is difficult because of many conditions that influence row-crop machine capacity. Some field conditions that influence machine capacity include physical field size, field shape, and row length. Agricultural engineers at Auburn University Agricultural Experiment Station are currently working on a system that is hoped to be useful in predicting machine capacity.

Field Machine Efficiency

One method of measuring the influence of row length and field shape on effectiveness of the machine during field operation is to determine "field machine efficiency." Field machine efficiency is an indication of how well suited a specific field is for machinery use. Field machine efficiency involves machine time spent turning at row ends and time spent doing actual field work. It is expressed as a per cent. Time used for such activities as adding seed and fertilizer, chemicals, and for making adjustments is not included since these items are related to the machine operation being done on the field and not to the field itself. A field machine efficiency value of 90% means that the machine was doing productive work in the field 90% of the time and spent 10% of the time turning at row ends.

Efficiency Values

The field machine efficiency values in Table 1 were obtained from field studies at Auburn. These data show that field machine efficiency values vary from field to field.

The three machines used in Field 1 were the sidedresser, flame cultivator, and sweep cultivator. Field machine efficiency values ranged from 79% to 84% for this field. These same machines were used on Field 2 with field machine efficiency values ranging from 91% to 93%.

Results indicate that Field 2 had higher field machine efficiency values than Field 1. Results also suggest that field machine efficiency is not related to the machine operation on the field since the sidedressing operation had a field machine efficiency of 82% on Field 1 and 93% on Field 2.

TABLE 1. FIELD OPERATION AND FIELD MACHINE EFFICIENCY

Field No.	Field operation	Field machine efficiency
		Pct.
1	Flame cultivate	79
	Sidedress	82
	Sweep cultivate	84
2	Flame cultivate	91
	Sidedress	93
	Sweep cultivate	90

TABLE 2. FIELD ROW LENGTH AND FIELD MACHINE EFFICIENCY

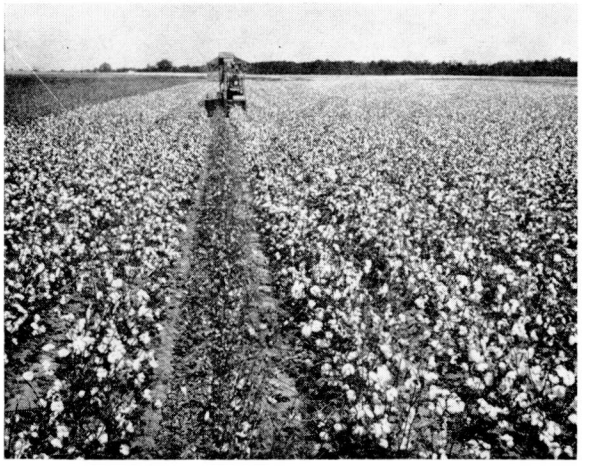
Field No.	Average row length	Per cent of total rows in field	Field machine efficiency (av. all machines)
	Ft.		*Pct.*
1	385	25	
	370	25	
	325	25	
	265	25	82
2	1,000	70	
	910	15	
	780	15	92

At this point one may question why the efficiency values for Field 2 are higher than for Field 1. Data in Table 2 help answer this question. Field descriptions in the table include not only the average row length but also the per cent of total rows in the field in each respective row length.

From Table 2 it appears that field machine efficiency and average row length are interrelated. Field 1 has an average efficiency for all machines used on it of 82% and has rows that are rather short. Field 2 has an average field machine efficiency for all machines used on it of 93%. Seventy per cent of its rows are 1,000 ft. or longer.

The field machine efficiency value for a specific machine operation on a particular field is correlated with efficiencies of other machine operations on the same field. If field machine efficiency is relatively low for one machine operation on a specific field, it tends to be low for other operations on the same field. This is indicated by information in Tables 1 and 2.

The field machine efficiency value for a single machine operating on a field can be used to predict the efficiency of other operations on the same field and to compare efficiency values for different fields. Thus a farm operator by determining a field machine efficiency value for the same machine operating on each of his fields, could predict efficiency values for other operations on these fields and could compare these values for all fields. By this comparison method he could determine which fields were most efficient for machine use. He could take necessary action, in fields where field machine efficiency values are low, to improve row arrangement, row length, or row-end turning conditions.



For effective machine use a field machine efficiency value of less than 90% per field is not desirable. A field machine efficiency of 90% to 95% should be the goal.

Field shape, field size, turning space, row length and arrangement should be planned to produce field machine efficiency values of 90% or more. Fields with values lower than this are too inefficient to warrant using large, expensive, high capacity machinery on them.

MANAGEMENT AFFECTS YIELD AND QUALITY OF YUCHI ARROWLEAF CLOVER

C. S. HOVELAND and E. L. CARDEN,
Dept. of Agronomy and Soils

W. B. ANTHONY and J. P. CUNNINGHAM,
Dept. of Animal Science

HIGH QUALITY FORAGE is generally scarce in late spring when most winter annual crops have matured. But Yuchi arrowleaf clover offers a solution to this problem. Quality of this forage remains high from winter through late spring under both grazing and hay management. It generally remains productive 2 months longer than crimson in spring, maturing in June.

With popularity of Yuchi arrowleaf established (more than 10,000 acres in State last winter), experiments were begun by Auburn University Agricultural Experiment Station to learn how management systems affect forage quality. Plantings were made in September 1966 and 1967 at the Plant Breeding Unit, Tallassee. Harvests were made at 1-, 2-, 3-, 4-, 5-, and 6-week intervals during winter and spring, and forage samples collected each time.

Digestibility of dry matter was determined by placing nylon bags containing the forage samples in the rumen of steers fitted with fistulas (openings into the rumen). The bags were removed after 24 hours and digestibility calculated on the basis of undigested matter remaining in the bag. This is a reliable measure of digestibility and a good indicator of forage quality.

Forage yield was highest when Yuchi arrowleaf was cut every 6 weeks, as shown by these 2-year averages:

Time between cuttings	*Dry forage yield per acre, lb.*
1 week	2,120
2 weeks	2,830
3 weeks	3,080
4 weeks	3,250
5 weeks	3,950
6 weeks	5,240

Harvesting at 5- or 6-week intervals (hay stage) decreased the productive period, as did cutting every 4 weeks. Extended early spring droughts both years reduced yields below those in previous tests. As expected, total yields were reduced by clipping weekly. However, yields differed little among 2-, 3-, or 4-week cutting intervals.

There was a sharp reduction in live shoots on clover plants cut every 4 weeks as compared with 3-week cutting interval, Figure 1. Shoot numbers were even less on clover cut every 5 or 6 weeks. Number of new buds and shoots declined at all cutting intervals during spring, but the reduction was greater when cut at the hay stage.

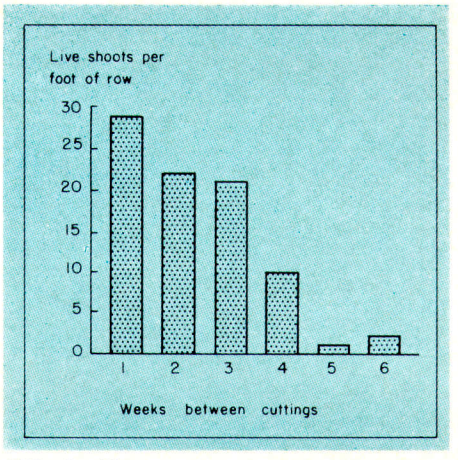


FIG. 1. How cutting interval affects number of live shoots on Yuchi arrowleaf in May is illustrated by 2-year average results.

Yuchi arrowleaf is well suited to grazing, but cutting for hay in late spring causes poor regrowth. Thus, using early grazing followed by one hay cutting may be a way to utilize its heavy growth in late spring.

Digestible dry matter (DDM) of Yuchi arrowleaf remained at a high level (70-85%) throughout winter and spring regardless of cutting frequency, Figure 2. Forage from the other cutting intervals had digestibility similar to that of the 3- and 6-week treatments shown in Figure 2. Results were similar in both years. For Coastal bermuda in the same trial, DDM was only 43%.

Generally, forages with dry matter digestibility of 66% or more are considered to have excellent quality. Results of this experiment show that Yuchi arrowleaf cut at the hay stage has high quality. Quality also remained high during the blooming period in late May. In contrast, digestibility of crimson clover cut every 4 weeks was high in winter but declined rapidly in late March and April. Autauga crimson clover normally reaches full bloom by early April at Tallassee.

In forage cut at the early bloom stage, digestibility of leaves was similar for arrowleaf (84%) and crimson (78%). However, DDM of stems was 68% for Yuchi but only 50% for crimson. This probably accounts for the apparent high quality of Yuchi arrowleaf in late spring as it becomes more stemmy.

High forage quality of Yuchi arrowleaf is well established by the Auburn findings. Since regrowth is poor when the clover is cut only at hay stage, thereby reducing total yield, best production is possible by winter and early spring grazing, followed by a single cutting for hay or silage in late spring.

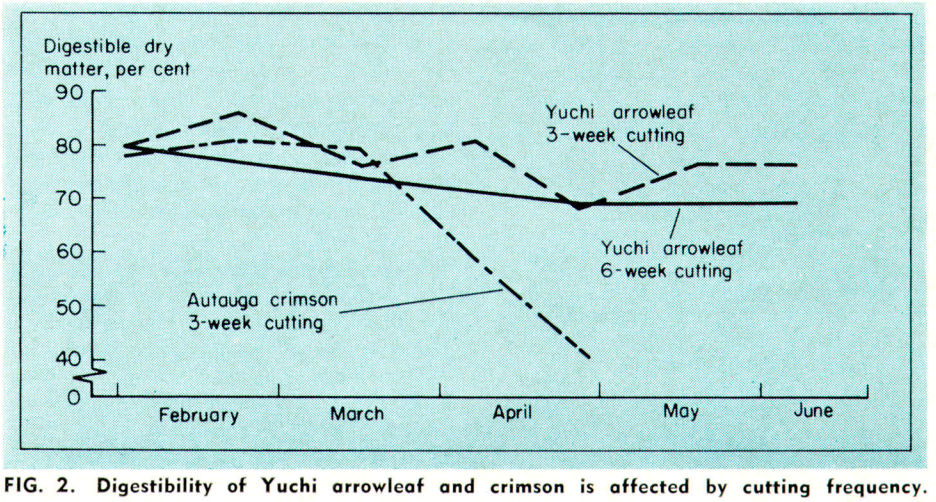


FIG. 2. Digestibility of Yuchi arrowleaf and crimson is affected by cutting frequency.

JOB PLANS of ALABAMA FARM YOUTH

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

THOUSANDS OF BOYS AND GIRLS reared on Alabama farms leave high school every year to enter the labor force and begin their adult lives.

At one time many of these youths would have remained on farms. At present, only 1 out of 10 farm-reared boys in the United States finds employment on farms as either an operator or laborer. In light of this farm exodus, it is important that people responsible for education, vocational counseling, and youth programs have a clear picture of the occupational desires and expectations of farm youth in order to better serve their needs.

A Study in Northeast Alabama

During the spring of 1966, a study was conducted by the Auburn University Agricultural Experiment Station among students in 19 high schools located in Cherokee, DeKalb, Jackson, and Marshall counties. All students attending the 10th and 12th grades in the selected schools completed detailed questionnaires relating to their future plans. Among the nearly 2,100 students who participated in the study, approximately 600 reported living on farms. However, only 185 of these youth reported their father's occupations to be a farm operator or laborer. This indicated the presence of a number of part-time farm situations – a fact that should be remembered in interpreting the following findings.

Occupations Wanted by Farm Youth

Although the study involved both 10th and 12th grade students, it was observed that grade was not an important factor associated with these youths' occupational desires. When students from both grades were combined, less than 20% of the farm boys were found to desire or expect to farm in adult life, see table. A somewhat larger proportion (about ⅓) indicated they expected to live on farms. This difference clearly suggests a continued value for farm life in an era of nonfarm occupations. Similar proportions (about 25% each) were found of those who desired to enter either a profession or a skilled job. Managerial and semi-skilled occupations were the only other occupational categories desired by as many as 10% of the boys.

JOB PLANS OF FARM YOUTH

Type occupation	Boys		Girls	
	Desire	Expect	Desire	Expect
	Pct.	*Pct.*	*Pct.*	*Pct.*
Profession	25	27	34	25
Farming	18	19	—	—
Skilled labor	27	21	17	15
Managerial	9	7	1	—
Semi-skilled labor	12	19	5	5
Sales and clerical	4	5	40	28
Unskilled	—	1	—	—
Glamor	4	2	1	1
Homemaker (girls only)	—	—	3	26
Number of respondents	*322*	*290*	*283*	*265*

Relationships between occupational desires and expectations revealed only minor sources of inconsistency. The proportion of boys expecting to attain skilled occupations was smaller than the proportion who desired such jobs; while the proportion expecting to attain semi-skilled occupations was larger than that desiring semi-skilled jobs. The failure to find any large portion of these farm boys with conflicting desires and expectations does not mean that most of them felt secure about their future. Varying degrees of uncertainty with regards to the ability to achieve their expected occupations were expressed by almost half (45%). Obviously, many of these boys recognized their job aspirations were somewhat optimistic but they had not yet changed to more realistic goals.

Although farming was not a realistic career choice for girls, it was believed that farm girls would favor living on a farm. Instead, only 11% of these girls expected to live on a farm.

Farms and rural areas in general provide few occupational opportunities for girls and their desires and expectations reflected this fact. The orientation of the largest proportion (40%) was toward clerical and secretarial work; whereas, the next largest proportion (34%) was toward such professions as teaching and nursing. Considerable difference existed between the occupations desired and expected among the girls. Almost ¼ of them did not really expect to enter the labor force. Some girls were already married and others anticipated early marriage. In general, girls were more certain of realizing their occupational expectations than were the boys; but even so, 37% expressed some uncertainty about their future plans.

All youth have certain valued conditions that they hope to find in their adult occupations. Slightly more than half of these farm-reared boys expressed a value for working with things rather than with people or ideas. Similarly, half of them preferred to work outdoors. On both of these value conditions it was expected that much larger proportions would hold to these traditional farm values than was found. The same divergence from tradition was exhibited by the fact that only ⅓ desired to be self-employed.

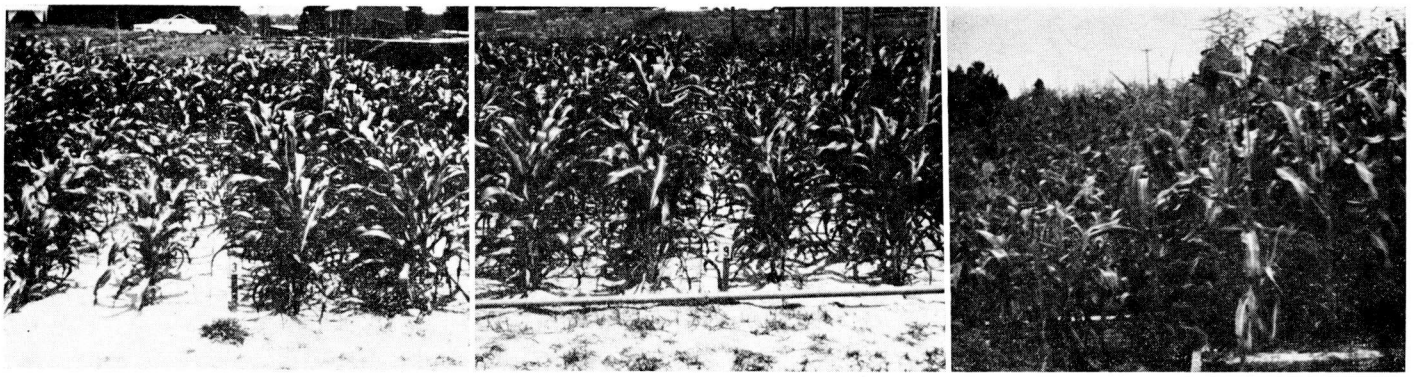
Another job condition valued was that of steady employment, considered "very important" by 62% and 'important" by another 27%. Making good money was another condition viewed as important by 80% of these boys. Lesser proportions valued having an opportunity to help others (69%) and having a chance to become an important person (45%).

Job conditions stressed most by girls reflected somewhat different value emphases than those of boys. These differences were most pronounced relative to the proportion preferring to work inside (88%) and to work with people rather than things or ideas (84%). With regard to other job related values, the pattern of responses among girls paralleled that observed among boys. The only differences were that girls placed somewhat less emphasis on making money and more on opportunities to help others. This latter value was consistent with such commonly expressed career goals as teaching and nursing.

Farm vs. Nonfarm Youth

A comparison was made between the occupational desires of these farm-reared youth with their nonfarm counterparts attending the same schools. At first glance there were two obvious differences. First, only 4% of the nonfarm boys desired to farm compared to 18% of the farm boys. Second, about 15% more nonfarm than farm boys wanted to enter professional occupations. However, when those boys aspiring to farm were excluded from consideration this latter difference was less pronounced, although farm boys were still less likely to desire a profession and more likely to desire a skilled occupation than were nonfarm boys.

These findings leave many questions unanswered.



Plots in upper left photo show sweetcorn fertilized with 2,000 lb. of 8-8-8 per acre without irrigation; plot on left with no organic; plot on right with organic; 1967. Plots in the center photo received 2,000 lb. 8-8-8 plus irrigation; plot on left received no organic and plot on right had organic; 1967. In the photo on right, plots at left received no irrigation while plots on right received irrigation; 1965.

ORGANIC MATERIAL and IRRIGATION for SWEETCORN on Light Sandy Soil

W. A. JOHNSON and J. L. TURNER, *Department of Horticulture*

EXPERIENCE HAS SHOWN that light sandy soils are less suited to sweetcorn production than darker type soils containing more organic matter.

Studies at the Auburn University Agricultural Experiment Station on a light sandy soil have shown that good crops can be produced when good practices are followed.

Experiments with different fertilizer rates, organic material, and irrigation were conducted over a period of 3 years at Auburn. Irrigation was applied each week during drought periods or when plants or soil indicated a need for water at the rate of 1 in. per application. Organic material consisted of 6 tons of dry lespedeza sericea applied and turned 1 to 2 months before planting the crop each year. Results in yields of marketable sweetcorn in dozen ears per acre, percentage marketable ears, and weight per dozen ears from different rates of fertilizer, organic material, and from irrigation are given in the table.

When organic or irrigation was not added the yield of marketable corn was not increased by increasing the rate of fertilizer above 800 lb. per acre. The highest yield was obtained from 1,200 lb. of fertilizer when organic was added. When both organic and irrigation were applied the best yield was from 1,600 lb. of fertilizer. Therefore, with no organic and irrigation the marketable yield of corn represented 46.2% of the total yield; with organic it was 57.9%, and with both organic and irrigation it was 71.8% of the total yield. The average marketable yields from all organic and irrigation treatments were 695 doz. ears from 800, 962 from 1,200, and 1,010 doz. marketable ears from 1,600 lb. of fertilizer per acre.

When organic was applied yields of marketable corn were 210 doz. ears higher with 800 lb. of fertilizer, 418 with 1,200, 446 with 1,600, and 368 doz. ears higher with 2,000 lb. of fertilizer per acre than yields without organic. These higher yields represent increases of 40.0, 78.4, 110.4, and 88.9% at the, respective, rates of fertilizer. When irrigation was applied organic resulted in a greater increase in yield at the 800 lb. fertilizer rate than at the higher rates of fertilizer. The average yields from all fertilizer rates were 360 doz. ears higher from organic without irrigation and 333 doz. higher from organic with irrigation. With both organic and irrigation applied the yield was 880 doz. ears greater than the yield without either.

The value of irrigation depends to a great extend on length and time drought periods occur. During the growth period there were 44 drought days at 1 in. with 12 days in April and 27 in May in 1965; 46 days in 1966 with 16 in April, 13 in May, and 18 in June; and in 1967 there were 28 drought days with 18 in April and 19 in May. Therefore, there were greater differences in yields of corn from irrigation in 1965 and in 1966 than in 1967, see photo at right above. With irrigation applied the average yields of marketable corn were 4% greater from 800 lb. of fertilizer, 100% from 1,200, 203% from 1,600 and 196% greater from use of 2,000 lb. fertilizer per acre when organic was not applied. When organic was applied irrigation resulted in an increase of 33, 37, 84, and 100% from the use of the, respective, rates of fertilizer. Using both organic and irrigation resulted in an increase of 450 doz. ears from 800 lb. of fertilizer, 765 from 1,200 and 1,160 doz. ears from use of 1,600 lb. of fertilizer per acre.

Increasing the amount of fertilizer applied did not increase the weight per dozen ears of corn either without or with organic or irrigation. Irrigation increased ear weight 12%.

EFFECTS OF RATES OF FERTILIZER, ORGANIC MATERIAL, AND IRRIGATION ON YIELD OF MARKETABLE SWEETCORN

Fertilizer per acre[1]	Treatments and marketable ears, 1965-67						
	Yields per acre			Per cent of total yield		Weight per dozen	
	No irri.	Irri.	Inc. from irri.	No irri.	Irri.	No irri.	Irri.
Lb.	*Doz.*	*Doz.*	*Doz.*	*Pct.*	*Pct.*	*Lb.*	*Lb.*
	No organic						
800	524	546	22	46.2	55.2	6.25	7.31
1,200	533	1,067	534	46.2	63.0	5.93	6.36
1,600	404	1,223	819	33.4	61.4	5.71	6.75
2,000	414	1,227	813	33.6	60.3	5.64	6.40
	Organic[2]						
800	734	974	240	50.4	68.3	6.43	7.03
1,200	951	1,298	347	57.9	66.8	6.14	6.66
1,600	850	1,564	714	52.9	71.8	5.99	6.62
2,000	782	1,561	779	53.1	72.2	5.96	7.16

[1] Fertilizer grade used was an 8-3.52-6.64 N-P-K (8-8-8 N-P_2O_5-K_2O). The fertilizer was applied in 3 equal applications, 1 before and 2 after planting.

[2] Organic material applied consisted of 6 tons of dry lespedeza sericea per acre applied 1 to 2 months before planting the crop.

A History of Botany and Plant Pathology at Auburn University

J. A. LYLE, *Department of Botany and Plant Pathology*

WORK IN BOTANY AND PLANT PATHOLOGY was initiated at the Alabama Polytechnic Institute (Auburn University since 1960) in 1883.

That year, P. H. Mell was appointed botanist of the Alabama Agricultural Experiment Station, a position he held until 1902. While here, he authored bulletins on woods, grasses, and other flora of the State.

Although the department has always been primarily a teaching department, some noteworthy contributions have been made in research. Several notable men have been associated with the department. The most outstanding of these was George F. Atkinson, appointed late in 1889 to fill the newly-created position of biologist. He spent only 3 years at Auburn, but he accomplished more in that length of time than has any other member of the department before or since. Atkinson's publications covered a variety of subjects ranging from pure mycology to physiological disturbances to entomological problems.

Cotton Diseases

From the standpoint of Alabama's agriculture, Atkinson's most important work was on cotton diseases. He was the first to show conclusively that cotton "rust" could be corrected by applications of potash fertilizers. This work, published in 1892, resulted in a revision of fertilizer practices in Alabama and probably did more than any other one thing to improve cotton yields in the South at that time. Atkinson also isolated and named the fungus causing Fusarium wilt. He published three Experiment Station bulletins describing the root-knot nematode disease, leaf blights, damping-off, anthracnose, angular leafspot, and "areolate mildew." Atkinson probably contributed more to our knowledge of cotton diseases than any other man.

Atkinson was succeeded in 1892 by J. M. Stedman, who published papers on boll rots of cotton and on blights of fruit trees. Stedman held this position until 1895, when he in turn was succeeded by L. M. Underwood, who served as biologist for 1 year.

F. S. Earle was appointed biologist in 1896. He and Underwood published "A Preliminary List of Alabama Fungi." Earle later published an article on the flora of Alabama. He resigned in 1901, and was succeeded by E. Mead Wilcox, who remained until 1908. During his tenure at this institution, Wilcox published several bulletins on diseases of oak, apple, cherry, peach, pear, plum, and sweetpotato.

F. E. Lloyd was appointed botanist and plant physiologist succeeding Wilcox. He published papers on coloring of persimmons, leaf water and stomatal movement of cotton, and other physiological material. He also wrote a monograph on guayule. Lloyd resigned in 1912 and was succeeded by J. S. Caldwell, who remained at Auburn until 1916. Among articles Caldwell published was one on natural wilting of plants.

F. A. Wolf served as plant pathologist of the Experiment Station from 1911 until January 1, 1916. During this period, he authored many articles on the diseases of apples, citrus, cotton, eggplant, peanut, peach, rose, and walnut. Wolf's work on Cercospora leafspot of peanut was another landmark. He described in detail the life history of this disease's causal organism, *Cercospora personata*. It was more than 20 years before any other significant contributions were made to our knowledge of this disease.

Other Scientists

Other scientists who contributed greatly to the research and teaching programs in the department, or who later became outstanding faculty elsewhere, are listed here with their areas of research: W. J. Robbins, plant physiology; G. L. Peltier, citrus canker; W. A. Gardner, soil toxins; E. F. Hopkins, forage crop diseases; G. R. Johnstone, sweetpotato physiology and poisonous plants; L. E. Miles, dry-rot of wood; G. L. Fick, satsuma physiology; J. L. Seal, field crop diseases; E. V. Smith, weed control and poisonous plants; H. M. Darling, potato diseases; C. T. Wilson, peanut, soybean, and vegetable diseases; and R. L. Self, vegetable diseases.

From these beginnings, the department has developed into one where knowledge is gained, preserved, and disseminated in all of its broadest concepts. The fundamental place of plants in the economy of daily life, as the basic source of the world's food and energy, requires careful and detailed study of their forms, structures, processes, growth and reproduction, and other attributes. Only by such studies may we discover the maximum potential of plants. Conducting these studies is the responsibility the department has accepted.

Research Varied

Since botany deals not only with the well-known seed plants such as pine and cotton, but also with such lesser-known plants as algae, ferns, lichens, liverworts, mosses, and the disease-causing bacteria, fungi, and viruses, research responsibilities in the field are endless. This calls for a high degree of competency on the part of the faculty.

The high-level training of the 21-member senior faculty of the department is evidenced by the fact that 19 of them hold the Ph.D. degree. Further strength is indicated by the diversity of specialties and training institutions represented.

Fundamental and applied research in the department deals with corn, fruit, forage crop, forest, pecan, peanut, and small grain diseases; fungal and higher plant cytology, ecology, physiology, and taxonomy; herbicidal degradation, physiology, and translocation; mycotoxins; plant parasitic nematodes; and viruses.

An integral part of the department's varied research and teaching program is the offering of B.S., M.S., and Ph.D. degrees.

Part of the test area at the Lower Coastal Plain Substation, Camden, shows results of the summer burning treatment (right) compared to check area which received no treatment (left).

Controlling Hardwood Undergrowth in Hilly Pine Forest

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Department of Forestry

W. J. WATSON
Lower Coastal Plain Substation

An invading undergrowth of hardwoods in hilly pine stands can spell trouble and heavy costs for the future.

Developing hardwoods can exclude shrubs and herbs that are highly desirable for wildlife species. Most importantly, a well-developed hardwood understory is an expensive barrier against the establishment of a new pine stand after the old one is harvested.

A study started in 1961 at the Lower Coastal Plain Substation, Camden, was designed to test the effectiveness of 2 burning treatments and 2 herbicide treatments in controlling small undergrowth hardwoods of 1- to 3-in. in diameter. The study was applied in 30- to 40-year-old loblolly pine stands growing in old fields of Ruston and Susquehanna soils. The terrain was hilly, with slopes varying from 5 to 35%. The pine forest was open to dense in stocking, and the hardwood undergrowth was sparse to dense, although dense in most of the plots. Each treatment was applied to 7 plots, each 1/5-acre in area.

The two burning treatments were repeated winter burning and repeated summer burning. The initial burn for both treatments was applied in the winter of 1962 to reduce dangerous fuel accumulations. Summer burning was then applied in 1963 and 1965, and winter burning was applied in 1964, 1965, and 1966.

It was hoped that frequently repeated summer burning would ultimately kill the rootstocks of the hardwoods, but it developed that the more open pine plots could not produce enough fuel for annual summer burning. The winter burning was designed to keep the hardwoods reduced rather than to kill the rootstocks. The actual burning technique, which is complicated and critical in hilly terrain, can not be described in this article.

Herbicide treatments consisted of foliar misting in June 1961 using a gasoline-powered backpack mistblower. Weedone Special Air Spray was applied in one treatment and ACP-M-654 in the other. The lethal chemical for the Weedone was butoxy ethanol ester of 2,4,5-T, while that for the ACP-M-654 was an emulsifiable acid of 2,4,5-T. For each treatment, 2 lb. of 2,4,5-T were applied per acre in 1 gal. of oil and 4 gal. of water.

Results

Results of the treatments are presented in Tables 1 and 2. The burning data were taken in 1967 just prior to a third summer burning application. The herbicide data were taken in July 1964.

Table 1. Percentages of Understory Hardwoods Completely Killed by Treatments

Treatment	Sweet-gum	Wing. elm	Hick.	Red oak	Wtr. oak	All
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Summer burn	19	4	6	0	6	10
Winter burn	12	0	0	5	0	4
2,4,5-T ester	80	0	25	0	31	37
2,4,5-T acid	73	0	40	7	12	33

Table 1 shows percentages of complete hardwood kill (no re-sprouting) by species. High-percentage kills were attained only for herbicide misting on sweetgum.

Table 2 shows percentages by species of hardwoods suffering at least 50% kill of live crowns. The burning treatments produced high percentages for all species, while the herbicide treatments produced high percentages only for the sweetgum.

Table 2. Percentages of Understory Hardwoods Suffering at Least 50% Crown Kill after Treatments

Treatment	Sweet-gum	Wing. elm	Hick.	Red oak	Wtr. oak	All
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Summer burn	97	100	86	88	94	94
Winter burn	92	84	71	70	90	82
2,4,5-T ester	83	50	58	35	64	63
2,4,5-T acid	79	27	50	21	22	46

Summer burning was more effective than winter burning, but the difference was not enough to warrant a preference for the more hazardous burning season.

The burning treatments are being continued, and new herbicide treatments will be tested. At this time, the data indicate that burning is more effective than herbicides in keeping small hardwoods under control, except where the bulk of the hardwoods are sweetgum. In such a case, the herbicides will completely kill a large portion of the understory.

RURAL PEOPLE AWARE OF MEDICARE PROGRAM

J. E. DUNKELBERGER, *Department of Agricultural Economics and Rural Sociology*

THE CONTROVERSIAL "Medicare Bill" was signed into law on July 30, 1965, marking a historic event in public health legislation for the United States.

This new legislation introduced two important changes in the Social Security Act. First, it created a program of hospital insurance for persons over 65 years of age as a part of their social security benefits. Second, it provided a voluntary program of medical insurance that an elderly person may subscribe to at a small monthly cost. Both programs are meant to foster better health among the nation's elderly who must maintain themselves on limited, fixed incomes during an era of skyrocketing hospital and medical costs.

The medicare programs went into operation in July 1966. During the year between passage and beginning of the programs, the Social Security Administration and public health offices distributed information and contacted elderly people about enrolling in the program. Success or failure of the program largely hinged on whether these efforts effectively made people aware of medicare provisions.

Whether rural people in Alabama were aware of medicare was of particular interest to Auburn University Agricultural Experiment Station. Thus, information was sought about extent of awareness and most used sources of information. A survey already underway in Clarke, Fayette, Monroe, Montgomery, and Tallapoosa counties during the summer of 1966 provided an opportunity to learn about general awareness of medicare. This survey was focused on rural farm and nonfarm households that had originally been contacted in 1959-60 as part of an earlier study. Since it was known that a sizeable portion of these households had elderly members for whom the new health program had direct relevance, these families were a logical source of information.

Medicare is intended as a program to ensure that the elderly of the United States are provided with basic hospital and related health care regardless of their ability to pay. It was found that 60% of the 220 rural households contacted were covered by some form of private medical insurance. This is not a good indication of the situation facing those eligible for medicare benefits, however, since households headed by people of working age were more likely to have medical insurance than were households of the elderly. Slightly less than half (47%) of the households having elderly members had medical insurance, as compared with 68% of other families, see table.

PERCENTAGE OF RURAL HOUSEHOLDS COVERED BY MEDICAL INSURANCE AND SOURCES FROM WHICH THEY FIRST HEARD OF MEDICARE, FIVE ALABAMA COUNTIES, 1966

Factors investigated	Proportion reporting, by household composition		
	Having eligible members	No eligible members	All households
	Pct.	*Pct.*	*Pct.*
Private medical insurance			
Have	47	68	60
Don't have	53	32	40
First heard about medicare			
Haven't heard	5	7	7
Radio and television	47	58	53
Newspapers and magazines	17	24	21
Social Security Office	23	1	9
Relatives and friends	5	7	7
Professional people and other sources	3	3	3
Number of respondents	*135*	*85*	*220*

Most of the households surveyed (94%) had heard of the medicare program. In general, they first heard of it through the mass media (newspapers, magazines, radio, television), regardless of whether there was an eligible, elderly person in the household.

A slight majority of the households (53%) said they first became aware of the program through radio and television, and another 21% mentioned newspapers and magazines. Small percentages of households reported they first heard about medicare through the Social Security Office (9%), relatives and friends (7%), or professional people, such as doctors and welfare workers (3%).

First information about medicare was found to differ in some cases between households with an elderly member and those not having members eligible for benefits. Most significant was the finding that the Social Security Office played a more important role in informing eligible persons. This was a source through which almost 25% of households with eligible members had become aware of the program. Conversely, households lacking elderly members were more often dependent on the mass media for information about medicare.

Further consideration was given to the number of households that had heard about the medicare program from any of the various information sources. Combinations of mass media were leading sources, but the role of friends and relatives as a secondary source of information was noted. Radio and television were the most common sources (87%), followed by newspapers and magazines with 72% and friends and relatives mentioned by 63%.

Professional workers, such as doctors and social workers, were seldom mentioned by households with or without elderly members. In light of the strong opposition of the American Medical Association to medicare, such a finding was not surprising about doctors. However, the fact that public health and social workers were seldom mentioned cannot be explained.

The Social Security Office was mentioned as a source of information by only 25% of all households surveyed, but this source was named in 60% of households having elderly members. Also, it is possible that much of the information received through the mass media, particularly radio and television, resulted from information campaigns sponsored by the Social Security Administration. The extent to which this was true could not be determined with these data.

In general, findings of the Auburn study indicate that rural people are aware of the medicare program. The majority of eligible persons in the survey area had taken steps to receive available services under the program.

Nematodes in Alabama Water Resources

E. J. CAIRNS, E. K. MERCER, and T. W. MERRITT
Department of Botany and Plant Pathology

NEMATODES, or roundworms, are a large group of animals better known as the cause of diseases in man, animals, and plants than as aquatic animals.

A few years ago, public concern was aroused by the presence of small nematodes in some municipal water supplies. Now, the expanding study of various important aspects of the abundant and diverse water resources in Alabama raises questions about the significance of aquatic nematodes. A project funded by the Office of Water Resources Research, U.S. Dept. of Interior, was started in 1965 at the Water Resources Research Institute at Auburn University. The plan called for a survey of samples of all types of fresh-water resources over the State, an extended study of nematode populations at one location, and a study of the food and energy requirements of one common, representative type of aquatic nematode.

Survey

The majority of nematodes found during this study cannot be regarded as swimming creatures. They were found in greatest numbers in the bottom covering of ponds, streams, rivers, and lakes. Only a few specimens of land plant-parasitic nematodes were found, suggesting either that they do not survive long after being washed from the land or that few are carried into the water. Most of the nematodes, and probably the most important, were the kinds that could feed on microorganisms, particularly bacteria. There were some predaceous types that could feed on various small organisms, including other nematodes. All types of water resources contained nematodes of various kinds and in widely differing quantities.

Population Study

This phase was conducted at a man-made fish pond, which is a common type of water resource. Even in a relatively uniform and stable environment like this the quantity and kinds of nematodes present varied widely, largely depending on the amount of organic sediment on the pond bottom. Also, occasional nematode population changes occurred at all the sampling sites at the same times during the year. However, no close correlation could be found to oxygen, carbon dioxide, pH, temperature, or bacteria and fungi in the surroundings.

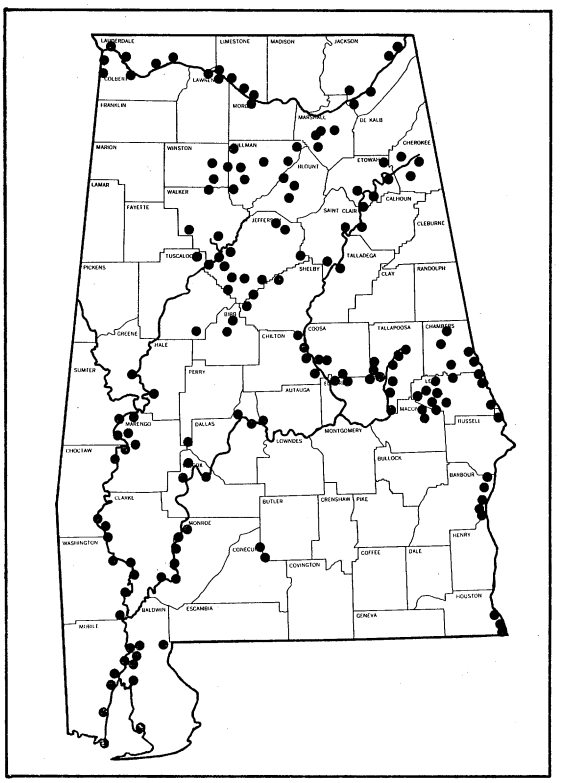
Feeding Study

This work, with a bacterial-feeding nematode, involved use of a sensitive respiration measuring device and radioactive isotopes for determining the energy and food requirements of the nematode. The nematode was also found to be remarkably selective in its feeding, ingesting mostly living bacterial cells, ignoring the dead ones, and taking in only small amounts of the products released by the bacteria. Estimates based on experimental data indicate each active nematode required from about one-half million to more than one million live bacteria per day, depending on the nematode's size and sex.

"Grazing" by the nematodes on the bacteria present could be important if it keeps the bacteria populations in an active growing condition instead of in a decline from overpopulation. This would keep the bacterial conversion of organic wastes and pollutants into usable nutrients for other plants and animals at a higher rate. Nematode activities may also indirectly assist this conversion by transporting and mixing the bacteria into the substrate.

The nematode studied was found to have mechanisms which aided in its survival in a fluctuating environment. Under conditions of crowding of the nematodes, when bacterial food is abundant, its dispersal activity increased. Conversely, a shortage of food induced a quiescent, energy-conserving state from which recovery occurred quickly when conditions were suitable.

The presence of a variety of nematodes in all types of fresh-water resources in Alabama has been established. Some of the nematode population fluctuations and particularly the relationship with the organic debris and bacteria in the bottom layer have been studied. It now remains to be learned if the nematodes may themselves be sources of food in the energy and food chains with other aquatic organisms.



Nematode sampling locations. Samples were taken at various depths and into the tributaries at each location. Scuba diving was used for collecting the overlying layer on the bottom and for determining conditions on the bottom. Measurements were taken for depth, current, pH, oxygen, temperature, and water clarity. Data regarding the bottom type and its covering deposits were also collected.

SOUTHLAND CANTALOUPE—

Auburn Developed Variety Fits Southern Needs

J. D. NORTON, *Department of Horticulture*

SOMETHING NEW in the melon business—a disease resistant cantaloupe variety named Southland—has been developed at Auburn University Agricultural Experiment Station. Adapted for growing throughout the Southeast, the new variety has proved its ability to make good yields of high quality fruit in areas where mildew and blight are problems.

Southland has relatively high resistance to downy mildew and powdery mildew and moderate resistance to gummy stem blight. Such resistance is particularly important in the Southeast where prevalence of these diseases and susceptibility of commercial varieties has discouraged cantaloupe production.

The existence of resistance to downy mildew by a high quality melon variety was first demonstrated in the late 1930's, when Smith's Perfect was introduced (from an unknown source). This variety also showed that high quality fruits could be produced in humid climates. Smith's Perfect is still grown to a limited extent, but it is too late and productivity is too erratic for commercial plantings.

Since the advent of Smith's Perfect, breeding efforts have intensified to develop varieties adapted to southern conditions. These efforts have been responsible for varieties such as Seminole, Florida No. 1, Florisun, Georgia 47, Edisto, Edisto 47, and Gulfstream – developed by Florida, Georgia, and South Carolina agricultural experiment stations and USDA Agricultural Research Service. And now Southland has made its appearance.

From Resistant Selections

Southland was developed at Auburn from a cross between Florisun and Georgia 47. Following the cross, seed from several F_2 field selections were combined to form the foundation stock for Southland. Seed were planted in isolated "mass blocks" in the field. Thus, Southland was derived by breeding of resistant selections of similar type to obtain resistance to downy mildew, powdery mildew, and gummy stem blight.

The new variety inherited resistance to powdery mildew and downy mildew, along with high fruit quality, from both parents, Georgia 47 and Florisun. And these characters are combined with desirable plant and fruit types from the Florisun variety.

Fruit Quality Good

Seedlings of Southland plants are vigorous, exceedingly so at relatively high temperatures. Although the variety possesses resistance to prevalent diseases, spraying for control is desirable when weather is favorable for disease development.

Fruit from spring planted Southland – if well grown – resemble those of Hale's Best Jumbo, as shown in the photo. Eating and shipping quality are superior.

Southland fruits are mostly elliptical in shape, although many may be more rounded than elliptical. They measure 5 to 6 in. in diameter and 6 to 8 in. long. Size varies at different fertility levels and in different production areas, but the average is close to Hale's Best Jumbo. Weight of Southland melons at Auburn averaged 2.87 lb., slightly below the 2.93 lb. average of Hale's Best Jumbo.

The fruits are slightly to deeply ribbed and well covered with a medium to coarse net. The flesh is thick and deep orange in color. Flavor and aroma are excellent when grown under moderately dry conditions, and fair to good when weather is more humid. Seed cavity of the melon is moderately small.

As with Hale's Best Jumbo, fruit matures in about 70 to 75 days. For best quality, it should be harvested near the full-slip stage.

Grown under the number AC-63-11, Southland has been in trials at several locations of Auburn's Experiment Station System and in the Southern Cooperative Cantaloupe Variety Trials of other states, as well as in demonstrations. It has compared favorably with established varieties in yield, but proved superior in quality (measured by content of soluble solids), as shown by results summarized in the table. Thus, it should help fill the need for commercially acceptable varieties of good quality for production in the South.

Seed of Southland has been released for increase by the Alabama Crop Improvement Association and will be available from local seed dealers.

YIELD, FRUIT WEIGHT, AND QUALITY OF CANTALOUPE VARIETIES, FIVE ALABAMA LOCATIONS,[1] 1964-68

Variety	Substation average			Auburn average			Average all locations		
	Yield/ acre	Fruit wt.	Soluble solids	Yield/ acre	Fruit wt.	Soluble solids	Yield/ acre	Fruit wt.	Soluble solids
	Lb.	*Lb.*	*Pct.*	*Lb.*	*Lb.*	*Pct.*	*Lb.*	*Lb.*	*Pct.*
AC-63-11 (Southland)	19,821	3.48	11.8	18,560	2.78	11.9	19,569	3.04	11.82
Hale's Best Jumbo	13,730	2.68	6.2	18,186	2.93	7.0	14,621	2.73	6.36
Edisto 47	15,318	2.94	10.0	19,020	3.34	10.5	15,932	3.02	10.10

[1] Gulf Coast, Wiregrass, Chilton Area Horticulture, and North Alabama Horticulture substations, and Main Station, Auburn.

protein level indicates nutritive value of forage

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Most cattlemen recognize that nutritious forage is essential for profitable livestock production. But their efforts to provide high quality forage are complicated because of the varied and variable measures of forage quality.

Two chemical components of forage – crude protein and crude fiber – are frequently used in evaluation. The first of these is a valuable indicator of quality, but the other has little meaning and may even cause selection errors.

Not only is protein content important in forage quality, but recent findings at Auburn University indicate that high protein forage is generally rich in other nutrients and is highly digestible. This finding came from ruminant nutrition research at the Agricultural Experiment Station that has emphasized examination of forages for nutritive value and identification of factors that influence nutritive value.

Coastal bermudagrass has received much study because it is grown on all soil types in Alabama and is the State's most important upland pasture crop. Coastal samples were taken on three dates in 1965 from two farms in each of Alabama's 67 counties.[1] This intensive examination of Coastal was mainly to establish the level and variation in its mineral components. The detailed mineral data will be published later, but information on some of the major nutrients in selected groups of samples are summarized here. This preliminiary report is particularly concerned with crude protein content of the forage and its association with other important nutrients.

Results given in Table 1 are from 20 Coastal bermuda samples selected for a high content of crude protein and 20 samples having a low crude protein content. In addition to mineral content, the forages were analyzed for dry matter digestibility, cell wall and non-cell wall constituents, and ether extracts.

Differentiation between cell wall and non-cell wall constituents of plants is a new and valuable method of examining forage for nutritive value. The cell wall portion of the plant is primarily lignified cellulose (of little feed value), whereas the non-cell wall portion is the soluble, highly digestible part. The procedure was developed by P. J. Van Soest, Animal Science Division, USDA, ARS, Beltsville, Maryland.

In the Auburn study the dry matter digestibility of forages was determined using small samples in nylon bags suspended in the rumen of a steer for 24 hours. (The steer was fitted with a permanent rumen fistula – opening – which gave entry to the rumen by removing the screw cap.)

The experimental forages were grouped by crude protein content. One group contained an average of 20.21% protein and the other had 6.69%. The high protein forage also had relatively more mineral, non-cell wall constituents, and ether extract, and was higher in digestibility. The low protein forages had more cell wall material (lignified cellulose).

An interesting fact about the high protein forage was that not only was there more protein, but the protein contained more amino acids, which are essential for good nutrition, Table 2.

Results of the Auburn research reveal the associated nature of nutrients in forage. When forage is properly fertilized, harvested, and stored, it may well be rich in crude protein. Because it is high in protein, it also will be richer in other nutrients and more digestible than low protein forage.

Table 1. Relation of Crude Protein Level to Presence of Other Nutrients in Coastal Bermudagrass Forage

Nutrient	Content,[1] by protein level in forage	
	High (20.21%)	Low (6.69%)
Minerals		
Ash, pct.	6.86	5.52
Calcium, pct.	.48	.36
Phosphorus, pct.	.30	.19
Magnesium, pct.	.21	.13
Potassium, pct.	2.45	1.38
Iron, p.p.m.	110.30	75.35
Copper, p.p.m.	8.35	5.15
Zinc, p.p.m.	24.40	16.45
Manganese, p.p.m.	115.25	96.30
Van Soest values		
Non-cell wall constituents, pct.	27.10	22.11
Cell wall constituents[2], pct.	72.90	77.90
Ether extract, pct.	2.03	1.09
Dry matter digestibility, pct.	54.34	41.85

[1] Dry matter basis.
[2] Not corrected for ash.

Table 2. Amino Acid Composition of High and Low Protein Coastal Bermudagrass

Amino acid	Content,[1] by protein level in forage	
	High (20.21%)	Low (6.69%)
	Pct.	*Pct.*
Aspartic acid	13.22	7.37
Threonine	3.21	2.78
Serine	2.41	1.99
Glutamic acid	6.21	6.18
Alanine	3.40	3.10
Valine	3.01	2.73
Isoleucine	1.94	1.70
Leucine	2.68	2.22
Lysine	3.25	2.99
Histidine	1.36	1.25
Arginine	2.43	1.89
Proline	5.11	7.25

[1] Percentage of total crude protein.

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[1] Samples were made available by O. N. Andrews, Extension agronomist, and personnel of the Cooperative Extension Service in each county. Without their help the study would not have been possible.