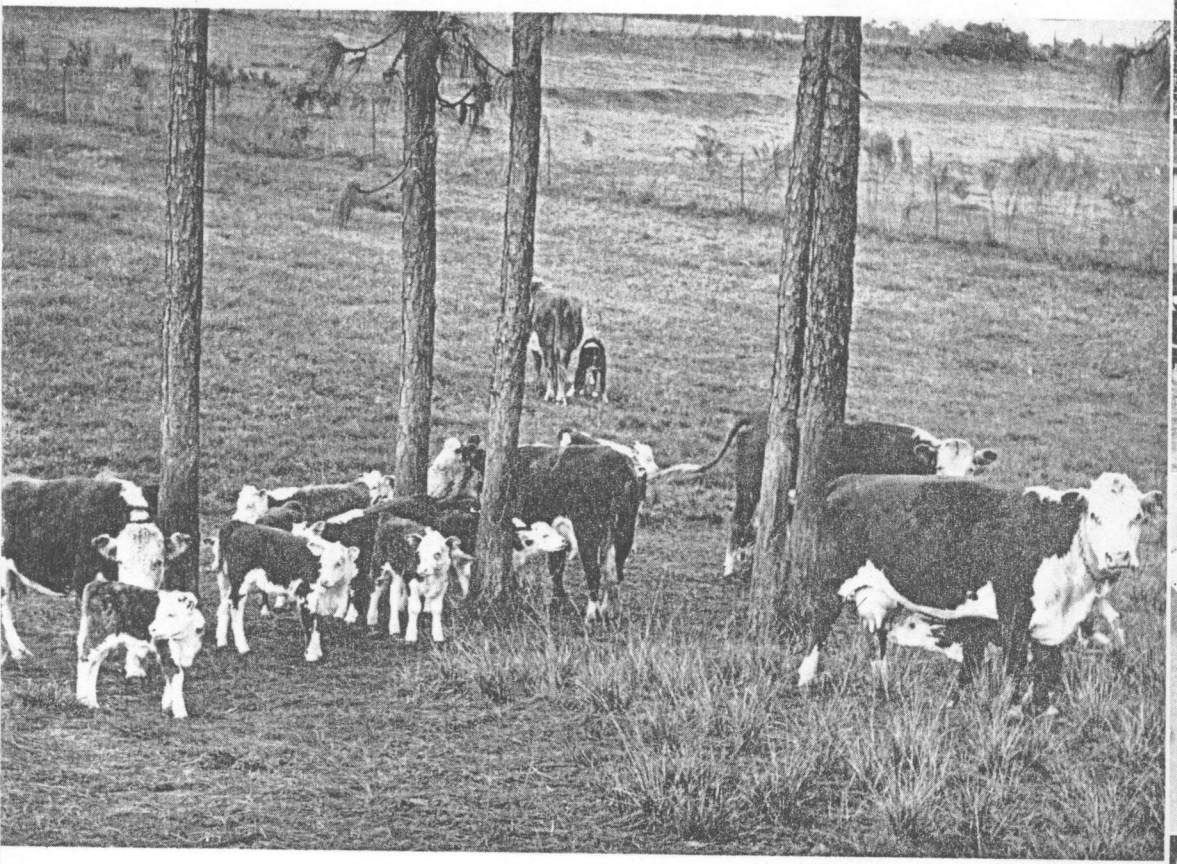
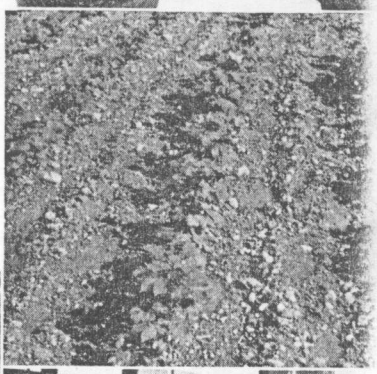
SPRING 1959

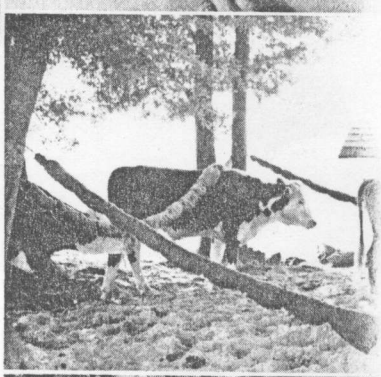
HIGHLIGHTS

of

AGRICULTURAL RESEARCH







AGRICULTURAL EXPERIMENT STATION SYSTEM

of the

ALABAMA POLYTECHNIC INSTITUTE

A Quarterly Report of Research
Serving All of Alabama

HIGHLIGHTS of Agricultural Research

VOLUME 6, No. 1 SPRING, 1959

In this issue . . .

Published by

AGRICULTURAL EXPERIMENT STATION of the ALABAMA POLYTECHNIC INSTITUTE

Auburn, Alabama

New and Timely PUBLICATIONS

Listed here are timely and new publications reporting research by the Agricultural Experiment Station.

Circular 126. Using Low-Volume Farm Sprayers covers uses for sprayers and tells how to calibrate and adjust sprayer for different spraying jobs.

Circular 127. Mechanized Cotton Production in Alabama gives results of latest research on producing cotton mechanically.

Progress Report 71. Effects of Feeding Boron to Hens to Prevent Flies explains how feeding small amounts of boron to hens prevents fly breeding in manure.

Progress Report 72. Artificial Light for Growing and Laying Birds presents results of tests comparing different lighting systems for layers.

Basic research in PEPPER BREEDING *gives promise of saving important industry*

W. H. GREENLEAF, *Vegetable Breeder*

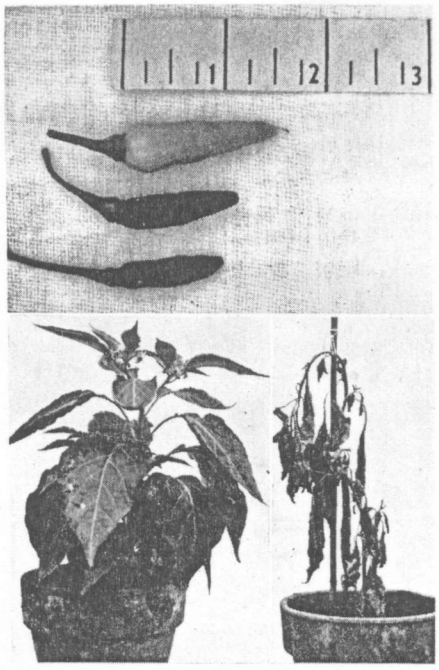
WHEN AN American soldier brought a hot pepper back to Louisiana from the state of Tabasco, Mexico in 1853, he could scarcely have foreseen that it would make culinary and virus history.

The culinary history begins in Louisiana with Edmund McIlhenny's hot sauce marketed under the brand name Tabasco since 1868. The Tabasco virus story begins at the Georgia Experiment Station some 75 years later. It was in 1945 that the Tabasco variety was included in pepper cultures to discover possible sources of resistance against bacterial leaf spot disease for breeding Pimento.

The Tabasco plants, however, wilted from an unknown disease. The wilting occurred early in July as the plants were beginning to fruit. All were dead or dying by mid-July. No other varieties were thus affected.

Disease Identified in Alabama

The scene of the virus story moves to the API Agricultural Experiment Station, where in 1949 Tabasco was observed to wilt. It was here that the Tabasco pepper was later to become a test plant in the study of the virus.



ABOVE: The two fruits at top show size range of peppers from a type of Tabasco bred for resistance to tobacco-etch virus at the API Agricultural Experiment Station. The third fruit is from the susceptible Tabasco pepper.

BELOW: Though inoculated with the etch virus, the Auburn-developed type at left demonstrates its resistance to the disease. Wilting of Tabasco pepper plant at right was caused by etch virus.

Using sap from wilted plants, transmission of the disease was accomplished by leaf inoculation. The nature of the virus remained obscure until it was identified at Auburn in 1951 as tobacco-etch virus.

Sensitivity Unique

The Tabasco pepper is highly sensitive to "etch," infection, usually resulting in a fatal wilt disease within 1 to 2 weeks. In fact, its unique wilt reaction makes it a diagnostic tester host for "etch" virus. By contrast, commercial pepper varieties react only with a vein-clearing, leaf-mottling, and fruit puckering disease that is much less serious. There is another important difference between the two. The Tabasco variety (*Capsicum frutescens*) and other commercial peppers (*Capsicum annuum*) do not cross when grown in the same field. Experimental hybrids between the two are largely sterile.

Breeding Resistant Peppers

Early in the Pimento breeding program at Auburn, it became desirable to shift emphasis to virus resistance. Two sources of "etch" resistance were available. One was an introduction from Peru that was found to be a form of *C. frutescens* or relative of Tabasco, and the other was a strain of Cayenne pepper, *C. annuum*. Information on nature of the two resistances (immunity or tolerance) and on mode of inheritance became critically important for making a choice between them for Pimento breeding.

For both objectives, the Tabasco variety became a valuable tool, first as a sensitive virus tester and second as a susceptible parent in inheritance crosses with the resistant *C. frutescens* source. Inheritance was found similar in both pepper species. Resistance was determined by a single recessive gene pair, but with a higher level in the Cayenne, approaching immunity. This fact plus that of full fertility of the Cayenne X Pimento crosses made it the logical choice for Pimento breeding, whereas the Peruvian source was better suited for breeding Tabasco.

Looking ahead to a possible future "etch" problem, resistant Tabasco type peppers have been bred as an adjunct to the Pimento breeding program at Auburn.

In recent years the wilt disease has become serious in the large commercial Tabasco-growing areas in Louisiana, where growers are losing as high as 75% of their plants during the first harvest of green fruit. Thus, results from basic research in Pimento breeding at the Alabama Station give promise of producing a commercially desirable "etch"-resistant Tabasco type pepper in time to rescue an important industry.

ACKNOWLEDGEMENT: The author in reporting here on his earlier work with peppers at the Georgia Agricultural Experiment Station and his later research at the Alabama Station, makes the following acknowledgments for valued assistance and counsel:

To Dr. F. O. Holmes, Rockefeller Institute for identification of the tobacco-etch virus.

To V. G. Perry, former graduate student of the Alabama Polytechnic Institute, for experimental transmission of the disease by leaf inoculation.

To Dr. S. G. Younkin, Campbell Soup Co., Riverton, N.J., and to Dr. H. H. McKinney, virologist, U.S. Department of Agriculture, Beltsville, Md., for discovery of etch virus resistance in a Peruvian species of *C. frutescens* and in a Cayenne pepper, *C. annuum*, respectively.

Stand effects from different placements are shown above. Fertilizer was placed with seed (left), under seed (center), and 2-3 in. to side and below seed (right).

Fertilizer PLACEMENT CRITICAL *for cotton*

J. T. HOOD *and* L. E. ENSMINGER
Department of Agronomy and Soils

FERTILIZER PLACEMENT is an important factor for top yields of cotton. This is especially true with today's reduced acreage and use of higher rates of fertilizer.

Poorly placed fertilizer can cause decreased yields. If fertilizer is placed in contact with seed or where moisture can carry it to the seed, the seed may not germinate. Even if the cotton comes up, the seedlings may die. This type of damage occurs primarily because the soluble salts in fertilizer dehydrate (dry out) the young seedlings.

With fertilizer properly placed there are no harmful effects to cotton. Placement in relation to seed also influences the efficiency by which fertilizer is taken up by plants. This is especially true for phosphorus.

Stand Studies

Studies have been made by the API Agricultural Experiment Station to measure the effect of fertilizer placement on cotton stands. Results of different placements are shown in the photos. When fertilizer was placed in contact with the seed very poor stands resulted. Poor stands also occurred when the fertilizer was placed directly under the seed, because as the soil dried moisture rose and moved the salts up to the seed. Where fertilizer was placed 2 to 3 in. to the side and 2 to 3 in. below the seed, there was no salt damage. Since there is little lateral (sideways) movement of moisture in soil, the fertilizer salts did not come in contact with the seed. With fertilizer below the seed, it is easy for the plant's feeder roots to intercept the fertilizer band.

Certain fertilizers seem to affect stand more than others. Those containing ammonium phosphate (18-18-18) gave poorer stands when placed with the seed than did fertilizers containing superphosphate (8-8-8), Table 1. When gypsum was mixed with the ammonium phosphate fertilizer, considerable improvement in stand resulted.

Effects of placement and fertilizer grade on germination also showed up in yields, Table 1. Since only a limited number of seed were planted (1 every 3 in.), yields were lowered by reduced germination.

TABLE 1. EFFECT OF PLACEMENT AND GRADE OF FERTILIZER ON STAND AND YIELD OF COTTON

Placement	Fertilizer[1] grade	Stand	Seed cotton yield
		Pct.	*Lb./a.*
Side and below seed	8-8-8	100[2]	1,412
Below seed	8-8-8	68	908
With seed	8-8-8	20	277
With seed	18-18-18	2	47
With seed	18-18-18 with gypsum	26	662

[1] Rate was 60 lb. each of N, P_2O_5, and K_2O.
[2] Stand from this was set to equal 100%.

Efficiency of Placement

Field studies at several locations have been conducted by the Station to compare broadcast applications with properly row-placed fertilizer. Row placement gave higher yields, Table 2. At high phosphorus rates the difference was small. When lower rates were used the difference in favor of proper row placement became larger. Roots of plants reach a greater portion of the fertilizer quicker if it is placed in a band near the seed than if it is scattered throughout the soil.

The best placement of fertilizer for cotton at planting has been in narrow bands 2 to 3 in. to the side and 2 to 3 in. below the seed. If equipment is not available for side placement and low rates are used, fertilizer can be bedded on about 2 weeks before planting. On soils that have been well fertilized in the past or where high rates are used, broadcast applications give good results.

TABLE 2. EFFECT OF ROW AND BROADCAST PLACEMENT OF FERTILIZER ON YIELD OF COTTON, AVERAGE OF 8 LOCATION-YEARS

Placement	Rate P_2O_5 applied	Seed cotton yield	Increase for row placement
		Lb./acre	*Lb./acre*
Row	High[1]	1,450	55
Broadcast	High	1,395	
Row	Low[2]	1,397	121
Broadcast	Low	1,276	

[1] High rate was 60 lb. in 1956 and 1957 and 72 lb. in 1958.
[2] Low rate was 30 lb. in 1956 and 1957 and 24 lb. in 1958.

Cotton at left had no treatment to prevent boll weevil damage. The field at right got timely applications of an effective insecticide.

COTTON INSECT CONTROL

J. W. RAWSON *and* F. S. ARANT
Department of Zoology-Entomology

COTTON INSECTS must be controlled for economical production. Unless a good control program is followed, profitable yields cannot be made.

The boll weevil is considered the No. 1 pest to cotton growers. Its seasonal abundance during 1958 in central Alabama is shown by the graph.

Many reports of resistant or hard-to-kill weevils have been heard in recent years. Results of laboratory and field studies in Alabama show no evidence of inherited boll weevil resistance to insecticides normally used for control. However, there has been a difference in ease of killing between different aged weevils and during different periods of the season. In general it was found that 9-day-old weevils are harder to kill with BHC or toxaphene than 2-day-old ones, and boll-fed weevils are harder to kill than those that have fed on squares. These differences were not obtained with Guthion.

Chlorinated Hydrocarbons

Satisfactory control of boll weevil and various other cotton insects has been obtained with the chlorinated hydrocarbon insecticides—aldrin, dieldrin, BHC, endrin, heptachlor, or toxaphene. When bollworms are a problem, DDT is added to these materials, except in the case of endrin and toxaphene. Chlorinated hydrocarbon insecticides will not control aphids or spider mites.

Results of 3 years study by the API Agricultural Experiment Station show that chlorinated hydrocarbons have fairly long-lasting effect. Applications of 30 to 40 lb. of 20% toxaphene or 2% endrin dust per acre at 8-day intervals were as effective as 15 to 20 lb. put on every 4 days.

Tests with granular heptachlor show promise of good boll weevil control with only two applications. The 5% heptachlor granules were put out at the rate of 40 lb. per acre just before emergence of the first and second generation of weevils. This treatment gave as good weevil control as did 12 dust or spray applications. Heptachlor granules are not effective against bollworms.

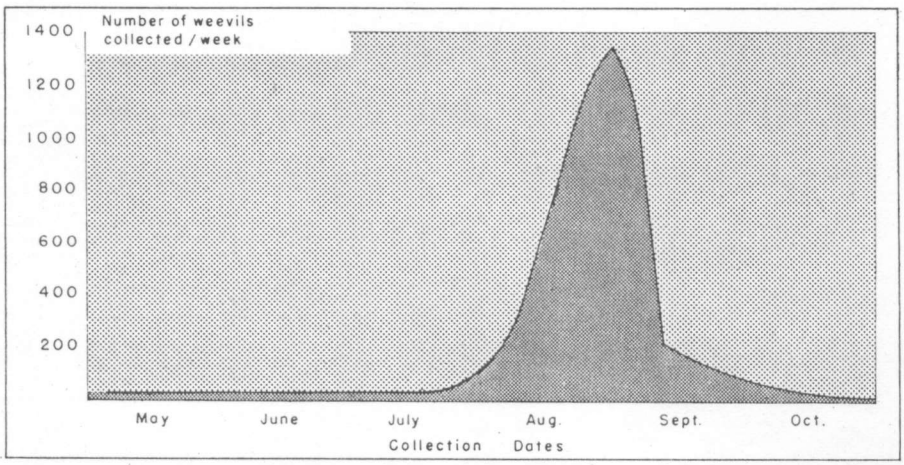
Phosphate Insecticides

Malathion, methyl parathion, and Guthion (organophosphate insecticides) give satisfactory control of boll weevil, aphids, some species of spider mites, and other cotton insects. As with other materials, proper timing of applications and use of correct amounts are necessary. Malathion and methyl parathion are relatively short lasting, but Guthion has a relatively long residual effectiveness.

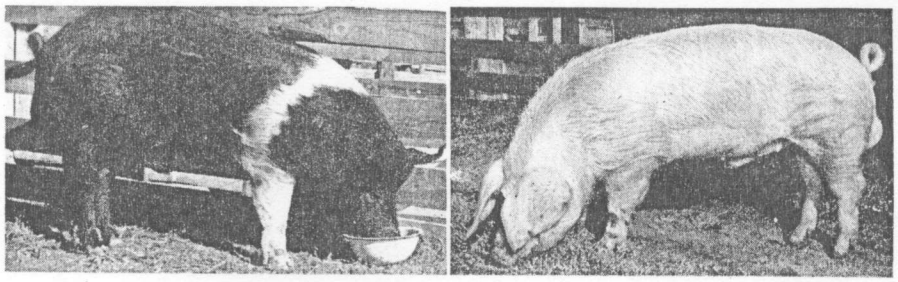
Results of 3 years research indicate that 30 to 40 lb. of 2.5% Guthion dust per acre at 8-day intervals is as effective for boll weevils as 15 to 20 lb. applied every 4 days. Parathion, ¼ lb. per acre, controlled aphids and some species of spider mites. Poor results were obtained with 2% parathion and 5% malathion dust applied at rate of 20 lb. per acre for control of the strawberry mite. Demeton (Systox), ¼ lb. per acre, controlled aphids and most species of mites infesting cotton. This material lasts 2 to 8 weeks. Demeton and parathion are not recommended for boll weevil control.

Several of the new organophosphates show promise of controlling one or more species of cotton pests. Two% Trithion and 4% ethion dusts, 20 lb. per acre, has satisfactorily controlled strawberry mite in northern Alabama. One-half lb. per acre of Delnav was also effective against mites. Trithion (2% to 4%) applied at 20 lb. per acre and Delnav, ½ to 1 lb. per acre, showed promise of controlling boll weevil in limited experiments. Trithion is also effective against aphids. In preliminary tests, American Cyanamid 12880, 1 lb. per acre, was effective against aphids and mites and had relatively long residual life. The organophosphates will not control bollworm.

Except for malathion, the phosphate materials recommended for cotton insect control are more hazardous than most other cotton insecticides. Endrin is more toxic than the other commonly used chlorinated hydrocarbons.



Seasonal abundance of weevils is illustrated by graph showing number of weevils caught per week in 24 traps during 1958 season in central Alabama.



Hampshire boar at left gained 2 lb. per day and had back fat almost 1 in. thick. The Landrace boar at right gained 2 lb. per day and had back fat slightly over 1 in. thick.

Top BOARS *sire better* CROSSBREDS

C. D. SQUIERS, *Associate Animal Breeder*

LEADING PORK PRODUCERS are easing the problem of competition by crossbreeding their animals for quality and economy.

The progressive swine grower now knows that he must: (1) increase volume, (2) decrease costs, and (3) improve the quality of his product if he is to stay in business. The possibility of an increase of 10 to 20% in pork marketed with no increase in number of breeding animals is making crossbreeding popular with growers. Producers often overlook the fact that a successful crossbreeding program is built on a foundation of purebred stock. The producer who attempts to utilize hybrid vigor by crossing inferior animals of different breeds is starting his crossbreeding program at the wrong level.

Results of research by the API Agricultural Experiment Station show that marked differences exist among boars of the same breed in capacities to sire the right kind of crossbred pigs.

Successful crossbreeding operations involve a rotation of boars of 2 or more breeds. Most advantages of crossbreeding come from the superior productivity of crossbred sows. Some advantage is also gained in rate and economy of gain. Hybrid vigor does not cause improved carcass quality. In a well planned crossbreeding program, boars from good carcass breeds are alternated with boars from breeds with less desirable carcasses. Alternate boars are selected with strong factors so that the net result is a good balance between carcass merit and other important traits. In such operations it is important to use the right boar, from the right breed, at the right time in the program.

Selection Study

A selection project is in progress at the Station with the objective to develop strains of Landrace and Hampshire hogs that cross well. In this study, several boars are selected from each strain on the basis of individual performance and performance of ancestors. These boars are then bred to selected sows of the other strain. Crossbred pigs are tested for reproductive performance, rate and efficiency of gain, and carcass merit. Based on this information, one or more boars from each strain are selected to sire a new purebred generation. A comparison is made between the reproductive and lactation performance of the Landrace X Hampshire daughters of two Landrace boars (Table 1). Although both groups did well, the

TABLE 1. CROSSBRED DAUGHTERS FROM LANDRACE SIRES COMPARED

Sire	Litters	Pigs/litter	Wt./litter
	No.	*56 da.*	*56 da.*
I	43	9.16	390.2
B	22	8.90	340.8

sows sired by boar "I" weaned more pigs and had heavier litters at weaning. In Table 2, a comparison is made of rate of gain and carcass merit among a group of Landrace X Hampshire pigs sired by several Landrace and Hampshire boars. It will be noted that Landrace 136 and Hampshire 31 sired pigs that gained well and had excellent carcasses, whereas the pigs of the other 4 boars were deficient in either growth rate, or carcass, or both.

Crossbreeding System

In a well planned crossbreeding program, alternate use is made of breeds that tend to complement each other. For example, a three-breed rotation might involve boars from (1) a breed especially good in sow performance (Landrace or Yorkshire); (2) a breed especially good in growth and feed conversion (Duroc or Poland China); and

TABLE 2. GAINS AND CARCASS MERIT OF LANDRACE X HAMPSHIRE PIGS SIRED BY DIFFERENT BOARS

Boar	Number of pigs	Average daily gain	Number of carcasses	Pct. lean cuts
	No.	*Lb.*	*No.*	*Pct.*
L 136	30	1.67	11	51.0
H 31	24	1.68	12	50.3
L 10	18	1.61	8	48.0
H 15	18	1.65	10	48.1
H 56	12	1.57	7	49.2
L 94	18	1.51	5	48.6

(3) a breed good in both sow performance and rate and economy of gain (Hampshire).

Individual Performance

In addition, careful attention must be given to selection of the individual boars used from the viewpoints of performance and meatiness. The successful producer of market hogs can no longer afford to buy boars from his neighbor unless the neighbor has production-tested stock that crosses well with his. The breeding program of the future must help the producer decrease costs, increase volume, and produce a higher quality product leading to greater demand. Corn Belt producers recognize that such a program means use of better boars – can Alabama growers afford to think differently?

ROOT-KNOT NEMATODE *situation in* ALABAMA

E. J. CAIRNS, *Nematologist*
N . A. MINTON, *Nematologist, USDA*

A RECENT SURVEY showing five different species of the root-knot nematode that cause galled root systems to a wide range of plants spells bad news to Alabama farmers.

The fact that these species attack many plants makes the situation complex. However, awareness of the situation makes chances for successful control measures better than in the past. The important point is that these species do have some differences in their abilities to attack certain plants. To turn these host range differences to the grower's advantage, all recommended crop plants for Alabama are being tested by the API Agricultural Experiment Station against the five species. Results to date indicate some encouraging prospects for particular crops and varieties that are less susceptible to certain species.

Past Recommendations

In the past, occasional failures of generalized recommendations as to suitable crops and resistant varieties to be planted in infested areas resulted from regarding the root-knot nematode as a single pest. The chances of success with crop rotations will be improved by knowing which species is present in a particular area. The map should not be used as a guide to the presence or absence of each kind of root-knot nematode in a localized area as the survey was limited in scope. Accurate identifications are made as a free service at Auburn from soil and galled root samples sent in for examination.

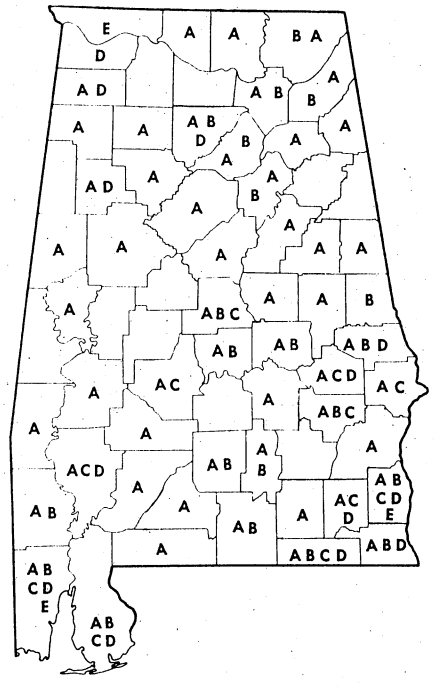
Low-Cost Control

Results of research and the experiences of an increasing number of growers in the South show that chemical control of nematodes is a profitable measure for plants of high value. However, in the present situation, cost factors make finding other control measures very desirable. Successful plant production in infested areas can also be obtained if plants are used that are either tolerant or relatively resistant to at least some of the species.

Another approach to low-cost control is through use of plants that bring about a reduction in parasite populations in the soil. Some plants are unsuitable food for nematodes causing death by starvation. There are other plants that act as traps; the nematodes enter the roots but are unable to complete their life cycles. An example of this is crotalaria. Such possibilities for control have scarcely been explored.

Growers Can Help

Alabama growers can help develop these low-cost control methods. The entire state is a testing ground for plant tolerance or resistance against various species. Observant growers can report instances of plants of any kind, even weeds, that do not appreciably gall or otherwise seem unaffected under circumstances where the diseased condition would be expected. Send such information to the Nematology Laboratory, Department of Botany and Plant Pathology, API Agricultural Experiment Station, Auburn. Soil and galled root samples can also be sent for determining which of the species are in plantings. These determinations are a free service and a means of broadening knowledge concerning this important plant pest.

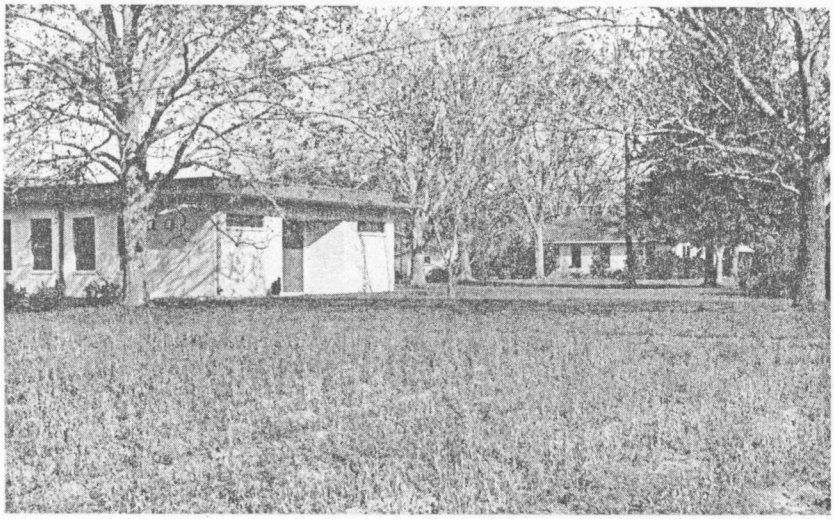


The map shows locations of five species of root-knot nematodes found in Alabama. A. Cotton, B. Southern, C. Javenese, D. Peanut, and E. Northern.

Nematodes In Heavy Soils

Another aspect of the root-knot nematode situation in Alabama has been the frequent findings of these parasites in the heavier types of soil. For example, once they have been introduced, on infested transplants from other areas, they can thrive even in heavy soil. However, it may be true that they are more abundant and more damaging in the lighter soils. Too many instances of severely root-knotted plants from heavy soil types have been observed to mean freedom from the disease once the soil has been infested.

The hazard of introducing or transferring root-knot nematodes from one place to another is of special importance. To introduce these pests into new areas is bad enough, but to bring another species into infested areas could certainly complicate low-cost control through use of rotations and resistant varieties. The usefulness of these methods is dependent upon differences in host ranges that exist between the individual species. To have more than one species present at a time may make control by these means impossible except through use of chemicals.



The GULF CO/

a story of adv through researc

R. E. STEV
OTTO B

A NEW FARMING ERA has come into being in southwestern Alabama since establishment of the Gulf Coast Substation in 1930. Results of research at the Substation have pointed the way for many major advances in the region's agriculture.

A unit of the API Agricultural Experiment Station, the Gulf Coast Substation was set up in accordance with an act of the 1927 Alabama Legislature. The act provided for five substations and stated that one should be located in the Gulf Coast Area. In 1930 the Substation was established near Fairhope, in Baldwin County, on 720 acres donated by official agencies of the area.

Striking Changes

Farming changes in the Gulf Coast area since 1930 have been almost spectacular. One of the most striking has been the successful shift to livestock farming. When full-scale work began at the Station in 1931, there were no improved pastures (only open range), quality of cattle was poor, there were no markets, and cattle ticks were a problem. Since then the region has developed a highly successful livestock program. Lush, green pastures, both in summer and winter, and herds of good beef and dairy cattle are typical of the area. Modern livestock auctions are now available, open range has been abolished, and cattle ticks eradicated.

Yields of such crops as corn, soybeans, Irish potatoes, and sweet corn have increased greatly during the last 30 years. For example, corn yields have jumped from 16 bu. per acre to about 35 in Mobile County and 42 in Baldwin County in 1957. Soybean yields are 50% better, and potato yields have doubled.

Early Research

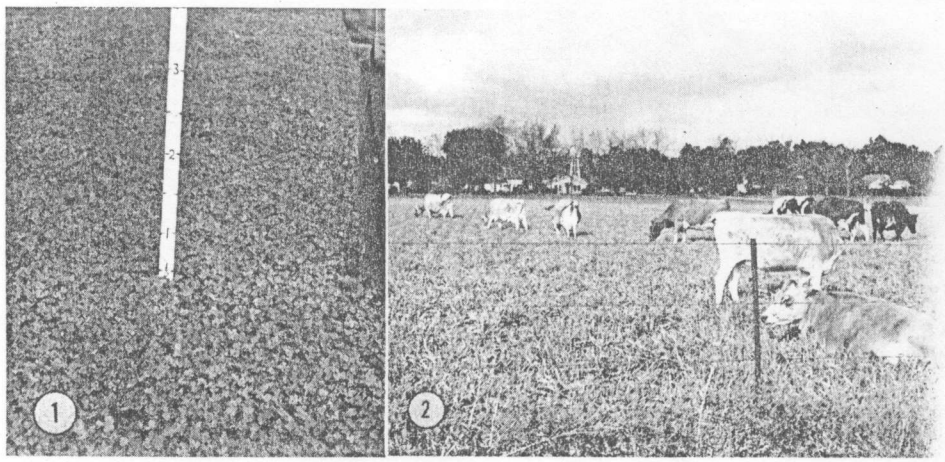
When the new Substation was established, Gulf Coast farmers were keenly interested in possibilities of truck crops and satsuma oranges and much of the early work dealt with such crops.

Some early work with Irish potatoes caused radical changes in production practices and resulted in greater success with this crop. It was found that large seed pieces gave higher yields than the small pieces normally used, especially when high fertilizer rates were used. With 1,500 lb. fertilizer per acre, yields from ½-oz. seed pieces were 144 bu. per acre as compared with 213 bu. when 1½-oz. pieces were planted.

Research on number of cultivations needed for potatoes revealed that farmers were cutting yields by over cultivating. Ten years results showed that cultivating more than twice cut production.

Alabama was the dumping ground for much undesirable and diseased seed potatoes when the Substation was established. As a result of a Substation program of testing seed potatoes, Alabama potato growers are now getting top quality seed.

In early fertility research, it was learned that phosphorus was the limiting factor in crop production on new soils of the region. Before this time, it was generally believed that phosphorus was not needed for corn, even on newly-cleared land.



These photos show results of research at the Gulf Coast Substation. (1) Stands of clover like this are now being grown. (2) This high-quality oat vember. (3) These good-

UBSTATION—
agriculture

tant Editor
ntendent

The first report of damage by the imported fire ant came from the Gulf Coast Substation in 1935. Research on controlling this pest, which began there in 1949, was some of the earliest control work done.

Grassland Farming Begun

With realization that perishable crops could not be produced on a large enough scale to use all available land, new experiments with pasture and forage crops were started in 1936. First attempts failed when neither lespedeza nor white clover persisted when planted on carpetgrass sod after disking new land. Later, new strains of white clover were tested on land that had been in cultivation and excellent pasture resulted. This showed that good land preparation, proper fertilization, and the use of adapted, vigorous strains of white clover was the key to good pasture on suitable soils. After this discovery, the work continued and proved that excellent permanent pastures of white clover and Dallisgrass can be established and maintained in the Gulf Coast area.

Crimson clover and ryegrass have been grown successfully as winter grazing crops for several years at the Substation. This combination allows Gulf Coast farmers to cash in on their mild winters and have good grazing during most of the year. Although the climate is not ideal for oats, this crop is providing top quality fall and winter grazing. Results show that when disease-resistant varieties are planted early in September, good grazing is usually available by the middle of November.

To put information on pasture and forage production to practical use, a dairy management unit was put into operation around 1942. Results from this work show that dairying can be a profitable business in the area. With pastures as the main dairy feed, milk is produced at rock-bottom costs.

The 30-cow dairy unit is a one-man operation that utilizes 89 acres of the Substation. A 5-year (1949-53) summary of income and expenses reveals how the dairy unit has paid. Average sales were $14,409 per year, with cash expenses of $3,617. This left a return of $10,792 to land, labor, capital, taxes, depreciation, and other costs. Returns during the past 5 years averaged about the same.

Other Crops

Corn has been grown on more acres than any other crop in southwestern Alabama. Now that hybrid varieties and results from research on corn production are being used, yields have increased greatly and this crop has become a successful enterprise.

Sweet corn is a profitable crop for many Gulf Coast farmers as a result of research at the Substation. When work was begun, an open-pollinated, soft, white corn was being grown and there was no control for the corn earworm that was damaging much of the crop. The Substation brought in and tested hybrid sweet corn and adapted varieties came into use in the area. Methods of controlling the earworm were developed that were effective enough to result in 90% to 95% worm-free ears.

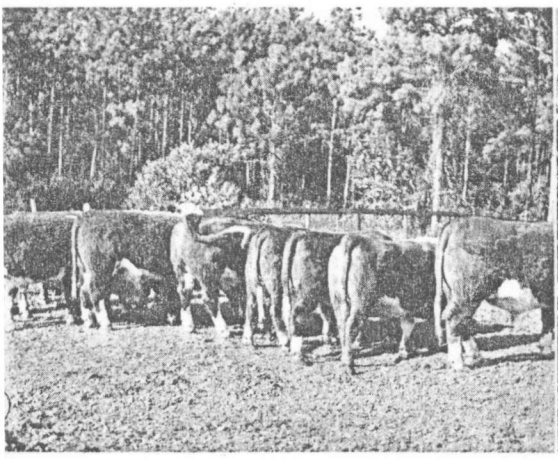
Soybean yields have increased 50% in southwestern Alabama since the beginning of variety testing and fertility studies. Ogden variety was introduced to the area by the Substation and has continued to be a favorite.

Beef Project Added

With growth of the beef cattle business, information was needed on the profitableness of different methods of growing and finishing. A study that was begun in 1955 is comparing results from different handling of both spring- and fall-dropped calves. All groups of calves in the test are grown on pasture, with some being sold off winter grazing, some after winter and summer grazing, and others fed in dry lot before marketing. The value of stilbesterol is also being evaluated.

Results to date show that all management methods tested made more profit than from selling calves at weaning. The winter grazing period was the most profitable, with summer grazing making the least profit. However, the most profitable procedure was to carry weaned calves through about 6 months of winter grazing and finish on a full feed. The 90- to 100-day feeding period increased grade by one full Federal grade.

Numerous other projects have been carried out at the Gulf Coast Substation and others are in progress now. Superintendent Otto Brown and assistants Harold Yates and J. E. Barrett have worked closely with staff members from the Main Station at Auburn in all phases of the research. Success of this work is dramatically shown by today's farming program in the Gulf Coast area.



ded good grazing by No- were finished on full feed after winter grazing. (4) Corn yields have more than doubled in the Gulf Coast area.

PASTURE PLANTS VALUABLE *in cattle* NUTRITION

W. B. ANTHONY, *Animal Nutritionist*

THE YARDSTICK OF VALUE for a pasture plant is how well an animal can eat the plant's forage, digest, and use it to produce milk or meat.

Cattle are economical users of pasture forage because they have stomach capacities for holding large amounts of roughage. They can break it down in the stomach for good digestion.

The major feedstuffs eaten by cattle are pasture herbage, hay, and silage. The forepart of the stomach (rumen) provides a favorable place for the development of microorganisms that help in breaking down these feeds. Also, these microorganisms produce vitamins and amino acids used by the animal.

Research Results Cited

The Animal Husbandry and Nutrition Department of the API Agricultural Experiment Station, in cooperation with various substations has conducted research on evaluating the nutritive value and digestibility of many pasture plants.

Results of these studies show that most all commonly grown pasture plants have about equal feeding value in the early spring and summer. Low daily gains of animals on these forages result from low daily intake.

TABLE 1. SEASONAL VARIATION OF DRY MATTER DIGESTIBILITY FOR VARIOUS FORAGES

Type Forage	Month	
	May	August
	Pct.	*Pct.*
Pensacola Bahia 80 lb. N[1]	55	54
Coastal Bermuda 80 lb. N[1]	54	55
Alfalfa-orchard[2]	65	...
Dallis-clover[2]	69	66
Sericea[2]	57	55
Dallis-clover[3]	68	63
Dallis-clover irrigated[3]	69	66
Alfalfa-orchard[3]	62	...
Alfalfa-orchard irrigated[3]	65	71

[1] Wiregrass Substation, Headland.
[2] Piedmont Substation, Camp Hill.
[3] Tennessee Valley Substation, Belle Mina.

Dry matter digestibility was above 60% for most of the plants studied during the first few months of the grazing season (Table 1). When digestibility dropped below 60%, performance of cattle was reduced. This was especially true of young cattle. Yearling steers made about the same gain during early spring and summer whether grazing coastal Bermudagrass or Dallisgrass-white clover (Table 2). Average daily gains during the best grazing months of the year were rather low for all the forages. The wide range in types of pasture included in this comparison should be noted.

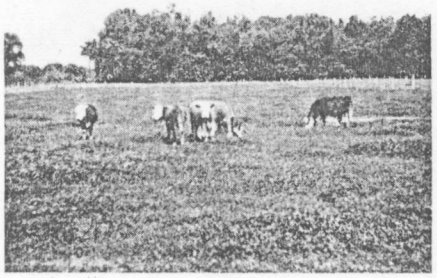
TABLE 2. DAILY GAINS OF YEARLING CATTLE GRAZING VARIOUS TYPES OF PASTURES

Type Pasture	Period of Year		
	April	May	Aug.
	Lb.	*Lb.*	*Lb.*
Coastal Bermuda[1]	2.20	0.86	1.46
Bahia[1]	2.71	1.62	1.58
Alfalfa-orchard[2]	1.03	2.09	1.19
Sericea[2]	....	0.99	0.73
Dallis-white clover[2]	1.37	1.88	1.47
Crimson-coastal[2]	1.32	0.69	1.06
Dallis-white clover[3]	0.68	1.50	1.24
Dallis-white clover irrigated[3]	1.12	1.79	1.44
Alfalfa-orchard[3]	2.23	2.38	1.26
Alfalfa-orchard irrigated[3]	1.70	2.49	1.52

[1] Headland
[2] Camp Hill
[3] Belle Mina

Grazing Plus Dry Forages

Yearling steers consumed from 12 to 15 lb. of dry forage daily while on grazing. No important difference was noted among various types of forages. Feeding the cattle other feeds while they grazed did not stimulate them to consume more forage. In fact, the cattle grazed proportionally less and maintained about the same amount of dry matter intake (Table 3). Dry weather seriously lowered digestibility of grasses and protein content declined as the plants matured. In late summer the availability of protein in grasses is usually quite low. The low dry matter and protein digestibility of grasses in late summer should be a guide to livestock farmers in harvesting these crops for hay. Cut late in the summer, most grasses produce low quality feed. Quality of forage is important for livestock production especially for animals producing at a high rate.



Beef cattle grazing on good growth of white clover and Dallisgrass at the Tennessee Valley Substation, Belle Mina.

Tests at Piedmont Substation

In tests conducted at the Piedmont Substation, yearling steers made 1 lb. of live weight gain on 6.52 lb. of digestible dry matter coming from Dallisgrass-clover pasture. Under the same conditions, it took 17.86 lb. of digestible dry matter from lespedeza sericea to produce 1 lb. of gain. In metabolism studies conducted at Auburn, it was found that coastal Bermudagrass fed alone had 937 digestible calories per lb. whereas early-cut alfalfa had 1,136 digestible calories per lb. When 30% of concentrate feed was added to the coastal Bermudagrass, the digestible calorie content per lb. was 1,111 – still a little less than the calories in excellent quality alfalfa.

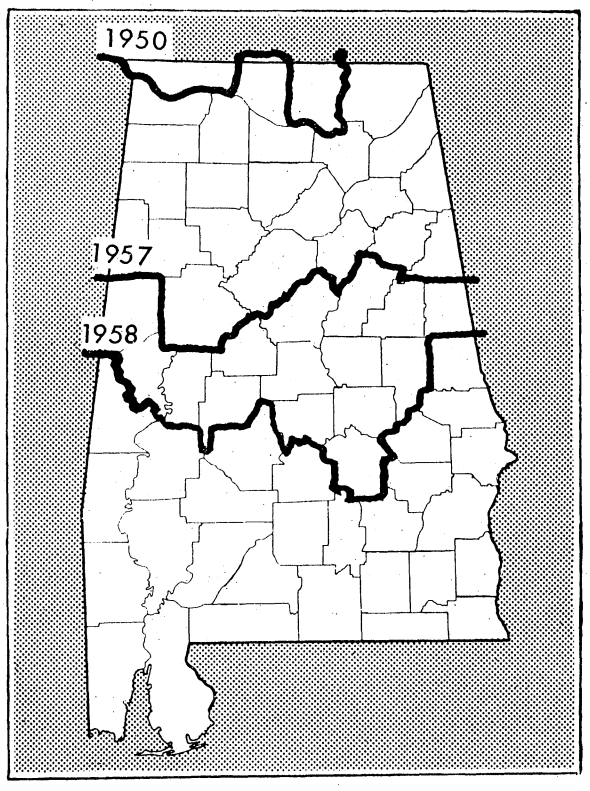
TABLE 3. INFLUENCE OF SUPPLEMENT ON AMOUNT OF BERMUDAGRASS PASTURE EATEN BY YEARLING STEERS[1]

Treatment	Dry matter consumed daily
	Lb.
1955	
Grass alone	13.83
Grass + 1.5 lb. CSM	14.27
Grass + 1.5 lb. CSM + 10 mg. stilbestrol	12.44
1956	
Grass alone	17.84
Grass + 4 lb. cane molasses	16.61
Grass + 7.5 lb. ground ear corn	16.23

[1] Test conducted Wiregrass Substation.

European borer will not PUT ALABAMA OUT *of* CORN-GROWING BUSINESS

W. G. EDEN, *Entomologist*



Shown here is the movement of the European corn borer in Alabama since 1950. By 1958, 35 counties north of that line were infested. No borers were reported in Bibb, Clay, Coosa, and Talladega counties within the infested portion of the State.

SINCE CROSSING our northern borders, the European corn borer in the last 8 years has infested nearly two-thirds of Alabama.

Found first in Lauderdale and Madison counties in 1950, it had taken the pest 33 years to migrate from Massachussetts where it was first discovered in the United States in 1917. Attempts to halt the corn borer have failed and it has continued to move southward toward the Gulf. Since discovery of the insect in Alabama, entomologists like those of other invaded areas helplessly watched its movement into new territory.

Movement in Alabama

For 2 years, 1951 and 1952, no movement was recorded, but in 1953 it was found in Etowah County. Though infestations were not severe enough to attract attention, the insect had gradually moved southward. Four additional counties were found infested in 1954 and seven in 1955. By the end of 1956, the corn borer was known to be in 15 northern Alabama counties. It was found as far south as Cleburne, Jefferson, and Tuscaloosa counties by the end of 1957. Last year, the corn borer was recorded in 11 additional counties, the southernmost of which was Montgomery. (See map.) If it continues to move southward at its present rate, every county in the State will be infested within a few years.

Can Still Grow Corn

Although the corn borer is a severe pest and must not be taken lightly, it is emphasized that the **insect will not put Alabama farmers out of the corn-growing business.**

In the Mid-West where the corn borer has been for years, a general rule of-thumb is that each corn borer per stalk reduces yield by 3%. Although this has not been determined for Alabama, it is likely that the pest does about the same damage here as it does in the Corn Belt.

Recognition

Alabama farmers should learn to recognize the corn borer, its damage, and when to apply control measures. The adult stage of the corn borer is a pale, yellowish brown moth with a wing spread of about 1 in. The wings have dark irregular bands running in wavy lines across them. The worms are from ¾ to 1 in. long, flesh-colored, and have rather small, round, brown spots.

Infestations in corn fields are often indicated by cornstalks with broken tassels or by lodged (broken) stalks. Other signs of the presence of the corn borer are small feeding areas on the leaves; fine, sawdust-like castings on the upper sides of the leaves or on the stalks; small holes in the stalks with castings protruding from the holes; and flesh-colored worms boring into the stalks, tassels, or ears. After study of the corn borer, it is easy to distinguish it from the corn earworm, fall armyworm, and southern corn-stalk borer, all of which may be found in most any Alabama corn field.

Controls

Research results of the API Agricultural Experiment Station show use of insecticides to be a valuable tool in European corn borer control. The most satisfactory result will be obtained from use of properly timed applications of sprays or granules. The need for treatment must be determined, of course, by value of the crop and amount of infestation. Details of these procedures are being worked out for Alabama conditions. Indications are that treatment of field corn will usually be profitable if 50 or more egg masses per 100 plants are present or if extensive leaf feeding is present on early corn that is more than 3 ft. in extended height.

The following insecticides and rates are recommended at the present time on corn: DDT, 1.5 lb. per acre; endrin, 0.3 lb.; or toxaphene, 3.0 lb. Heptachlor also looks promising.

WHEN *should* *corn be* PLANTED?

J. T. COPE, JR., *Associate Agronomist*

LOCATION AND VARIETY are factors that determine the best time to plant corn in Alabama.

Location is important because of large differences in climate, especially temperature and rainfall distribution. The average date of last killing frost in the spring varies from about February 20 on the Gulf Coast to about April 5 near the Tennessee line. Average warm-season precipitation (April through September) varies from about 38 in. near the Coast to as low as 24 in. in some central areas of the State.

Variety of corn is important because of large differences in number of days between planting and maturity of the early, medium, and late hybrids. Planting date for corn should be selected so that the period of maximum moisture need for the variety will come at a time when rain can be expected. The period of greatest moisture need is from about 10 days before to 20 days after silking and tasseling.

Time of Planting Tests

Experiments on time of planting corn were conducted at 9 Alabama locations from 1953 through 1957. Locations included 4 stations in northern, 2 in central, and 3 in southern Alabama. Varieties varied between locations and from year to year.

Early or short season hybrids used were Funk G-50, McGurdy 95, and PAG 61. Medium season varieties were Funk G-711, Funk 779-W, PAG 620, PAG 631, and U. S. 13. Late and very late varieties included Coker 811, Coker 911, Dixie 11, Dixie 18, Dixie 29, Dixie 33, Funk G-714, La. 521, and Tenn. 10.

Results are presented in the table. Yields for the best dates in these experiments are in bold type. Experiments were not the same at all locations within a region. Therefore, some hybrid types were tested more frequently than others and comparisons cannot be made of yields in the table between maturity groups. These data are suitable only for comparing dates of planting for individual maturity groups of corn within a region. The Experiment Station Corn Variety Report should be used in selecting hybrids to be planted.

Results show that in each region there is a tendency for hybrids of later maturity to have earlier best planting dates. Early maturing hybrids should be planted later than the full season corns. This is in contrast to the common practice of planting the short season hybrids for early hogging-off. The data show that early planting of early hybrids will result in yield loss. This loss is great enough in most cases to justify planting the more productive medium or full season hybrids, harvesting, and storing the corn for feeding the following summer. For these reasons, early maturing hybrids are not generally recommended.

Plant For Rainfall

These results on date of planting appear reasonable when considering rainfall distribution in most areas of Alabama. May and June are the driest summer months. Rainfall increases considerably in July and August. Therefore, it is logical that quick-maturing corns should be planted late so that their period of maximum water need will come when rain is most probable. By the same reasoning, full season corns should be planted earlier.

As was expected, results show that all types of corn should be planted earlier in southern than in northern Alabama. Best planting dates are:

Northern Alabama

Early varieties.....April 20 to May 10
Medium varieties.....April 10 to April 30
Late varieties.....April 1 to April 20

Central Alabama

Early varieties.....April 10 to April 30
Medium varieties.....(Inconclusive data)
Late varieties.....April 1 to April 20

Southern Alabama

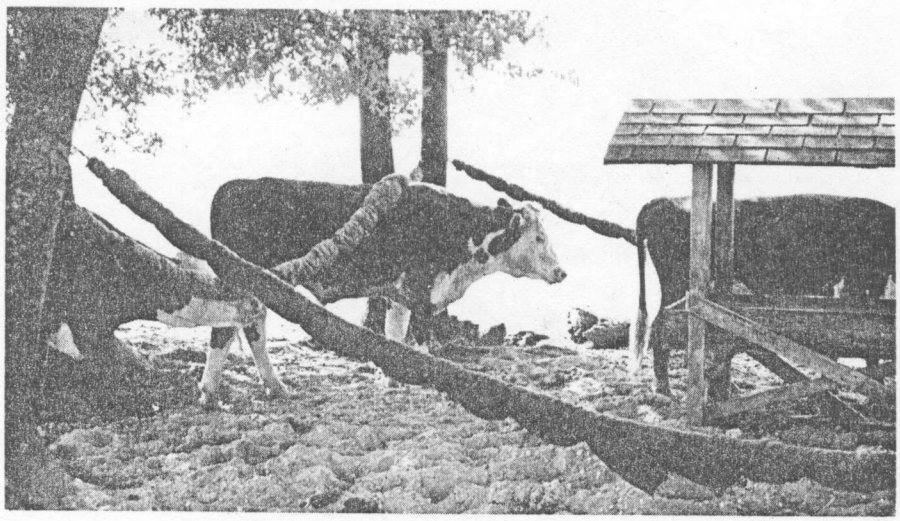
Early varieties.....April 1 to April 20
Late and very late varieties.....March 20 to April 10

These dates are about the same as recommended dates for planting cotton. Time of planting is less critical for corn than for cotton. It is usually wise not to plant all corn at one time because of probability of drought. For farmers producing both cotton and corn, it is wise to plant late varieties of corn first, then plant cotton, and finish planting with the shorter season corn hybrids.

CORN YIELD FROM DATE OF PLANTING EXPERIMENTS AT NINE LOCATIONS, 1953-57

Maturity of hybrids	Times tested	Per acre yield from different planting dates									
		Mar. 1	Mar. 11	Mar. 21	Mar. 31	Apr. 10	Apr. 20	Apr. 30	May 9	May 19	May 29
	No.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
NORTHERN ALABAMA[1]											
Early	23				46.4	47.9	**52.0**	**51.8**	**51.5**	47.3	39.0
Medium	20				53.8	**55.2**	**57.6**	**55.7**	54.0	54.0	47.0
Late	10				**55.3**	**57.3**	**55.4**	50.6	49.8	48.2	40.8
CENTRAL ALABAMA[2]											
Early	9		33.5	35.6	39.8	**45.4**	**46.4**	**45.9**	41.7	39.6	
Medium	4		23.2	23.1	29.8	40.1	40.2	**43.4**	**44.0**	44.2	
Late	7		41.0	46.4	**55.4**	**55.6**	52.2	50.0	49.7	46.7	
SOUTHERN ALABAMA[3]											
Early	11	23.4	26.3	40.1	**44.2**	**45.7**	**42.2**	34.5	27.1	22.4	
Late	13	**50.7**	**48.5**	**47.6**	**47.1**	**45.6**	41.2	33.5	24.6	21.0	
Very late	15	47.7	48.9	**61.4**	**60.7**	**59.3**	54.6	46.8	41.3	37.6	

[1] Sand Mountain, Tennessee Valley, and Upper Coastal Plain Substations and the Alexandria Field.
[2] Aliceville and Prattville Fields.
[3] Gulf Coast and Wiregrass Substations and the Brewton Field.



Cattle walking under backrubbers get application of insecticide for pest control.

BACKRUBBERS—
cheap and easy method of controlling livestock pests

KIRBY L. HAYS, *Assistant Entomologist*

CONTROLLING ANY INSECT pest is costly and requires a lot of work. Finding ways of reducing cost and simplifying the work is an aim of all insect control research.

Better and cheaper methods are especially needed for controlling external parasites of livestock. Although sprays of several insecticides give good control of horn flies and other pests, many cattlemen do not follow a consistent spray program because of the work and expense.

Backrubbers Show Promise

A method of controlling cattle pests that shows promise of saving both time and money is the use of backrubbers. These devices apply small quantities of insecticide to the backs of animals as they walk under. This eliminates the necessity for penning and spraying animals at frequent intervals.

Single backrubbers have been used for many years by U.S. farmers. They control insects satisfactorily in small pastures and other areas in which animals come in contact often with the rubber. However, the single type is not adequate in large pastures or pastures with large woodlots.

In research at the Lower Coastal Plain and Black Belt Substations, a special type backrubber that is simple to make has proved to give good cattle insect control. The items necessary for construction can be found on most farms or purchased for as little as $5. A few strands of barbed wire, some burlap bags, and binder twine are all that is needed.

An area frequented by animals and preferably shaded is best for constructing the backrubber. Three or 4 trees forming a square or triangle about 16 ft. on each side are ideal to use, but well braced posts can be used. Three strands of barbed wire are twisted together and fastened to the trees or posts enclosing the square or triangular area. The wire is fastened 4 ft. from the ground at each end and allowed to sag to about 20 in. above the ground in the middle.

After securing wires to posts or trees they are wrapped with 2 to 3 layers of burlap, making a roll about 6 in. in diameter. The topmost layer of burlap breaks the joints in the layer below. Binder twine is used to tie the burlap securely.

Insecticide-Oil Mixture

An insecticide-oil mixture is used on the backrubber. One gal. is enough for 16 ft. for the first treating. After that, applications of ½ gal. per 16 ft. are needed every 2 to 3 weeks. Yearly cost of the insecticide-oil mixture is about 15¢ to 20¢ per animal where large herds are treated.

In the tests, 5% DDT, 2½% malathion, or 2½% Korlan have given good control of horn flies. An emulsifiable formulation of insecticide is mixed with oil for applying on the backrubber. Under Alabama conditions, a 3-to-1 mixture of No. 2 diesel fuel and 30W motor oil has been satisfactory. Burned motor oil should not be used since toxic substances may irritate animal's skin.

Salt Ensures Application

A salt trough or block of salt placed in the center of the backrubber area ensures that animals pass under the backrubber, provided salt is not supplied at other locations. In coming to get salt at least twice each week, the cattle will get applications of the insecticide for control of horn flies and other external parasites.

Single backrubbers provide adequate insect control under suitable situations. In pastures of 10 acres or less they are usually adequate when constructed in loafing areas and a block of salt placed nearby. They are also satisfactory when erected across lanes or openings in fences through which animals often pass.

Backrubbers should be constructed before the "fly season" begins for cattle to become accustomed to them. They should not be used on dairy animals because insecticides are taken into the body and get into milk.

Index to Articles Published in

HIGHLIGHTS *of* AGRICULTURAL RESEARCH

1954-1958

LISTED according to subject on these two pages are 146 articles published in the first five volumes of HIGHLIGHTS OF AGRICULTURAL RESEARCH. Extra copies of all issues excepting Volume 3, Number 4, winter issue of 1956, are available to readers who are missing copies and wish to complete their files of the quarterly. Write Editor, API Agricultural Experiment Station, Auburn, Ala., for needed copies; specify volume, number, and issue date.

Animal Breeding

BEEF BREEDERS AIDED BY SIRE-TESTING PROGRAM—Gregory. Vol. 1, No. 2. 1954.

BETTER HOGS THROUGH PERFORMANCE TESTING—Squiers. Vol. 4, No. 2. 1957.

CATTLEMEN KEEP SHARP EYES ON PERFORMANCE TESTS—Warren. Vol. 4, No. 3. 1957.

HIGHER MILK PRODUCTION FROM BETTER SIRED REPLACEMENTS—Autrey. Vol. 1, No. 1. 1954.

SUPERIOR HOGS SOUGHT IN BREEDING PROGRAM—Squiers. Vol. 1, No. 3. 1954.

Animal Production

HOGS NEED ZINC TOO!—Tucker. Vol. 3, No. 2. 1956.

MANAGED CALF CROP INCREASES BEEF PROFITS—Anthony and Warren. Vol. 4, No. 1. 1957.

NITROGEN — NOT GUILTY OF GRASS TETANY—Roberts. Vol. 3, No. 4. 1956.

PASTURE OR CONCRETE FOR GROWING HOGS—Tucker. Vol. 4, No. 3. 1957.

SELECTION—THE KEY TO MORE FALL LAMBS—Wiggins. Vol. 5, No. 4. 1958.

SHEEP—ON THE COMEBACK IN ALABAMA—Martin. Vol. 2, No. 4. 1955.

Crop Storage

PEANUTS LOSE WEIGHT IN STORAGE—Yeager and Ward. Vol. 5, No. 3. 1958.

STORING GRAIN CAN BOOST PROFITS—White and Yeager. Vol. 5, No. 2. 1958.

WHAT HAPPENS TO PEANUTS DURING STORAGE?—Ward, Yeager, and Butt. Vol. 2, No. 3. 1955.

Dairy Husbandry

COASTAL BERMUDAGRASS VERSUS ALFALFA HAY AS A DAIRY FEED—Hawkins. Vol. 5, No. 3. 1958.

HOW MUCH PROTEIN FOR DAIRY COWS?—Hawkins. Vol. 5, No. 4. 1958.

NO STOOP—NO SQUAT! V-TYPE PARLOR CUTS MILKING TIME 25% PER COW—Yeager, White, and Alvord. Vol. 2, No. 2. 1955.

PORTABLE PENS SUPERIOR FOR RAISING CALVES—Autrey. Vol. 1, No. 2. 1954.

RAISE HEIFERS CHEAPER BY CUTTING OUT GRAIN—Autrey and Hawkins. Vol. 5, No. 1, 1958.

SERICEA—SHORT AS A NUTRITIVE ROUGHAGE—Hawkins. Vol. 3, No. 4. 1956.

Farm Buildings

A SINGLE DESIGN FOR LOW-COST BARNS—Grub. Vol. 3, No. 2. 1956.

ENJOY COOLER SUMMER TEMPERATURES FROM ATTIC VENTILATION—Grub. Vol. 5, No. 2. 1958.

MILKING PARLOR DESIGNED WITH POCKETBOOK IN MIND—Grub. Vol. 4, No. 3. 1957.

RESEARCH RESULTS SHOW FARM STORAGE IS SAFE AND PROFITABLE—Butt. Vol. 1, No. 2. 1954.

Farm Economics

ALABAMA'S CHANGING AGRICULTURE—Yeager. Vol. 3, No. 4. 1956.

FARMING ON 30 ACRES—Blackstone and Gissendanner. Vol. 5, No. 4. 1958.

OPPORTUNITY TO GROW—Wilson. Vol. 5, No. 3. 1958.

PRODUCTIVITY — THE BASIS OF FARM LAND VALUES—Alvord. Vol. 2, No. 4. 1955.

TANKS REPLACE MILK CANS—Marshall and Yeager. Vol. 4, No. 2. 1957.

TREND TOWARD LARGER FARMS IN ALABAMA—Yeager. Vol. 3, No. 2. 1956.

Fertilization

BELIEVE IN SIGNS? DISCOLORED CAMELLIA LEAVES INDICATE DEFICIENCY OF PLANT NUTRIENTS—Orr. Vol. 2, No. 2. 1955.

GROW OR BUY NITROGEN FOR CORN?—Cope. Vol. 2, No. 3, 1955.

LIME FOR GOOD STAND AND YIELD OF COTTON—Rouse and Adams. Vol. 5, No. 4. 1958.

MAINTAINING ENOUGH SOIL POTASSIUM IMPORTANT—Rouse. Vol. 3, No. 1. 1956.

PECANS NEED ZINC—Hagler, Vol. 3, No. 1. 1956.

SOIL TESTING—LEADING TO IMPORTANT CHANGES IN FERTILIZATION—Wilson. Vol. 3, No. 3. 1956.

SOIL TESTING MAKES IT POSSIBLE FOR ALABAMA FARMERS TO GET THE MOST FROM THEIR FERTILIZER DOLLARS—Wilson. Vol. 1, No. 3. 1954.

SOIL TESTS—THE KEY TO MORE PROFITS FROM PEANUTS—Scarsbrook and Cope. Vol. 2, No. 4. 1955.

SULFUR IS A NECESSARY ELEMENT FOR PLANT LIFE—Ensminger. Vol. 4, No. 1. 1957.

WINTER LEGUME CROPS FOR GREEN MANURE—Cope. Vol. 5, No. 3. 1958.

Field Crops

A QUICK TEST FOR SEED PEANUTS—Browne. Vol. 5, No. 4. 1958.

HOW COTTON YIELDS ARE AFFECTED BY DEPTH OF SEEDBED PREPARATION—Corley, Stokes, and Kummer. Vol. 1, No. 2. 1954.

IMPROVED SORGHUMS PRODUCE HIGH YIELDS OF SILAGE AND SYRUP—Langford and Stokes. Vol. 3, No. 2. 1956.

MAN-MADE WEATHER FOR COTTON RESEARCH—Rouse and Sowell. Vol. 3, No. 4. 1956.

MORE MOLASSES FOR ALABAMA—Cope. Vol. 4, No. 3. 1957.

PLANTING COTTON ON TIME URGENT THIS YEAR—Cope. Vol. 5, No. 1. 1958.

RESULTS TELL TIME FOR PLANTING OATS—McCain and Selman. Vol. 2, No. 3. 1955.

WILEY SORGO—A NEW VARIETY FOR QUALITY SIRUP PRODUCTION — Langford. Vol. 4, No. 1. 1957.

Fish Production

ARE FARM PONDS WORTH THE MONEY?—Hutchinson and White. Vol. 5, No. 3. 1958.

GROWING DEMAND FOR FISHING PERMITS ON FARM PONDS—Prather. Vol. 5, No. 1. 1958.

NOW COMMERCIAL FISH FARMING—Swingle. Vol. 5, No. 4. 1958.

SAVE IT! WHY HAUL IT?—Swingle. Vol. 4, No. 3. 1957.

Food Processing

NEW PROCESS PRODUCES SUPERIOR JAM AND JELLY—Harris. Vol. 4, No. 4. 1957.

NEW USES FOR LOW GRADE SWEETPOTATOES—Harris and Barber. Vol. 5, No. 3. 1958.

Forage Crops and Pastures

CRIMSON CLOVER—STILL THE TOP FORAGE PRODUCER—Langford. Vol. 4, No. 4. 1957.

FALL AND WINTER GRAZING FOR ALABAMA—Langford. Vol. 1, No. 2. 1954.

PASTURE RENOVATION — Patterson and Searcy. Vol. 5, No. 2. 1958.

PERENNIAL SUMMER GRASSES FOR UPLAND PASTURES—Langford. Vol. 4, No. 2. 1957.

QUALITY PASTURES ARE MONEY SAVERS!—Evans. Vol. 3, No. 2. 1956.

Forestry

EVEN ON ABANDONED CROP LAND PINES PAY—Livingston and Carothers. Vol. 2, No. 3. 1955.

SOIL AND QUALITY PINE SEEDLINGS—May and Gilmore. Vol. 4, No. 1. 1957.

THIN OR NOT TO THIN?—Livingston. Vol. 3, No. 3. 1956.

THIRTY YEARS RESEARCH HAS PROVIDED TIMBER OWNERS BETTER METHODS FOR HIGHER RETURNS—DeVall. Vol. 2, No. 2. 1955.

TREES CAN BE NO BETTER THAN THEIR PARENTS—Garin and May. Vol. 1, No. 1. 1954.

WHAT'S YOUR WOODLOT WORTH?—Christen. Vol. 4, No. 4. 1957.

Fruits and Vegetables

BEAN AND SQUASH YIELDS UPPED BY SOIL FUMIGATION—Jonnson and Ware. Vol. 5, No. 4. 1958.

EARLY PEACHES MEAN MORE PROFITS FOR GROWERS—Hagler and Johnson. Vol. 2, No. 4. 1955.

FERTILITY IMPORTANT TO QUALITY PRODUCTION—Hagler and Carlton. Vol. 3, No. 4. 1956.

MINOR ELEMENTS FOR FRUIT AND VEGETABLES—Wear and Hagler. Vol. 5, No. 3. 1958.

Insects and Controls

A Word of Caution About Insecticidal Residues—Blake. Vol. 4, No. 4. 1957.

Are Alabama Boll Weevils Getting Harder to Kill—Arant and Burkhalter. Vol. 5, No. 1. 1958.

Boll Weevil—Then and Now—Roy and Arant. Vol. 5, No. 3. 1958.

Control Soil Insects with Insecticide Fertilizer Mixtures—Eden. Vol. 4, No. 3. 1957.

Cotton Insects Can Cost State's Growers $50 Million in a Single Year—Arant. Vol. 2, No. 2. 1955.

Facts About the Imported Fire Ant—Arant, Hays, and Speake. Vol. 5, No. 4. 1958.

Fight Against Grain Insects Begins Now!—Eden. Vol. 3, No. 1. 1956.

Imported Fire Ant—On the March in Alabama—Blake. Vol. 3, No. 3. 1956.

Insects are Forests' Worst Enemy—Hyche. Vol. 5, No. 3. 1958.

Insect Damage to Stored Corn Can be Greatly Reduced—Eden. Vol. 1, No. 2. 1954.

Life History of European Corn Borer Important—Eden. Vol. 5, No. 2. 1958.

Peanuts—A Favorite Delicacy of Stored Food Insects—Hyche and Arthur. Vol. 2, No. 3. 1955.

Progress Made in Control of European Corn Borer—Eden. Vol. 4, No. 1. 1957.

Systemics — A New Approach to Fighting Ornamental Plant Insects—Arthur. Vol. 2, No. 1. 1955.

Systemics May be Future Control of External Parasites—Adkins. Vol. 3, No. 2. 1956.

Irrigation

Irrigation? Depends on Reliable Water Source, Costs of System and Operation, and Use of Good Methods—Wilson. Vol. 1, No. 3. 1954.

Plastic Hose a Labor Saver in Sprinkler Irrigation—Bouwer and Helms. Vol. 4, No. 2. 1957.

What's to be Gained from Irrigation of Peaches—Hagler and Carlton. Vol. 5, No. 1. 1958.

Marketing

Cash in On—Seasonal Price Changes—White and Yeager. Vol. 3, No. 1. 1956.

Egg Profits or Losses? Profitable Operation Hinges on Good Management and Marketing Practices — Blackstone and Henderson. Vol. 1, No. 3. 1954.

Factors Affecting Farm Prices of Livestock and Livestock Products—Lanham. Vol. 1, No. 2. 1954.

Freeze 'Em! Surplus Eggs Can Be Processed for Home Use and for Market—Goodman. Vol. 2, No. 2. 1955.

Market Facilities Lagging Behind Peach Production—Danner and Smith. Vol. 5, No. 2. 1958.

Presto-Pi Liked By Consumers in Study—Marshall and Danner. Vol. 5, No. 4. 1958.

Shoot for Heavier, Quality Calves Says Market Study—Danner. Vol. 4, No. 1. 1957.

Which Meat gets Shoppers' Dollars? Marshall and Danner. Vol. 5, No. 1. 1958.

Wide-Open Market for High Quality Christmas Trees—Alvord. Vol. 4, No. 4. 1957.

Mechanization

Land Selection and Preparation are First Steps in Cotton Mechanization—Corley, Stokes, and Kummer. Vol. 1, No. 3. 1954.

Cotton Insecticides of Little Value if Not Properly Applied—Corley, Stokes, and Kummer. Vol. 2, No. 2. 1955.

Mechanical Harvest Takes Away Drudgery of Hand Picking — Corley, Stokes, and Kummer. Vol. 3, No. 3. 1956.

Planting and Cultivating are Important Steps in Cotton Mechanization—Corley, Stokes, and Kummer. Vol. 2, No. 1. 1955.

Work-Free Dairy Feeding — Rollo. Vol. 4, No. 4. 1957.

Plant Breeding

A More Tasty, Nutritious Sericea Is Now Possible—Donnelly and Hawkins. Vol. 1, No. 3. 1954.

Cooperation Speeds Up New Corn Hybrids To Farmers—McCain. Vol. 1, No. 1. 1954.

New Alabama White Clover Now in the Making—Gibson. Vol. 1, No. 1. 1954.

New Cottons and Corns are Products of Years of Plant Breeding—Smith and McCain. Vol. 2, No. 1. 1955.

Vegetable Varieties for Alabama Conditions—Isbell. Vol. 1, No. 1. 1954.

Plant Diseases

Disease Control of Small Grains Has Two-fold Purpose—Lyle. Vol. 5, No. 3. 1958.

Research Points to Arrest of Plant World Thugs Threatening White Clover—Curl. Vol. 2, No. 3. 1955.

Seed Treatment Protects Seedling Oats Against Disease and Results in Better Stands—Lyle. Vol. 2, No. 2. 1955.

Terraclor Effective Control for Southern Blight—Diener. Vol. 5, No. 2. 1958.

Poultry Husbandry

Auburn Strain White Leghorn — Moultrie, King, and Cottier. Vol. 1, No. 1. 1954.

Boron Fed Layers Keeps Down Flies—Goodman. Vol. 5, No. 2. 1958.

CRD—A Dreaded Poultry Disease Complex—McNeil. Vol. 3, No. 3. 1956.

Do Antibiotics Increase Egg Production?—Ingram. Vol. 5, No. 3. 1958.

Even More Meat Per Pound of Feed May Be Expected from Poultry Nutrition Research—Ingram. Vol. 2, No. 1. 1955.

Fowl Pox—A Constant Threat—Edgar and Bond. Vol. 4, No. 2. 1957.

Hybrid Vigor at Lower Cost—Moultrie, Cottier, and King. Vol. 2, No. 3. 1955.

Leucosis—the Killer of 50 Million Hens a Year in the U.S.—Cottier, Moultrie, and King. Vol. 2, No. 4. 1955.

Light for Broilers—How Much?—Moore and Moultrie. Vol. 3, No. 4. 1956.

More Eggs for Market in the Fall—King. Vol. 1, No. 2. 1954.

New Remedy for Roundworms in Poultry—Edgar. Vol. 3, No. 2. 1956.

Quality Broilers at Lower Feed Costs—Cottier. Vol. 4, No. 4. 1957.

"Stimulighting" Hens—a New Development for Upping Egg Production—King. Vol. 5, No. 1. 1958.

Worms Cut Production of Chickens—Edgar. Vol. 5, No. 3. 1958.

You Can Now Inoculate Against Coccidiosis—Edgar. Vol. 3, No. 1. 1956.

Soil Pests and Soil Borne Diseases

Fumigants — Destroy Soil Pests — Lyle, Cairns, and Smith. Vol. 2, No. 4. 1955.

Microbe Versus Microbe—Curl. Vol. 4, No. 2. 1957.

Nematodes and Root-Rot Cause Seedling Damage—Hopper. Vol. 5, No. 3. 1958.

Nematodes—Tiny But Mighty—Research Under Way Points to Development of Better and Cheaper Controls—Cairns. Vol. 2, No. 1. 1955.

Variety Testing

Better Yields Result from Crop Variety Testing Program—Rogers. Vol. 1, No. 1. 1954.

Weed Control

Chemical Control of Johnson and Bermudagrass Now a Fact—Searcy. Vol. 4, No. 1. 1957.

Chemical Weed Control in Cotton Cuts Hoe Labor 80-100%—Searcy. Vol. 2, No. 1. 1955.

Radioactive Herbicides Aid Research—Davis, Funderburk, and Sansing. Vol. 5, No. 3. 1958.

2,4-D Effects on Oats—Searcy and Sharman. Vol. 5, No. 4. 1958.

Weed Strawberries with Chemicals—Livingston, Carlton, and Hagler. Vol. 4, No. 2. 1957.

Weeds in Pastures Costly—Searcy. Vol. 3, No. 1. 1956.

Wild Garlic and Onions Now Can Be Controlled—Searcy. Vol. 3, No. 4. 1956.

Wildlife

Feathers—The Signs of Age—Haugen. Vol. 3, No. 3. 1956.

Saint or Sinner?—Davis and Haugen. Vol. 4, No. 3. 1957.

Miscellaneous

A Report from the Agricultural Experiment Station—Smith. Vol. 3, No. 1. 1956.

New Buildings for Teaching and Research—Smith. Vol. 5, No. 4. 1958.

Nuclear Energy and Farm Research at Auburn—Wilson. Vol. 3, No. 3. 1956.

Plant and Animal Breeding—What it Means to the Farmer—Simmons. Vol. 1, No. 1. 1954.

Research Units Form System Serving All of Alabama—Smith. Vol. 1, No. 2. 1954.

The Black Belt Substation Story—A Review of Services to the Region—McGraw, and Smith. Vol. 5, No. 4. 1958.

Today's Research and Tomorrow's Demands—Wilson. Vol. 2, No. 4. 1955.

Too many DEER *in* ALABAMA?

WILLIAM H. ADAMS, *Graduate Research Assistant*

You may be able to have your own deer hunt in the near future if the present rate of increase in deer population continues.

Since deer respond well to restocking and subsequent protection, a rapid increase of deer in Alabama has occurred during the last decade. The initial restocking program, started during the CCC era, has expanded and today there are about 85,000 deer in 56 counties. At this rate, the next decade may find peak populations of deer in every accessible "nook and cranny" of suitable habitat even including some farmland.

To date, these deer have been confined primarily to large tracts of timberland and National Forests. However, as deer become overcrowded, they leave woodlands and go into fringe areas near farmland where they actually fare better.

Research Conducted

In anticipation of future increases research studies on the Choccolocco Wildlife Management Area in northeastern Alabama were conducted by the Cooperative Wildlife Research Unit of Auburn. Range surveys, census, and hunter-kill data indicate that deer numbers in Choccolocco are at or beyond carrying capacity. This area is overcrowded because deer reproduce so rapidly they will exceed the carrying capacity of their range if annual surpluses are not removed.

Although 898 bucks have been harvested since 1948, kill records indicate the rate of increase still exceeds the rate of removal. This information shows a remaining breeding population of about 2,000 deer with a sex ratio of 1 buck to 3 does. The estimated 1958 crop of 1,500 fawns swells the total population to 3,500 deer. This number is far in excess of the overwintering capacity of the Choccolocco range for maximum yield. Barring heavy winter mortality, the 1959 crop of perhaps 2,000 fawns will swell the total population beyond 5,000 deer. Therefore this year's hunter will be confronted with a population of 80 deer to the square mile or 1 deer for every 8 acres.

Adequate Food Needed

This is the story of deer range with inadequate harvest. If deer are allowed to exceed range carrying capacity, lowered productivity and food shortage will result. Young deer are the first to feel the effects of food shortage, especially nutritious items. This is reflected in antler development. The dwindling number of branched antlers in 1½-year old Choccolocco deer demonstrates this fact. At 1½-years, well-fed deer can be expected to produce good racks instead of spindly spikes.

Percentage of Bucks with Spikes at Choccolocco—1½ Years of Age

Year	*Pct.*
1955	76
1956	82
1957	98

Experience has shown that removal by hunting is the only practical way to harvest surplus deer when natural losses are at a minimum. This cannot be done by removing male deer only. Therefore, the logical solution to this deer problem is management employing biological indicators to detect unfavorable trends. When the trend is toward overpopulation, hunting of either sex should be permitted under managed conditions. This will ensure adequate harvest of surplus and prevent range abuse.

Sportsmen Opinions

How do sportsmen feel about legalizing doe hunting in order to maintain healthy herds? Opinions from 568 hunters in Choccolocco recently showed that 79% approved, 20% disapproved and 1% withheld opinion on shooting does.

What can you do with deer on your farm? Will you manage them like livestock by estimating your annual surplus and removing it by hunting or will you mismanage them and allow excessive numbers to damage crops and compete with livestock for grazing?

FREE Bulletin or Report of Progress
AGRICULTURAL EXPERIMENT STATION
of the ALABAMA POLYTECHNIC INSTITUTE
E. V. Smith, Director
Auburn, Alabama
Permit No. 1132—2/59-8M

PENALTY FOR PRIVATE USE TO AVOID PAYMENT OF POSTAGE, $300