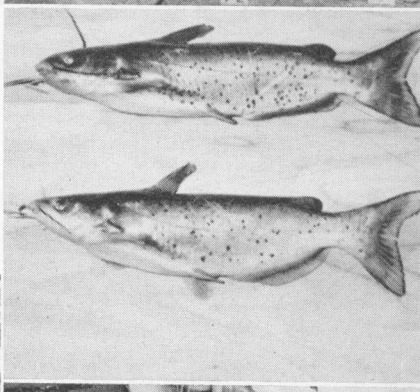
Mr Andrews Edw

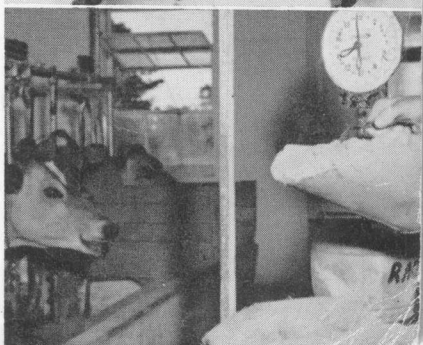
WINTER 1958

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 5, No. 4 WINTER, 1958

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.

Bul. 313. Growth of Pine Plantations in Alabama's Coastal Plain.

Leaflet 57. What Can I Pay for Feeder Pigs?

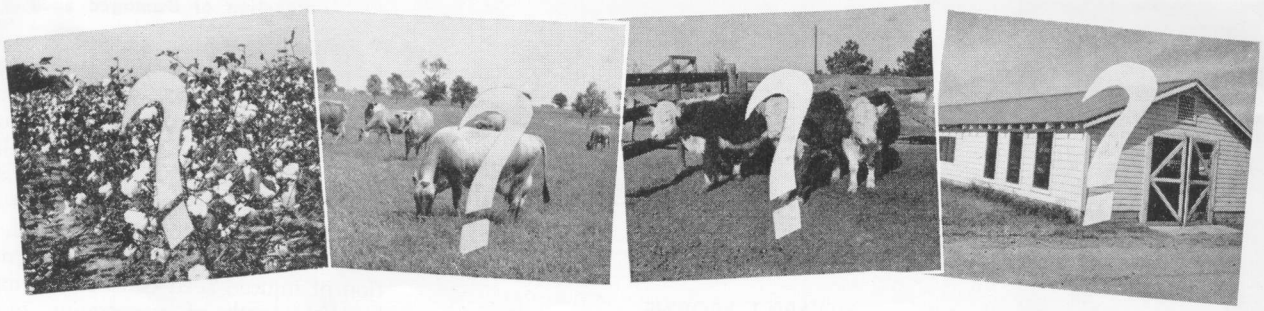
Leaflet 58. Supplementary Illumination of Poinsettias.

Leaflet 59. Effects of Storage and Forcing Temperature on Easter Lily Growth.

Leaflet 60. A Comparison of Starr Millet Sweet Sudangrass, Johnsongrass as Da Forages.

Progress Report 68. Breeding Meat-Type Hogs for Alabama.

Free copies may be obtained from your county agent or by writing the API Agricultural Experiment Station, Auburn, Ala.



FARMING *on* 30 ACRES

J. H BLACKSTONE, *Agricultural Economist*
S. E. GISSENDANNER, *Superintendent, Sand Mountain Substation*

A 30-ACRE FARM presents a challenge in farm management, and Alabama has a lot of challenges. About 30%, or more than 50,000 farms, are between 20 and 49 acres in size.

Income from cash crops on farms of this size is usually not enough for family needs. Opportunities for supplementing income by the addition of one or more livestock enterprises are more limited than on larger farms. The land area is too small for efficient production of beef or milk from grazing crops. Choices are limited to those enterprises that use a high proportion of labor per unit of land and that can be operated with purchased feeds. Broilers and layers are good examples of such enterprises.

Production Unit Study

A fairly typical 30-acre farm has been operated for several years as a cotton-poultry unit by the Sand Mountain Substation at Crossville, Alabama. In recent years, the land on this farm has been used as follows: cotton 3.6 acres, corn 23, alfalfa 1, and farmstead buildings, lots, garden, and roads 2.4 acres. Cotton yields have varied from a low of 400 lb. of lint per acre to a high of more than 1,000. Corn yields varied from 20 to 60 bu. per acre.

The poultry flock is kept in 3 houses. Each house is built to handle 500 to 550 laying hens. Two houses are in constant use for layers. One house is used as a brooder house from January through July. About, 1,200 sexed baby chicks are placed in the brooder house in early February. The young hens are divided between 2 houses in July. One house of old hens is carried over from July to late December or early January each year. While the house capacity is approximately 1,500 layers on the floor, the system of management would provide for an average of about 1,200 layers on hand for the year. In 1956, there was an average of 1,146 layers on hand and they produced an average of 226 eggs. In 1957, there was an average of 1,240 layers on hand with an average production of 209 eggs. Total production for each of these two years was about 21,600 dozen eggs. All eggs were sold at the farm to a local produce dealer at wholesale prices. All layers are fed "cafeteria" style. A 32% protein supplement and shell corn are before the layers at all times.

Returns

Cotton yields were extremely good in 1956 but far below normal in 1957. Egg sales averaged 35.17¢ per dozen in 1956 and 33.95¢ in 1957. The differences in cotton yields and egg prices led to a drop in gross cash sales of some $1,200 from 1956 to 1957. However, sales were sufficient in each of these years to pay all expenses, allow for depreciation of buildings, machinery and equipment, feed and supplies, and of the flock; and to pay 6% interest on average investment; and to pay the operator approximately $1 per hour for all work done on the farm.

Experience with this unit has shown that income on small farms can be increased by addition of a flock of laying hens. The money available to this farm operator for family living has been considerably above that of the average Alabama farm family. The figures do not reflect the value of the food consumed by the family. Considering gross income, home produced foods, and "free house rent," this operator has fared as well or better than many others who have left farms to seek industrial employment. Since Alabama and the Southeast use many more table eggs than are produced in the region, there are opportunities for increasing income on many small farms by addition of a flock of laying hens.

Possibilities

The program followed on this unit should be regarded as the first step in adjustment rather than the ultimate goal for 30-acre farms. At present the operator does all farm work on this unit except for some labor hired to chop, hoe, and pick cotton. Even so, the farm provided employment for only about 60% of the man's time.

The next step is to provide profitable employment for all of the man's time. This can be accomplished in a number of ways. The layer flock can be increased or the eggs can be retailed on routes in nearby towns. Or the operator can use his spare time for part-time, off-farm employment.

With the growing trend toward greater specialization and the increasing use of newer and more efficient machinery, it may be more profitable for the operator to specialize in one enterprise. He might, for example, acquire sufficient additional land to provide full employment and justify the purchase of special machinery for certain jobs such as sprayers or combines. By giving up all row crops on the other hand and devoting full time to the layer flock, the number of hens could be increased to 5,000, or possibly more if automatic feeders were installed.

The 30-acre farmer is not doomed!

Like all other people, he must adjust as conditions change. There are abundant opportunities for adjustment and each farmer can choose among these opportunities and select those most suited to his needs and wishes.

A QUICK TEST *for* SEED PEANUTS

EDWARD T. BROWNE,
Assistant Botanist

PEANUT GROWING would be much simplier if a farmer could look at a sack of seed peanuts and know that he would get a stand in the spring.

It is almost that simple now since a new chemical seed testing method has been developed by the API Agricultural Experiment Station. The test will tell in a few hours the per cent germination of seed peanuts. It saves time when compared to the standard germinator test that requires 10 days.

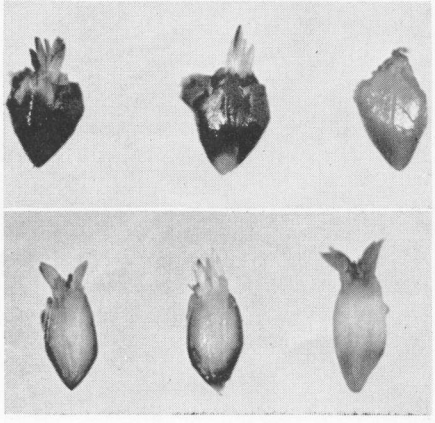
Research Conducted

For several years various tests have been made at the Station with peanut seed using a chemical solution to stain living tissues. The chemical used is TTC, an abbreviation for 2,3,5-triphenyltetrazolium chloride. When used, living tissues are stained red while dead tissues are unstained. Research results have shown that TTC may be used successfully on a wide variety of seeds including corn, wheat, rice, and soybeans. However, satisfactory results have been achieved on peanuts only within the past 14 months. Prior to that time, staining was accomplished, but certain changes in procedure and staining reactions were required before germination percentage could be properly determined.

Testing Method

The test for germination is performed by using a 1% solution of TTC in water adjusted to pH 7. The germ of the peanut, the part involved in growth of the stem, leaves, and roots in germination, is removed and placed in warm water at 115° F. for 1 hour. The water is then replaced with the TTC solution and held at 115° F. for 1 hour. The solution is removed and the germ is rinsed in water and analyzed. One hundred seeds selected at random have proved satisfactory for determining germination of most lots of peanuts used at the Station.

At first, external staining of the germs was used to measure seed condition. However, it was later observed that this stain did not completely penetrate the germs. Furthermore, germs could not be placed into two classes, stained and unstained. It was found that many peanuts that did stain in some areas would not germinate. Consequently, by halving the germs lengthwise with a razor blade after staining, it was possible to determine in most cases those seed that would germinate.



At top are whole peanut germs, at bottom are germs halved lengthwise. Left, normal staining; center, injury to germ; and right, no staining indicating a dead germ.

Reaction of Damaged Seed

Usually the peanut germ is stained in a very narrow zone at the outside edge. However, where the germ has been injured in picking, or more often in shelling, there is either no stain at these places or only a very light stain Slight injury apparently does not prevent germination of peanut seed, but deep-seated injury can. The germination of injured seed can be determined by the depth of penetration of the stain beneath the point of injury. When normal germs have been stained and halved lengthwise, a very fine U-shaped zone can usually be observed within. Ways to tell if the germs are dead are: The stain crosses this U-shaped zone isolated spots of stained tissue; a general staining in the length of the germ; no staining in the germ; large areas of stain in the germ.

Varieties Tested

Until this method was perfected it was not often possible to determine germination by TTC staining. However, dependable results have been obtained for nearly all lots of varieties tested by this method. Varieties tested include: Dixie Runner, Early Runner, Dixie Spanish, Virginia Bunch 67 Georgia 119-20, Florispan, and Southeastern Runner 56-15. This included seed cured by various methods and seed of high, medium and low germinability. Some seed tested had been in storage for 2 years. The quick test is more difficult to interpret in seed of low germination and old seed.

The value of this test is that it is simple. With a little experience anyone can run the test. Except for a constant temperature chamber or oven to hold the temperature at 115° F., no special equipment is necessary. It is important to select seed at random. All seed with germs destroyed or badly injured by insects should be counted since these would, in all probability, be included with good seed in a germinator test.

STAINING AND GERMINATION TESTS COMPARED

Variety	Viability by	
	TTC staining	Germinator
	Pct.	*Pct.*
Florispan	75	69
Dixie Runner	75	74
Georgia 119-20	39	22
Dixie Spanish	89	92
Early Runner	70	73
Virginia Bunch 67	59	63

SELECTION--*the key to more* FALL LAMBS

E. L. WIGGINS, *Associate Animal Breeder*

LAMBS THAT REACH market weight in the spring when prices are high are most desirable. To have these, ewes must be bred in May and June.

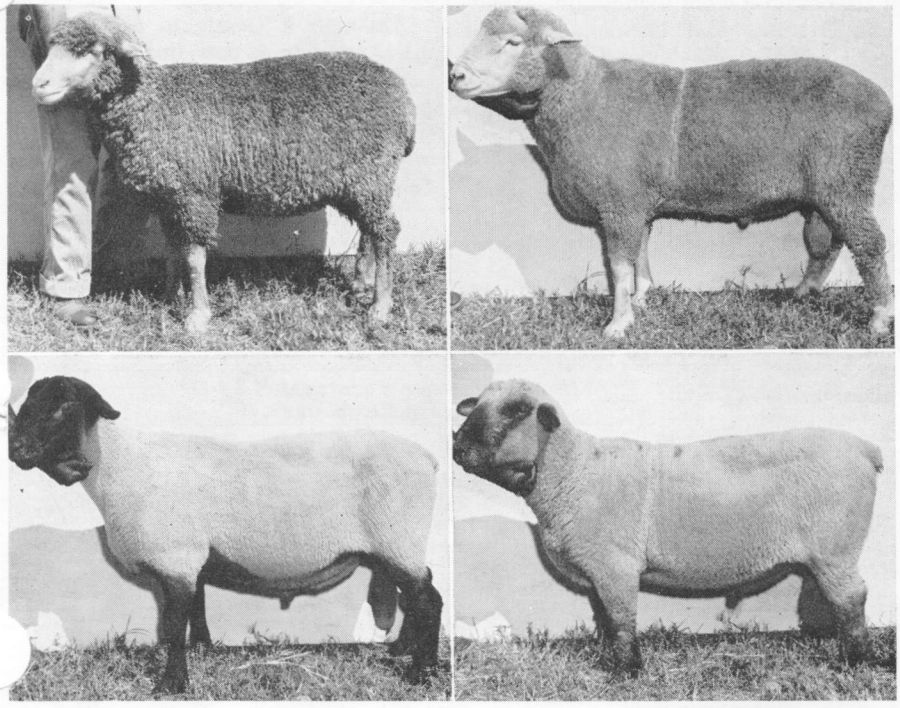
Results of studies by the API Agricultural Experiment Station show that fall-dropped lambs have a number of advantages over those dropped at any other time: (1) They and their mothers make maximum use of temporary winter grazing. (2) They are not bothered by heat and humidity. (3) Parasites are more easily controlled in winter. (4) They reach market weight in the spring when lamb prices are higher.

Unfortunately many ewes will not breed during May and June. Therefore, efforts to produce fall-dropped lambs have not been completely successful. Several years ago research was begun at the Station to obtain information on some problems associated with a fall lambing program.

Comparisons Made

Existing breeds and strains of ewes were compared for their ability to breed early under Alabama conditions. Results of this comparison were consistent with reports from other experiment stations regarding early lambing ability of fine wool (Rambouillet or Merino) ewes. In Alabama, ewes that performed best in producing early lambs have been straight grade Rambouillet. The poorest performers have been locally grown ewes with virtually straight mutton breeding. Ewes representing first crosses of Rambouillet on mutton breeds have been intermediate in performance.

Most ewes in certain breeds and strains have either bred early or late. However, individual ewes have deviated widely from the averages of their groups. This gave basis for another approach to the problem of early lambing; namely selection for early lambing within breeds and strains. Preliminary results, based on small numbers of ewes, are encouraging. Ewes born in October and November have been superior in performance to ewes born in February and March. This indicates that it is a mistake to save "carry over" lambs for breeding purposes. It also indicates that the best source of early-breeding ewes may be early born ewe lambs from the farmer's flock.



A Rambouillet ewe, upper left, has been lambing in October. A Columbia dual purpose ram, upper right, is bred to Rambouillet ewes for replacements. The Hampshire ram, lower left, and Suffolk ram, lower right, are of the mutton breeds and representative of the type needed to produce big, heavy, fast-growing market lambs.

Breeding Season

Other research is on the breeding season of the ewe in Alabama. When does it begin? How long is it? What factors affect it? Last year at Auburn about 250 Rambouillet ewes were checked for heat from lambing until the beginning of the 1958 breeding season. Practically all ewes had regular heat periods while nursing lambs. The average interval from lambing to the first heat was about 75 days. Some ewes were bred while nursing lambs and conceived. The earlier the ewe lambed within the lambing season the sooner she returned to heat after lambing.

Use of artificial measures such as air conditioning, light control or hormones may be effective in inducing ewes to come into heat. However, they appear to be of limited practical value. Therefore, if early breeding ewes can be found in existing breeds and strains or can be developed through breeding and selection, this is the best practice for the farmer to follow.

Records Important

Records show that some ewes repeatedly lamb late. Research at other experiment stations also shows some ewes consistently have poor production records. These ewes should be culled. To do this it will be necessary to identify individual ewes and keep records on such important things as date of lambing, number of lambs born and raised, weaning weight of lambs, and fleece weight. A few simple records properly kept and intelligently used are extremely valuable in developing a highly productive and profitable flock.

Damage to oats from 2,4-D applied at the 5-leaf stage is shown. Treatment rates are (left to right) no treatment, ¼ lb. per acre, ½lb., and 1 lb. per acre. Amounts are acid equivalent.

2,4-D EFFECT ON OATS

V. S. SEARCY and W. R. SHARMAN,[1]
Dept. of Agronomy and Soils

ALABAMA FARMERS rely on oats as a forage and grain crop. And, research results show this to be a good choice. Oats have consistenly produced good yields of top-quality forage and grain in all parts of the State. To a lesser degree, other small grains also are important in Alabama's farming program.

As with other crops, weeds sometimes cause serious problems in small grain. Such broadleaf weeds as dock, wild mustard, wild onions, and wild garlic are often serious pests in oats and other small grains.

It has been known for several years that 2,4-D[2] is an excellent herbicide for controlling many broadleaf weeds. However, the effect of 2,4-D on oats grown in Alabama was not known. Learning effects on oats is important since this crop is the most important small grain in Alabama. In addition, oats are reported to be the most susceptible of the small grains to 2,4-D. Thus, any damage from 2,4-D should be less for wheat, rye, and barley than for oats.

Experiment Begun

An experiment was begun by the API Agricultural Experiment Station in the fall of 1955 to determine the effect of an amine formulation of 2,4-D on oats. Four varieties were tested at 4 stages of oat growth with 4 rates of 2,4-D. Varieties used were Victorgrain, Arlington, Atlantic, and DeSoto. Rates of 2,4-D were 0, ¼, ½, and 1 lb. (acid equivalent) per acre. It was applied when the oats were in the 5-leaf, tillered, jointing, and hard-dough stages.

Effect of the chemical on oats is given in the table. Listed are grain yield and weight per bu. from the different treatments. Since all varieties responded similarly to 2,4-D, figures given are averages.

The data show that grain yield and weight per bu. were both reduced when 2,4-D was applied at the 5-leaf stage of growth. When applied at the tillered, jointing, or hard-dough stage, neither grain yield nor weight per bu. was reduced by any treatment.

There were no differences among the ¼, ½, or 1 lb. rates of 2,4-D. The ¼-lb. per acre treatment damaged the oats as much as the 1-lb. rate when applied at the 5-leaf stage of growth. As much as 1 lb. per acre of 2,4-D did not affect oats when applied at the tillered, jointing, or hard-dough stages.

Growth Stage Important

As shown by results reported, stage of growth is the important factor in using 2,4-D to control weeds in small grains. Even the ¼-lb. treatment injured oats when applied at the 5-leaf stage. But, when tillered or at later stages no damage resulted from as much as 1-lb per acre.

Although it is safe to use 1 lb. of 2,4-D per acre on oats, this amount may be more than is needed. One-half lb. per acre will control most broadleaf weeds that are troublesome in oats if applied when oats are well tillered (about 6 in. high).

The same treatments should be safe for other small grains too.

GRAIN YIELD PER ACRE AND WEIGHT PER BUSHEL OF OATS TREATED WITH 4 RATES OF 2,4-D APPLIED AT 4 STAGES OF GROWTH

Stage of growth when 2,4-D applied	Unit of measure	Effect of different per acre rates of 2,4-D,[1] average of 4 replications				Stage average[2]
		0	¼ lb.	½ lb.	1 lb.	
5-leaf	Lb./a.	1,712	1,510	1,472	1,536	1,515
	Wt./bu.	31.72	30.03	30.69	30.84	30.52
Tillered	Lb./a.		1,765	1,841	1,762	1,789
	Wt./bu.		31.81	32.56	32.34	32.24
Jointing	Lb./a.		1,771	1,715	1,778	1,754
	Wt./bu.		31.97	32.16	32.53	32.22
Hard-dough	Lb./a.		1,713	1,707	1,633	1,684
	Wt./bu.		31.53	31.53	31.75	31.65
No 2,4-D	Lb./a.					1,712
	Wt./bu.					31.72
L. S. D. (.05) for grain yield						93
L. S. D. (.05) for weight per bu.						.65

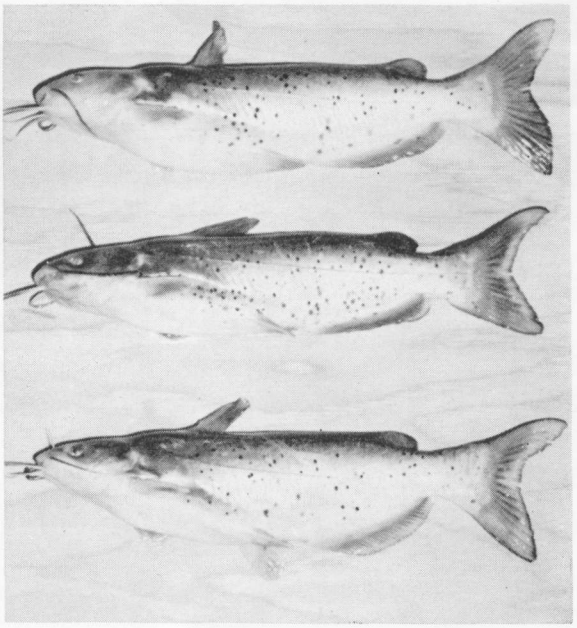
[1] Acid equivalent (amine formulation).
[2] Does not include the 0 rate.

[1] Formerly graduate assistant.
[2] 2,4-dichlorophenoxyacetic acid.

Now

COMMERCIAL FISH FARMING

H. S. SWINGLE,
Fish Culturist



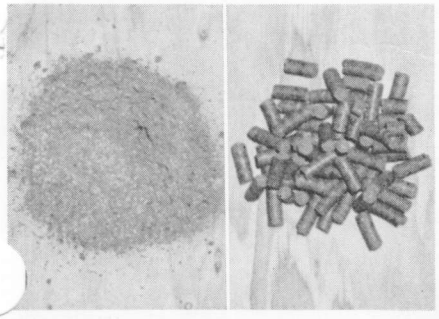
In ponds stocked at per acre rate of 3,000, channel catfish yielded 2,300 lb. per acre per year.

COMMERCIAL FISH FARMING is here!

It is the kind of farming man has been looking for – one that requires little labor except for a short period during harvest and processing.

Widely known for its fresh water fish research, the API Agricultural Experiment Station several years ago began to explore possibilities of fish production on a commercial scale.

Its first research dealing with commercial fish led to development of successful methods for commercial production of bigmouth buffalo fish. With fertilization, it was possible to raise 400 to 800 lb. of buffalo per acre per year at a cost of about 6¢ to 7¢ per lb. However, there was little market in Alabama for this fish. People were not familiar with the buffalo and its forked bones in the flesh. Nevertheless, commercial fishermen along the Misissippi River for years have been harvesting and marketing buffalo. Thus the methods developed at Auburn found immediate use in the rice-field areas of Arkansas, Louisiana, and Mississippi. Hundreds of acres are now devoted to the production of buffalo fish in those states.



Station-developed, Auburn No. 1 fish feed; left—dry mix feed, right—same in pelleted form, which produced the highest yields of channel catfish per acre.

Recent Developments

Subsequent experiments at Auburn have dealt with production of catfish, which have a ready sale throughout the Southeast and elsewhere. Methods were developed first for commercial production of the red cat (speckled bullhead). With fertilization and feeding, it was found possible to produce 900 lb. of this species per acre in 10 to 12 months. In experiments, the cost of fertilizer and feed to produce a lb. of red cats varied from 10¢ to 14¢. When the dressed cats were sold at 50¢ per lb., the return per acre for labor and other costs varied from $70 to $100. Where the pond was opened to public fishing prior to draining for harvest, approximately an additional $100 per acre was obtained from the sale of fishing permits.

The most promising of the commercial fish is the channel cat. This species has yielded within 10 to 12 months 1,000 lb. per acre at a stocking of 1,000 cats; 1,500 lb. at a stocking of 2,000 cats; and up to 2,300 lb. per acre with a stocking of 3,000 cats. The cost for feed plus fertilizer to produce a lb. of the channel cat varied from 9¢ to 14¢. Based on the experiments, returns above cost of fertilization, feed, and labor of dressing varied from $90 to $300 per acre, depending upon rates of stocking and rates of feeding. This fish has a ready market, and appears very suitable for commercial production. However, the channel cat does not reproduce readily in ponds, and it is available for stocking from only a few commercial hatcheries that have learned how to spawn and raise the young fish.

Experiments are now in progress in federal and state hatcheries to develop reliable methods for producing the young fish. Until this is accomplished and more commercial hatcheries are developed for their production, the number of acres that can be stocked with channel cats is limited.

Imported Species

Experiments are now in progress with two tilapias – one a pondfish from Asia and the other from Africa. These fish give high production and are very rapid growing. They are somewhat similar to the bluegill in appearance, and reach a larger size in 4 months than does the bluegill in a year. The possibilities of these species both as sportfish and as commercial fish are now being studied.

This research is establishing the basis for fish farming – a new type of agriculture. It is part of the research program of the API Agricultural Experiment Station devoted to the development of a more diversified agriculture for Alabama and the Southeast.

The BLACK BELT SUBSTATION STORY--*a review of services to the region*

E. L. McGRAW, *Associate Editor*
L. A. SMITH, *Superintendent*

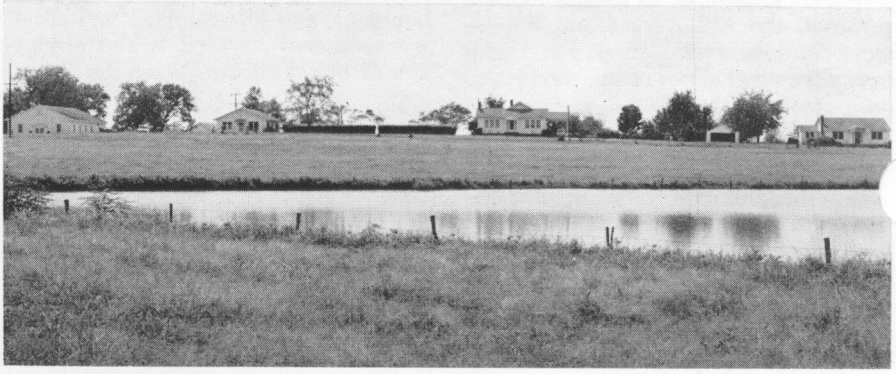
THE BLACK BELT SUBSTATION near Marion Junction in Dallas County is well known for research with cattle and pastures. It is a part of the Agricultural Experiment Station System of the Alabama Polytechnic Institute. The Substation was one of the first branch experiment stations to be established after authorization by an act of the State Legislature in 1927.

Problems of the Black Belt

Black Belt farmers were faced with many problems in 1931, when the Black Belt Substation began operations. The unique soil formations of the area restricted the selection of crops. Boll weevils often destroyed the cotton crop. Heavy infestation of Johnsongrass in many fields made production of row crops difficult. The need for adjustment was recognized but the question was:

– What kind of adjustment?

At the outset the late K. G. Baker, first superintendent, with help of agronomists and animal husbandmen at the Main Station, Auburn, realized that a successful agriculture would involve utilization of all natural resources and cooperation with nature rather than a battle against it. They knew grass would grow on Black Belt soils. This suggested the possibility of pastures to support a livestock economy. Pastures would eliminate the need for plowing up the land and subjecting it to erosion; pastures would eliminate the need for fighting Johnsongrass; and pastures could provide a stable income.



The Black Belt Substation was established in 1930 near Marion Junction in Dallas County on 1,100-acre tract of rolling prairie land typical of the region. Shown here are headquarters buildings and a stock water pond in foreground.

Establishment of pastures, however, required answers to many questions: What grasses or legumes or combination of legumes and grasses would be best adapted? Could fertilizer be used profitably on pastures? How much pasture would be required per animal unit? What kind of feed supplements would be needed? What kind of livestock management program would be required to use the forages most profitably?

Research Conducted

To answer these questions, large scale pasture experiments were started in 1931 on the lime soils. Encouraging results were obtained. On well treated lime land, white clover and Dallisgrass were found to do well as permanent pasture. Supplementary grazing of Johnsongrass, oats, black medic, and Caley peas was developed. These crops, along with the permanent pastures of white clover and Dallisgrass, gave a near year-round grazing as had ever been developed on a practical basis.

Besides pasture experiments, other research work includes beef cattle breeding, hay crops, control of insects of pastures, crops and livestock, pasture fertilization, pasture management, small grains, and weed control.

Based on this experimental work, acreages and production of feed, forage crops, and improved pasture have increased rapidly. The result has been the development of the Black Belt as a meat and milk producing region.

The beef cattle program revolves around a cow and calf system with the calf going to market at weaning, about 8½ to 9 months of age. Experiments have shown advantages of fall and winter calves over spring calves when selling milk-fat. An upgrading program using good bulls and saving better heifers from better cows has been practiced through the years. Cross-breeding experiments, using Hereford, Shorthorn, Angus, and Brahman breeds are in progress at the present. Calves from these experiments are to be evaluated when milk-fat and when weaned and fed to heavier weights.

Research results have shown the necessity for use of phosphate and potash on the lime soils and phosphate, potash, and lime on the acid soils used for growing grazing crops. Over a 10-year

period, 1933-42, a plot of lime land treated with 400 lb. of superphosphate per acre annually produced 307 lb. of beef annually, as compared with an average of 144 lb. of beef on an untreated control plot. Use of 50 lb. of muriate of potash per acre in addition to phosphate resulted in a further increase of 77 lb. of beef per acre.

Sheep Added

Sheep were added to the station in 1951. An experiment comparing Dorset ewes and Suffolk-Rambouillet ewes for their early lambing ability is in progress. A second flock of sheep is on a 179-acre beef-dairy-sheep management unit. A total of 50 ewes carried on 30 acres of land returned $812.96 to capital, labor, and management during 1957.

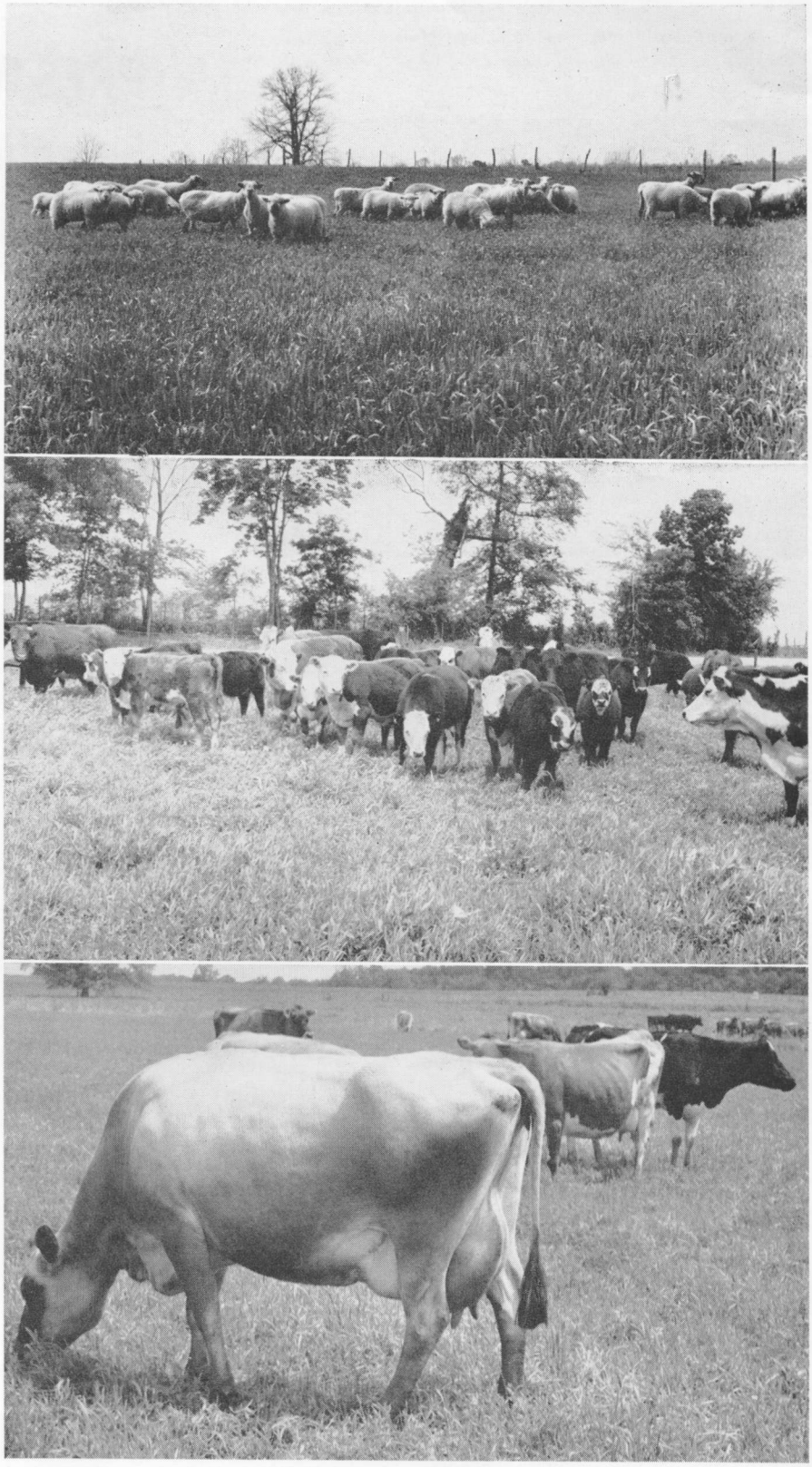
In addition to the dairy producing manufacturing milk on the management unit, another produces grade A milk. At the latter dairy, experiments in progress include comparisons of different crops for silage, stages of maturity, and methods of preservation. Six experimental silos were erected this year. Grazing experiments with dairy cows are also conducted. Comparisons of strip grazing, rotational grazing, continuous grazing, and soiling or green chopping Johnsongrass are being made.

Quality hay has long been emphasized by personnel of the Station. A highlight of research on hay production has been the use of a hay stem crusher. Curing time is cut in half by use of this crusher on Johnsongrass. When properly fertilized, Johnsongrass cut at the right stage and cured makes an excellent grass hay.

Fire Ant Control

Fire ant control experiments were begun at the Substation in 1953. The present recommendations of 2 lb. of heptachlor, 2 lb. of dieldrin, or 4 lb. of chlordane granules per acre to control the fire ant are results of research at this Substation.

The late K. G. Baker did much to bring about a stable, prosperous agriculture to Black Belt farmers through a sound livestock program. Succeeding Baker in 1951 was the late W. B. Kelley, who continued to expand the research program of the Station. The present superintendent is L. A. Smith and assistant superintendent, H. W. Grimes.



Land, forage, pasture crops, and animals are primary research subjects at the Black Belt Substation. Above—flock devoted to early lambing experiments; center—part of beef herd used in cow-calf experiments; below—dairy cows of farm management unit on which milk produced for manufacturer is an important source of income.

W. W. MARSHALL, JR.,* and M. J. DANNER,
Department of Agricultural Economics

PRESTO-PI LIKED
by consumers in study

Presto-Pi was tested for consumer acceptance in food stores in a small city. Sales were compared with those of frozen fruit pies. The product was well liked by store owners and housewives.

DEVELOPING NEW sweetpotato products has been an aim of the API Agricultural Experiment Station for several years. Need for such development is shown by the drop in sweetpotato acreage and lowered consumption during recent years. But even with decreased production, marketing lower grades is still a problem.

In earlier research begun in 1942, candies and other specialty products were made from sweetpotatoes. Nationwide consumer acceptance tests were made with these products. A fully cooked sweetpotato flour was also developed and tried with commercial bakeries and food processors. Although highly acceptable to consumers these specialty products failed "to make the grade" with food processors because of high production costs.

Frozen Puree Developed

With expansion of the frozen food industry, there is interest in new sweetpotato products for freezing. A frozen sweetpotato puree was developed by Experiment Station horticulturists and tested in school and commercial cafeterias primarily for use in pies and as a souffle. This product utilized No. 2 and jumbo grades, grades that are difficult to market fresh. Results indicated that the product was generally acceptable for use in souffle and pies. However, the puree required addition of other ingredients and considerable preparation.

To determine if consumers would accept a family-sized, ready-to-use sweetpotato mix, a new study was made. The mix contained sweetpotato puree, sugar, whole milk, egg white, margarine, milk powder, and salt. It was suitable as a pie filling, souffle, or casserole without adding other ingredients. Presto-Pi was chosen as the brand name.

The final product was designed as a plain mix to which a housewife could add various spices or flavors if she wished. It was expected, however, that the mix would be used plain in most instances. To prepare the mix as a souffle or casserole required only a 20-minute baking period. A pie shell and 40 minutes of baking time was needed for making a pie.

Consumer Study

Presto-Pi was tested in a small city whose population was mainly industrial workers, the fastest growing segment of Alabama's population. Five food stores in the city did a majority of the business and all cooperated in the study. All handled Presto-Pi in their freezers as part of their regular frozen food line. A modest amount of radio and newspaper advertising and in-store demonstration was done. At the end of the 12-week test, a sample of households was drawn in the city and interviews were conducted.

Presto-Pi sales were difficult to evaluate, although attempts were made to obtain comparisons with sales of frozen apple and peach pies. The product was competitively priced. In store A, 23 packages of Presto-Pi were sold during the test run as compared with 36 apple and 51 peach pies. Sales of Presto-Pi in store B were much greater than sales of comparative pies, but the latter were only infrequently offered. Store C did not offer peach pies, but had 20 sales each of Presto-Pi and frozen apple pie. In store D where Presto-Pi was actively promoted by the management, 132 packages were sold. Frozen apple pies were not offered in this store. Canned apple pie filling was used as the comparative item and had 67 sales. Only 8 packages of Presto-Pi were sold in store E compared to 38 frozen apple pies.

Promotion Needed

Store operators thought the product was good but that considerable promotion would be needed. None of the operators had the product returned as unsatisfactory.

In interviews with housewives it was found that the most impressive features about Presto-Pi were that it was quick and easy to prepare and that it contained no "strings." However, because of the size of the sample and because few Presto-Pi sales were made in the stores, only a few households were found that had bought the product. Opinions were obtained from all households as to preferences for a complete mix as compared with a product that would require preparation. There was considerable evidence that housewives would like to add their own ingredients such as eggs and milk to a prepared puree base. Using sweetpotato puree as a base and adding the other ingredients probably would be more satisfactory to the housewives than would a complete mix.

* Resigned.

R. D. ROUSE and FRED ADAMS,
Dept. of Agronomy and Soils

LIME
for good stand and yield of COTTON

LIME HELPS COTTON in at least three ways. It (1) neutralizes soil acidity, (2) supplies calcium and sometimes magnesium, and (3) increases availability of nitrogen, phosphorus, and potassium in the soil.

Neutralizing an acid soil is highly important for good crop production. When a soil becomes acid, certain soil constituents are changed into forms that are toxic to plants. More than extremely small amounts of these materials injure cotton. These naturally occurring toxic materials are primarily aluminum and manganese and usually are present in harmless form. Only soil acidity will make them harmful.

Since all soils contain fairly large amounts of manganese and aluminum, the chemical form in which they occur is vital. As a soil becomes more acid, more aluminum and manganese are converted into toxic forms. Thus, neutralizing acidity is necessary to prevent plant damage.

Seedlings Damaged Most

As plants become more mature, they are better able to withstand soil acidity. However, vigor and survival of seedlings are greatly affected by excessive aluminum and manganese.

The ability of seedlings to withstand excessive amounts of aluminum and manganese is affected by temperature. Research results at Auburn have shown that seedlings are damaged more by excessive amounts of these elements as the temperature is lowered. This means that cotton seedlings on a limed soil will be more vigorous and survive better during early spring than will cotton on a more acid soil. Plants often do not fully recover from a poor start and yield is reduced.

Fertilizer Affects Damage

It has been found that using large amounts of certain fertilizers may increase the damage from soil acidity. Thus, it is doubly important to correct soil acidity when using high rates of fertilizer for high yields.

The photographs below show the effect of liming on survival of cotton seedlings at Auburn in 1957. The seedlings came up equally well on all three plots. However, growth was slower and a higher percentage of seedlings died with increasing soil acidity. The high mortality rate in the most acid plot (pH 5.0) was probably caused by a combination of excessive aluminum and manganese, nutrient deficiency, and seedling disease.

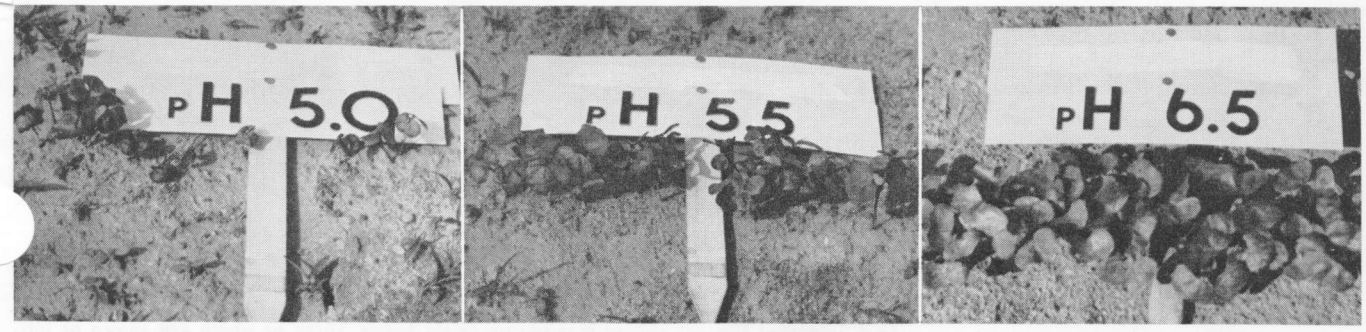
The plot labeled pH 5.5 (too acid for cotton) had higher survival and better growth than the more acid plot. With a pH of 6.5, which is favorable for cotton, there was nearly perfect survival of seedlings and the plants grew vigorously from the start. Although the cotton on the pH 5.5 soil appeared to overcome the initial setback of seedling damage, its lasting effect is shown by the following yields:

Soil pH	*Seed cotton yield lb. per acre*
5.0	391
5.5	1,659
6.5	2,126

Soil Tests Show Needs

About two-thirds of the samples sent to the Experiment Station Soil Testing Laboratory have been found to have pH below 5.8 and need liming for cotton. Field tests all over Alabama have shown that yield increases can be expected from applying the amount of lime needed on soils with a pH below about 5.7 Yield increases from lime become greater as soil pH decreases. Increases have been as little as 50 lb. of seed cotton per acre and as high as 1,500 lb., depending on the pH.

It takes several months for agricultural limestone to react with the soil so that plants get full benefit. This points up the importance of putting out lime on time. By having soil tested now to determine how much lime is needed, it can be applied early enough for best results.



Effect of acidity on survival and growth of cotton seedlings is shown above. Very acid plot (left) had poor survival and growth. Cotton on less acid plot (center) performed better. Favorable pH (right) resulted in top survival and growth.

On attack! Here is a magnified action picture of imported fire ants attacking and feeding on a cutworm.

FACTS *about the imported fire ant*

F. S. ARANT, *Head, Zoology-Entomology Dept.*
KIRBY L. HAYS, *Assistant Entomologist*
DAN W. SPEAKE, *Asst. Leader, Wildlife Research Unit*

IMPORTED FIRE ANT! Friend or foe? Or maybe both? Here are known facts, based on research to date.

Just how the imported fire ant reached Alabama is unknown. It is believed to have arrived in Mobile by ship from South America prior to 1920. It was first reported in entomological literature in 1929, and the first known damage to field crops from this insect was to seedling corn in Baldwin county in 1935. The insect continued to spread slowly and to attract attention primarily by its burning sting inflicted on laborers working in areas heavily infested by the ants.

By 1949 the insect was known to occur in 12 counties in southwestern Alabama including Autauga in the central part of the State, in 14 counties in southeastern Mississippi, and in two in northwestern Florida. In subsequent years, spread was rapid over much of Alabama and Mississippi and into Louisiana, Texas, Arkansas, Georgia, and South Carolina.

The API Agricultural Experiment Station began research on imported fire ant in the late 1940's. Problems studied since then include life history, food habits, and control of the ant; baits and attractants; status of the insect in Argentina; productivity of quail in infested and non-infested areas; and effect of broadcast applications of dieldrin and heptachlor granules on quail and other wildlife. Major facts uncovered in these studies are summarized here.

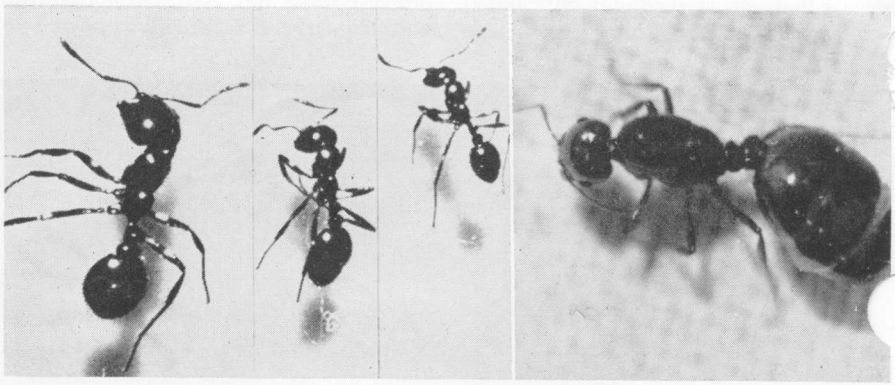
Habits

Each colony of the imported fire ant is composed of at least six recognizable forms: a queen, winged males and females, and three worker castes. The winged sexual forms leave the mound and mate in the air. The female settles to the ground, chews off her wings, and digs a shallow tunnel in the earth. In this tunnel she lays a small clutch of eggs that hatch a week to 10 days after deposition. Resulting larvae are cared for by the queen until they pupate 1 to 2 weeks after hatching. The period of pupation lasts 1 to 2 weeks. After the first brood of workers emerge, they take over all duties of the colony except egg laying.

The worker ants search for food through a network of tunnels radiating as far as 66 ft. from the mound. Their food consists principally of insects that they sting to death and devour. One laboratory colony killed and consumed 20 adult boll weevils within 2 hours. The ants have been observed devouring house fly larvae, boll weevil grubs, cutworms, and many other destructive insects in the field. Occasionally, they consume seed that are high in fat and protein content. Although okra, potatoes and other crops are sometimes attacked, damage to plants in general is rare, except that resulting from building mounds. Captive laboratory colonies became cannibalistic rather than feed on growing plants they had been reported to relish. No damage to livestock has been observed. Cattle and sheep graze over the mounds and even lie down near them. Newly born livestoc is rarely if ever killed.

Damage

Fire ant damage is of two principal types. The mounds interfere with the operation of mowers, combines, and other farm machinery, expecially in heavy soil. The worker ants inflict stings on laborers clearing clogged mower blades, handling hay, harvesting some field crops, or performing other tasks in heavily infested areas. The sting



Each imported fire ant colony is made up of six forms, three of which are shown at left. These are large, medium, and small workers; all are adults. Right—A queen after having removed her wings and prior to digging small tunnel and egg-laying.

Left—Cattle grazing near fire ant mound. Center — Bermudagrass growing from mound; note closely grazed grass on and around mound. Right—Fox-quail controversy ended by insecticide at Camden area. The dead fox pup was one of five litter mates taken from a den. Two were autopsied and were found to contain enough insecticide to cause death of the pups. It is likely they died from eating dead, poisoned birds or other animals brought into the den by the mother fox.

causes a burning sensation and usually results in formation of a tiny pustule that remains several days. There is no severe or prolonged pain or after effects except in rare instances where an individual is allergic to the sting. Allergic reactions may be severe, as is true with stings from bees, wasps, and other related insects.

Occurrence

Mounds of the imported fire ant occur in many types of habitat. The preferred places are open areas, such as pastures, old fields, road right-of-ways, banks of streams, fence rows, wastelands, and island areas in marshlands. Mounds are sparse in heavily shaded woods, but are common in open woods. Cultivation decreases the fire ant population and prevents construction of large mounds.

In newly invaded open areas, as many as 120 mounds per acre have been counted. However, competition between colonies for food and space eliminates many of the weaker colonies, resulting in a fairly stable population of fewer large mounds. The number of mounds in a stable population varies with availability of food, which depends on type and fertility of the soil, and with the season. In many open areas the number ranges from 25 to 40 mounds per acre.

Control

Although many insecticides have been effective in killing imported fire ants, only three have been found to give effective control for 3 to 5 years. These are chlordane applied broadcast at the rate of 4 lb. technical per acre, and dieldrin and heptachlor each at the rate of 2 lb. per acre. Any one of these insecticides may be applied as a granular formulation or in a fertilizer mixture. No injury to cattle or sheep has resulted from the experimental application of granular insecticides or fertilizer mixtures to occupied pastures during the winter months for fire ant control. All livestock in treated pastures were vigorous animals maintained at a high nutritional level.

Effects on Wildlife

Studies on quail productivity in various sections of the State have been conducted each year since 1955. Results show that the percentage of young quail to old in the hunter's bag has been as high or higher in areas with heavy populations of imported fire ant than in some areas where the ant does not occur.

Broadcast applications by plane of dieldrin or heptachlor granules for fire ant control near Camden caused heavy mortality to wildlife. The entire area of 3,600 acres (1,200 acres with dieldrin and 2,400 with heptachlor) was treated except for portions of beaver ponds.* The rate of application was 2 lb. per acre for each material. All resident quail, 13 coveys, disappeared from the two areas. The only survivors were among two coveys ranging to a large extent but not entirely off the treated area. Only 2 quail disappeared among the 8 coveys on a 600-acre untreated area during the same period; 17% of the quail lost on the treated areas were recovered as dead or dying birds. Dead quail were recovered from 7 of the 13 resident coveys on the treated areas. All specimens autopsied contained sufficient dieldrin or heptachlor to attribute their death to the insecticide. One covey of 10 quail was observed almost daily until the entire covey was gone. Half of these birds were picked up dead or moribund.

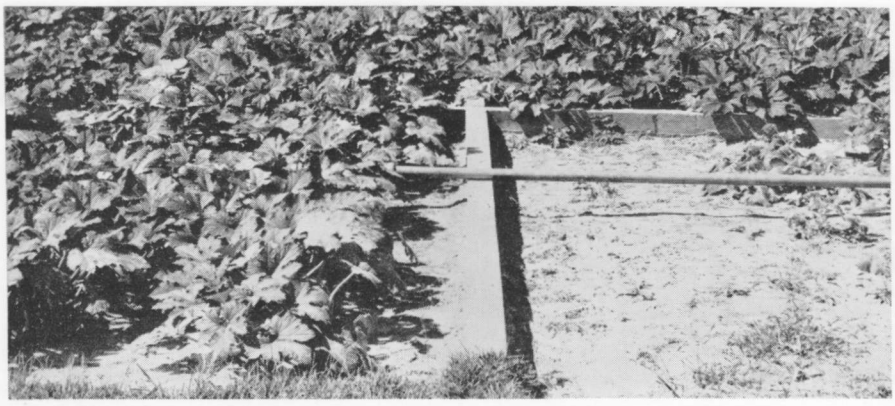
Laboratory autopsies and analyses implicated the insecticides as cause of heavy mortality among 41 other species of animals exclusive of fish. The dead animals included snipes, rails, cardinals, brown thrashers, mockingbirds, meadowlarks, woodpeckers, rabbits, red fox pups, feral house cats, rats, mice, salamanders, and frogs. Other species found dead, but not autopsied, included a racoon, woodcock, wild turkey (poult), chuck-wills-widow, and several species of snakes. More animals were found dead in old fields and along border areas than in open fields or dense woods.

Further Research

Research is continuing on effects of present fire ant control measures on wildlife and on the biology, ecology, and food habits of the pest. Quite promising is the possible use of baits for control. These are mixtures of small amounts of insecticide and a "come-on" compound that lures the fire ant to his last meal without endangering wildlife.

So, research moves toward improved, low-cost controls that would further safe-guard public health and conserve wildlife.

* Portions of ponds were treated accidentally.



Plots used in testing soil fumigants are shown. Plot at right front was not fumigated before squash was planted. Plots at left and rear were fumigated. Note difference in growth.

BEAN *and* SQUASH YIELDS *upped by soil fumigation*

W. A. JOHNSON and L. M. WARE,
Department of Horticulture

ROOTKNOT NEMATODES cause heavy losses to vegetable growers when highly susceptible crops are grown on the same areas year after year.

Soil Fumigants Compared

Tests conducted at the API Agricultural Experiment Station over a 4-year period on a light-textured soil compared effects of ethylene dibromide (EDB) and 1, 3 dichloropropene mixture (DD) as control measures. Beans and squash were used as test crops and records kept on yield and incidence of rootknot.

Methods of application using 3 treatments with each of the 2 materials were: (1) row application once each year, (2) broadcast once each year, and (3) broadcast once every 2 years. The check received no fumigants. Fumigants were applied 8 weeks before planting in 1954, 6 weeks before in 1955, and 4 weeks before in 1956 and 1957. After soil treatment each year, beans were grown in the spring followed by squash in late summer.

Records of rootknot development were obtained after harvest by selecting 10 plants or groups of plants from 10 different locations in each plot. Each plant or group of plants was placed in 1 of 10 classes, 1 – no visible rootknot and 10 -- severe rootknot. Each index reading equals the sum of class times number of plants in class.

EFFECT OF SOIL FUMIGANTS AND METHODS OF APPLICATION ON YIELD OF BEANS AND SQUASH AND ON AMOUNT OF ROOTKNOT

Treatments		Yield per acre		Rootknot damage					
Soil fumigants		Beans 3-yr.	Squash 4-yr.	Beans 4-yr.	Squash 4-yr.	Yr. applied		Yr. not applied	
						1st & 2nd yr.		3rd & 4th yr.	
Kind	Application					Beans	Squash	Beans	Squash
		Lb.	*Lb.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
0	0	9,120	3,703	78	92	68	88	88	96
EDB	Row	12,780	14,442	16	32				
DD	Row	12,690	15,363	16	24				
EDB	Broadcast	12,390	14,425	15	14				
DD	Broadcast	13,350	15,580	14	14				
EDB	Broadcast[1]	10,710	12,810	38	54	21	39	55	70
DD	Broadcast[1]	11,310	15,345	21	20	20	14	22	26
LSD	.05	794	2,240	6	11	5	12	9	12
	.01	1,088	2,880	8	15	7	16	13	17

[1] The fumigants were applied every other year.

Yields and Damage

All treatments resulted in greate yields than check, and each treatmen reduced considerably the amount of rootknot. Yield of beans over the 3-year period was increased from 9,120 to 12,-780 lb. per acre and squash from 3,703 to 14,442 lb. from row treatment of EDB.

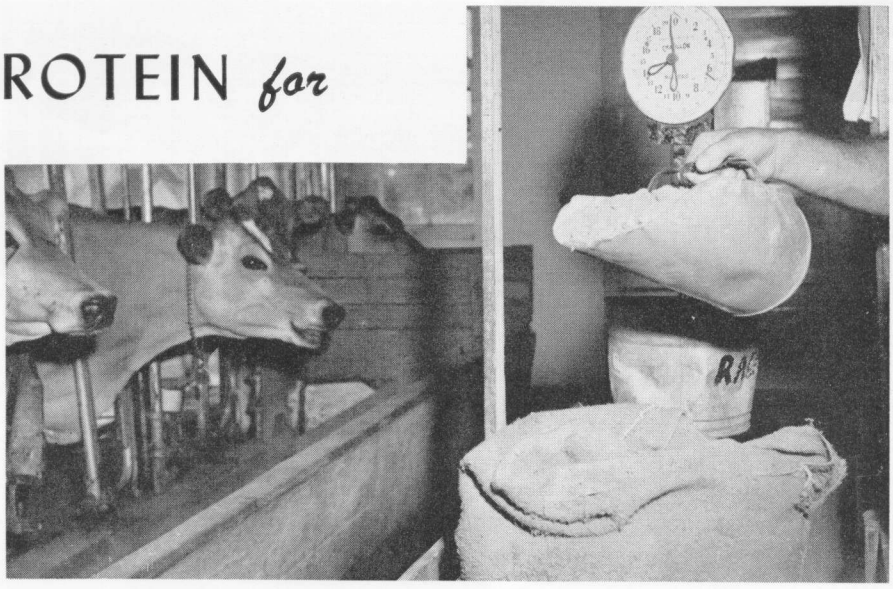
The two fumigants, when applied each year, showed no important difference in yield or amount of rootknot present when applied either as row or as broadcast treatments with one exception. That was DD broadcast each year resulted in higher yields of beans than EDB broadcast. There were no important differences of yield of beans or squash in methods of application, or in the amount of rootknot shown on beans, the first crop planted after treatment. For squash, the second crop grown after treatment, more rootknot was noted where the row application was used than in area where broadcast treatment was applied.

The greatest difference between ED. and DD was from the residual effects of the two chemicals. In the table under percentage of rootknot for years applied, beans was the first crop grown after treatment and squash was the second crop; for years not applied beans was the third and squash was the fourth crop grown after the broadcast treatment once each 2 years. For 4 consecutive crops grown after treatment, results show that the soil fumigant DD has somewhat longer residual benefit than EDB.

Squash roots taken from soil not fumigated are shown at top; average yield was 3,700 lb. per acre; at bottom, squash roots taken from fumigated soil; average yield was 15,000 lb. per acre.

HOW MUCH PROTEIN *for* DAIRY COWS?

G. E. HAWKINS,
Associate Dairy Husbandman



THERE ARE MANY IDEAS about effects of feeding high protein rations to milking cows. Many dairymen believe that high protein feeds cause mastitis development. Others think that such rations are necessary for high milk production.

Along with the interest in protein level, many have wondered about the value of feed containing such estrogens as stilbestrol for dairy cattle. This interest resulted from reports that stilbestrol increases feed efficiency of fattening cattle.

Rations Tested

In Auburn tests, soybean meal and cottonseed meal were compared with a concentrate mixture to determine effect of high protein levels on milk production and mastitis occurence. Since soybean meal is usually high in estrogens, effect of these substances on production was also measured.

Six experimental rations were used with 5 cows per ration. Before going on the 28-day experiment, cows in each group received similar feeds.

During the experiment the cows got about 70% of their TDN (total digestible nutrients) from Johnsongrass hay or alfalfa hay as the only roughage. The other 30% was fed as either a concentrate mixture, cottonseed meal, or soybean meal. The cottonseed and soybean meals were 41% protein grade. The concentrate mix (21% protein) was made of 29% ground shelled corn, 28% citrus pulp, 40% cottonseed meal, 2% steamed bone meal, and 1% salt. In previous studies a 17% protein concentrate mix did not supply enough protein when Johnsongrass was the only roughage. This accounts for the use of the 21% protein mix for the study.

Production Response

Cows on both hays produced more milk when fed the concentrate mixture than when fed soybean meal or cottonseed meal (see table). The trend in milk production over the 28-day test was similar for cows fed cottonseed meal and those fed soybean meal. However, cows fed Johnsongrass hay dropped more in production than those fed alfalfa hay regardless of whether they were fed the concentrate mixture or one of the protein supplements.

PERSISTENCY OF MILK PRODUCTION[1] AS RELATED TO RATION FED

Type of concentrate fed	Persistency by cows on two hays	
	Alfalfa	Johnsongrass
	Pct.	*Pct.*
Concentrate mixture	103	90
Soybean meal	92	84
Cottonseed meal	92	87

[1] Persistency of production is milk production during the last week of the experiment expressed as a percentage of production during week before test.

Nevertheless, all cows in all ration groups ate enough digestible protein and enough TDN to produce milk at the pre-experimental level (100% persistency). Assay of the feeds showed that their estrogenic potency did not affect persistency of production.

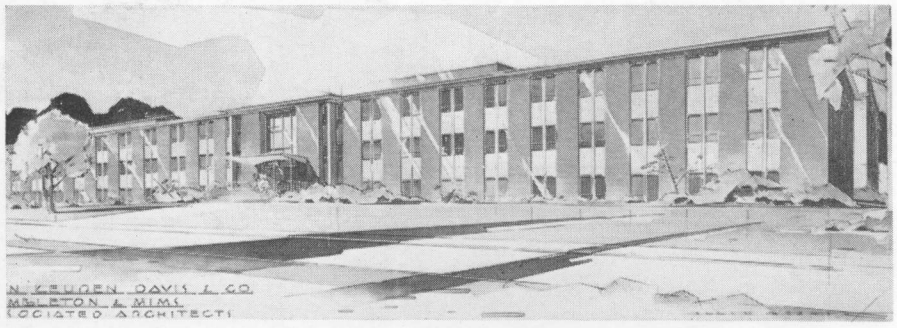
Protein content of the alfalfa hay was about 5% more than that of the Johnsongrass. Thus the decreases in milk yields of cows fed cottonseed meal and of those fed soybean meal were not a result of feeding too much protein. If any beneficial effect could be obtained from a protein supplement as the only concentrate, it should have shown up with cows fed Johnsongrass hay. Most likely the lower persistency resulted from a deficiency of some nutrient needed by rumen bacteria, which reduced the net energy available from the hays for milk production.

Effect on Mastitis

Among the 15 cows fed Johnsongrass hay, 2 developed mastitis during the experimental period. One of these was fed the concentrate mixture and the other was fed cottonseed meal. Mastitis in the cow on the concentrate mixture persisted one day and that of the cow on cottonseed meal was clear the third day after it was detected.

Among the cows fed alfalfa hay, the only case of mastitis found was in a cow fed soybean meal. This case developed 4 days before the cow went on the experimental ration at a time she was being fed alfalfa hay and the concentrate mixture. Another indication that this case of mastitis was not affected by the soybean meal was that it cleared up while she was fed this high protein meal.

As shown by these test results, feeding protein supplements as the only concentrate had no effect on the occurrence of mastitis. However, use of such high protein rations was not economical, since production declined more when the meals were fed than when cows received a concentrate mixture.



New buildings for TEACHING *and* RESEARCH

E. V. SMITH,
Dean and Director

NEW AND MODERN classrooms and laboratories for teaching and research are about to become a reality on Ag Hill at Auburn, thanks to efforts of thousands of friends who worked for passage of Amendment 5 last December.

Plans are nearly complete for a new Biological and Plant Sciences Building and for a wing on the Animal Husbandry and Dairy Building. Construction is expected to begin early in 1959 and should be completed in 1961.

The plans provide for buildings that are both functional and attractive. Going into these plans are several months work in determining possible locations, space and equipment needs, and designing buildings that would satisfy requirements efficiently and economically. In all, the plans are results of close cooperation of staff members, dean and director's office, department of buildings and grounds, campus planning committee, and architects.

The Biological and Plant Sciences Building will consist of 3 floors and will contain approximately 135,000 sq. ft. of floor space. The first floor will be used by the soil testing laboratory and the departments of Horticulture and Botany and Plant Pathology. The Department of Agronomy and Soils and some of the Botany and Plant Pathology laboratories will be housed on the second floor. All of the third floor will be used by the Zoology-Entomology Department. The building will front on College Street and will be approximately 354 ft. long. It will extend back of Comer Hall for about 190 ft.

The wing on the Animal Husbandry and Dairy Building will be a 3-story structure, and will add about 35,000 sq. ft. of floor space. The enlarged building will be occupied by the departments of Animal Husbandry and Nutrition, Dairy Husbandry, and Poultry Husbandry.

Research laboratories in both buildings are designed to permit use of newest and best techniques available to modern scientists. Special laboratories for handling radioisotopes will be located in each building in addition to chemical and biological laboratories.

In this program is included necessary remodeling of Comer Hall to accommodate administrative offices of the Dean and Director, Agricultural Economics and Publications departments, and possibly the Agricultural Library.

In addition to these two major buil ings, plans are being developed f several other facilities. Included in this group is a meats laboratory and abattoir, which will make possible an improved teaching program and permit more complete research on carcass quality and evaluation; an auditorium with 600 seating capacity; a livestock arena and judging pavilion; and additional greenhouses for teaching and re search. It probably will not be possibl to construct all of these facilities with the funds that are available at present. As soon as the contract is signed for construction of the two major buildings, a decision can be made regarding priorities for the other buildings.

The agricultural research program will be strengthened also by new facilities for research in animal diseases. A new animal disease research laboratory will be built near the new large animal clinic building that is planned for the School of Veterinary Medicin The animal disease research program financed with Experiment Station fun and is administered through a cooperative arrangement with the School of Veterinary Medicine.

Good research in agriculture is dependent upon good facilities. The buildings that are being planned will provide these facilities.

FREE Bulletin or Report of Progress
AGRICULTURAL EXPERIMENT STATION
of the ALABAMA POLYTECHNIC INSTITUTE
E. V. Smith, Director
Auburn, Alabama
Permit No. 1132—11/58-8M