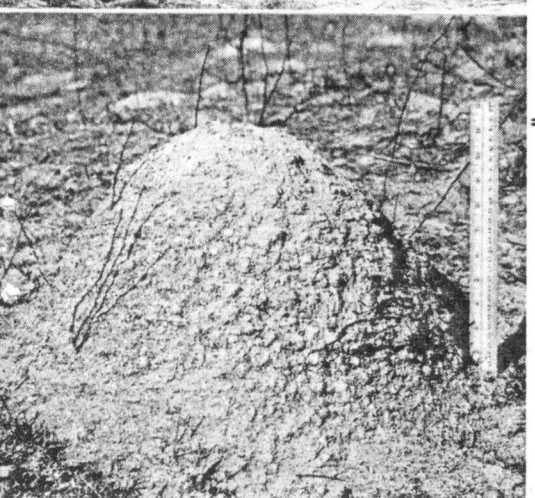


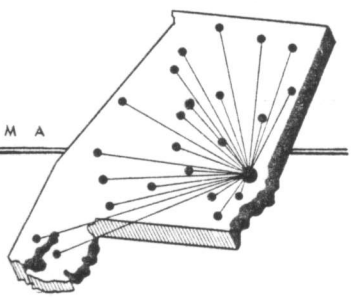
VOL. 3 NO. 3 FALL 1956

HIGHLIGHTS *of* AGRICULTURAL RESEARCH

In this issue — Nuclear Energy and Farm Research . . . CRD—A Dreaded Poultry Disease Complex . . . Mechanical Harvest . . . Thin or Not To Thin? . . . Imported Fire Ant . . . Soil Testing . . . Feathers—The Signs of Age.

AGRICULTURAL EXPERIMENT STATION SYSTEM
of the ALABAMA POLYTECHNIC INSTITUTE

SERVING ALL of ALABAMA



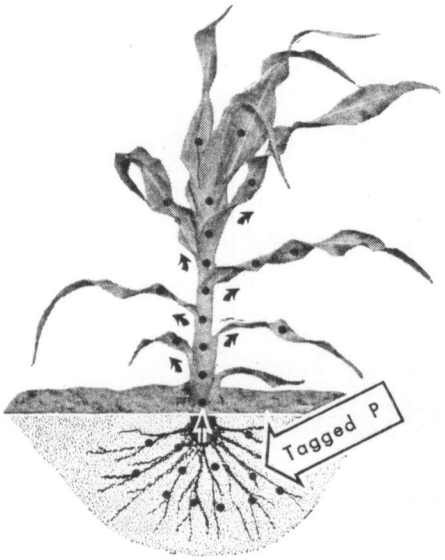


Photo-diagram shows phosphorus uptake by corn plant as indicated by tagged (radioactive) phosphorus in fertilizer.

NUCLEAR ENERGY *and* FARM RESEARCH *at Auburn*

COYT WILSON, *Associate Director*

AGRICULTURAL SCIENTISTS use many tools and techniques. From the simple magnifying glass to electron microscopes and from precise analytical balances to cattle scales are two of the many examples of range in size and complexness.

Among the newest is the use of radioisotopes. Radioactive forms of carbon, phosphorus, sulfur, and calcium can be incorporated in fertilizers, pesticides, or animal food. By use of special instruments, their movement into and through the plant or animal can be followed. Radiations from the highly active isotopes of such elements as uranium, cobalt, and radium can be used to speed up the rate of mutations in plants. Most of these mutations are worthless or lethal, but a small percentage of them may possess superior characteristics that the plant breeder can use to develop improved varieties of crop plants. Other promising practical uses of these radiations include the preservation of food and the destruction of insects in stored grains.

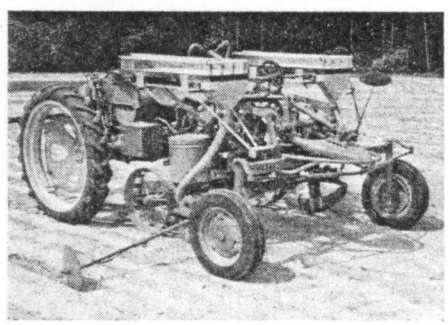
Research at Auburn

Radiophosphorus, supplied by the Fertilizer and Lime Section of USDA Agricultural Research Service, has been used by the API Agricultural Experiment Station's Department of Agronomy and Soils in greenhouse and field studies in Alabama since 1950. The addition of radiophosphorus to phosphate fertilizers makes it possible to distinguish between fertilizer-phosphorus and soil-phosphorus in crops. If a phosphate fertilizer containing radiophosphorus is added to a soil upon which plants are grown, the radioactivity of a gram of phosphate separated from the plants indicates the amount of phosphate derived from the fertilizer. Thus, if the phosphate separated from the plant is only 25% as active per gram as that in the fertilizer, only 25% of the phosphate came from the fertilizer. This principle has been used to study the residual value of various phosphates and to measure the availability of various sources of phosphorus.

Radiophosphorus has been used to determine the time of arrival of plant roots at certain depths. Radiophosphorus is placed under plants at various depths. Different plants or areas are used for each depth studied. When the above ground portion of a plant shows definite activity, it is assumed that roots have penetrated to that particular placement depth.

In the Station's Department of Animal Husbandry and Nutrition, studies have been underway for about 2 years on the use of irradiation for sterilization and preservation of foods. Ground beef that has been irradiated by radioactive cobalt is tested at Auburn to determine rate of destruction of B-vitamins and possible formation of toxic products. Other projects in this department utilize tracer compounds for study of metabolism of amino acids and related compounds. These studies will provide a better understanding of the relationship of specific compounds, such as choline, to nutritional disorders like edema and some of the cancer-like tumors.

By injection of radioactive solution, a plant is made "hot." Thus, nematodes that become radioactive may be assumed to be root feeders.



Especially designed distributor that is suitable for applying tagged fertilizer.

The Department of Botany and Plant Pathology uses radioisotopes obtained from the Atomic Energy Commission, Oak Ridge, to study the feeding of nematodes on plant roots. Plants are made radioactive and exposed to various kinds of nematodes. If the nematode becomes radioactive, it may be assumed that it has fed on the plant. In other studies the nematodes themselves will be made radioactive and allowed to feed on plant roots. If the plants become radioactive, it will be proof that the nematode injects materials into the plant. If this is true, it will help explain why disease symptoms sometimes develop out of proportion to the amount of root tissue destroyed by the nematode.

Radioactive materials and nuclear radiations have become valuable additions to the research tools and techniques at Auburn.

CRD—*a dreaded poultry disease complex*

ETHEL McNEIL, *Associate Poultry Pathologist*

CHRONIC respiratory disease (CRD) is probably the most dreaded disease complex facing broiler growers. In addition to killing some birds, this disease prevents proper weight gains of others and increases production costs.

As the name indicates, CRD is a prolonged sickness. First symptoms are sneezing and inflammation of the windpipe, which may be confused with symptoms of other respiratory diseases.

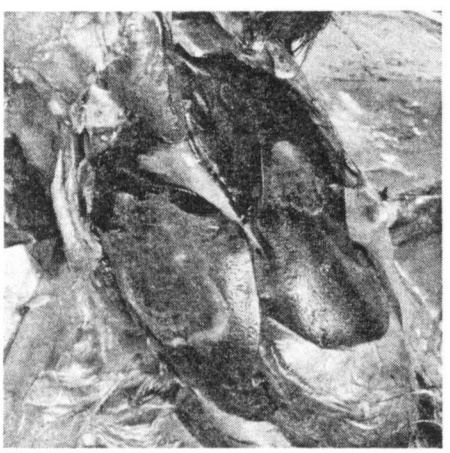


Fig. 1. Heart and liver of bird with CRD. White film over part of liver is characteristic of the disease.

A white film over the heart and liver and yellowish cheesy material in the air sacs are the most typical lesions of the late stage of the disease, Figure 1.

Causative Agent

A small microbe known as PPLO (pleuro pneumonia-like organism) is always found as a causative agent. By itself it rarely if ever produces the CRD symptoms as described. Along with such irritating agents as other bacteria and viruses, and especially under such favorable growing conditions as poor ventilation, crowding, and wet litter, PPLO does produce the lesions already described.

Bacteria that are normally found in the bird's intestine play a part in producing CRD. They invade the heart, liver, lungs, and air sacs of almost all such cases. Antibiotics injected into sick birds are given mainly in the hope of combatting such bacteria.

Research at Auburn

It is generally recognized that strains of bacteria may become resistant to some of the antibiotics. In research at the API Agricultural Experiment Station, pieces of liver, lung, or air sacs from CRD cases are streaked directly on bacterial culture plates. Small discs of filter paper that have been soaked in either penicillin, dihydrostreptomycin, terramycin, or aureomycin are placed on the plates. After 16 to 20 hours of incubation at body temperature, the presence or absence of a clear zone around the paper discs means sensitivity or resistance to each antibiotic, Figure 2. This is a rapid method of finding out which antibiotic is most likely to be effective in a particular flock at a given time.

Using the paper-disc method, 120 strains of bacteria have been grown from the tissues of field cases of CRD and tested for sensitivity to 9 antibiotics. This type of testing is being continued as new products are made available. Since many bacteria become resistant to one or more products, it is important that growers have information on several that may be effective.

Egg Transmission

It has been proved that PPLO can be transmitted through the egg. Control of this phase of the problem is one of the most widely discussed aspects of CRD. PPLO has been isolated from the windpipe and unabsorbed yolk of chicks taken directly from incubators. Unlike viruses, PPLO can be grown in test tubes. At this Station, PPLO has been isolated from the oviduct and semen of adult birds.

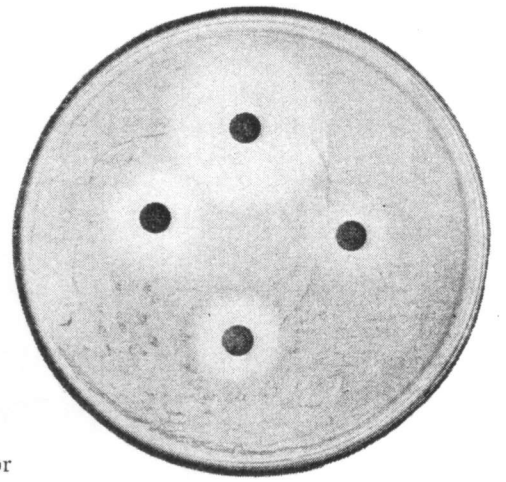


Fig. 2. Culture of bacteria from case of CRD. Clear areas around discs indicate sensitivity to the antibiotics.

Recently there have been attempts in Canada and the United States to inject breeding stock with high levels of dihydrostreptomycin or terramycin in the hope of preventing egg transmission.

In order to draw sound conclusions from any treatment program, a considerable number of untreated birds must be left on the same premises under the same management practices. At Auburn, adult birds in individual cages have been repeatedly tested by isolation of PPLO from the reproductive tract to establish presence and amount of infection. Some of these birds will be injected with antibiotics and retested to learn the effect of the drugs. If any drug appears to be effective, the treated birds will be mated to find out whether this method can be used to prevent egg transmission. A blood test (serum plate test) will be done on each bird before and after treatment to learn how reliable a guide it may be.

During the years when PPLO was present only in the windpipe and sinuses, egg transmission did not occur. It is conceivable that it will be neither possible nor necessary to eliminate all PPLO from breeder birds to prevent egg transmission.

Fig. 1. Spindle picker operating under favorable conditions at Tennessee Valley Substation. Note clean-picked row, center.

MECHANICAL HARVEST*

takes away drudgery of hand picking

T. E. CORLEY, C. M. STOKES and F. A. KUMMER
Department of Agricultural Engineering

OH MY aching back!

It takes about 70 hours of bending and reaching to pick a bale of cotton by hand. With machinery, however, this drudgery of harvesting cotton can be practically eliminated.

Results of mechanization studies at the Sand Mountain, Tennessee Valley, and Wiregrass substations show that cotton can be harvested successfully with machines. Nevertheless, plenty of problems were encountered.

Strippers and spindle pickers were evaluated, with emphasis on mechanical characteristics, adaptability, and limitations for use under varying conditions. Poor defoliation, new growth, fields infested with vines, uneven plant size, and non-uniform maturity often made it impossible to use mechanical strippers. These same conditions, although unfavorable, did not necessarily prevent picking with spindle machines. While waiting for cotton to open as required for stripper harvesting, much cotton shed, especially during rainy and windy weather. The stripped cotton contained about 33% foreign matter, resulting in ginning trouble. Evaluation of the strippers indicates that present-day mechanical strippers are not satisfactory for use in Alabama.

Harvesting Efficiency

Efficiency of the spindle pickers was affected by plant conditions as they are influenced by weather, Table 1. Small plants, small and knotty bolls, and low yields resulting from the 1954 drought contributed to low efficiency. Spindle picker efficiency was based on once-over picking, except in 1955 at one location where the cotton was picked twice. Starting when cotton was about 60% open and picking again when remaining bolls were open, twice-over picking reduced weather loss and increased overall efficiency. However, when yields are low, as in 1954, it might pay to take a chance on weather losses and make one picking when all cotton is open. The additional amount and quality of cotton obtained from two pickings may not offset cost of second picking.

TABLE 1. SPINDLE PICKER PERFORMANCE UNDER CERTAIN CONDITIONS, 1954-55[1]

Condition	Year 1954[2]	Year 1955
Plant height, in.	16.7	31.8
Bolls per lb., no.	86	69
Seed cotton yield per acre, lb.	1,144	1,839
Machine efficiency,[3] pct.	90.2	95.6
Overall efficiency,[4] pct.	80.0	93.4

[1] Average of all variety and spacing plots at three locations (96 replications).
[2] Extremely dry season.
[3] Percentage of cotton on plant harvested by the machine.
[4] Percentage of total yield (including weather loss) harvested by machine.

Plant compressor sheets of the picker were equipped with a rib plate attachment that forces cotton around the spindles and increases their effectiveness. Data from three tests show that machine efficiency was 91.8% without plates and 94.7% with plates. However, the attachment increased the foreign matter content from 6.9 to 8.5%. This attachment caused the spindles to puncture green bolls; hence, it is not used until the last picking.

Effect of Defoliation

At the Tennessee Valley and Sand Mountain substations, defoliation had no significant effect on spindle machine efficiency and foreign matter content during either year, Table 2. It had no effect on grades in 1954, but resulted in about a half grade increase in 1955. In the earlier year, it was very dry during the growing and harvesting seasons, whereas in 1955 it was dry during the harvesting season. Considerable natural defoliation occurred in undefoliated plots of each test, Figure 2. The authors believe defoliation will prove more beneficial in rank cotton during years of "normal" or wet conditions.

TABLE 2. EFFECT OF DEFOLIATION ON SPINDLE PICKER EFFICIENCY, FOREIGN MATTER CONTENT AND GRADES, AVERAGE OF TWO LOCATIONS

Item	Defoliated	Undefoliated
Machine efficiency:		
1954, pct.	89.7	89.9
1955, pct.	96.0	95.7
Foreign matter content:		
1954, pct.	8.2	9.0
1955, pct.	7.1	7.7
Grades:[1]		
1954, bales	1-M Lt Sp 1-LM	1-M Lt Sp 1-LM
1955, bales	1-M, 1-LM+ 3-SLM	2-SLM 3-LM+

[1] U. S. Government grades. All cotton was ginned at local gins.

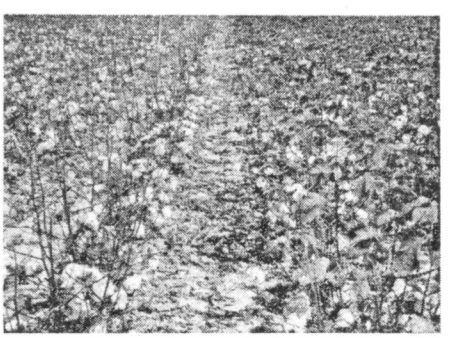


Fig. 2. Defoliated (left) and undefoliated (right) rows of cotton one week after applying defoliant. Note the natural defoliation at right. If you defoliate, apply chemical 7 to 10 days before machine picking.

* Cooperative study with Farm Machinery Division, Agr. Engin. Res. Branch, ARS of USDA.

THIN—

or not to thin?

K. W. LIVINGSTON, *Assistant Forester*

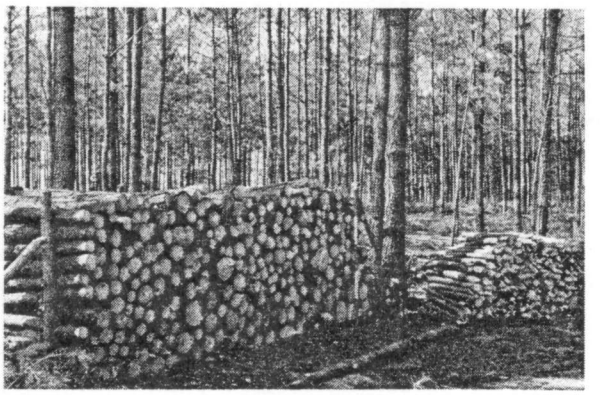


Fig. 3. Moderate thinning of this 19-year-old plantation yielded 10 cords of pulpwood, 52 small fence posts, and over 1½ cords of stove wood per acre.

SHOULD PINE plantations in Alabama be thinned?

The answer is not always immediately obvious. Research results have shown that, contrary to widespread belief, thinning southern pine plantations seldom if ever increases growth in total merchantable volume. Drastic thinning, especially at young ages when trees are reaching merchantable size, nearly always reduces volume growth.

A large proportion of the crown- and root-space in the stand is left unoccupied and idle, Figure 1. A number of

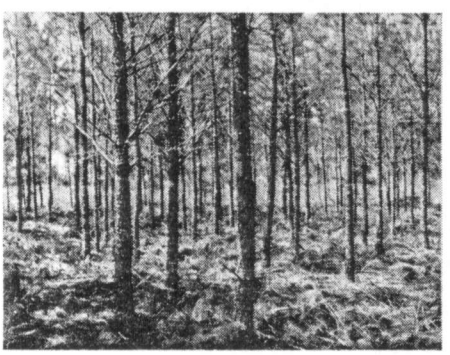


Fig. 1. Heavy thinning leaves much space unoccupied and reduces total growth.

years elapse before roots and crowns of trees left grow enough to fully occupy the available space and utilize all available soil moisture, nutrients, and sunlight.

Eye on Volume

Thinning can increase net volume yield when trees are removed that cease to grow or are about to die as a result of crowding or disease. Shown in Figure 2 are dead trees on the ground. Had these trees been removed before they died, their volume would have been added to the total net yield. Though extremely light thinnings that merely anticipate mortality are not always commercially feasible, they can furnish valuable products for local or home use.

Quality as well as quantity is an extremely important consideration. In any thinning, the straightest, clearest stems that support vigorous crowns are left. They will grow into premium quality sawlogs, and their growth can be accelerated by a moderate thinning that reduces competition. Such thinning must remove more than just trees about to die, but it need not be severe enough to materially reduce net growth. Generally, it is delayed until the greater portion of trees cut is merchantable or useful at home. The cutting is done when the best trees still have a third

Fig. 2. Above: Forked tree (arrow) could have been thinned to improve quality of others. Below: Dead trees could have been thinned and marketed before dying.

or preferably more of their length with living branches.

When and How

Obviously, the question of thinning cannot be answered for Alabama as a whole or for one county. It can be answered only for an individual plantation, by a qualified person who keeps in mind not only biological factors involved but also the desires and needs of the owner. The same considerations govern the answer to the question of when and how to thin. The owner of a large acreage, such as a pulp company, who is interested primarily in maximum volume production, might elect to do no thinning and concentrate on areas ready for final harvest. The owner who grows wood to keep his sawmill operating will undoubtedly elect to thin in order to give growing room to the potentially most valuable sawlog trees.

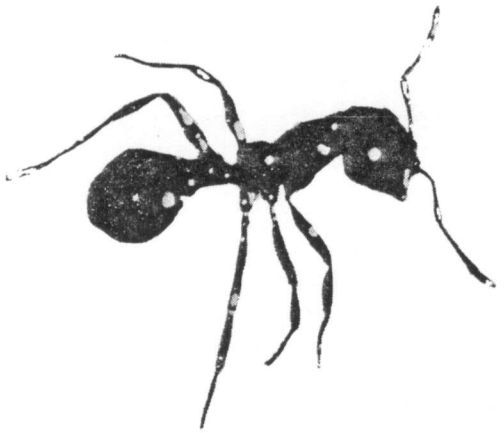
The owner who grows trees for a cash crop has a wide choice. He bases his decisions on individual needs and these guide rules:

(1) Moderate thinning can be made to increase quality with little sacrifice in quantity growth.

(2) Thinnings yield early financial returns that, because of compound interest, are worth relatively more than later returns.

(3) Severe thinnings generally reduce total volume growth.

(4) Frequent light thinnings that merely anticipate mortality increase net volume but are not always economically feasible.



IMPORTED FIRE ANT
—on the march in Alabama

G. H. BLAKE, Jr., *Assistant Entomologist*

If you've never had a bout with stinging ants, consider yourself lucky. When the insect involved is the imported fire ant, the bout generally becomes a rout — and in short order! Imported fire ants are vicious stingers and attack without provocation.

The imported, or mound-building, fire ant may be a stranger to many Alabamians, but in southern Alabama it has introduced itself with a punch, or more precisely, with a sting. It is believed to have been brought into the United States at Mobile about 1925 on a shipment of fruit from South America. Since that time it has spread to other areas and now is found in approximately 30 Alabama counties.

Pest to Agriculture

Imported fire ants (workers) are reddish to reddish-black and range in length from ⅛ to ¼ inch. They are similar to many native ants. The imported fire ant is best identified by the type of mound in which he lives. Their mounds vary in height from approximately 6 inches to nearly 2 feet (Figure 1), whereas nests of native ants are usually flat.

The fire ant is of economic importance for these reasons: (1) it frequently attacks germinating seed and young tender plants, (2) it builds unsightly mounds that can damage farm machinery, (3) it interferes with harvest of crops, and (4) its sting causes extreme irritation and may result in death. In fields planted to row crops, the ants sting persons harvesting such crops as strawberries and potatoes. In other fields both the ants and mounds cause concern. The dried mounds can damage cutter bars of mowers and combines. Silage-harvesting machines and combines become clogged with the moist soil from the mounds to the extent that the machines must be stopped for cleaning. The ants attack the operators as they clean the machinery.

Research Yields Controls

Results of several years' experiments by the API Agricultural Experiment Station show that insecticides will control fire ants in pastures and in row crops. Organic insecticides in dust, spray, and granular formulations, and in mixtures with fertilizer have been tested. The materials have been applied to individual ant mounds and to infested areas by broadcast application.

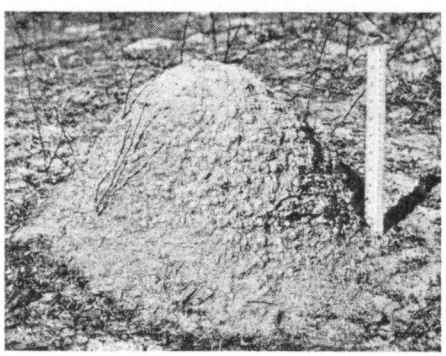


Fig. 1. Typical imported fire ant mound.

Most effective and long lasting control of imported fire ants can be obtaned by broadcasting chlordane, dieldrin, or heptachlor in infested areas. Four pounds of actual chlordane, or 2 pounds of heptachlor or dieldrin are applied per acre. In experiments that are still in progress, these treatments have effectively controlled fire ants for at least 2 years. Dieldrin was effective for 3 years in one experiment.

Fire ant nests are frequently located along ditches and roadways and in woodlands where the only practical treatment is application of the insecticides to the mounds. Chlordane as a 10% dust or a 2½% emulsion spray is effective as a mound treatment. At least 2 ounces of the dust or ½ pint of the spray is applied to each hill. Control is more complete when the mound is raked down before chlordane is applied.

Mound treatment will kill ants in mounds, but will not prevent ants from adjacent areas from reinfesting the treated fields. As a result, the ant population is not materially reduced from year to year. Mound treatment, therefore, is used only in localities where area treatment is not practical, in areas with spotted or light infestation, or for temporary control preceding harvest operations.

Time to Treat

The insecticides are applied to pastures in late winter or early spring, Figure 2. Generally, little foliage is on the ground during this period, and most of the insecticide will fall on the soil. This minimizes the problem of insecticidal residues and ants will be killed before they begin their spring swarms to establish new colonies.

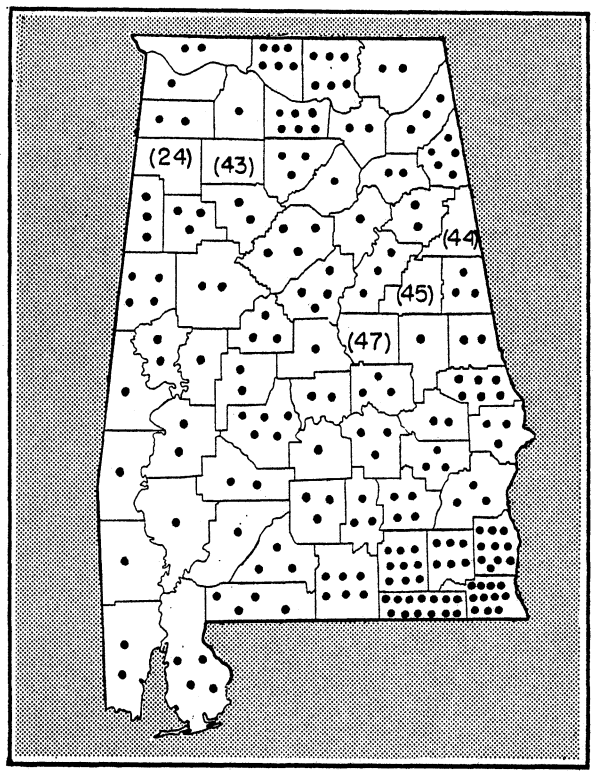
Since fertilizer applications are generally applied to pastures in late fall or winter, the insecticides may be applied with the fertilizer and cost of one operation will be saved.

Fig. 2. For controlling fire ants in pastures, insecticides can be applied with fertilizer and save one operation.

SOIL TESTING—

Leading to important changes in fertilization

C. M. WILSON, *Soil Chemist*



In the first 3-year period of the soil testing program, 1953-55, 20,144 samples were tested. The map shows volume of testing by counties, each dot representing 100 samples. Six counties in the Wiregrass and three in the Tennessee Valley areas lead the State with 500 or more samples per county.

SOIL TESTING is leading to many basic changes in Alabama's fertilization program.

Results from 3 years of testing by the API Agricultural Experiment Station emphasize the imperative need for the program. This need is brought home to the farmer at a time when it is important to have soil tested preparatory to fall planting.

A summary of 19,187 of the 20,144 samples tested in the Station's laboratory from the time the program was started on February 1, 1953, until January 1, 1956, points up the following facts:

(1) Alabama soils generally are now better supplied with phosphorus than with potash, and (2) the majority of Alabama soils are moderately to strongly acid.

Of the samples tested, 42% showed high phosphorus content in contrast to only 9% that showed high potash; 58% of the samples was medium to low in phosphorus content, whereas 91% was medium to low in potash content.

CASES WHERE BASIC FERTILIZERS ARE NEEDED

Region	Even PK[1]	High P low K[2]	Low P high K[3]
	Pct.	*Pct.*	*Pct.*
Limestone Valley	79	10	11
Sand Mountain	79	6	15
Highland Rim	83	9	8
Piedmont	75	12	13
Black Belt	71	25	4
Coastal Plains	73	6	21
State average	75	8	17

[1] 4-12-12, 8-8-8 or 0-14-14 recommended.
[2] 4-16-8 or 0-16-8 recommended.
[3] 4-8-16 or 0-10-20 recommended.

Phosphorus Buildup

The foregoing conclusions are not surprising when these factors are considered: (1) Phosphorus is not lost from the soil by leaching nearly as much as potash, and will build up more rapidly in the soil; and (2) a majority of mixed fertilizers used in the past has been of the high phosphate-low potash types, such as 4-10-7 and 6-8-4.

Several years ago when new land was still being brought into production and when relatively low rates of fertilization were being practiced, soils of the State were in general more deficient in phosphorus than in potash. A long period of fertilization with high rates of fertilizers has brought about a change. Data now indicate a need for fertilizers having an even ratio of phosphate to potash in a majority of the cases.

Given in the table are the percentage of cases where the three basic kinds of fertilizers (even phosphate-even potash, high phosphate-low potash, and low phosphate-high potash) are needed. Beneath the table, recommended grades to meet these needs are listed.

The high acidity of Alabama soils can be corrected by a sound lime program. If soil testing accomplishes only one purpose—promotion of a good lime program—then it is well worth all the money invested. Farmers in the State are applying about 150,000 tons of lime annually, whereas they should be using approximately 1,000,000 tons every year.

Farmers' Opportunity

The Station's soil testing laboratory is equipped to handle up to 30,000 samples annually. In excess of 9,000 samples have been analyzed this year and at least 4,000 more are expected. To date, only a small percentage of Alabama farmers is taking advantage of soil testing. Many farmers are missing the opportunity to do away with guesswork and fertilize according to needs.

Soil testing for fall planting is just as important as testing for spring planting. In past years about two-thirds of the samples came into the laboratory during the winter and early spring and about a third in late summer and early fall. Often, farmers will wait until the last minute to send in samples. The Station recommends that the samples be sent in 1 to 2 months before planting to allow ample time for liming.

Instructions for sampling are easy to follow. Cartons and instructions can be obtained at your County Agent's office.

FEATHERS—
the signs of age

ARNOLD O. HAUGEN, *Leader*
Alabama Cooperative Wildlife Research Unit *

QUAIL CAN'T hide their age behind feathers!

When a biologist looks at the wing feathers of a quail he can determine (1) whether the bird hatched during the past summer, or (2) the date of hatch, if the bird isn't over 150 days old.

A study in which 520 Alabama sportsmen supplied over 11,000 wings in the 1955-56 hunting season disclosed that 83.5 per cent of the quail killed were young of the year. This indicates that hens on an average hatched and raised at least 10 young. This is twice the number raised per hen during the drought year of 1954.

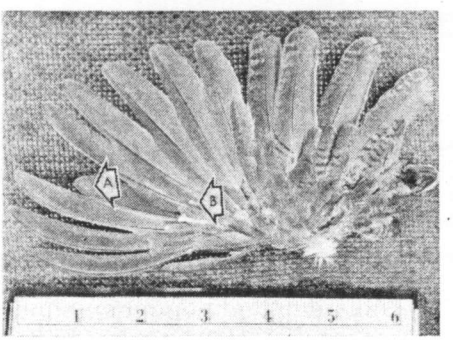
The high production of quail in 1955 is unusual when one considers that the hatch was unseasonably late. Studies in 1952, 1953, and 1954 indicated that the peak of hatch came in June. In 1955, however, the peak was delayed until August and two-thirds of the hatch came off after July 1. This delay of about a month and a half suggests that some factor, probably climate, destroyed large numbers of early nests. A quail will repeatedly try to renest if its nests are destroyed. As far as is known, it is rare for a quail to bring off more than one brood in a summer. Second broods have not been found in Alabama. The average quail lays 14 eggs, which are incubated 23 days.

A comparison of percentages of young in the soil provinces shows that the Tennessee Valley for the second year in a row led in productivity of quail (84.5% young). The Piedmont had the lowest percentage of young (79.9%) in 1955.

Chilton County led the State with 89.2% young. Barbour was second, Butler third, Cullman fourth, Covington fifth, and Escambia sixth.

The increase in quail wings received by the Research Unit, the increase in numbers of quail heard calling along a call count route during the 1955 nesting season, and favorable comments of hunters support the outstanding production of quail in 1955.

The greatest harvest of quail was made during the first half of the 12-week hunting season. The peak came during the first 6 weeks of the season, with the harvest falling off sharply after the holidays.



A—Order of replacement of flight feathers indicates age and hatching date. B—Light tips are found only on young of year. In this case, (A) indicates age of 82 days, (B) young of year.

* Jointly sponsored by the Alabama Department of Conservation, API Agricultural Experiment Station, U. S. Fish and Wildlife Service, and Wildlife Management Institute.

New and Timely PUBLICATIONS

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

Progress Report 59. Fattening Rations for Finishing Steers after Summer Grazing presents a comparison of five rations for finishing steers after summer grazing.

Progress Report 64. Increasing Weight and Slaughter Grade of Thin Beef Calves by Grazing and Feeding reports results of finishing calves by grazing and feeding.

Leaflet 41. Storing Shelled Corn in Alabama describes safe storage methods and gives results of storage experiments.

Leaflet 50. Control of Soil Insects and Leafhoppers Attacking Sweetpotatoes gives methods of controlling wireworms, leafhoppers, and other sweetpotato insects.

Circular 117. Harvesting and Storing Silage reports results of 3 years of testing silage harvesting methods in Alabama.

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

HIGHLIGHTS
of
AGRICULTURAL RESEARCH

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