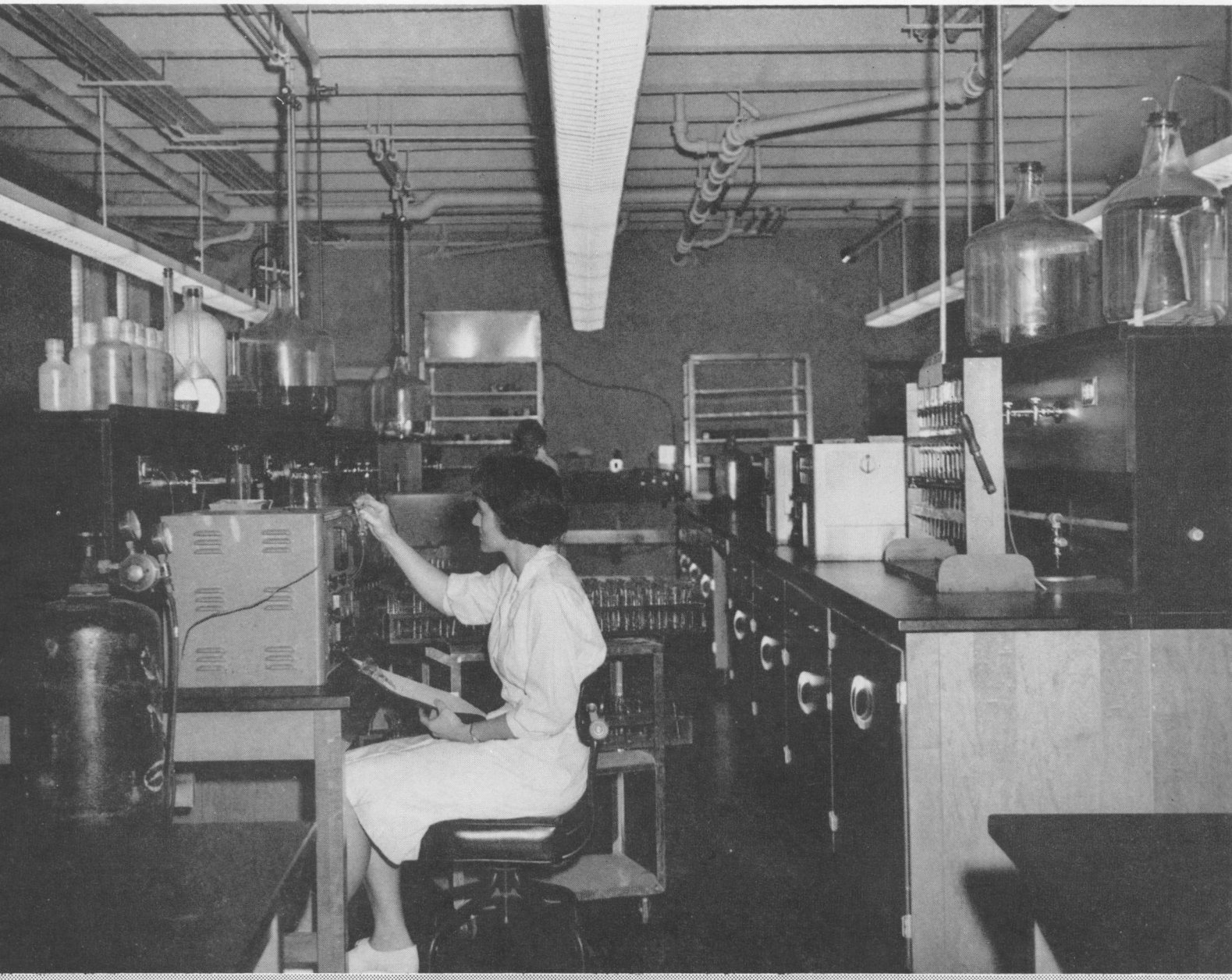
HIGHLIGHTS
OF AGRICULTURAL RESEARCH

VOLUME 8, NUMBER 4 WINTER 1961



Agricultural Experiment Station
AUBURN UNIVERSITY

HIGHLIGHTS *of* Agricultural Research

A Quarterly Report of Research Serving All of Alabama

VOLUME 8, No. 4 WINTER, 1961

In this issue . . .

On the cover. Funchess Hall has made available space for this up-to-date soil testing laboratory. The laboratory was long cramped in inadequate quarters. Since the establishment of the laboratory in 1953, more than 58,000 soil samples have been tested. Highest number tested in one year was 21,500. Samples are tested for $1 each. In the foreground is Mrs. Janice Ellis, laboratory technician.

Published by

AGRICULTURAL EXPERIMENT STATION of AUBURN UNIVERSITY

Auburn, Alabama

New and Timely PUBLICATIONS

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

Bul. 335. Crimson Clover in Alabama presents a summary of recent research on this widely-grown winter legume and gives recommended production practices.

Cir. 133. Cost of Clearing Land gives results of Experiment Station studies comparing cost of clearing land by different clearing methods.

Cir. 137. Producing Fence Posts from Thinnings points up possibilities of producing fence posts from pine plantation thinnings.

Prog. Rept. 75. Grinding and Molassifying Hay for Dairy Cows reports results of tests comparing long hays with those ground and molassified.

Prog. Rept. 81. Low-Cost Greenhouse gives details on how to construct a new type greenhouse using polyethylene plastic and reinforcing wire.

Free copies may be obtained from your County Agent or by writing the Auburn University Agricultural Experiment Station, Auburn, Alabama.

DAN W. SPEAKE, *Assistant Leader*
Cooperative Wildlife Research Unit

GOOD QUAIL HUNTING *follows moist, cool summers*

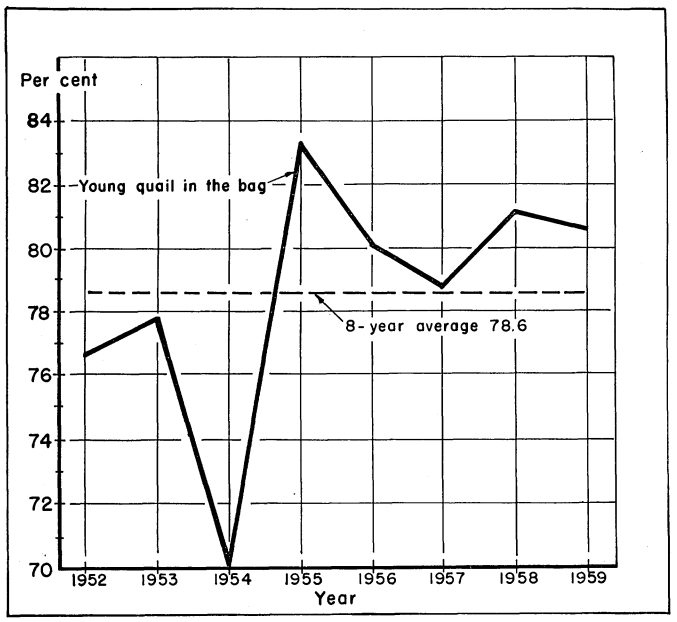
When summers are moist and cool, quail hunters can be optimistic. Droughty summers mean poor quail reproduction!

Results of research by Auburn University Agricultural Experiment Station show that reproductive success of quail is closely related to summer rainfall, and to a lesser degree to temperature. Since about 80% of the average fall population is made up of young birds hatched that summer, the success of the reproductive season determines the overall success of the hunting season.

Wing Studies

The Auburn findings are based on a study of 57,080 quail wings supplied by Alabama hunters during an 8-year period. From a quail wing two things were determined: (1) Whether the bird was an adult or hatched during the past summer, and (2) the date of hatch if the bird was not more than 150 days old when shot. In addition to data from quail wings, other information was useful, including quail population data, weather records, measurements of hunting success, observations of spring covey dispersal, and summer brood counts.

Quail production, as measured by percentage of juveniles in the wing samples, was best when total rainfall was higher than normal or normal and accompanied by average seasonal temperatures no higher than normal during the period of May through August. Quail reproduction in extremely dry, hot years was much poorer than average. This was true for the State as a whole from 1952 through 1959, and in the soil regions considered separately from 1953 through 1959. Regions could not be considered separately in 1952 because there were too few wings in the sample. Regional data indicated that good reproduction could sometimes occur when rainfall was below normal provided temperature was cool to normal.



The summers of 1952, 1953, 1954 were hot and dry; those of 1955, 1958 were cool and wet; and those of 1956, 1957, 1959 were cool with normal to less than normal rainfall but not extremely dry.

Fall quail populations on a 1,409-acre study area (Piedmont Substation) fluctuated in the same way as reproductive success for the State and its regions considered separately. Fall populations were correlated with weather in the same way from 1950 through 1960.

The order of hatch (based on the wing samples) was associated with reproductive season weather. Abnormally late hatches were usually associated with wet, cool weather during June, July, and August. Abnormally early hatches were usually associated with wet, cool May weather.

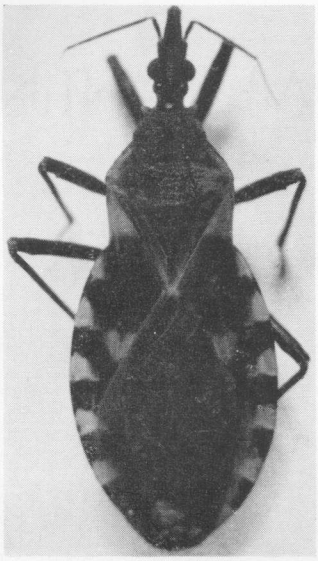
Other Factors

Success of the nesting and rearing season is not the only important factor determining year-to-year quail populations. We know that different land uses resulted in different carrying capacities and that predators may exert some influence. Barring extensive changes in the land-use pattern, it appears reasonable to conclude that for a given large area in Alabama the most important factor determining a fall population is the summer production as affected by weather.

Weather may affect the hatchability of quail eggs. If humidity and temperature are not right at hatching time, chicks may stick to the inner membrane and the eggs will not hatch even though the chicks are alive. Hot, dry weather may cause the hen to desert the nest or it may affect survival of the young or possibly all of these. Severe drought may indirectly affect the survival of young quail by causing reductions in food supplies. Data from this study indicate that the effects of weather under Alabama conditions are more important on the nests than on the chicks.

Quail very rarely produce more than one brood per hen per year. For practical purposes it may be assumed that only one brood is produced. Second or third attempts at nesting are usual if nests are broken up early. Most quail hatching after about July 1 represent the results of successful second or third attempts. In this study good quail reproduction was almost always associated with abnormally large percentages of late hatched birds (hatched after July 1). This probably means that nest destruction and/or destruction of young birds by agents other than weather was so important that a season's reproductive success usually depended on the success of second and third nesting attempts.

In excellent years such as 1955, the average quail hen may successfully raise 11 chicks as compared to 5 in 1954 (a very poor year). In years of poor quail reproduction, hunting success falls off drastically. The law of diminishing returns ensures that adequate brood stock will be left for the following year.



At left is the common kissing bug, which is the carrier of the Chagas' disease organism. The bug is black but marked with red bars; it measures about 1 in. long.

CHAGAS' DISEASE *in Alabama*[*]

KIRBY L. HAYS
HENRY F. TURNER
PETER F. OLSEN

Department of Zoology-Entomology

CHAGAS' DISEASE has long been known and feared in South and Central America. The disease is caused by a tiny protozoan parasite, *Trypanosoma cruzi* (Chagas). It particularly affects children and young adults.

Although only two cases of human Chagas' disease have been reported as originating in the United States, there is evidence that some cases have gone undetected. Health authorities have become concerned because of the increasing discoveries of infected animals and insects.

The acute stage of the disease is evidenced by fever, swelling of the face, and anemia. Symptoms of the chronic stage that may follow depend on the massing of parasites in the tissues. The common points of localization are the muscle of the heart, tissues of the liver or spleen, or the central nervous system. Since there is no effective method of treatment, control of the disease depends on control of animal and insect carriers.

Carriers

For some time it has been known that the parasites infect wild vertebrate animals and insects in the western United States. The disease, however, was first reported in the East in 1954 when it was found in raccoons in Maryland. Since that time the organism has been isolated from opossums, skunks, foxes, and raccoons in Georgia and from several animals in Louisiana. Reported here is the isolation of the organism from opossums in Alabama. The first was made from an opossum captured in Lee County about 4 miles north of Auburn. The second isolation was from an opossum taken on the Barbour County Wildlife Management Area. Neither animal showed clinical symptoms of the disease, although the opossum from near Auburn was in poor physical condition. The disease organisms from each of the animals are being used to infect laboratory experimental animals.

Transmission

The disease is generally transmitted from animal to animal or from animal to man by cone-nose or kissing bugs of the family Reduviidae. These bugs are called kissing bugs because of their preference of biting around the mouth and face. When the bug bites and sucks blood from an infected animal, some of the organisms are also taken into the digestive tract of the bug where they multiply and in a short period may be found in the bug's feces. The parasites do not invade the tissues of the bug, but change form and multiply in the lumen of the gut.

The bug has a habit of defecating while feeding or shortly thereafter. The site of bite itches and causes the bitten animal to scratch the area. Thus, the puncture made by the bite or another skin abrasion becomes contaminated with feces containing the organisms. The parasites find their way into the blood stream, and then invade the tissues where they multiply. The common kissing-bug vector (carrier) in Alabama is probably, *Triatoma sanguisuga* (Leconte). This insect is seldom seen by the casual observer. In Alabama it is commonly found in dens of woodrats and within loose decaying wood inside hollow trees. The kissing bug feeds on the blood of animals that inhabit such dens. However, they apparently can live for long periods without blood, since many wild-caught specimens had little or nothing in the gut. The habitat in which some were found did not appear to have been inhabited by an animal for a considerable period of time.

Life History

Adult kissing bugs mate and the female deposits eggs that hatch in about 10 days. The immature bug seeks a blood meal after which it molts. Newly hatched bugs may live as long as 3 weeks without food. There are 5 immature stages in the life cycle, which is completed in about 1 year. Adult bugs are not strong fliers, but are capable of flying short distances.

Records in the museum of zoology-entomology department show that this insect may invade houses and feed upon the human inhabitants, thus providing the potential for transmission of the disease.

Fecal examinations of wild-caught kissing bugs have revealed that some of them were infected. The infected bugs were collected from hollow oak trees in Barbour County, Alabama. Passage of the organism through bugs and young animals increases the virulence of the strain of the disease. After two passages, one of the Georgia strains of the organism produced mortality and severe damage to the heart muscle in laboratory mice.

EDITOR'S NOTE: The authors of this report would appreciate receiving information from readers of Highlights of Agricultural Research regarding the presence of kissing bugs in their areas of the State.

[*] This investigation is supported by Research Grant E-3307 from the Institute of Allergy and Infectious Diseases, National Institutes of Health, U.S. Public Health Service.

Improved FOWL CHOLERA TYPHOID Control

E. C. MORA and S. A. EDGAR
Department of Poultry Science

THE RAPID GROWTH of the poultry industry has been accompanied by new disease problems.

Concentration and movement of eggs and chicks is the easiest way to disseminate old, introduce new, and bring in new forms of old diseases. Until recently, fowl cholera and fowl typhoid were diseases mainly in the North Central and Northeastern States; however, these diseases are increasing in the Southeastern States.

Fowl cholera and fowl typhoid are two of the oldest known diseases of poultry. Immunity and immunization were first demonstrated by the use of vaccine of these diseases. Although they are caused by totally different bacteria, there are certain relationships that link them.

Sanitation and Management

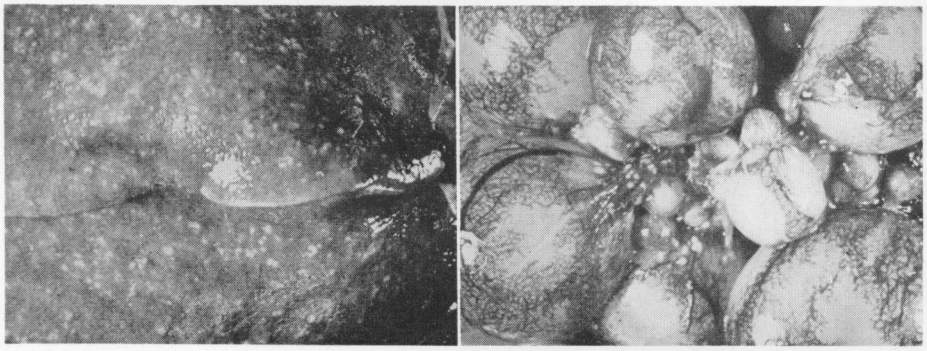
Fowl cholera and typhoid are frequently associated with poor sanitation and management. They can occur any time of the year in birds of any age, but more frequently in birds over 10 weeks old. Both sexes can be infected though the symptoms may be more evident in females than males. As far as is known, all birds and mammals, including rodents, are susceptible and serve as carriers. The bacteria usually gain entrance through the mouth and nose, which means that the most common sources of infection may be contaminated feed, water, soil, or litter. These are usually contaminated by carriers including poultry, wild birds, or rodents. Disease bacteria can also be introduced in feces on coops, shoes, and equipment.

The bacteria that cause fowl typhoid can be transmitted through the egg. The skin and tissues of poultry can be penetrated by bacteria if the birds are in a weakened condition.

The symptoms of fowl cholera and fowl typhoid are very similar and often resemble infectious coryza, bronchitis, bluecomb, vitamin A deficiency, and Newcastle disease. In all cases where possible, the field diagnosis should be verified by laboratory diagnosis. As with other diseases, the best control is prevention, which always means good management and sanitation.

Control Measures

Once fowl typhoid or cholera occur on the premises, there are two alternatives. The first is depopulation, which is costly but preferred by some growers. After depopulation, thorough cleaning of the contaminated housing and equipment is necessary. However, this is not an assurance that the disease will not recur when new replacements are brought in. Depopulation is not the treatment of choice except with old birds.



Pinpoint areas of infection are common of both fowl cholera and typhoid in the liver, left, and typical congestion of both cholera and typhoid are seen in the ovae, right.

The second alternative is treating the infected flock. The following have been found to provide some control of cholera and typhoid outbreaks: (1) sulfamerazine-0.5-1.0% in feed or 0.2% in water for 5-7 days: (2) sulfaquinozaline-0.04% in water for 2-3 days or 0.025% for 5-7 days; (3) NF-180-300 gm. per ton of feed for 3 days; and aureomycin or terramycin-1,000 gm. per ton of feed for 5-7 days. Same benefit may be obtained with two injections of 50 mg. per bird, 48 hours apart.

These treatments have not been wholly successful since mortality nearly always resumes after the drug is discontinued.

At the Auburn Agricultural Experiment Station, a plan of treatment combining vaccination with medication has been used effectively. Vaccination against fowl cholera and fowl typhoid has not had a good reputation in the past. However, several advances have been made in the past few years that warrant a second look at vaccination for control of these diseases.

Since 1880 many bacterins have been developed with variable and unpredictable results. More recently a successful emulsified bacterin has been developed. The oil-in-water type is designed to give a delayed immunity, one in which the peak of immunity is reached a long time after the administration. This type does not lend itself well for stopping epidemics. The Auburn Station has developed bacterins that are fast acting and give prolonged immunity. In addition they do not produce trauma as oil emulsions do. To date, over one million birds have been vaccinated with these bacterins with successful results.

As soon as a diagnosis of fowl cholera or typhoid is made, the birds are vaccinated with ½ cc. of bacterin. At the same time the birds are put on high level medication for 4 days at the end of which time the drug may be decreased to the prophylactic level or removed entirely. A second injection is given to each bird 15-21 days after the first. This second injection boosts resistance. Experience has been that mortality ceases within 1 week and does not increase after removal of the drug. Birds vaccinated against fowl typhoid give positive reactions to the pullorum test. Hence, breeder hens will have to be treated differently, or this would have to be taken into consideration in interpreting the pullorum test.

Pullets and turkeys can be vaccinated but not medicated just prior to being moved into contaminated housing and ranges. After 6 months, the vaccinated birds had not shown signs nor symptoms of cholera or typhoid.

In healthy birds egg production is not affected by the vaccinations. Egg production returned to normal a few weeks after suppression of infection by vaccination in diseased flocks where production had dropped drastically.

Farm Livestock Slaughter Decreasing in Alabama

A. C. HUDSON* and M. J. DANNER
Department of Agricultural Economics

SLAUGHTERING LIVESTOCK for home use is going the way of many other farm practices.

Thirty years ago almost every Alabama farmer slaughtered hogs for his family's use. Today this has dropped to almost half (including all processed for home use, regardless of place of slaughter). However, more cattle are slaughtered now that freezers are available for beef storage.

Strangely enough, this recent decline in farm slaughter has occurred while more cattle and hogs are being produced and marketed. Figure 1 shows trends in hog numbers, marketing, and slaughter for Census periods beginning in 1929.

Information on farm slaughter came from a mail survey of Alabama farmers in 1959. This survey was made by Auburn University Agricultural Experiment Station to determine (1) importance of farm slaughter for home use, and (2) seasonality of this slaughter. Information from a 1939 study afforded a basis of comparison between the two periods. The small sample was drawn to represent farmers who had sold 10 or more head of livestock. Thus, results probably apply more to large than to average farmers.

* Resigned.

How Many Slaughtered?

For the entire sample, 29% slaughtered only hogs, 6% slaughtered only cattle, and 27% killed both hogs and cattle for home use. The remaining 38% reported no home slaughter, Figure 2. Proportion slaughtering hogs only ranged from 40% in northern Alabama to 13% in the central region. However, the central part of the State was the only area where farmers reported farm slaughter of cattle only. About one-fifth of central Alabama farmers slaughtered cattle for home use.

Slaughter of both hogs and cattle for home use was not important in northern Alabama, but about one-third in remaining areas reported slaughter of both.

1959 vs. 1939 Slaughter

A report of the 1939 study revealed that 89% of farmers slaughtered hogs and 8% slaughtered cattle for home use. This compares with the current proportion of 56% for hogs and 33% for cattle, Figure 3.

Number of cattle on Alabama farms has shown a much greater increase than for hogs. However, the increased number of home freezers and the greater adaptability of beef to freezing probably accounts for the increase in cattle slaughter over that of hog killing.

Farmers who slaughtered only hogs for home use killed an average of 3 hogs during 1959. Those who killed both cattle and hogs averaged slaughtering about 4 hogs and 1.4 head of cattle. Fewer farmers slaughtered cattle only, but those who did averaged almost 2 head for home use. While fewer farmers in southern Alabama reported farm slaughter than in other areas, they killed more hogs than did those in other parts of the State. In the central area, an average of 2 head of cattle were killed for each 3 farmers. This dropped to 3 cattle for each 5 farmers in the southern area and 1 for 5 farmers in the northern region.

Months of Slaughter

November, December, and January are still favorite "hog-killing" months, with about two-thirds of hogs slaughtered during this time. Nevertheless, some slaughter is done the year-round.

Slaughter of cattle was also highest during November, December, and January, but these months accounted for only one-third of the total for the year. It was evenly divided for the remainder of the months. The more even seasonal spread of cattle slaughter was associated with availability of home freezers and the fact that beef does not lend itself to curing during cold weather as does pork.

Although home production of food has declined in recent years, the majority of farmers included in the Auburn survey still slaughter meat for their family's use. Availability of home freezers enables these families to maintain a more complete supply of pork and beef for year-round use.

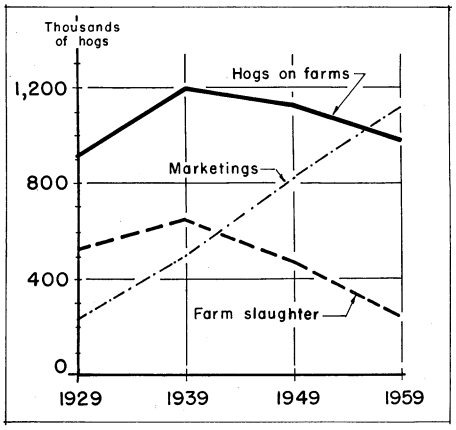


FIG. 1. The graph shows hogs on farms, number marketed, and number slaughtered on farms in Alabama, 1929 until 1959.

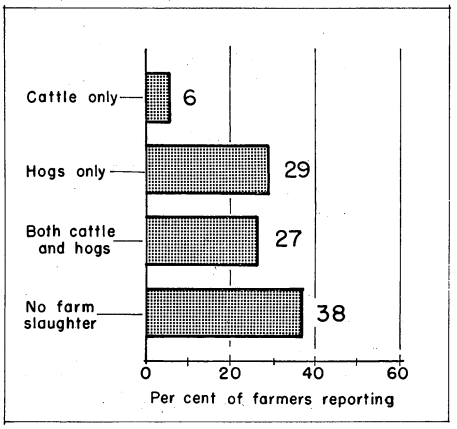


FIG. 2. Percentage of Alabama farmers reporting livestock slaughter for home use in 1959 is shown by the graph above.

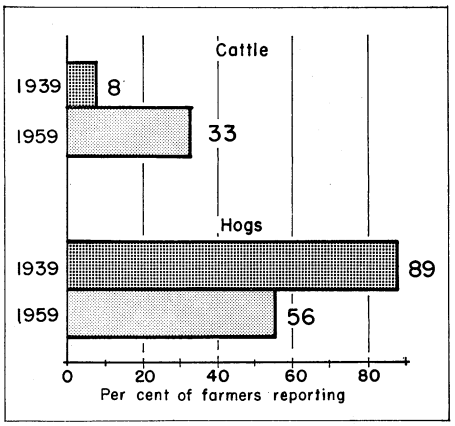
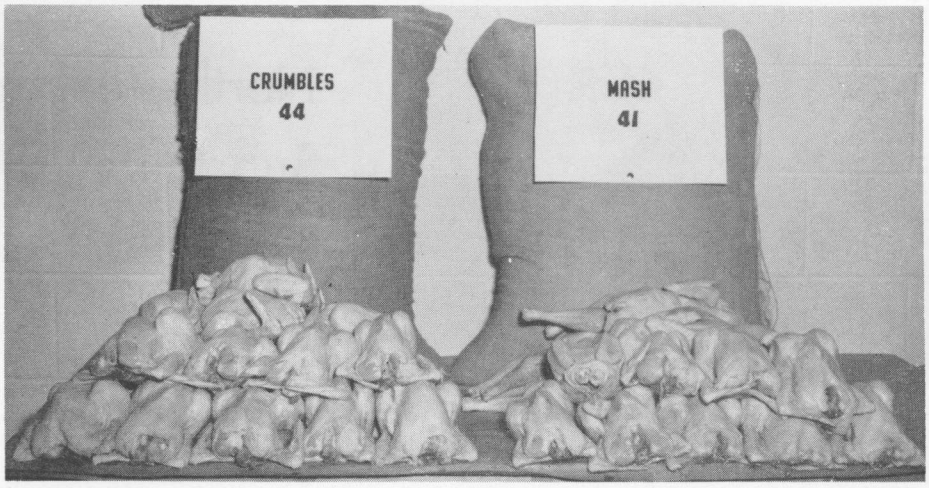


FIG. 3. Shown here is a comparison of 1939 and 1959 slaughter of cattle and hogs for home use by Alabama farmers.

BROILER PRODUCERS are caught in a profit squeeze. This is true for both grower and contractor. Production costs and broiler prices have been coming closer together in recent years. In many cases during the last several months, cost of producing broilers has been equal to or above the market price.

Feed prices and feed efficiency are main factors determining cost of producing broilers. These factors are of primary importance to broiler producers in their efforts to reduce costs.

One possibility for cost reduction is for the producer to mix protein concentrate with ground grains to make a suitable feed. Another possibility is to buy



One sack of crumbles produced 44 lb. of broiler meat in the Auburn study as compared with 41 lb. for 100 lb. of mash.

MASH vs. CRUMBLES for BROILERS

G. J. COTTIER, *Poultry Husbandman*

all ingredients and mix a complete feed. Growers of any size can use the first method, but only large operators can use the other system. With both methods an all-mash feed is produced, since pelleting and crumbling machinery is too expensive to be used in this size operation. Feed costs are less with either method than for bought commercial mash or crumble feed, largely because of less overhead costs in small mills.

Since home-mixed mash is cheaper than crumbles, producers need to know how mash compares with crumbles in broiler growth and feed efficiency. To provide this information, Auburn University Agricultural Experiment Station in 1960 began feeding tests to compare mash with crumbles. In most broiler areas these are the most popular methods for feeding broilers.

A total of 2,871 broilers (18 pens with an average of 160 broilers per pen) was used for the study. Half were fed all-mash and the other half got only crumbles. All feed was of the high energy type from the same formula produced at the same commercial mill. The first broilers were started in March 1960 and the last in May 1961. Each of the nine tests lasted 9 weeks.

Crumbles Best

Crumbles gave better results than did the mash. Broilers fed crumbles were heavier, required less feed, and were produced cheaper than those fed mash.

Broilers fed crumbles were heavier in six of the nine tests than those fed mash. There was no final weight difference in one test and mash-fed birds were heavier in the other two. Broilers fed crumbles averaged 3.13 lb. at 9 weeks as compared with 3.03 lb. for those fed mash.

PERFORMANCE OF TWO HOUSES OF 10,000 BROILERS EACH FED CRUMBLES OR MASH

Feeding method	Weight gain and feed efficiency					
	Average weight	Total meat	Feed required	Feed cost[1]	Value of meat[1]	Value of feed saved + extra meat
	Lb.	*Lb.*	*Lb.*			
Mash	3.03	30,300	74,500	$2,607.50	$4,242	
Crumbles	3.13	31,300	71,700	2,581.20	4,382	
Difference	.10	1,000	2,800	26.30	140	$166.30

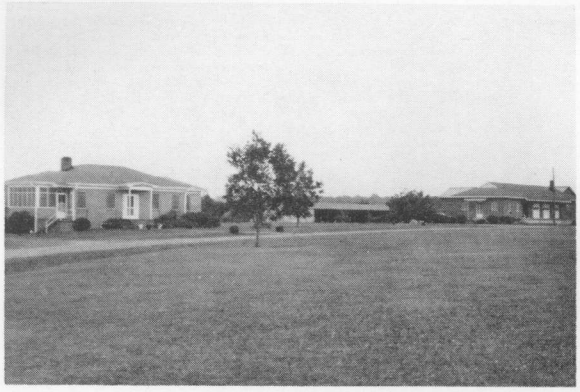
[1] Price of mash was $70 and crumbles $72 per ton. Broiler price was 14¢ per lb.

A sex difference was noted in response to method of feeding. Males fed crumbles were 0.13 lb. heavier than males fed mash, but the difference was only 0.06 lb. in favor of crumbles fed the females. Average weight of both sexes favored crumbles by 0.10 lb. Males were heavier at 9 weeks than females for both feeding systems – 0.67 lb. for crumbles and 0.60 lb. for mash. Where growth alone is considered, crumbles should probably be fed for growing males.

Saving of feed is another advantage of crumbles over mash. Broilers fed crumbles were more efficient in all trials than were those fed mash. This difference amounted to 0.17 lb. of feed per lb. of meat. In a house of 10,000 broilers the saving would amount to 2,800 lb. of feed per brood, and the crumble-fed broilers would produce 1,000 lb. more meat, see table.

As shown in the table, value of feed saved plus extra meat produced amounted to $166.30 more for the broilers fed crumbles – about 1⅔¢ per broiler selling at 14¢ per lb. As the price of broilers goes below 14¢ or as feed prices go down, the difference in profit would be less. The reverse would be true if the broiler price was above 14¢ or feed more than $70 to $72 a ton. Since there was 1,000 lb. more meat produced on crumbles than on mash, each rise in price of 1¢ per lb. of broiler means $10 more profit for each 10,000 broilers fed on crumbles.

Crumbles are usually $2 more per ton than mash. With results obtained in this study and with broilers selling for 14¢ and crumbles at $72 per ton, mash should be about $6 less per ton than crumbles for comparable profits.



The superintendent's home, office building, and fruit and machinery sheds are shown above.

North Alabama Horticulture Substation OFFERS RESEARCH ON SPECIALTY CROPS

E. L. McGRAW, *Associate Editor*
T. S. MORROW, *Superintendent*
M. H. HOLLINGSWORTH, *Asst. Superintendent*

In a relatively short period of 12 years, research on horticultural crops at the North Alabama Horticulture Substation has brought industry and agriculture together for economic improvement in the northern Alabama area.

Not only has industry furnished a ready market for farmer-produced products but furnished employment for several hundred people. A good example of the results of this research is the pimento industry that has grown from 4 acres in 1947 to approximately 6,000 acres last year and 8,370 acres this year. At present this crop comprises 1/6 of the acreage in the United States and accounts for ¼ to ⅓ of the total tonnage produced. Production-wise the crop yields 2 tons per acre as compared with the national average of 1.2 tons. In terms of increased income, it has meant an additional 1 to 1¼ million dollars. Most of the farmers sell their peppers on a contract basis. Some farmers have produced as much as 7 tons per acre. The major research with pimento includes fertilizer treatments, disease and insect control, weed control, and breeding work.

Southern blight, a soil-borne fungus disease, has destroyed as much as 60% of pimento pepper crop in areas of Alabama. Experiments in 1953-54 and 1956 showed that Terraclor applied as a setting water treatment substantially reduced disease losses. The chemical was applied in 1953 and 1954 as a 20% dust. This material was mixed with the upper 2-3 in. of soil in the furrow at the rate of 720 lb. per acre. In 1954 a solution was prepared containing 7 lb. of 75% wettable powder in 100 gal. of water. This material was applied to the soil around the base of plants at the rate of 1 pt. per plant from 3 to 6 weeks after planting. In 1956, the terraclor (PCNB) mixture was found to be most effective when prepared at a rate containing 2-3 lb. of 75% wettable powder in 100 gal. water and applied as setting water around the transplants at the rate of ⅓ qt. per plant.

The pimento is a host plant of the European corn borer. Results of research have shown that the best control for this insect includes use of 20 lb. per acre of dusts of DDT, 10%; toxaphene, 20%; or Sevin, 10%. Dustings should be made at not more than weekly intervals beginning about July 1. The month of August is a particularly crucial time on pimentos, and intervals between dustings should be shortened to not more than 5 days. It is imperative that a protective coating of insecticide be kept on the pepper at all times during the egg-laying period of the adult moth of the borer. Dusts must be reapplied when washed off by rain.

History of Station

Funds were made available for this Substation, located at Cullman, by the 1947 Alabama Legislature. Realizing a definite need for research on vegetable and fruit crops, the Legislature approved the establishment of this Substation to serve the truck areas of Alabama north of Birmingham.

The Substation consists of 160 acres of soil types typical of the Cullman County, Sand Mountain areas. A total of 100 acres is in cultivation, 35 acres in woodland, and 14 acres in pasture.

From the beginning a complete production and management research program for the leading truck crops and fruits of the areas has been conducted.

Sweetpotato Research

At present 22 varieties of sweetpotatoes are being tested. Fertilizer tests were also included in this research until 2 years ago. The goal has been for more sweetpotatoes grown on fewer acres. The average production ranges from 100-150 bu. per acre. One problem in sweetpotato production is that approximately 25% is lost in storage. Tests have shown that for best storage the crop is stored immediately after harvest at 85° F and 85 to 90% humidity for a curing period.

The best fertilizer treatment for sweetpotatoes found through research at the Substation is 800 lb. of 4-12-12 per acre at planting plus 24 lb. N per acre when plants are bunched ready to run. Tests are also being made of the use of vine cuttings in production.

In disease research Allgold and Goldrush varieties were found to be more resistant to stem rot and internal cork than the Porto Rico. Dipping of sweet-

Varietal work at the Substation constitutes a larg the sweetpotato variety plots and right is a part eight crops are being tested.

potato sprouts or slips in fungicidal suspensions of chloranil (Spergon) and captan before field planting also reduced stem rot (Fusarium wilt) in the field.

Through tests on the use of electric hotbeds in producing sweetpotato slips and proper handling after production, farmers have been given an economical method of producing certified plants.

Tests with the Centennial variety, imported from Louisiana, have shown definite possibilities for high production of good quality sweetpotatoes.

Another project of economic importance in sweetpotato production has been the control of the wireworm. The loss of one truckload of sweetpotatoes by a local farmer was the beginning of an extensive research and control program in the area. The Substation found that 2 lb. of aldrin or dieldrin (technical material) applied in the row at planting or 5 lb. applied broadcast will control the pest.

Weed control in sweetpotatoes, started this year, shows promising results for chemical weed control in this crop.

Pimento pepper was a crop that helped many farmers in their search for new enterprises. Shown above is a part of the pepper grown on the Substation.

New Type Apples

Early season apple production in Alabama may have economic potential because of the possibility of placing apples on northern markets before producing areas of the East.

An extensive research project was begun at the Substation in 1960 to ascertain the possibility of growing early-ripening apple varieties on dwarfing rootstocks.

Since current trends in agriculture are toward more fully mechanized operations, the possibility of restricting the size of apple trees to reduce maintenance and harvest costs in the orchard is apparent. In addition, if apple trees can be reduced to produce fruit at a younger age, the drawback of maintaining an orchard for 6 to 8 years before a crop can be harvested is greatly reduced. Through the use of certain dwarfing rootstocks, these desired effects can be achieved.

Trees of the Lodi variety on Molling IX rootstocks planted in 1960 yielded ½ bu. of 3 in. or larger in diameter fruit the following year.

Data from experiments on the control of apple diseases since 1958 have resulted in the recommendation of dodine (Cyprex) for the control of apple scab and streptomycin (Agrimycin, Agristrep, Phytomycin) for the control of fireblight of apples and pears. Scab and fireblight are two of the most important diseases of pome fruits. The effectiveness of captan (Orthocide), thiram (Thylate), ferbam, (Fermate), and an experimental fungicide (phaltan) for the control of summer diseases such as bitter rot, sooty blotch, flyspeck, and other fruit-rotting and spotting diseases of apples have been evaluated the past 4 years.

Data from experiments on the control of fireblight showed that excellent control of this bacterial disease was obtained with 2 or 3 sprays of streptomycin applied at a rate of 50 p.p.m. starting with 20-25% bloom and repeated every 4 or 5 days through full bloom. Excellent control of apple scab was obtained with the new fungicide, dodine from 1958-61. This material, sold as Cyprex, is far superior to other apple fungicides in the control of this important disease.

Captan is recommended for application throughout the season at 7-14 day intervals and imparts a high quality fruit finish. Phaltan should not be used until cleared by Federal Drug Administration and USDA for commercial use on apples. When available, it will give superior control for bitter rot, sooty blotch, and flyspeck since it provides longer lasting control. Ferbam with captan or dodine for cedar rust control in early season sprays improves the control of primary infections by the fungi that cause scab, sooty blotch, and flyspeck. Thiram may be substituted for ferbam in the early sprays. Thiram can be applied throughout the season whereas ferbam leaves an undesirable residue after third spray. Thiram's effectiveness on the wide range of summer diseases has not been fully evaluated in Alabama.

Other Research

Probably the most extensive research at the Substation has been that of varietal work. At present there are on test 31 varieties of peaches, 16 apples, 10 strawberries, 12 bunch grapes, 7 plums, 22 sweetpotatoes, 11 pears, 10 dwarfstock apples and varieties of Irish potatoes.

Peaches have been destroyed or seriously damaged during the past year from frost. This emphasizes the necessity of planting in areas free of frost pockets.

Results of research at this Substation have gone far in developing a better economy for the area through the production of fruit and truck crops. Today, Cullman County is the second largest commercial truck producing area in Alabama.

t of the research in progress. Left is a section of he pea variety tests. More than 100 varieties of

AUBURN 56 VARIETY

Valuable to Entire Cotton Belt

L. J. CHAPMAN, *Assistant in Agronomy*

Resistance of Auburn 56 variety, right, to the nematode-fusarium wilt complex is shown in this field. Fox variety is at left.

DEVELOPMENT of Auburn 56 cotton filled a big need of the entire Cotton Belt.

This variety has been outstanding in performance wherever nematodes and fusarium wilt are a problem – from the Carolinas to the West Coast and from Missouri south to Mexico. Auburn 56 does well in areas where earliness is of prime importance, yet is well adapted to areas with longer growing season.

Nematode-Fusarium Wilt Resistance

Although it has other outstanding characteristics, Auburn 56 is most superior in its resistance to the fusarium wilt-nematode complex. Fusarium wilt is caused by a soil-inhabiting disease organism that enters cotton roots through openings made by nematodes. Nematodes also damage small root tips, stunting growth and reducing yield.

Nematodes and wilt occur in the lighter textured soils throughout Alabama and in other Southern States. It is in these areas that Auburn 56 displays its superiority. For example, at the Plant Breeding Unit, Tallassee, on soil severely infested with nematodes and wilt, the variety has been outstanding since 1949.

During 1956-60 at five southern Alabama locations, Auburn 56 averaged 734 lb. of lint per acre in 23 tests. This compares with 706 lb. for Dixie King, 691 for Plains, 683 for All-in-One, 675 for Coker 100A, and 647 lb. per acre for Empire.

This outstanding performance takes place wherever the nematode-wilt complex is a problem. Southeastern Missouri has many acres on which the disease complex is so severe that loss on non-resistant varieties often approaches 100%. In recent Missouri Agricultural Experiment Station tests at Deihlstadt on heavily infested soils, Auburn 56 produced 1,094 lb. of lint per acre without soil fumigation. A popular non-resistant variety yielded 995 lb. per acre when fumigated. Fumigation did not increase yield of Auburn 56. In 1954-59 Louisiana tests on soil severely infested with the wilt-nematode complex, Auburn 56 was far superior to other resistant varieties.

Suited for Mechanical Harvest

Another important characteristic of Auburn 56 is that it hangs in the bur well for extended periods and is adapted to harvest with spindle pickers. This will be of increasing importance as more and more of Alabama's cotton crop is harvested mechanically.

Auburn 56 has the greatest degree of storm tolerance of all the Southeastern cotton varieties. In late September 1956 at Auburn, in the marginal area of hurricane "Flossie," this variety withstood 40-50 m.p.h. winds accompanied by 7 in. of rainfall during 48 hours with only 6% loss. This was the lowest of 25 varieties, with others losing as much as 25% of its cotton. In spindle picker tests, Auburn 56 has consistently given greater picker efficiency than varieties with less storm resistance.

And if all this is not enough, Auburn 56 is one of the few cottons that shows some tolerance to *Verticillium* wilt.

Variety Development

Development of such a variety did not just happen. Rather, it was the culmination of many years' work by a dedicated scientist, the late Homer B. Tisdale, plant breeder and agronomist.

Actually, Auburn 56 is not a new cotton. In 1909 in a breeding block of Cook cotton being grown in Lee County on soil infested with nematodes and wilt, three plants were found that withstood the pests. These three plants were harvested and ginned separately and the seed planted in separate rows the following year. One of the rows showed almost perfect resistance, but the others were badly damaged.

The wilt-resistant strain was designated Cook 307-6. In 1914 Mr. Tisdale began breeding work with this strain. Superior lines were isolated and tested on wilt-infested Alabama soils. This variety, which produced staple of ⅞ to 15/16 in. in length, became the most popular wilt-resistant variety grown in Alabama and to a lesser extent in Georgia, South Carolina, Mississippi, and Louisiana.

With the shift to longer-staple cotton, Cook 307-6 gradually lost popularity. In 1936 a breeding program was begun to transform Cook 307-6 with its superior resistance to a variety with more desirable fiber characteristics. Out of a multitude of crosses made by Tisdale and J. B. Dick, agronomist, the most promising material resulted from Cook 307-6 x Coker 100 x Coker 100 x Coker 100 wilt. In 1953, after 17 years of rigorous selection and testing, Auburn 56 was released to growers. It possesses the excellent resistance of its counterpart of almost a half-century ago plus a staple that averages 1-1/32 to 1-1/16 in. in length, good gin turnout, and good spinning qualities. It has the best combination of yield and resistance to the nematode-wilt complex available in any commercial variety.

SILAGE – Good for Wintering Stocker Calves

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

CORN SILAGE supplemented with ground ear corn and protein has been the top ration for wintering stocker steers in Tennessee Valley tests. Sorghum silage was second, ahead of oat silage, grass-legume hay, and oat grazing. The rations were evaluated on the basis of daily gain and cost per cwt. gain.

The feeding trials have been underway since 1955 at the Tennessee Valley Substation. Stocker calves averaging about 400 lb. have been purchased each fall for the experiments. Groups of the calves are wintered on corn, oat, or sorghum silage fed free choice plus 2 lb. of ground ear corn and 1½ lb. cottonseed meal per head daily. Another group has been wintered on oat grazing. The calves graze when forage supply and weather conditions permit; when off grazing they get silage plus supplement in drylot.

Performance data from all tests since 1955 are summarized in the table. Corn silage, when properly supplemented, has given good results as a feed for growing cattle during fall, winter, and early spring. Results from sorghum silage have been less satisfactory. However, research is underway with new hybrid sorghums, which produce silages of higher grain content, in attempts to improve animal performance. Oat silage has proved unsatisfactory and has been removed from the comparison.

Corn and sorghum silages excel grass-legume hay as a winter feed for stocker calves, particularly when cost of gain is considered. In the 1960 study, however, good quality alfalfa hay was equal to corn silage when the same supplements were fed with each.

The test area of oats planted solely for grazing is about 15 acres and is usually stocked with 20 animals. The calves grazed oats an average of 100 days per season. They were fed silage plus supplement when off grazing – an average of 52 days per year during the 6-year experiment. Some harvested feed must be provided the stocker calves on oat grazing during wet weather and at other times when grazing is not adequate. Silage has been excellent for this purpose.

PERFORMANCE OF DIFFERENT FEEDING SYSTEMS FOR WINTERING STOCKER CALVES

Item	Resultant for each feeding plan[1]				
	Sorghum silage	Corn silage	Oat silage	Grass-legume hay	Oat grazing
Daily gain, lb.	1.24	1.53	0.82	1.31	1.24
Feed cost/cwt. gain	$11.92	$11.53	$21.52	$12.84	$14.14
Daily intake, silage or hay, lb.	24.4	24.3	18.5	11.2	----

[1] The same amount of supplement was fed with each system, except in the case of oat grazing it was fed only as required.

Animal performance and cost of gain on oat grazing vary greatly from year to year because of variable gain rate and amount of supplemental feed required. Although young cattle make satisfactory gains on oat grazing, the silage feeding system shows more promise under certain conditions.

The silage system has advantages for large operators who farm expensive row-crop land. The same land area can be used to produce oat grazing followed by corn for silage in an intensive farming system. Six-year average production data from such a system are given below:

Corn following oats	
Corn silage, tons per acre	10.96
Oat grazing following corn	
Grazing days per acre, number	155
Beef per acre, pounds	269
Average daily gain, pounds	1.24
Days grazed, number	100
Days fed off grazing, number	52

Yields of corn silage on the 15-acre field used for oat grazing have varied from 5.7 to 15.2 tons per acre. Production cost per ton has ranged from $5.84 to $13.03, with an average of $7.71.

Average yield of sorghum silage during the 6 years was 13.92 tons per acre. Cost was $5.31 per ton for production.

New SORGHUM VARIETIES for silage

C. S. HOVELAND, E. M. EVANS, and R. M. PATTERSON
Department of Agronomy and Soils

ALABAMA FARMERS are growing more sorghum for silage. The many new varieties may offer promise of higher quality than that of silage produced from old varieties.

Corn is generally considered the ideal silage crop for productive soils. Silage from corn with high grain content is easy to preserve and makes high quality roughage. However, many soils in Alabama are too droughty for corn to produce satisfactory silage yields. Sorghums withstand drought well and resume growth after rain. Since the feeding value of sorghum silage is generally lower than corn, it may be supplemented with concentrates.

Research has been conducted by the Auburn University Agricultural Experiment Station for two years at five locations in the State. This research was to determine the yield potential of new sorghum varieties for silage. The tests were at the Tennessee Valley Substation, Belle Mina; Piedmont Substation, Camp Hill; Plant Breeding Unit, Tallassee; Black Belt Substation, Marion Junction; and Gulf Coast Substation, Fairhope. The sorghum varieties and corn were planted in late April or early May. Plots were fertilized with 20 to 30 lb. per acre of nitrogen and adequate phosphorus and potassium at planting time. The tests were sidedressed with 40 to 80 lb. of nitrogen per acre each year. The sorghum varieties were harvested in dough stage and corn when well dented.

Forage yields from one cutting are given in the table. Yields are reported as dry matter rather than green weight because time of harvest and weather conditions affect moisture content. The dry matter content of the forages harvested generally varied from 25 to 35%.

Yields from the tall-growing varieties, Sart, Beefbuilder, Lindsey 115F, and Yieldmaker, generally were higher than those from corn. The yield difference in favor of the tall sorghums was even greater at the Black Belt Substation. The earlier maturing varieties FS-1A, NK-300, and NK-320 were generally less productive than corn. However, in central and southern Alabama, these sorghum varieties will often make sufficient regrowth from the stubble to mature another crop before frost. Yields from the second cutting have in some cases exceeded the first cutting. It should be emphasized that in order to get another cutting, these varieties must be planted early and sidedressed with nitrogen after the first harvest. Later varieties cannot be expected to produce a second crop.

Feeding trials indicate that sorghum varieties with high grain content give better performance than those with low grain. Several of the new sorghums have a high proportion of heads in the forage and may produce higher quality silage than varieties with low grain yields such as Sart. Grain content of the silage of all varieties may be reduced by the sorghum midge insect. NK-300 consistently has given the highest grain production of varieties tested. FS-1A generally has been seriously damaged by sorghum midge, sharply reducing grain yield.

Lodging is often a serious problem with tall growing sorghums. Sart is particularly susceptible to lodging and several other varieties, NK-320, Beefbuilder, and Silo King have lodged badly in some tests. Tall growing varieties with large heads can be expected to lodge when subjected to hard winds. However, little lodging has been encountered with Lindsey 115F, Yieldmaker, and FS-22. Shorter growing varieties, such as NK-300 and FS-1A, ordinarily do not lodge. These sorghum varieties, except Sart, were developed under dry conditions in the Western United States. Hence, they may be damaged by stalk rot organisms common in the Southeast.

Several new sorghum varieties show promise for improved silage production. Beefbuilder, Lindsey 115F, and TE Yieldmaker are recommended as tall growing varieties that yield well and produce more grain that Sart. Lodging, however, can be a problem with these tall growing varieties. NK-300 is recommended as a shorter growing high grain variety for silage.

PLANT CHARACTERISTICS AND DRY FORAGE YIELDS OF FIRST HARVEST FROM SUMMER SILAGE CROPS AT FIVE LOCATIONS IN ALABAMA, 1960-61

Variety	Ht. at harvest	Time to silage maturity	Composition of oven dry material[1]			Dry forage yields per acre				
			Head or ear	Stem and sheath	Leaves	Belle Mina	Camp Hill	Tallassee	Marion Junction	Fairhope
	Feet	*Days*	*%*	*%*	*%*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Sart	14	140	4	77	19	10.70[2]	6.15	6.88	10.21	8.04
Asgrow Beefbuilder	12	130	14	69	17	8.30	5.38[2]	5.90	8.46[2]	7.98[2]
Lindsey 115F	12	120	32	54	14	7.02	---	4.64	6.89	7.18[2]
TE Yieldmaker	10	120	42	46	12	6.73	4.54[2]	4.16	6.56	7.28[2]
DeKalb FS-22	10	120	7	78	15	5.94[2]	4.54	5.32	5.83	6.44
Asgrow Silo King	9	130	28	59	13	6.28	---	4.72	5.03	---
NK-320	9	105	39	43	18	5.70[2]	4.37	3.67	4.72	5.62
NK-300	6	105	46	38	16	5.86	3.78	3.07	4.39	4.96
DeKalb FS-1A	6	90	43	40	17	4.22	4.00	2.58	3.48	3.92
Dixie 18 corn	9	105	51	34	15	6.78	4.66	5.13[2]	4.75	6.01

[1] Data shown were obtained from the Gulf Coast Substation experiment in 1961 except that for Silo King which was obtained at the Plant Breeding Unit.
[2] Tested only one year.

Income RESOURCES in RURAL CENTRAL ALABAMA

JOHN M. HUIE and E. E. KERN
Department of Agricultural Economics

MANY FACTORS contribute to the income characteristics of an area – income levels existing, opportunities available to the residents, and challenge for improvement.

Income characteristics and resources available to rural families in Autauga, Bibb, Coosa, and Elmore counties were included in a cooperative study by the Rural Development Committee of the four counties, the Auburn Extension Service, and the Agricultural Experiment Station. A total of 809 families were interviewed by local committee members. The sample was chosen at random to represent a cross section of the rural population.

Based on sources of income, 54% of the respondents received more than ½ of their incomes from nonfarm work. Another 25% received the major portion of their incomes from nonwork sources, such as investments, pensions, and welfare programs. A smaller group, 12%, received the largest share of their incomes from farm sources. The remaining 9% received their income from several sources with no single one accounting for as much as 50% of the total. Nonfarm families had the highest annual cash income, $4,000. Families devoting most of their time to agricultural pursuits received about $3,700 annually, while nonwork families reported receiving about $1,500 annually.

Types of off-farm employment engaged in by family members were similar among income groups, Table 1. Manual labor, factory employment, and jobs related to the forest industry were primary types of work reported. In about ⅓ of the cases, the husband was the only family member engaged in nonfarm employment, while in 10% of the cases the wife was the only family member employed. Twenty per cent of the families reported both husbands and wives working in nonfarm pursuits.

Among farmers, cotton, beef, corn, and pork were the major items sold. Truck crops, forest products, eggs, broilers, and milk were produced for sale on a smaller scale.

TABLE 1. OFF-FARM EMPLOYMENT OF HUSBANDS AMONG RURAL FAMILIES IN SAMPLE, CENTRAL ALABAMA COUNTIES

Type of employment	Families			
	Farm[1]	Non-farm[2]	Non-work[3]	All[4]
	%	%	%	%
Manual work	24	26	13	26
Factory workers	0	16	7	14
Forestry and related jobs	16	13	0	13
Public works	12	10	13	10
White collar work	4	5	0	5
Merchant	4	1	0	2
Other (miscellaneous)	40	29	67	30

[1] Based on 25 families reporting.
[2] Based on 362 families reporting.
[3] Based on 15 families reporting.
[4] Based on 444 families reporting.

TABLE 2. INCOME DISTRIBUTION AMONG RURAL FAMILIES IN SAMPLE, CENTRAL ALABAMA COUNTIES

Income	Families			
	Farm[1]	Non-farm[2]	Non-work[3]	All[4]
	%	%	%	%
Under 500	14	2	7	5
500-999	16	6	38	16
1,000-1,999	22	16	38	23
2,000-2,999	8	18	8	14
3,000-4,999	4	29	6	19
5,000-9,999	19	26	2	19
10,000 and over	17	3	1	4

[1] Based on 93 families reporting 50% or more farm income.
[2] Based on 407 families reporting 50% or more nonfarm income.
[3] Based on 181 families reporting 50% or more nonwork income.
[4] Based on 689 families reporting (includes 8 with no source over 50%).

In addition to cash income received, more than ½ of the families reported having some type of home garden to supplement their incomes. Beef, pork, broilers, eggs, and milk were also produced for home use in a substantial number of cases. Although live-at-home benefits were reported more frequently among farm families, nonfarm and nonwork families also had many home-produced items. These things obviously helped overcome some of the disadvantages of low cash incomes.

Distribution of income was quite different among the 3 family groups, Table 2. Forty-four per cent of all families received less than $2,000 annually. Range among families in this income category was from ¼ of those in the nonfarm group to over 80% of those in the nonwork group. About ½ of the farm families received less than $2,000 annually. Almost ⅓ of the nonfarm families received above $5,000 annually as compared to 36% of the farm families and 3% of the nonwork families.

Age of husband was definitely related to the level of family income. Thirty-nine per cent of those families whose husbands were between the ages of 35 and 44 years received above $5,000 annually. The percentage of families in this group increased up to this age category and then declined steadily. Only 14% of the families whose husbands were between the ages of 55 and 64 years received above $5,000 annually.

Health of husband was also related to the level of family income received. Only 22% of those families whose husbands had good health received below $2,000 annually as compared with 50% of those with fair health and 73% of those with poor health. In each income category, from the lowest to the highest, the percentage of husbands reporting good health went up as compared to those reporting fair and poor health.

Education of husband was directly related to the level of family income. Whereas a small percentage of families whose husbands had below a 6th grade education received above $5,000 annually, the percentage increased steadily to 74% of the families whose husbands had above high school education but below a college degree. A total of 94% of the families in the lowest income group was associated with less than a grammar school education of the husband.

About ⅓ of the families expressed outward dissatisfaction with their income situations and many felt that little could be done to improve their conditions as far as they could determine. Problems beyond their control were cited as reasons for having to maintain the status quo. However, the most pressing need was felt to be that of increased employment opportunities. Other problems related to the need of educational opportunities, better health programs, and better markets and agricultural prices.

CONSTANT CHANGE — *Theme of Alabama's Agriculture*

J. H. YEAGER, *Agricultural Economist*

NOTHING IS AS certain as change! This has been said about the weather, but it is just as true of Alabama's agriculture.

Despite the great strides made during the 1940's and early 1950's, the last 5 years have seen continuing and rapid changes. Data in the 1960 Census of Agriculture point up the shifts made from 1954 to 1959. A summary of the major changes from 1954 to 1959 are presented in the table.

Farms Becoming Fewer

Number of farms and land in farms declined during 1954-59. Part of the change in numbers is the result of a change in definition of a farm. While number of farms was declining, average farm size increased more than one-fifth. Increasing size has been the trend since the 1930's.

Value of farm land and buildings per acre also jumped – from $59 to $93. As a result of size increase and higher value per acre, value per farm almost doubled in the 5-year period.

All categories of farm land acreage declined from 1954 to 1959. The 6 million acres of cropland harvested in 1959 was about half that of 20 years ago. The drop in land used for harvested crops was not accounted for by increases in permanent pasture and farm woodland. Acreage devoted to these uses also declined. Farm land has been lost to highways, cities, airports, military reservations, commercial forest operations, and other nonfarm uses.

Tenants Disappearing

Tenant farmers, particularly sharecroppers, are a vanishing lot in the State. Many tenants are working at off-farm jobs and others are employed as hired farm workers on large, mechanized farms.

Young farmers are going the way of tenants, with average age of farmers continuing to increase. This increase amounted to 1 year from 1954 to 1959. In 1959, less than 10% of farmers were under 35 years of age and 20% were over 65. Age of the farm operator influences decisions and physical activity and, in turn, affects farming operations.

Farms Better Equipped

The fewer farmers remaining are better equipped for farming and for comfortable living. The percentage of farms with telephones and home freezers more than doubled. Farms with tractors increased from almost one-third to slightly less than half of all farms.

Progress was made in fertilizer and lime use, too. Although still low in relation to needs, twice the percentage of farmers applied lime and liming materials in 1959 than in 1954. Acres of land limed increased by 33%. Commercial fertilizer was used on fewer acres because less acreage was farmed.

Farming expenses were greater in 1959 than in 1954. Out of four major farm expense items listed in the 1960 Census, increases were greatest for feed and machine hire. Increasing purchases of production items are indications of a greater degree of commercialization of Alabama farms.

Both increases and decreases were recorded for livestock, poultry, and crop production during the 5 years. While numbers of cattle and calves, milk cows, and sheep and lambs declined, there was an increase in number of hogs and pigs on farms. Chickens on farms also increased, with spectacular changes in broilers and eggs sold. Acreage of soybeans for beans jumped 36% and there was a 15% increase of sorghums for grain or seed. On the other hand, acreage of corn, oats for grain, peanuts harvested, cotton, vegetables for sale, and hay showed decreases.

These changes mean something to the urban resident as well as to the farmer. They point to a growing commercial and mechanized agriculture in the State that is more efficient.

MAJOR CHANGES IN ALABAMA AGRICULTURE DURING 1954 TO 1959

Item	1954	1959
No. of farms, thou.	177.0	115.6
Land in farms, mil. acres	20.8	16.5
Value per acre, $	59	93
Average farm size, acres	118	143
Farm land		
Cropland, mil. acres	7.5	6.0
Per. pasture, mil. acres	2.5	2.2
Woodland, mil. acres	10.3	7.8
Farm operators		
Tenants, thou.	61.6	32.2
Prop. tenants, pct.	35	28
Average age, years	49.8	51.1
Working off-farm 100+ days, pct.	31	35
Prop. nonwhite, pct.	26	25
Facilities and machinery		
Telephone, pct.	16	34
Home freezer, pct.	16	42
Grain combine, pct.	3	4
Corn picker, pct.	2	5
Pick-up hay baler, pct.	2	4
Truck, per cent	34	48
Tractors, per cent	30	46
thou.	65.2	70.8
Fertilizer and lime		
Using fertilizer, pct.	82	83
Using lime, pct.	4	8
Acres fertilized, thou.	4,781	3,933
Acres limed, thou.	229	304
Expenses		
Feed, mil. $	52.2	96.9
Machine hire, mil. $	8.5	15.2
Hired labor, mil. $	29.6	36.2
Gasoline and other fuel, mil. $	15.8	19.4
Livestock and poultry		
Cattle, calves, thou.	1,796	1,526
Milk cows, thou.	320	208
Hogs and pigs, thou.	889	1,222
Sheep and lambs, thou.	55	36
Chickens kept, thou.	5,682	7,771
Chickens sold, thou.	41,142	141,208
Eggs sold, thou. doz.	22,040	57,752
Acres of crops		
Corn[1], thou.	2,076	1,671
Sorghums[1], thou.	17.5	20.2
Oats[1], thou.	173	90
Soybeans for beans, thou.	90	122
Peanuts harvested, thou.	193	188
Cotton, thou.	1,154	799
Vegetables for sale, thou.	64.9	47.4
Hay, thou.	507	380

[1] Harvested for grain or seed.

SHEEP RESEARCH in Alabama

E. L. WIGGINS, *Associate Animal Breeder*

Some of the ewes with lambs at the Auburn Station are shown at right.

SHEEP RESEARCH, begun at the Auburn University Agricultural Experiment Station in 1954, compares ewes of different breeds or strains for suitability to early lamb production.

Climatic, management, and economic factors make fall-dropped lambs definitely more desirable than those dropped in the spring under Alabama conditions. Because of difficulty in getting a high percentage of ewes to lamb in the fall, the primary measure used in evaluating performance was the percentage of breeds and strains that would lamb in October, November, and December.

Two groups of about 30 ewes each were purchased for each of four substations: Black Belt, Lower Coastal Plain, Piedmont, and Tennessee Valley. Breeding began about May 15 each year and continued until about September 1.

Almost 80% of the ewes of the grade Rambouillet, the Columbia x Rambouillet and the Dorset x Merino groups lambed before January 1. None of the other groups had a satisfactory percentage of ewes lambing early. All ewes were bought from commercial sources with no consideration of the time of year they were born.

Results from the Upper Coastal Plain Substation have shown that early-born ewe lambs perform more satisfactorily as breeding ewes than late-born lambs, (Highlights of Agricultural Research, Summer, 1961). More recently at the Black Belt Substation, early-born Suffolk x Rambouillet and early-born grade Dorset ewes performed more satisfactorily than did late-born ewes of the same breeding in earlier years.

Another objective of research at Auburn has been the possibility of developing early strains of ewes through selection and breeding. Results indicate that many Rambouillets will breed in the spring to produce fall-dropped lambs. In addition they are known to be hardy, good mothers, and good wool producers. Disadvantages are that they do not produce the percentage of twins desired and many have excess face covering and too many skin folds. Also their size, growth rate, and conformation could be improved. Two possibilities of developing a strain of ewes acceptable for Alabama conditions being tested include: (1) selection within the Rambouillet breed and (2) crossbreeding.

The original Auburn flock consisted of 400 grade Rambouillet ewes considerably above the breed average in size, fleece characteristics, and freedom from face covering and skin folds. Some of these ewes have been mated to Rambouillet rams and others to Columbia, Dorset, or Hampshire rams. Ewe lambs produced from these matings are being evaluated for early lamb production.

The percentage of ewes lambing before January 1 in the original Rambouillet ewes ranged from 74% initially to 83% last year. Most ewes produced from the above matings, saved for replacements, are still young and numbers in some of the groups are small. There has been some evidence of a lack of hardiness in some of the crossbred groups indicated by a higher death rate, more pronounced symptoms of parasitism, and more sluggishness in hot, uncomfortable weather. There have been more twins born to young crossbred ewes than to young Rambouillet ewes. This could be an important advantage for the crossbreds. Crossbred ewes have also produced lambs having better conformation.

Some research has been conducted on drylot feeding late-born lambs. Lambs too light to sell as slaughter lambs at late sales were put in drylot in 1960 and 1961. These lambs made good gains on a simple ration of ground corn, cottonseed meal, and alfalfa hay, see table. Gains were somewhat lower the second year, although the lambs were heavier at the start of the feeding period. No lambs were lost from parasitism or other causes. At the end of the feeding period, the lambs were fat without being excessively heavy. Therefore, drylot feeding appears to be a better way to handle late lambs than to carry them over on summer grazing, followed by winter grazing, and possibly a drylot feeding period. More work on this phase is planned including more efficient rations, pelleted rations, and possibly artificial cooling.

PERFORMANCE OF LAMBS FED IN DRYLOT DURING SUMMER MONTHS AT AUBURN, ALABAMA

Year	Date of feeding period	Lot	Lambs	Initial weight	Final weight	Average daily gain	Carcass grade
			No.	*Lb.*	*Lb.*	*Lb.*	*Score*
1960	May 31-	A	13	60	97	.339	14.6[1]
	Sept. 24	B	13	59	101	.374	14.4
	August 30-	C	15	68	97	.308	15.0
	December 3	D	14	70	103	.350	14.6
		E	15	69	100	.325	15.1
1961	June 5-	F	24	80	100	.238	---[2]
	August 7	G	24	78	98	.266	---
		H	24	78	101	.272	---

[1] Carcass grades based on the following scale: 14—high Choice; 15—low Prime; 16—average Prime.

[2] Carcass grades not obtained in 1961.

COTTON DISEASES— and George F. Atkinson

LILLIAN FOSCUE, *Graduate Assistant*

EVERY COTTON GROWER from a 4-H Club boy with one acre to a planter of hundreds of acres gathers a bigger crop because of the work of a biologist at Auburn whose name is generally unknown.

Fusarium wilt and root-knot nematode are familiar names to the cotton grower, but the grower's knowledge of these cotton diseases and the means for combating their destructiveness in his fields have been gained from the pioneer work of George Francis Atkinson 70 years ago.

Cotton was almost the only cash crop in Alabama during the early years of the Agricultural Experiment Station at Auburn. Over-production pushed the price down. To the individual farmer, there was no other choice. Cotton was the only crop on which he could get a loan and for which a ready market existed. The overall economics of cotton production was something no one farmer could do much about, but the increasing number of cotton diseases and insect pests that were attacking individual cotton crops presented more of a personal problem.

By 1890 specimens of diseased cotton were arriving at the Experiment Station in Auburn from all parts of the State labeled "black rust," "red rust," "frenching," and "root rot." It was up to the "book farmers" to come up with some answers before every cotton plant in Alabama wilted and died.

Prof. Atkinson arrived in Auburn late in 1889 from the South Carolina Agricultural Experiment Station. A Cornell graduate, Atkinson filled the newly created positions of professor of biology at the Alabama Agricultural and Mechanical College and biologist of the Experiment Station. His special work was the investigation of the diseases of plants caused by parasitic fungi and insects. Although he spent only 3 years at Auburn, Prof. Atkinson identified and described cotton rust, fusarium wilt (which bears his name as discoverer – *Fusarium vasinfectum Atk.*), nematode root gall, and other cotton diseases.

This is the third article of a series on Auburn University and its Agricultural Experiment Station System – its founding and its contributions to the progress of Alabama's agriculture. The series is being published in conjunction with Auburn's Centennial Celebration. – Editor

Black rust and its earlier stage, then called red rust, he found to be caused by a potash deficiency. Theories current at that time as to the cause of rusts ranged from the condition of the soil and lack of fertilizer to certain atmospheric conditions. With the proof offered by Prof. Atkinson, fertilization recommendations were revised. As soon as planters put the new recommendations into practice, black rust ceased to be a problem.

The fungus found by Prof. Atkinson to cause cotton wilt or "frenching" was a new one, which he named *Fusarium vasinfectum.* Wilt-resistant varieties have been developed based on this early work of Atkinson. (See story on Auburn 56 variety, p. 10.)

At the time he was working on cotton diseases, knotted roots and "rusty" leaves were frequently found on the same cotton plant. Separating the symptoms and attributing them to different causes, Prof. Atkinson showed that a plant weakened by attack of one disease offered less resistance to others. Therefore, a combined attack of nematode root gall and fusarium wilt was frequently found.

Prof. Atkinson laid the blame for the increase in cotton diseases observed in the 1890's to "impoverished and badly cultivated soils . . . the natural outcome of years of continued cultivation of the crop without a wise rotation with other remunerative farm crops and a careful diagnosis of the needs of the soil." He compared the conditions of the soil under a continuous one-crop cultivation to the unhygenic conditions of cities before people learned sanitation procedures.

Dr. James A. Lyle, head of the department of botany and plant pathology at this Station, gives Atkinson credit for "probably contributing more to our knowledge of cotton diseases than any other man before or since his time."

After he left Auburn, Atkinson returned to Cornell where he was named head of botany in 1896. He is best known to the general public for his book, *Mushrooms Edible and Poisonous.* At Auburn he gathered a comprehensive collection of fungi specimens of the Southeast for the college. A graduate student who did his first work with fungi as an assistant to Atkinson at Auburn was Dr. B. M. Duggar, who was instrumental in the discovery of one of the miracle drugs derived from a fungus growth – aureomycin.

FREE Bulletin or Report of Progress
AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY
E. V. Smith, Director
Auburn, Alabama
Permit No. 1132—11/61-10M

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