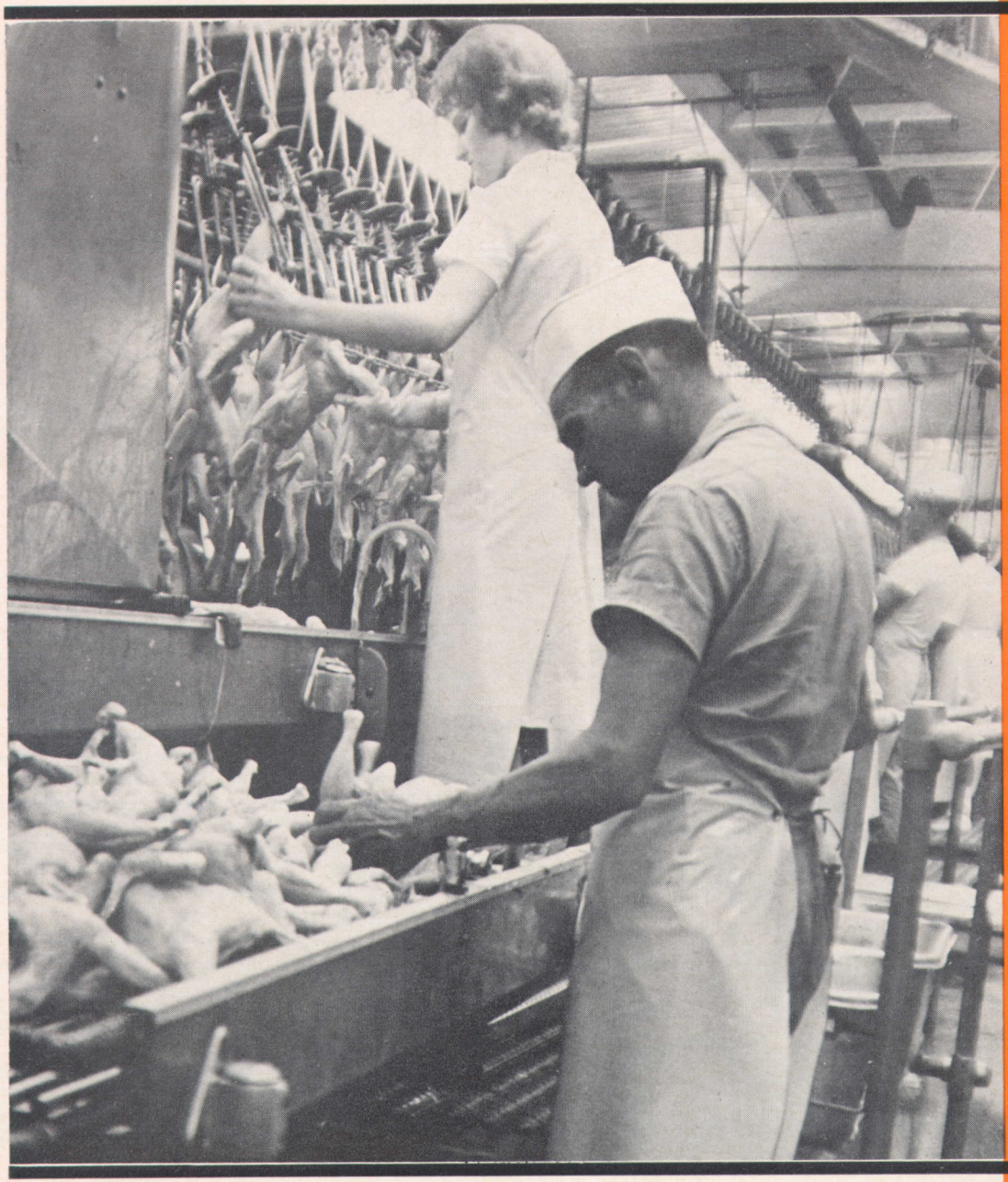
VOLUME 13, NUMBER 3 FALL, 1966

HIGHLIGHTS

OF AGRICULTURAL RESEARCH



BROILERS . . .
multi-million dollar
Alabama industry,
details on page 3

AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY

HIGHLIGHTS *of* Agricultural Research

A Quarterly Report of Research Serving All of Alabama

VOLUME 13, NO. 3 FALL 1966

In this issue . . .

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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. 329. Oats for Forage and Grain.

Bul. 335. Crimson Clover in Alabama.

Bul. 362. Response of Planted Pine Following Various Conversion Methods.

Bul. 363. Forage Systems Compared for High Producing Cows.

Bul. 367. Marketing Outdoor Recreational Services.

Bul. 368. Budgeted Costs of Producing Grade A Milk.

Bul. 369. Marketing Alabama Broilers.

Bul. 370. Fertilization of Loblolly Pine on Two Alabama Soils.

Cir. 145. Christmas Tree Production in Eastern Redcedar and Arizona Cypress Plantations.

Cir. 147. Diseases of Small Grains in Alabama.

Leaf. 66. Forage Production of Winter Annuals Sod-Seeded on Dallisgrass-White Clover.

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

ALABAMA'S BROILER INDUSTRY
Its Contribution to The State's Economy

MORRIS WHITE, *Department of Agricultural Economics and Rural Sociology*

FOUR OUT OF FIVE broilers grown in Alabama in 1965 were in one of 27 northern counties.

There is greater awareness of "chickens" in those 27 counties than in other counties, but even there the true economic importance of the broiler industry is not generally recognized. Although the average per capita consumption of broiler meat was greater in Alabama than in the U.S., 9 out of 10 broilers grown in the State went to consumers in other states or in foreign countries.

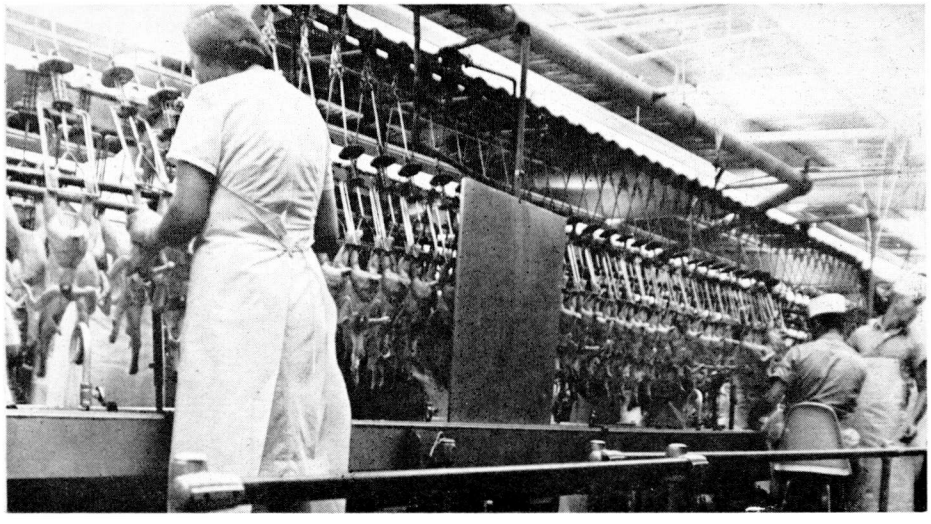
There were 3.6 million hens in hatchery supply flocks in Alabama in 1965. All of these, however, were not for the production of broiler hatching eggs.

In 1965 there were approximately 304 million broiler chicks placed in houses in Alabama, and slightly more than 285 million of those were processed under Federal inspection and marketed through commercial channels. Production of this number of chicks would have required approximately 390 million eggs and a flock of over 2 million hens. Housing for the laying flock would have required 6½ million sq. ft. of floor space necessitating an investment in excess of $5.2 million in buildings alone. Hens in hatching egg flocks consumed approximately 102,850 tons of feed valued at $8.5 million. The price of hatching eggs averaged 63¢ per doz. and the value of hatching eggs for broilers in 1965 approximated $20.5 million.

There were 84 hatcheries with a total capacity of about 35½ million eggs in Alabama in 1965. The number of broiler chicks hatched in the State was reported to be 313.9 million, for which hatcheries received an average price of $9.56 per hundred. The 304 million chicks placed in Alabama were valued at $29.1 million.

In a house constructed to enable control of temperature and humidity, 0.8 sq. ft. was allowed for each chick. In houses with limited temperature control, allowance of 1 sq. ft. per bird was the general practice. This meant that there were between 62½ and 76 million sq. ft. of floor space used if broilers were grown in 4 equal batches. This would amount to covering between 1,400 and 1,700 acres with broilers per batch. Investment in houses and equipment was estimated at approximately $60 million.

Approximately 2.38 lb. of feed were used to grow 1 lb. of broiler meat in 1965. At that rate, 1,153,412 tons of feed had to be milled, mixed, tested, handled, transported, and fed. The amount of corn or corn equivalent needed was 25½ million bu., or about half the total corn production in the State in 1965. Production of 4,000 average size farms, or 579.5 thousand acres was needed. To produce the soybean meal used would have required 3,480 farms or 504.4 thousand acres. Just for broilers almost three times the State's total production was needed. The value of broiler feed in the grow-out operation was estimated to be $92.3 million.



These broilers are being processed in one of the most efficient and modern plants in the Nation, with a capacity of 7,200 birds per hour. Approximately 160 employees are required to operate this plant.

Over 99% of the broiler feeding was done on a contract basis. Under most contracts the feeder furnished house, equipment, litter, electricity, fuel, water, and labor. Returns to a feeder usually consisted of a specified minimum, plus additional payments determined by the level of the price for broilers and by the feeder's standard of excellence in producing broilers efficiently. Assuming that they received an average return of $70 per thousand in 1965, the total paid would approximate $20 million.

The contractor supplied chicks, feed, medication, and management service, and paid for catching and transporting grown birds to the processing plant. The catching operation is labor consuming. With catching crews working 5 nights per week, an average catch per night in Alabama in 1965 would have equalled 1.1 million birds.

There were 18 processing plants in Alabama operating under Federal inspection in 1965 and several plants processing small volumes under state inspection. Capacity of plants varied but plants having capacities of 3,600 to 9,600 birds per hour did most of the processing.

A labor force of 3,426 persons working 40 hours per week for 52 weeks could have processed the broilers grown in 1965. One worker dressed birds that were consumed by 7,051 average consumers, or the service was provided for 2,000 housewives by one worker.

In round numbers processors purchased 285 million birds, or 969 million lb. at 14.3¢ per lb. for a cost of $138.6 million. They sold 707.6 million lb. of dressed broilers for an average of 25.5¢ per lb. for $180.4 million.

Alabama broilers were sold in many sections of the nation; however, almost 3/5 went to the East North Central States, while the Pacific Coast States got 3.9% and the North Atlantic States got 4.3%. About 1/5 remained in the Southeast.

Consumers across the country paid an average of 39¢ per lb. for the broilers purchased in 1965. Assuming 98% of the broilers grown and processed in Alabama were sold for that price, the retail value was approximately $270 million.

No one really knows the total value generated by the broiler industry in the State. However, the egg that began the journey sold for 5.25¢ and approximately 79 days later a plump, tender, nutritious, and delicious chicken was sold to the consumer for 97.5¢. Consumer approval of the services was evidenced through repeated purchases.

This yearling buck is equipped with a collar-mounted transmitter, antenna, and ear tag.

NEW DEVICE for

Determining deer movements

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Dept. of Zoology-Entomology

Deer equipped with small radio transmitters are providing Alabama wildlife biologists with much needed information about the extent of home range and movement patterns of white-tailed deer.

Deer populations are rapidly increasing throughout the State. The impact of this deer "explosion" is affecting both farm and forested areas.

The wildlife biologist, who may take much credit for the deer increase, must now seek more precise information about deer and their habits and range to gain greater insight into the overall role of deer in the new situation. Knowledge of movement patterns is essential for efficient management of any species. This is especially true with white-tailed deer since most techniques available for estimating populations are based on knowledge of movement patterns. The need for more precise information was brought to light recently after crop damage was attributed to deer. One question asked was "how far did the depredating animals come?" Another question, concerning steps to be taken if reduction of deer population becomes necessary, was "over how wide an area must such a reduction be made?"

A new technique recently developed now enables researchers to obtain answers to such questions concerning deer biology. The technique, known as radio-telemetry, is presently being used by the Auburn Wildlife Research Unit in cooperation with personnel of the State Conservation Departments of Alabama and Florida. Basically, it involves placing on deer miniature, collar-mounted transmitters that broadcast information in the form of radio signals. These are monitored with special directional receivers. The animal's location can be determined at any time by triangulation of readings taken at two separated points. At the same time information concerning the deer's activities and behavior can be obtained by observing characteristic variations in the signal pattern. Each animal is identified by its own "channel," or transmission frequency.

Twenty deer have already been radio-equipped and monitored for periods ranging up to 4 months. The results show the following tendencies related to size and shape of the animal's range (see table):

1. Rather than wandering at random, deer had definite movement patterns that resulted in restricted home ranges, averaging well under 300 acres.

2. The acres included were relatively consistent for deer in the same habitat type and population density class.

3. Ranges tended to be oblong shaped; this was true even where the animal was not conforming to an obvious habitat pattern.

4. A single deer released in unfamiliar surroundings wandered over an area 10 times larger than that of deer in familiar habitats.

These results are not necessarily indicative of deer in environmental situations other than those studied. Likewise, individual variation in behavior may occur even in areas under study. Most of the deer studied have been in forested areas with high deer population levels. Both of these factors may have a depressing effect on deer movement. Research is now in progress to determine relationships of these and other variables, with special emphasis on movements in agricultural lands.

Range Size and Location of Six Telemetrically Studied Deer

Deer number	Location	Area included	Dimension	
			Major axis	Minor axis
		Acres	*Miles*	*Miles*
1	Central Florida	230	0.97	0.59
2	Northwestern Florida	200	1.80	0.40
3	Northwestern Florida	147	0.76	0.38
4[1]	East Central Alabama	2,800	3.25	2.21
5	Northeastern Alabama	215	0.93	0.68
6	Northeastern Alabama	243	0.96	0.70

[1] This animal was released in unfamiliar surroundings.

Quality Varies Among Johnsongrass Hays

GEORGE E. HAWKINS and JOE A. LITTLE
Department of Dairy Science

JOHNSONGRASS is an important hay crop in a large area of Alabama. It is widely used by Black Belt dairymen to supply harvested forage needs of milking cows and replacement stock.

Despite the generally high quality of johnsongrass when cut at proper maturity, hay quality varies enough to be of major importance to dairymen. In tests at the Experiment Station, quality variations have been reflected in amounts of hay eaten and refused, and milk production by test cows.

Crude fiber content of test hays ranged from 30.3 to 33.5% and crude protein from 9.4 to 11.5%. The hay containing the highest crude fiber had the lowest TDN (total digestible nutrient) content, and cows ate less of this hay and produced less milk than those getting hay with lower levels of fiber.

Close relationships were noted between crude protein and digestible protein contents and between crude fiber and TDN contents of the test hays. Because of selective eating, however, there were large differences between composition of hays fed and forage consumed. This means that forage testing will not give an accurate evaluation of nutritive value of hay unless cows eat all of the hay fed. Nevertheless, forage testing can be used to provide a general quality guide to johnsongrass hay.

Four Hays Evaluated

In the Auburn study, four hays cut from early boot to full bloom stage were compared for relationships among chemical composition and digestibility, as well as for effect on amount eaten and milk production. Included in the project were intake and digestion trials with dairy steers, feeding trials with lactating cows, and chemical analysis of hays fed and portion refused. Composition of hay eaten was determined as the difference between that fed and refused.

Before beginning the 4-month feeding experiment, the cows produced an average of 51.8 lb. of 4% FCM (fat corrected milk) daily. Allowing for 20% refusal of hay, all cows were fed to provide the recommended nutrient allowances for maintenance and 110% of that recommended for milk production. The hays were fed in amounts to equal 50% of the ration, with a 16% crude protein concentrate making up the remainder. Large amounts of hay refused by the cows caused the hay consumption to equal 42.2, 41.9, 39.9, and 40.9% of ration eaten for test hays 1, 2, 3, and 4, respectively.

Quality Differences Found

Although there were high refusal percentages noted, the cows rejected mostly stems. For this reason, that part of the hay eaten had higher protein and lower fiber contents than that determined for the hay fed. Similar relationships were observed for the hays fed during digestion trials.

VARIATIONS IN JOHNSONGRASS HAYS

Quality measure	Experimental hays			
	No. 1	No. 2	No. 3	No. 4
Crude protein, pct. of dry matter				
Fed	9.4	11.4	9.9	11.5
Eaten	10.8	13.6	12.8	14.5
Crude fiber, pct. of dry matter				
Fed	30.3	31.3	33.5	31.8
Eaten	27.3	28.8	30.8	28.0
Allowance refused, pct.	30.1	30.9	36.2	35.3
TDN, pct. of dry matter in hay eaten by steers	67.1	66.9	64.7	65.6
Intake/cwt. of body weight, lb.	1.48	1.45	1.34	1.39
FCM per cow per day, lb.	44.1	43.0	41.3	43.7

TDN content of the hays ranged from 67.1 to 64.7%, which is relatively high. Affecting TDN digestibility figures was the selective eating of leaves and refusal of stems, and high digestibility of crude fiber in the forage consumed. Analysis showed digestibility coefficients of the crude fiber were 74.8, 74.3, 71.3, and 72.5%, respectively, for hays 1, 2, 3, and 4. Yet, digestibility percentages decreased as the content of crude fiber increased.

Although crude fiber of the hays was highly digestible, the content of TDN decreased 0.8% for each percentage increase in crude fiber. Digestible protein contents of the johnsongrass hays increased in proportion to the increases in the crude protein content of hays eaten (range of 6.2 to 9.8%, dry matter basis). Digestible protein in the hays eaten could be estimated with a high degree of accuracy from the crude protein content.

Amounts of hay eaten per 100 lb. of body weight varied among the test forages, as shown in the table. (Weight of cows averaged 1,223 lb. at start of test.) Total hay intake per cow decreased 0.55 lb. daily for each percentage increase in crude fiber of hay. Combining the TDN and intake data shows that cows fed the 30.3% fiber hay (No. 1) ate 1.41 lb. more TDN than those fed hay No. 3, which contained 33.5% fiber.

Daily 4% FCM production was 44.1 lb. by cows on the best hay (No. 1), as compared with 41.3 on the lowest quality forage (No. 3). Production increased an average of 1.23 lb. for each 1 lb. increase in hay eaten. In relation to crude fiber content, average daily milk production per cow decreased 0.84 lb. for each percentage increase in crude fiber of the hays fed.

Differences in average daily 4% FCM production by cows fed the four test hays were related to differences in amounts of TDN consumed as hay. These results emphasized the importance of providing excellent quality hay or other forage for high producing dairy cows.

Rumen fermentation studies were made with cows fed the four johnsongrass hays to provide additional information on quality differences. It was found that the percentage of acetic acid in rumen fluid increased and propionic acid proportion decreased with increases in the percentage of hay in the total ration. The increase in acetic acid and decrease in propionic acid in rumen fluid was associated with an increase in energy content of milk produced. Cows fed the best quality hay produced milk with the highest calorie, or energy, content.

The ROADSIDE LANDSCAPE

HENRY P. ORR and ERROL J. DONOVAN
Department of Horticulture

The daylily was one of 17 species of vines, ground covers, and herbaceous perennials evaluated for use on small cuts.

PLANTINGS in roadside landscapes are needed for conservation, safety, and beauty.

Since safety is of such importance in roadside development, familiar exit patterns are needed. These plants may also serve as a slight crash barrier. When planted in groups, narrow at the beginning and broader away from highways such as interstates, a driver can determine well in advance the exact point to turn off regardless of advance sign notices. Woody plants for such situations include: Dwarf Yaupon, Hetz Japanese Holly, Roundleaf Japanese Holly, *Ilex cornuta rotunda*, Shore Juniper, Andorra Creeping Juniper, Fragrant Sumac, Savin Juniper, Inkberry and many other plants.

At night, various plants can be an aid in directions along interstates. The use of lighter colored plants with darker plants will quickly catch the eye of the motorist at night. The lighter colored plants can follow up a turnoff and serve as a guide for traffic flow. The Silver Spreading Eastern Redcedar, Dawn Redwood, and Feijoa may be used as accent plants; Savin Juniper as a group; Burford Chinese Holly and Chinese Holly as background; and Birmingham Fraser Photinia as background or accent.

Plants can alleviate danger of crashes. Plants used as crash barriers should be of the type that have dense interlocking branches. Examples of such plants are: Chinese hollies, pyracanthas, photinias, barberries, ligustrums, elaeagnuses, arborvitae, Japanese hollies, and spreading junipers.

Safety-wise, plants should be used on medians at curves where there is a problem of severe glare from oncoming headlights. Many species planted as a group border will serve this purpose.

Good plants for this use are: Savin Juniper, Silver Spreading Eastern Redcedar, Japanese hollies, and *Ilex cornuta rotunda*, all good foreground plants. Japanese Photinia is good for both foreground and background plantings. Birmingham Fraser Photinia, Devilwood Osmanthus, Southern Waxmyrtle, Foster's Hybrid Holly No. 2, Chinese Fringetree, India Privet, elaeagnuses, and Alabama Dahoon are all good background plants.

Noise and dust abatement might be considered as either a conservation or a safety problem. Plant materials will not totally eliminate noise or dust from a highway, but the use of these materials can be effective. If the plants used are evergreens, they will be more effective for a longer period of time although some deciduous plants may be of value. The plants should be dense from ground level to ultimate height.

Plant examples of ideal choices are as follows: Japanese Photinia, Birmingham Fraser Photinia, India Privet, elaeagnuses, Burford Chinese Holly, Chinese Fringetree, arborvitae, and upright junipers.

Highway department officials realized the problems that existed and consulted with researchers in the ornamental horticulture field in search for answers.

The Department of Horticulture, Auburn University Agricultural Experiment Station, in conjunction with the Alabama Highway Department and the Bureau of Public Roads, United States Department of Commerce, initiated a study in April 1963 to determine the adaptability and method of establishing woody plants on roadsides.

Plantings were made on undisturbed right-of-way, on large and small cuts, and on fills. The plantings were made in January, February, and March 1964. Sixty species of shrubs and small trees were planted on undisturbed rights-of-way at three locations. Percentage of survival and rate of growth were recorded for each species. The survival of these species ranged from 85-100%. Twenty species of woody and herbaceous ornamentals were evaluated for use on large cuts. A total of 240 plants of each species was planted in January and February 1964. The survival of these plants was excellent, 85-100% with the exception of Roseacacea Locust which had a survival of 66%. This plant did not survive in excessively wet areas located at the bottom of cut, but it was very vigorous and suckered freely at top of cut.

Twenty-eight species of woody and herbaceous ornamentals were evaluated for use on fills. A total of 160 plants of each species was used in this test. Even though weed competition and erosion were major problems, survival ranged from 75-98%. Seventeen species of vines, ground covers, and herbaceous perennials were evaluated for use on small cuts. Survival, vigor, and rate of growth of these species were excellent. Survival percentages of these species ranged from 95 to 100%.

Five species were planted along a fill in February 1965. Ninety-six per cent of these plants, 120 of each species, has survived. Their vigor and rate of cover were excellent. Oriental Bittersweet was the best plant in this test, and it appears to be quite adaptable to roadside conditions.

The choice of shrubs, vines, and small trees included a few native species; most of the species chosen were introduced plants that had landscape characteristics valuable in many typical roadside landscape-conservation-erosion situations. Much is already known about the use and value of the adaptable woody plants native to Alabama.

Controlling weeds around plantings is one of the major problems encountered. Hand hoeing weeds is too costly and mowing is practically impossible. Use of selective herbicides soon after planting seems to be the most practical solution. Four herbicides – Azak, Casoron, Dacthal, and Herban – were evaluated for such use in July 1965. Of these four herbicides, only Herban 6 lb./acre, Casoron 8 lb./acre, and Casoron 4 lb./acre, were effective in controlling a broad spectrum of weeds. Dacthal at 10 lb./acre was also effective in controlling weeds but not as effective as Herban and Casoron. Azak at 20 lb./acre controlled crabgrass but it did not control any other weeds.

RYE-CLOVER PASTURE for Growing SLAUGHTER CATTLE

W. B. ANTHONY, *Department of Animal Science*
J. G. STARLING, *Wiregrass Substation*

Cool season pastures may constitute a profitable feeding system for young, slaughter cattle in Alabama. Here steers are grazing on rye-clover pasture at the Wiregrass Substation.

Cool season pastures may constitute a profitable feeding system for young, slaughter cattle in Alabama.

Results of tests at Auburn University Agricultural Experiment Station have shown that young cattle gain about 200 lb. per head during the grazing season, but do not fatten sufficiently for slaughter on warm season, permanent pastures. At the end of the grazing season, these animals carry only a Standard to Utility finish. Data from summer grazing at the Wiregrass Substation are given in Table 1.

Pastures Compared

In contrast to low weight gain of animals on summer grass, young cattle gain rapidly on cool season swards, such as small grains, and may carry a Good or better finish at the end of the cool season grazing period. Because of the high weight gain per animal per acre, such swards have an important advantage as a method for growing slaughter cattle. There are, nevertheless, certain risks in using small grain pastures. Extreme cold and extreme drought may cause complete loss of these pastures.

Table 1. Summer Gains of Yearling Steers on Permanent Pastures in the Wiregrass[1]

	Gain per animal[2]	Gain per acre[3]
	Lb.	*Lb.*
Common bermudagrass	181	259-335
Coastal bermudagrass	207	390-530
Pensacola bahiagrass	208	297-429

[1] Pastures received annually 160 lb. of N per acre.
[2] Six-year average.
[3] Low and high gain for the 6-year test.

Table 2. Steer Gain on Rye-Clover Pastures at Headland, Alabama[1]

	Gain per animal	Gain per acre
	Lb.	*Lb.*
1963 (132 days)	230	417
1964 (153 days)	280	405

[1] Clover contributed very little during these 2 years.

In experiments conducted by the Station, young cattle have gained as much weight in a relatively short time on cool season pastures as comparable cattle gained throughout a long season on permanent summer pastures. Results of grazing young cattle on rye-clover pastures at the Wiregrass Substation are summarized in Table 2. These cattle gained an average of 255 lb. per head and carried a high Standard to low Good finish at the end of the grazing period. Gains per acre on cool season pastures were comparable to gains on fertilized, summer-type, permanent pastures.

Another advantage of cool season, annual forage crops over warm season, permanent-type pastures, is that cattle to be grazed on summer pastures must usually be fed through fall and winter in order to be available for summer grazing. Fall and winter feed adds significantly to cost of production. The use of cool season swards eliminates most of this expense. In many operations it would be possible to carry weaned calves on late summer pasture until small grain pasture was ready to graze. A protein supplement fed to calves while on late summer pasture is desirable.

Cool Season Pastures

Data in Table 2 reveal the value of annual cool season pastures for young slaughter cattle. As noted, however, there are risks in using this type pasture. Research has shown that corn silage and a minimum of supplement can be used as a feeding program to substitute for small grain pastures. Cattle on test at Auburn were full-fed corn silage and 4 lb. of ground snapped corn and 1½ lb. protein supplement per head daily. The average daily gain of these cattle for 112 days was 2.51 lb. and the dry matter used per cwt. of gain was 601 lb. The performance of these cattle, therefore, is fully equal to the performance of cattle on small grain pasture, Table 2. It is not necessarily the lowest cost feeding program. Data show, therefore, that cool season forages are superior to warm season forages for the purpose of growing slaughter cattle. It also shows that corn silage with a minimum of supplement can be used as a feed substitute for small grain pasture.

HATCHERY MANAGEMENT Affects POULTRY PRODUCTION

S. A. EDGAR, *Department of Poultry Science*

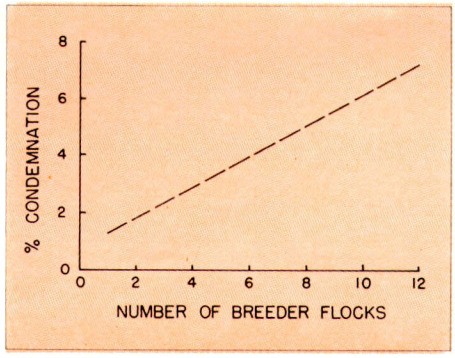
MANDATORY FEDERAL INSPECTION of dressed poultry moving interstate and losses from condemnation felt by industry caused special attention to be focused on factors suspected of having a bearing on condemnation.

A study by the Auburn University Agricultural Experiment Station included more than 250 items such as housing, equipment, management practices, sources and strains of chickens and hatchery management, and sanitation. It was found that certain broiler production practices not only influence performance but also condemnation. These findings led to an intensive investigation of hatchery management and sanitation.

A study of broiler production records of five companies in Alabama and Mississippi revealed relationship between condemnation and hatchery and breeder flocks and mixing of houses of broiler chickens from one or more breeder flocks. The effect of hatchery source on condemnation of one company is given in the table. Condemnation from all producer causes for May to July ranged from 2.88% for Hatchery A to 1.03% for Hatchery D. A mixture of chicks from A and D averaged 1.89%. When condemnation was more than approximately 1%, the bulk of it was because of air sac infection or systemic involvement or both.

A study of more than 2,000 broiler flocks marketed revealed that those flocks where air sac infection was the greatest cause of condemnation increased as the number of breeder flocks supplying a single house with chickens increased. As shown in the chart, condemnation averaged about four times as much in flocks composed of chicks from 8 or more breeder flocks versus flocks from one or two breeder flocks. Some broiler flocks from only one or two breeder flocks had high condemnation and were sometimes the major culprit in mixed broiler flocks, regardless of the type of equipment used. There was a tendency toward greater condemnation among large broiler flocks than small, but larger ones usually came from a larger number of breeder flocks than the smaller ones. Although broilers from mixed flocks performed slightly better for the best company growers, housing and management did not correct the fault of mixing flocks. Also, broilers from certain breeder stock sources of the same strain, performed better than that from others. There was a similar relationship between condemnation from leukosis complex and certain parent flocks and mixing of flocks as for air sac infection.

The most common causes of condemnation for disease reasons, (producer responsibility) are: air sac disease (CRD or aspergillosis), septicemiatoxemia, leukosis, infectious synovitis, and inflammatory processes. Trimming because of



The increase in condemnation from air sac infection with the increase in mixing of chicks from different breeder flocks is shown in the chart.

breast blisters and bruising are the greatest causes of downgrading. More recently, leukosis has been the greatest cause in some companies. The most common causes of condemnation, processor responsibility include: contamination, cadavers, picker damage, and missing viscera. Machine damage and coccidiosis are causes of downgrading.

The most common faults found in hatcheries were the following: Satisfaction with an 80% broiler hatch and an 85% to 88% commercial egg hatch; poor layout of hatchery and no physical division of activities; improper installation of hatchery room air intakes in relation to exhausts, resulting in reservoirs of microbial contamination; highly contaminated egg holding, traying, washrooms, and air ducts and roofs; setting of too many dirty or cull eggs; culls include those with poor shell quality, double yolks, cracks, checks, and floor eggs; cracking too many eggs in gathering or during transport, traying, racking, and transfer; improper egg-holding temperature and humidity and order of setting; faulty setter and hatcher temperature and humidity and exhausts; improper washing, sanitizing or dirty cloth wiping of eggs; ineffective fumigation and disinfection of setters, hatchers and equipment or none; doors between rooms wide open operating as a single building; too much mixing of eggs from different breeder flocks especially in hatcheries and of chicks in broiler houses; insufficient space or separate rooms for chick holding, supplies and repairs; lack of dollies or simple system for easy moving of eggs, chicks, and empty cartons throughout hatchery to facilitate thorough cleanup; excessive trash and equipment in rooms where it doesn't belong, interfering with cleaning; lack of guidelines for regular duties of employees and trouble shooting; inefficient labor, low pay, rapid turnover and failure to streamline certain operations; volume of chicks per man hour sometimes only 40% of norm (norm – 30,000 chicks per week per man); no records, poor records, or too complicated; lack of weekly and monthly performance on breeder flocks; percentages of production, hatching eggs, fertility, hatchability, mortality and egg conversion.

Goals that have been attained by some and that all should strive toward, broilers: 135 to 145 hatching eggs per hen while profitable; average hatch of 85% to 87% of eggs set, 99%+ first quality eggs set (tolerating less than 1% cracks and culls); eggs from one flock in a hatcher; placement of broilers from a single breeder flock, and chick costs not over 7¢; commercial layers: an average of 90% to 93% hatch of all eggs set during the first year of lay plus the foregoing.

CONDEMNATION AMONG BROILERS FROM DIFFERENT HATCHERIES OF ONE PRODUCER

Hatchery source	Number of flocks	Size of flocks average	Average condemnation per cent
A	37	13,277	2.88
B	15	16,546	1.67
C	38	11,861	1.19
D	24	12,095	1.03
Mixed A and D	18	22,266	1.89

Plants were placed in the greenhouse in early October and spaced 18 in. apart in 24-in. rows allowing 3 sq. ft. per plant.

TOMATO VARIETIES for GREENHOUSE PRODUCTION

J. D. NORTON, *Department of Horticulture*

GREENHOUSE TOMATOES for winter consumption are now a reality, thanks to 3 years of testing by the Auburn University Agricultural Experiment Station.

Procedure

Plants were started in 3-in. peat pots in the greenhouse in early August. In early October the plants were moved into the greenhouse and spaced 18 in. apart in 24-in. rows. This allowed 3 sq. ft. of greenhouse space per plant.

Well-rotted stable manure was compared with a commercial preparation as a 2-in. layer mixed well with the soil. An application of a 6-12-12 grade fertilizer at the rate of 1 ton per acre and dolomitic lime to a soil pH of 6.5 were applied. Then, soil was fumigated with methyl bromide before transplanting. Two applications of a 20-20-20 grade fertilizer were made to provide additional nutrition. The first was applied when the largest fruits on the lowest cluster were ½-1-in. diameter and the second when the tops reached the top of the trellis.

Plants were grown to a single stem, and when they reached the top of an 8-ft. trellis, they were topped by removing the growing tip above the cluster at top of the trellis. The harvest of fruit began in late December and continued through February.

Varieties Used

Nine varieties were included in the planting as shown in Table 1. Plots consisted of five plants. Each variety-plot was replicated four times. A split plot arrangement was utilized to permit comparison of growth media.

When varieties were compared, differences were recorded in yield, earliness, and fruit characteristics. The plants that gave the highest yield were Tuckcross O and Manapal, Table 1. Other high-yielding varieties were Tuckcross V, Michigan-Ohio Hybrid, Floralou, and Tuckcross W. Low-yielding varieties were Tuckcross M and Michigan State Forcing.

TABLE 1. AVERAGE YIELD OF NINE VARIETIES OF GREENHOUSE TOMATOES, AUBURN, ALABAMA, 1963-1966

Variety	Average yield per acre
	Lb.
Tuckcross W	176,282
Tuckcross M	153,612
Michigan State Forcing	129,993
Michigan-Ohio Hybrid	194,879
Tuckcross V	202,128
Manapal	206,146
Manalucie	176,999
Tuckcross O	223,189
Floralou	187,153

Individual fruit weight was highest for Manapal, Manalucie, Tuckcross O, and Floralou varieties, Table 2. Michigan-Ohio and Tuckcross W fruit were the largest of the remaining varieties.

Fruit matured earlier on plants of Tuckcross V, Tuckcross W, Tuckcross M and Michigan State Forcing varieties than other varieties tested. Medium maturity dates were recorded for Tuckcross O and Michigan-Ohio Hybrid varieties. Manapal, Manalucie and Floralou matured fruit later than other varieties.

TABLE 2. AVERAGE FRUIT WEIGHT OF NINE VARIETIES OF GREENHOUSE TOMATOES, AUBURN, ALABAMA, 1963-66

Variety	Average fruit weight
	Lb.
Tuckcross W	0.449
Tuckcross M	0.369
Michigan State Forcing	0.227
Michigan-Ohio Hybrid	0.453
Tuckcross V	0.334
Manapal	0.575
Manalucie	0.619
Tuckcross O	0.566
Floralou	0.490

The edible quality of the fruits was best in Manalucie, Manapal, Floralou, and Tuckcross O. Fruit quality of Michigan-Ohio Hybrid, Tuckcross V, Tuckcross W, and Tuckcross M was good. The Michigan State Forcing variety rated poor in quality.

External fruit color of Manapal, Tuckcross O, Manalucie, Floralou, Michigan-Ohio Hybrid, and Tuckcross V was excellent. Good external fruit color was recorded for Tuckcross W, Tuckcross M, and Michigan State Forcing. Internal fruit color was best in Manapal, Manalucie, Floralou, Tuckcross O and Michigan-Ohio Hybrid. The Tuckcross W, M, and V were satisfactory. Michigan State Forcing rated poor in internal fruit color.

The firmest fruits were produced by Manapal, Manalucie, and Floralou varieties. Tuckcross O, Michigan-Ohio Hybrid, Tuckcross V, and Tuckcross W varieties were medium firm. Tuckcross M and Michigan State Forcing were less firm than other varieties.

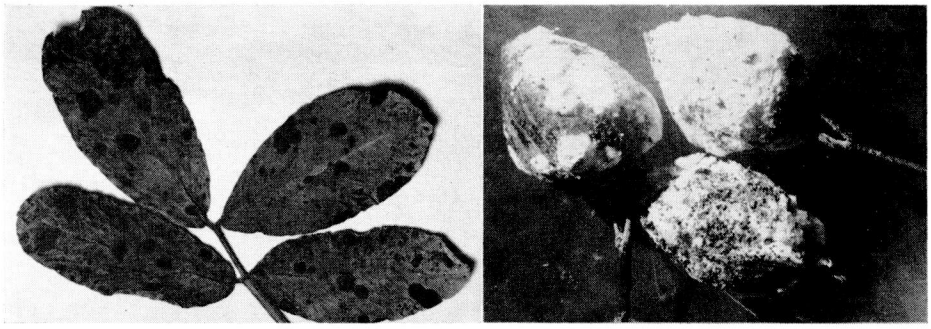
When soil mixtures were compared, some differences were observed among various varieties. However, the overall difference in response of the tomato plants to the commercial preparation and stable manure was not significantly different. Both were excellent soil additives.

Conclusions

Production of greenhouse tomatoes during the fall and winter months in Alabama can be highly profitable.

The current varieties most adapted to greenhouse production in Alabama are Manapal and Tuckcross O.

If greenhouse tomato operations are contemplated, a grower should seek preferably a market outlet to quality conscious food stores in a good urban market. Cost of producing greenhouse tomatoes is about 15¢ per lb. or more; therefore, some advance price agreement should be negotiated before large investments are made. Technology and know-how of greenhouse tomato production are very special skills.



Spots on leaves (left) are typical symptoms of leafspot of peanuts, a serious enemy of the crop. Boll rot of cotton (right) can be caused by southern blight disease pathogen.

WEATHER AFFECTS PLANT DISEASE DEVELOPMENT

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SEVERAL FACTORS are involved in plant disease development, but weather is one of the most important.

For an infectious plant disease to develop, there are three things that must take place at the same time. A susceptible plant must be present, the disease producing pathogen must be infectious, and environmental conditions must be favorable for disease development.

Environment is a complex factor. The air around a plant and the soil in which it grows constitutes the plant environment. The pathogen's environment varies between its host and either the air or soil, depending on whether it attacks plants above or below ground.

The aerial environment is, in reality, the weather. It consists of temperature, rain, atmospheric humidity, dew, evaporation, light, cloudiness, sunshine, wind, air currents, and atmospheric pressure.

Each weather element affects disease development and occurrence in various ways. However, temperature and moisture are probably the limiting factors for most diseases, especially those caused by fungal pathogens. Either of these weather factors can be decisive in the initiation, development, and spread of plant diseases. If one is continually favorable, the other becomes the deciding factor. If both are variable, then both must be favorable at critical times. If both are continually favorable, the disease becomes serious and may reach epidemic proportions.

Temperature often is the limiting factor in the seasonal and regional occurrence of diseases, determining their variation between seasons and their geographic distribution. Latitude and elevation can be effective in determining temperature and, thus, the geographic distribution of diseases. For example, late blight of Irish potatoes normally is considered to be a disease of northern latitudes. However, it can become highly destructive when winter months are cool and moist in the potato growing regions of Alabama and other Southern States.

Some pathogens develop best at low temperatures. For example, the fungi that cause plum pocket and peach leaf curl are seldom destructive except when spring weather is cool and wet. The virus that causes peach yellows is inactivated at relatively high temperatures and occurs commonly only in the more northern peach growing areas of the United States.

Among the pathogens that require high temperatures with favorable moisture conditions are those causing diseases such as bitter rot of apple, brown rot of stone fruits, tomato wilt, cabbage yellows, fire blight of pome fruits, southern bacterial blight of tomato, pepper, eggplant, and many other hosts, and southern blight of tomato, pepper, peanuts, and innumerable hosts.

Bitter rot of apples is well distributed throughout the world, but it becomes destructive only in the southern part of the apple growing regions. The southern blight pathogen is also restricted primarily to warm regions, where it can develop rapidly and become a serious disease problem on many crop plants.

Virtually all pathogens causing diseases of plants above ground are greatly dependent on moisture for their development. This is especially true when their prevalence depends on the number of disease development cycles that may occur. Although temperature obviously is important in determining how rapidly a disease may develop, moisture not only determines the number of disease cycles that may occur but whether there is any disease development at all.

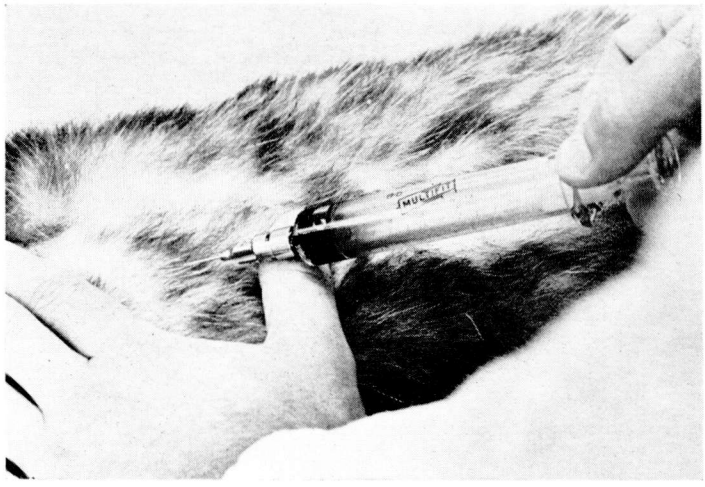
Cereal rusts, downy mildew of grape, apple scab, and bean anthracnose are seldom prevalent in dry regions or in those areas where weather is usually dry during critical periods for development of the diseases. Bean anthracnose seldom develops in the drier bean growing areas in the West, even when infected seed is planted. For this reason, it is common practice to grow seed beans in that area because of their freedom from anthracnose.

Leafspot of peanuts (see photo) in Alabama can be a destructive disease on this crop. Greatest disease development occurs only during periods of abundant moisture, as demonstrated by the lack of leafspot problem in the dry 1954 crop year.

In surveys to determine the occurrence of cotton seedling diseases and boll rots (see photo), it was discovered that anthracnose occurrence was separated definitely by a line through eastern Oklahoma and Texas. This line coincided approximately with the boundary between the under 10 and above 10 in. of average summer rainfall. Anthracnose can be a constant and important factor under high summer rainfall conditions in the eastern part of the Cotton Belt, but is essentially nonexistent in the drier western part.

With plants that are susceptible, the presence of a disease depends esssentially on favorable weather. The outer limits of disease distribution usually are the extremes of wet and dry and hot and cold weather that the pathogen can withstand. Thus, a plant disease may be an important or relatively unimportant factor in crop production, depending on how weather conditions in a given area in a given season permit its development and spread.

Removing blood sample from an animal ◆



Man, Animals and TULAREMIA in Eastern Alabama

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TULAREMIA, *Pasteurella tularense*, is normally a disease of rodents and rabbits. In some sections of the United States, the disease is referred to as "rabbit fever."

Tularemia was first discovered in 1912 during an outbreak of the disease among California ground squirrels. Seven years later a disease called "deerfly fever" turned out to be tularemia, which was transmitted from infected rabbits to man by the fly.

Pasteurella tularense was found in rabbits sold in the Washington, D.C., markets and "rabbit fever" was not uncommon among persons handling the rabbits.

Now the disease is not confined to rodents and rabbits; more than 50 vertebrate animals have been reported as naturally infected. Most human cases are traceable to direct contact with sick animals, although the disease is also transmitted by water and insects, especially ticks and flies.

Tularemia is an occupational hazard among farm workers who contact all sources of infection. Trappers and hunters usually are infected by handling dying or dead animals.

Reported here are partial results from an investigation[1] directed at the occurrence of tularemia among Alabama mammals, ways the disease may be transmitted to man, and effects of the disease on its host.

Symptoms of the Disease

In untreated cases tularemia may be fatal. Symptoms of the disease to date vary according to the way in which the bacteria enter the body. When the organism enters through an insect bite or puncture of the skin, an ulcer occurs at the wound and associated lymph nodes swell. Early symptoms include headaches, pains, and fever. If the inoculum is rubbed into the eyes, the inner surface of the eyelids are infected and there is a swelling of the salivary glands and lymph nodes of the head.

Breathing the bacteria produces inflamed lungs and swallowing the inoculum causes influenza-like symptoms. There is no commonly available form of vaccination against the disease. Therefore, at present curing the disease depends upon early diagnosis and treatment by a physician.

Materials Used in Study

During an earlier investigation of Chagas' disease conducted by Auburn University Agricultural Experiment Station in eastern Alabama, wild mammals were trapped. Large quantities of their serum were collected and frozen in anticipation of developing a test for Chagas' disease that would be applicable to wild animal serum. A reliable test was not developed; thus, these serum samples were available for other diagnostic studies.

Through cooperation of physicians and hospitals, serum samples were obtained from patients taken at random from adults.

Procedures Followed

Two procedures were used. The frozen serum was allowed to melt and was then screened for tularemia antibodies, using the slide test. In this gross screening, a drop of serum mixed with a drop of commercial antigen was examined for reaction under low magnification. Positive reacting and suspected serums were tested by a more accurate and precise method – macroscopic tube dilution procedure. Concentrations of serum solution ranged from 1 to 20 to 1 to 640. A dilution of 1 to 40 was considered negative, whereas a concentration of 1 to 80 was positive, indicating that the animal had contacted the disease.

Summary

Sufficient positive reactions resulted in the Auburn studies to warn Alabama farm and rural residents, hunters, trappers, and others **to use extreme caution in handling wild animals, especially those that appear sick.**

A total of 204 human serums and 134 wild animal serums were examined in this investigation. Of the 23 suspected raccoon serums, 5 gave positive reactions at the 1 to 80 or higher concentrations, indicating that the animals had had contact with tularemia organisms. Only 3 of the serums from 83 opossums were completely positive at the 1 to 80 concentration. One "wild" dog was tested and showed positive reaction at the highest level. Serums from 16 "wild" house cats were all negative and so were single serum samples from 6 other species.

Thirteen of the 204 human serums reacted in the screening test, but only one was completely positive and two were partially positive.

Tests results with animal serums demonstrate that tularemia may be present in Alabama mammals other than rabbits and rodents.

[1] Supported in part by U.S. Public Health Service Research Grant AI 03307 from the Institute of Allergy and Infectious Diseases.

SILAGE—
important ingredient in dairy forage systems

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RAPID ACCEPTANCE OF SILAGE by Alabama dairymen is causing many to consider major shifts in their forage feeding systems. Serious consideration is being given to systems using either all silage or high silage for meeting forage requirements.

Such factors as larger herds, high producing cows, higher land prices, shortages of labor, and production of more nutrients per acre are involved in needs for such changes. Advantages and disadvantages of either pasture, hay, or silage feeding systems have been apparent in the Gulf Coast Area.

Forage Systems Compared

Two forage systems are being compared in a controlled experiment at the Gulf Coast Substation, Fairhope. Half of the dairy herd is held in drylot and fed silage as the only source of roughage, and the remainder are on grazing crops and fed Coastal bermudagrass hay. Grazing crops include small grain, ryegrass, and clover for 7 months' fall and winter pasture. Millet is the only crop available for the 5-month period of summer grazing. Coastal hay is available daily to pasture cows.

A 16% protein ration of ground corn and soybean meal is fed as the concentrate to both groups of cows, at the rate of 1 lb. to 3 lb. of milk. Drylot cows get an additional 1 lb. of 41% soybean meal daily. Each cow is changed from one forage group to the other at the start of each new lactation period. This is done to eliminate effects of individual cow differences from test results. Silage is fed free choice twice daily in the drylot.

Results Show Differences

Differences between treatments are shown in the following table as an annual average for the 3-year study:

Item	*Drylot group*	*Pasture group*
Production per cow, lb. 4% FCM	9,775	10,501
Percentage butterfat	4.10	3.86
Percentage solids-not-fat	8.70	8.79
Acres of winter pasture	---	33.70
Acres of summer pasture	---	27.60
Acres of corn and grass silage	33.30	---
Pounds of concentrates fed per cow	3,282	3,318
Feed cost per cwt. of milk produced		
1963	$ 1.96	$ 2.07
1964	2.07	2.27
1965	2.48	2.06
3-year average	2.16	2.13

The high feed cost per cwt. of milk produced by the drylot group in the third year of the test (1965) offset lower costs during the first 2 years. Corn silage produced in 1964 for feeding drylot cows in the 1965 test year – November 1, 1964 to October 31, 1965 – yielded only 8.7 tons per acre. This is considerably lower than yields in the other crop years, which varied from a low of 13.3 to a high of 17.5 tons per acre.

Cost of producing, harvesting, storing, and feeding corn silage has varied from a low of $6.01 per ton (harvested weight) to a high of $9.13, and averaged $6.80. Since much of the corn silage fed in 1965 was from the crop that cost $9.13 per ton, this accounts for most of that year's high feed cost.

Because of the short 1964 corn silage crop, additional roughage was required before the 1965 crop was harvested. A combination of clover and ryegrass was grown and made into silage for this purpose. This type silage was harvested during 2 years of the study. It yielded only 6.21 tons per acre and cost $11.72 per ton of harvested weight, including the grain or citrus pulp added as a preservative, for all costs from production through feeding.

Over the 3-year period, drylot cows have averaged eating 13.7 tons of all silage per cow per year (harvested weight). The average fed-out cost of all silage has been $7.77 per ton.

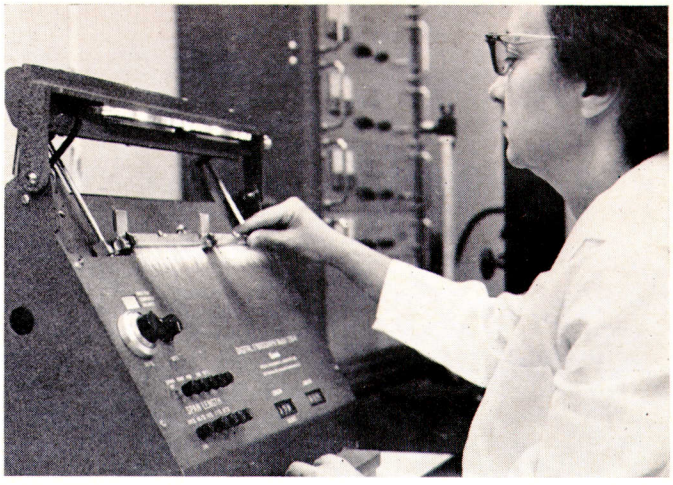
Drylot cows have required 1.3 acres of land per cow for production of all forages. Some 2.6 acres per cow have been required for the production of forages for the pasture cows. Much of the land used for pasture cows has been double cropped, so the total land requirement for pasture cows is not twice as much as for drylot cows. However, all hay fed to pasture cows has been purchased – an average of 1 ton per cow per year – which would increase the land needs for the pasture cows.

Major Findings

Butterfat tests have consistently been 2 to 3 points higher for drylot cows. This would add 14 to 21¢ per cwt. to the sales price of milk from drylot cows.

There were no differences in milk production per cow between the two groups during the first 2 years. Because of inadequate corn silage and perhaps some lack of management knowledge for handling drylot cows, their 1965 production dropped some 2,000 lb. per cow below that of pasture cows. This accounts for the 3-year production differences shown in the table. The combination of low milk production and high cost of silage resulted in a high feed cost for drylot cows in 1965.

Findings from this study point to a need for additional research on several other feeding systems and management practices. This research is needed to answer questions that will soon confront dairy farm operators regarding feeding systems, management practices, best use of limited land and labor supply, and investment costs. Information is also needed about group feeding of forages and concentrates and ratios of silage to concentrates.



Measuring fiber length of cotton with a fibrograph ◆

SPINNING QUALITY of *Alabama Cotton*

JAMES R. HURST, *Department of Agricultural Economics and Rural Sociology*

Cotton's competitive position greatly concerns agricultural leaders and industry.

Increasing yield, promoting more efficient production practices, and reducing costs have been emphasized. Less effort has been given toward improving quality of southeastern cotton to make it competitive in the total cotton market.

Alabama and other Southeastern States risk losing a larger share of the total market in the near future by not emphasizing quality improvement. Approximately 40% of Alabama cotton has remained in Commodity Credit Corporation stocks for the past 5 years. The percentage for other Southeastern States is even higher.

A recent trend by textile mills toward higher speed machinery to process cotton requires higher quality fiber. To meet these requirements, mills have used increased proportions of man-made fibers and cotton of higher quality.

Until recently official grade and staple standards of USDA were the usual measures of quality and the only basis for trading cotton. (Micronaire, or fineness, was added to USDA standards in 1963.) Under present conditions these measures are not adequate to determine spinning performance and thus value of cotton. This has caused mills to consider other fiber properties and to use mechanical instruments for more accurate fiber measurements. Consequently, much cotton has remained in CCC stocks because price support levels based on USDA standards exceeded values as determined by mills.

Auburn University Agricultural Experiment Station is participating in a regional study of cotton's consumption pattern. Attempts are being made to find what determines mill selection of cotton from specific production areas.

Data were obtained from 9 Alabama textile firms operating 29 mills and processing about ⅔ million bales during 1964-65. The study shows that only 28% of about 1 million bales processed by all Alabama mills came from the Southeast and more than 37% from the Central Belt, Table 1.

About 56%, or 560,000 bales, used by Alabama mills in 1964-65 was M-SLM grade and $1\frac{1}{32}$-$1\frac{1}{16}$-in. staple, Table 2. Alabama produced about 500,000 bales of this grade and staple – enough to have supplied more than 90% of the needs in this class. However, mills purchased a majority of this type cotton from the Central Belt because of quality characters other than grade and staple.

Seventy-five per cent of the firms indicated that southeastern cotton at best was inferior to central belt cotton. The reason given by 55% of the firms for using central belt cotton was – "it was better running."

The three reasons given most frequently for low quality of southeastern cotton were: (1) "overcleaned and overheated in ginning," (2) "low breaking strength," and (3) "non-uniform staple length."

More than ⅓ million bales of cotton purchased from the Southwest were mostly short staple (1 in. or less) and priced below southeastern cotton. Yet uniformity and other desirable properties permit it to be used for some products formerly made from southeastern cotton.

The needs are apparent, if Alabama cotton producers are to compete in the total cotton market. They must produce more cotton of the quality demanded by the textile mills.

To supply the mills with cotton of needed fiber properties, producers must know the extent of premiums and discounts that mills associate with these different properties. Cotton price support levels that permit prices to reflect all fiber properties that influence quality would provide incentive for improvement.

There are varieties with longer, more uniform, and stronger staple. These varieties must be evaluated and utilized. The best production, harvesting, and ginning practices must be followed to ensure that the natural good spinning qualities are preserved.

A system of cotton fiber quality testing and bale identification is needed to group cotton by larger uniform lots for orderly marketing.

Table 1. Proportion of Cotton Purchased by Alabama Textile Mills by End Product and Area of Growth, 1964-65

Product	Area of growth			Total
	Southeast	Central	Southwest	
	Pct.	*Pct.*	*Pct.*	*Pct.*
Yarns	12.3	----	1.2	13.5
Gray goods*	14.1	30.5	32.8	77.4
Finished fabrics	1.4	4.1	----	5.5
Manufactured articles	.8	2.8	----	3.6
Total	28.6	37.4	34.0	100.0

* Includes industrial.

Table 2. Cotton Consumed by Alabama Textile Firms, by Grade and Staple, 1964-65

Grade	Staple, inches					Total
	15/16 to ⅞	1	$1\frac{1}{32}$	$1\frac{1}{16}$	$1\frac{3}{32}$ to $1\frac{1}{8}$	
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
White						
SM	----	----	----	----	1.2	1.2
M	----	----	1.8	10.5	----	12.3
SLM	1.2	26.0	29.1	14.1	5.4	75.8
Light sp.						
M	6.3	----	----	----	----	6.3
SLM	4.4	----	----	----	----	4.4
Total	11.9	26.0	30.9	24.6	6.6	100.0

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BARRIERS To Increased Hog Production

MARKET HOG PRODUCTION has long been recommended to many Alabama farmers. Yet fewer hogs are now being produced than are consumed in the State. This shortage suggests a favorable market for meat-type hogs.

Because of the sizeable number of hog producers in Butler County, 107 farmers were contacted to get their views about the hog business. Of these farmers, 57 were hog producers and 50 were non-producers; 34 of the latter group were former producers and 16 had never raised hogs.

Current Producers

When asked what they would have to do before they could double the number of sows on their farms, producers mentioned four changes: 70% or more listed improved fencing, additional buildings, more acres in corn, and increased corn yields as barriers to expansion. It was not surprising that they regarded increased feed-corn production important since it was the general opinion of Butler County farmers that they could not profitably produce hogs on a bought-feed basis. However, fewer hog producers were of this opinion (41%) than were non-producers (64%). Half the producers said they needed more know-how before increasing operations. Two other important factors were additional labor and improvement in quality of hogs. Despite these barriers, 77% of the growers ranked hog production as one of their three most important enterprises.

Nature of change*	Farmers mentioning each change	
	No.	*Pct.*
Improve fencing	45	79
Additional buildings	44	77
Increase corn acreage	41	72
Increase corn yield	40	70
Improve scientific know--how	29	51
Borrow money	18	32
Improve quality of hogs	17	30
Stop selling corn	16	28
Employ additional labor	16	28
Buy additional corn	14	25
Reduce other enterprise	14	25

* Fewer than 10 mentioned: secure additional land, reduce or quit nonfarm work, improve water supply.

Non-producers

The hog business has long been a case of "feast or famine." In general, farmers have followed a pattern of periodically moving into production when demand and prices were good and out of production when markets and prices declined because of over production. In view of this, how did non-producers regard market hog production as an enterprise?

Thirty-four (68%) of the remaining 50 farmers were former producers, 13 of whom went out of the business in the last 2 years (1963-65) and an additional 11 farmers (32%) between 1960-63. Most of these hog operations had been small, with 19 having had fewer than 6 sows at peak operation. The most common reasons given by former producers for going out of market hog production were: price levels too low, conflict with off-farm work, and greater profit from other enterprises. Lack of proper buildings and equipment, work too confining, and high feed costs were other reasons often given.

Reasons for stopping*	Farmers mentioning each reason	
	No.	*Pct.*
Price levels at time	24	71
Conflicted with nonfarm work	18	53
More profitable enterprises	17	50
Lack buildings, equipment	15	44
Work too confining	14	41
High feed costs	12	35
Lacked production knowledge	9	26
Disease and parasite problems	8	24
Lacked adequate financing	5	15

* Fewer than 5 mentioned: dislike raising hogs, lack markets, waste disposal, government programs, illness, age.

Most of the 16 who never produced market hogs opposed such an enterprise. Only three ranked hogs as high as third among desirable farm enterprises, and only one thought money could be made from hogs. Reasons for not producing market hogs were: lack of interest (11 or 69%), confining routine (50%), lack of labor (38%), and loss of cash corn crop (31%). A factor in this disinterest was the belief that their wives would not favor starting a hog enterprise.

Hog production barriers*	Farmers mentioning each barrier	
	No.	*Pct.*
Not interested in hogs	11	69
Routine too confining	8	50
Lack of available labor	6	38
Stop selling corn	5	31
Secure additional land	4	25
Learn scientific know-how	4	25
Give up nonfarm work	4	25

* Fewer than 4 mentioned: need for more corn (acreage, yield), reduce other enterprises, and such problems as disease, parasites, waste disposal.

Conclusions

The data suggest the futility of any attempts to encourage inexperienced farmers to add hog production as an enterprise to their farm operations. Instead efforts to encourage hog production should be directed at experienced producers. Moreover, efforts to promote expansion or starting a hog operation should stress the market cycle and advise how to cope with it. Estimates of market supply and demand also should be made periodically and provided producers through all information channels available.

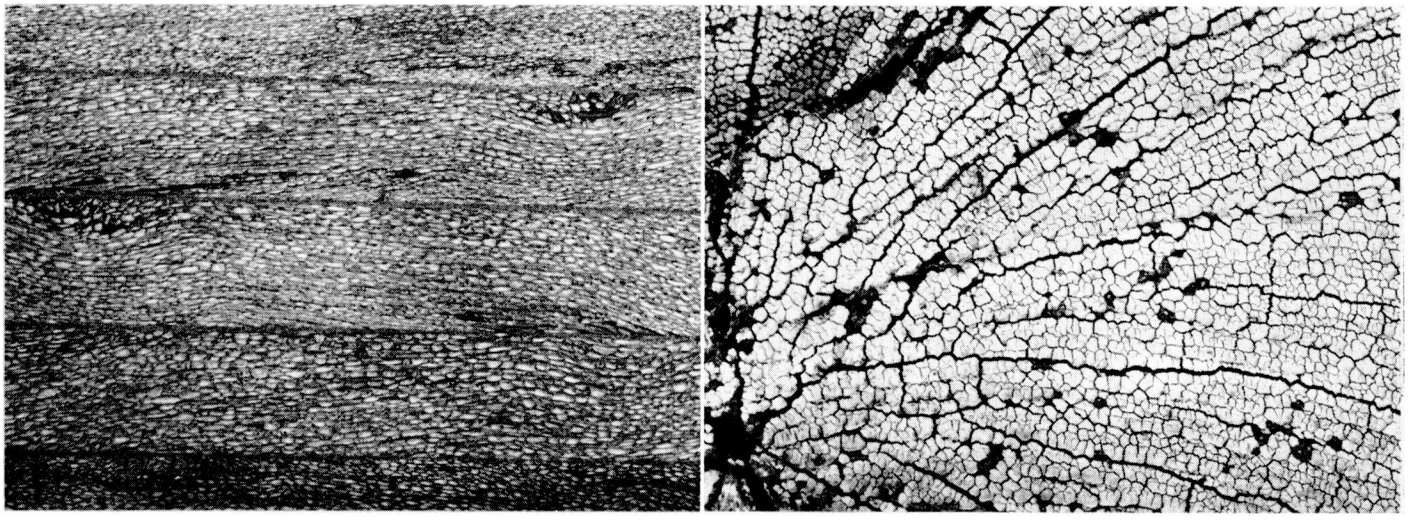

FIG. 1 (left). Shown is the characteristic lace-like pattern of partridge wood. FIG. 2 (right). These fruiting bodies of Stereum frustulosum (called conks) on the end of a partially decayed red oak log indicate that the log contains partridge wood.

PARTRIDGE WOOD—Useful Raw Material from Decaying Oaks

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Department of Forestry

WOOD DECAY usually is considered undesirable, but there are exceptions. In addition to the essential removal of space-consuming tree residues from the earth's surface, some types of decay can transform waste hardwood logs to a raw material that might be valuable for specialized product manufacture.

Action of certain degrading organisms within partially decayed logs creates unusual beauty with some types of wood. Various patterns and colors of stains and decays that change constantly during the degradation process present an appealing appearance. Sections from such logs often provide a material that can be used in manufacturing small products, such as picture frames, lamp bases, pipe racks, and figurines. Because of their unusual and distinctive appearance, such products can demand a price much greater than comparable items from sound wood.

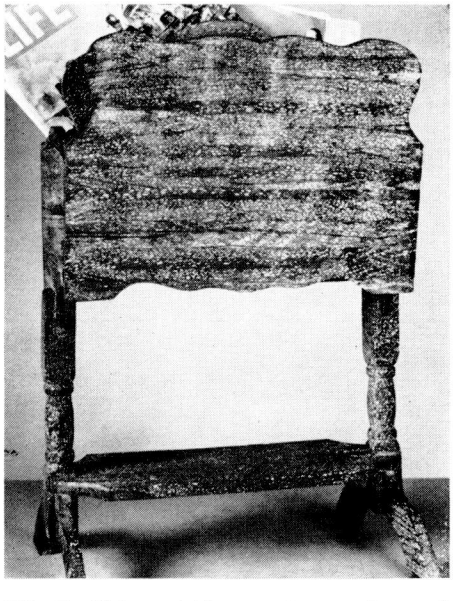

FIG. 3. This partridge wood magazine rack illustrates potential use for the product.

One example of such a wood that can be adapted for these purposes is "partridge wood," a designation for oak wood infested with the fungus *Stereum frustulosum* (Pers.) Fr. Action of this organism causes the wood to assume a characteristic lace-like pattern of alternating discolored solid portions and empty pockets of varying shapes arranged in a random fashion, Figure 1. Work with this degraded oak wood at Auburn University Agricultural Experiment Station has demonstrated its desirability for use in constructing specialized, artistic items.

Since Alabama's wood economy is largely dependent on pine forests grown for pulp and paper and to a lesser degree for other timber products, hardwood utilization has received only token attention. Emphasis on pine growth in the State has led to mass girdling, felling, and poisoning of hardwoods, resulting in large areas cluttered with standing dead trees, hardwood logs, and debris. Remains of these hardwoods presently are valueless, and serve only in providing food and habitat for a host of nature's degraders, particularly fungi. However, such oak logs may prove valuable because of transformation to partridge wood.

Preliminary surveys have shown that many of the decayed oak logs lying on the forest floor in Alabama contain partridge wood. The fruiting bodies ("conks") of S. *frustulosum* appear as small gray structures arranged in clusters on the log surface and serve as an indicator of partridge wood, Figure 2. One investigator has compared the appearance of these conk clusters to sheets of cracked mud. Surfaces of split sections or brushed surfaces of sawn sections from such logs reveal the characteristic pattern of partridge wood. Much of this wood is of poor quality (multiple insect cavities and drying checks), but sufficient amounts can be obtained for veneer facing on small products.

Although not as strong as sound wood, partridge wood has sufficient strength for normal working and for use in small products, Figure 3. Several items have been constructed in forestry laboratories at Auburn and displayed in various places to solicit public opinion concerning desirability of this wood.

A 2-day exhibit in the lobby of the Whitley Hotel in Montgomery drew an estimated 4,000 persons. The general public, interior decorators, and furniture manufacturers have voiced favorable reactions.

Since the esthetic value of partridge wood specialty products can command good prices, it appears that a small wood industry to utilize this presently valueless material could be a successful venture.

AFLATOXIN— serious problem in seeds, feeds, and food crops*

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AFLATOXIN IS a poisonous substance produced specifically by the fungus, *Aspergillus flavus*, when grown on wheat, corn, peanuts, and other food crops or in artificial media. Several mycotoxins (fungus-toxins) have been described in the last 40 years that are toxic or damaging to animals and man, but aflatoxin has been reported only recently.

In 1960, an apparently new disease (turkey-X) occurred in turkey poults in England causing the loss of more than 100,000 birds at 500 locations. Outbreaks in ducklings, pheasants, swine, and calves were subsequently reported. One shipload of Brazilian groundnut (peanut) meal, used as a protein source in starter rations, was found to be involved in all cases. Similar outbreaks of the disease occurred in East Africa and India from local groundnuts in those countries.

British workers isolated the fungus, *Aspergillus flavus*, from toxic Uganda peanuts and demonstrated that metabolites of this mold in peanut meal were the cause of the disease. It was further established that toxic groundnut feeds and meals had been present in England since 1951. Since an adequate method for determining aflatoxin was developed, it has been found in low quality stocks of most cereals, soybeans, cottonseed, peanuts, and other food crops and feedstuffs.

The relationship of molds to deterioration in stored peanuts has been studied at Auburn since 1955. When the cause of turkey-X disease was announced by British workers, an Auburn research team identified toxin-producing strains of *A. flavus* in Alabama peanuts.

Subsequent research has shown that *A. flavus* isolates from peanuts from Georgia, Florida, Virginia, North Carolina, Texas, and New Mexico were capable of producing aflatoxin. Aflatoxin was also produced with cultures of the fungus isolated from corn, oats, wheat, rice, and soybeans by investigators from other states. Thus, toxin-producing strains of *A. flavus* are probably worldwide in distribution.

The aflatoxin-producing ability of *A. flavus* isolates was demonstrated on natural seed substrates as well as one of two semisynthetic liquid media developed at Auburn for screening fungi in stationary culture. One suitable medium (SMKY) was composed, per liter basis, of 200 g. sucrose, 0.5 g. magnesium sulfate, 3 g. potassium nitrate, 7 g. Difco yeast extract, and demineralized water. The other medium (YES) giving maximum aflatoxin production consisted of 2% Difco yeast extract and 15-20% sucrose. This medium is simple and easy to prepare, relatively inexpensive, and ingredients are widely available.

Nutritional requirements of *A. flavus* for growth and aflatoxin production were the subject of a master's thesis by D. W. Eldridge. He found that sources of both organic and inorganic nitrogen are essential for high yields of aflatoxin in liquid culture media. That iron, magnesium, and zinc are essential to toxin production was shown in postdoctoral research by V. P. Agnihotri and the authors.

Effects of temperature on production of aflatoxins B_1 and G_1 by *A. flavus* and *A. parasiticus* Speare in flasks of peanuts and on artificial medium (SMKY) have been established in Auburn research. Optimum temperature for production of aflatoxins by *A. flavus* was near 25° C, whereas with *A. parasiticus* 25-30° C was best. At 25° the proportion of aflatoxins B_1 to G_1 produced by *A. parasiticus* was about 1 to 8, but at 35° C the proportions were reversed to about 2 to 1.

Under contract with the USDA Southern Utilization Research and Development Division, New Orleans, a study is underway on the limiting environmental conditions for mycotoxin development in peanuts. Such information is needed to assure processing of highest quality peanuts. The relationship between kernel maturity, physical damage to kernel and shell, and environment to formation of aflatoxin by *A. flavus* is being investigated in stored shelled and unshelled peanuts.

Although there are many unanswered questions concerning aflatoxin, studies to date have identified steps that will help prevent excessive toxin development. Once there is an awareness of the threat from aflatoxin, prevention and control are dependent on control of factors influencing mold growth, such as the following three steps:

(1) Harvest seed crops at maturity and follow curing and drying techniques to rapidly reduce seed moisture to safe storage levels. Use modern drying methods.

(2) Store cleaned and sound seed in dry, aerated, insect-free storage facilities. Foreign matter, whether soil or plant debris, and damaged or immature seed may affect aeration and moisture availability.

(3) Feed and food processors should determine toxin presence by chemical procedures before manufacturing and processing peanut products.

Improved techniques for growing, harvesting, drying, and storing food materials to prevent mold development are being further investigated. Research may eventually yield methods for detoxifying mycotoxin contaminated feeds and food materials.

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