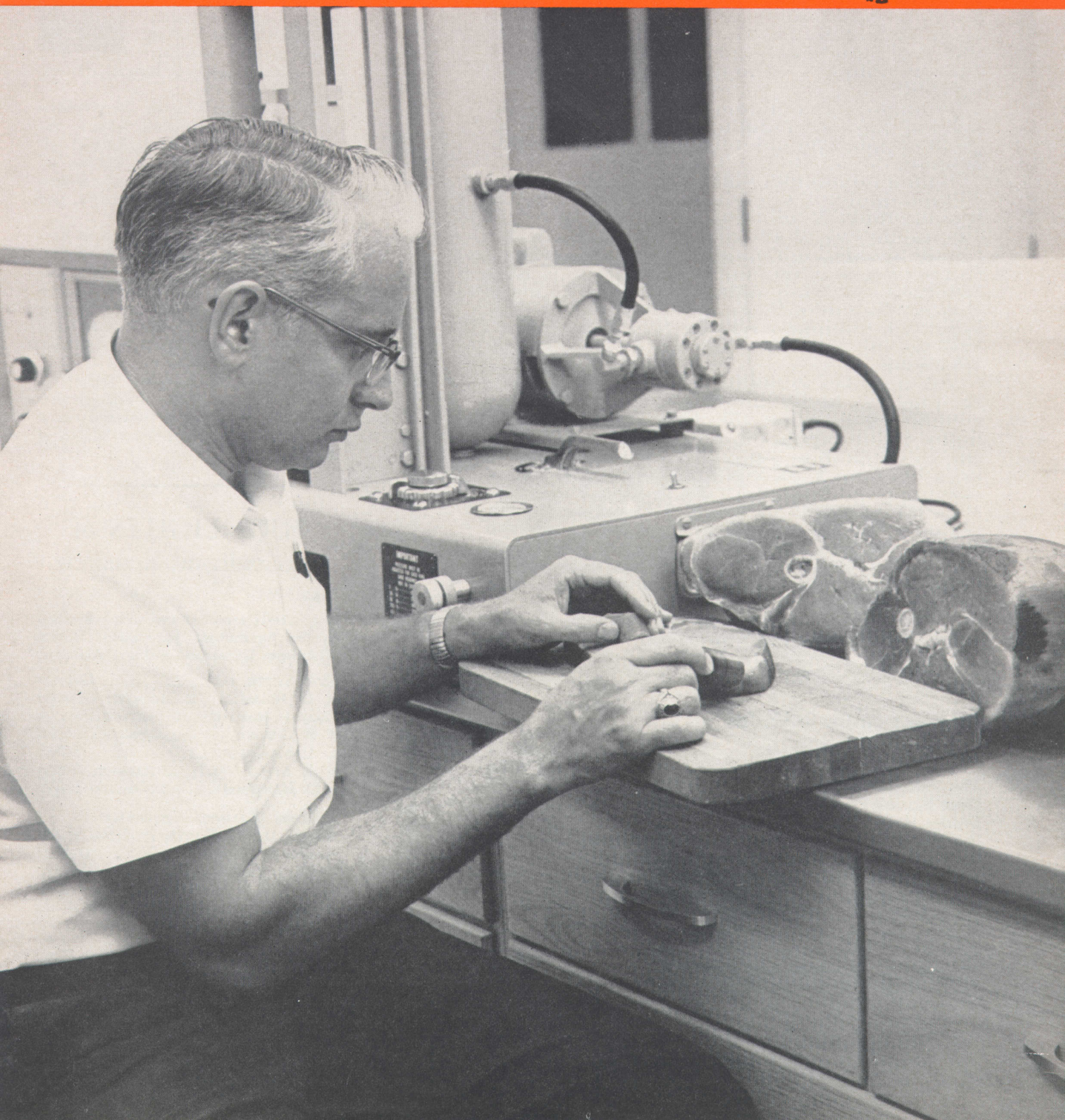
HIGHLIGHTS

of agricultural research

VOL. 16, NO. 3/FALL 1969

Agricultural Experiment Station
AUBURN UNIVERSITY



DIRECTOR'S COMMENTS

E. V. Smith

TO THE EARLY SETTLERS in this Country, autumn was a significant season. It was the season when crops were gathered and man could determine whether there would be ample food for his family during the coming winter. Thanksgiving had real meaning.

Autumn is also a significant season for modern affluent Americans. This is the season for football and for hunting. As man once dreaded the onset of winter, many of his descendants look forward to it as the beginning of skiing and other winter sports. Except for farmers, agribusinessmen, and small town residents, the fall harvest has lost much of its former significance.

Yet sensitive Americans in the city and country have recognized widespread hunger and malnutrition in the midst of plenty. In general, the problem has appeared too gigantic and too complex for solution.

Recently, President Nixon has announced a massive program "to banish hunger from America once and for all." Secretary of Agriculture Hardin has revealed some of the details of the program. He has requested $30 million for the Extension Service nationally to employ nutrition aides to teach low-income people the basics of good nutrition, food buying, and menu planning. More than 6 million school children will receive lunches free or at greatly reduced prices. These are but examples of the programs anticipated to be initiated or expanded. In fiscal 1971, it is estimated that added costs of such programs will be in excess of a billion dollars.

Only in a country with America's efficient agriculture could a food program for the poor, as outlined by Secretary Hardin, be undertaken with any promise of success. Only in such a country could so few farmers produce the food and other essentials for so many non-farmers. There is danger, however, that urban America may make the strategic mistake of taking for granted the nation's current agricultural abundance. If it is to continue: there must be economic incentive for intelligent, well-educated young people to enter the business of farming; agriculture must offer competitive advantages to industry if the latter is to continue to provide input supplies and marketing channels; the public must understand the need for and support public appropriations for research on critical agricultural problems.

For thinking Americans, urban and rural, the autumn harvest season should assume its original significance.

look for these articles

may we introduce . . .

Dr. L. E. Ensminger, in the story on page 11, reviews the history of Department of Agronomy and Soils, of which he became head in 1966 after being on the staff since 1944.

A native of Missouri, he did undergraduate study at University of Missouri and received his doctorate from University of Illinois. Before coming to Auburn Ensminger was on university agronomy staffs at Rutgers, Illinois, Idaho, and Florida.

Dr. Ensminger's major contributions to agronomic science have been in the area of chemistry of phosphorus and sulfur in soils and fertilizers. He has reported results in Experiment Station publications, popular magazines, and technical journals.

Numerous honors have come to Ensminger, including being named a fellow in American Society of Agronomy and award for meritorious service to agriculture from Alabama Soil Fertility Society. He holds membership in several honor societies, including Gamma Sigma Delta, honor society of agriculture.

A member of American Society of Agronomy since 1939, Ensminger has held many positions of leadership in it and the affiliated Soil Science Society of America.

HIGHLIGHTS of Agricultural Research

FALL 1969 VOL. 16, NO. 3

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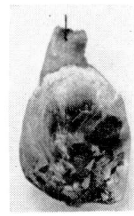
COVER PHOTO. Although taste is the ultimate test for country ham, shear tests indicate tenderness, as described on page 3.

Country Hams In A Hurry



D. L. HUFFMAN, J. R. JONES, and
W. E. POWELL, *Dept. of Animal Science*

TRADITIONALLY, country cured hams have been cured and aged for a year or longer. But today's commercial ham processor can't afford such a costly investment in production time and inventory expenses.

Like most old-time operations, ham curing can be speeded up. For the past several years, highly acceptable country cured hams have been produced in less than 2 months at the Meats Laboratory of Auburn University Agricultural Experiment Station.

Several methods of processing a rapid-cure, country style ham were evaluated in a recent study at the Lab. The methods were compared on the basis of yield of cured ham and evaluation by chemical analysis and taste panels.

Eighteen hams were randomly selected from 200-lb. crossbred pigs slaughtered at the Meats Laboratory. The hams were uniformly trimmed, wrapped in polyethylene paper, frozen, and stored at −10°F for 20 days (USDA requirements for hams to be certified free from *Trichinella spiralis*).

After frozen storage, two hams were randomly assigned to each of nine processes. These included (1) artery pumping at 3, 6, and 10%; (2) curing periods of 1, 2, 3, 4, and 6 weeks; and (3) aging for 2, 3, 4, and 6 weeks.

Hams were weighed, artery pumped with a 70% commercial brine to the designated level, dry rubbed with a commercial cure, and placed in the curing room. The curing room was held at 38-40°F and 75% relative humidity.

Hams left in cure for more than 2 weeks (processes 1, 2, 3, 5, and 6) were reworked with dry cure at 2-week intervals. After curing they were washed, placed in stockinette bags, and hung in the aging cooler, which was kept at 48-50°F and 75% relative humidity.

When the curing-aging period ended, hams were soaked in warm water for 30 minutes, scrubbed free of mold, surface dried, and smoked in a commercial smokehouse at 90-110°F for about 24 hours. They were then hung in a cooler at 36-38°F until samples were collected for chemical and taste tests.

Three center ham slices, ¾-in. thick, were removed from each ham. The first slice was trimmed free of external fat and bone, ground three times through a ⅛-in. plate, and stored in a glass jar at −5°F until chemically analyzed for moisture, fat, protein, and salt. The second and third slices were wrapped in freezer paper and stored at −5°F for tenderness test and taste panel evaluation.

The second and third slices were thawed in a refrigerator for 24 hours and then deep fat fried at 325°F to an internal temperature of 165°F. Seven 1-in. cores from slice two were tested for tenderness, and six uniform samples from slice three were evaluated for overall acceptability and saltiness by a six-member taste panel.

Results given in the table indicate that an acceptable country style ham can be produced in 4 to 9 weeks by one of several rapid-cure processes. All hams were acceptable in color, firmness, and general appearance, although there was individual variation within groups.

In general, varying amount of pump had a much greater effect on yield, tenderness, and overall acceptability than did the different curing and aging times. For example, hams in processes 1, 5, and 9 that had highest acceptability scores required 9, 6, and 4 weeks, respectively, to cure and age.

Hams brine pumped with 3% of green weight had the lowest yield of finished product, but received highest acceptability scores. These hams were also most tender in the shear tests. However, since there was little correlation between shear force and taste panel acceptability, tenderness may not be a major factor. The 3% ham required 8 to 9 weeks to cure and age for proper salt equalization, 2 to 4 weeks longer than hams in the other two groups.

Pumping hams to 6% resulted in the best yield of finished hams. Two of the three processes (4 and 5) within the 6% group had highly desirable acceptability scores, but the extremely low score of the two from process 6 reduced the group average. It appeared that after a 6-week curing-aging period the salt content increased to a slightly high level, lowering overall acceptability. Processes 4 and 5 combined highest yield with desirable acceptability scores, giving the most desirable results in the shortest time.

Hams pumped 10% required only 4 to 5 weeks of curing-aging for proper salt equalization, but these were low in yield and salt content. Although the two hams in process 9 were scored high by the taste panel, the entire group rated low in overall acceptability.

Moisture and salt averages for 3 and 6% hams were well within the accepted range, although there was considerable variation within each group. However, the 10% hams were slightly high in moisture and low in salt.

Hams pumped 3% and cured and aged for 8-9 weeks provided the most desirable ham, but had lowered yield of final product. Hams pumped 6% and cured and aged for 4-8 weeks had high yields, and two of the three processes in this group produced hams as acceptable as those pumped 3%.

EFFECT OF CURING METHODS ON YIELD AND QUALITY OF QUICK-CURE, COUNTRY STYLE HAM

Process number	Weeks in cure	Weeks aged	Yield of finished ham	Shear force[1]	Taste test rating		Chemical evaluation	
					Overall acceptability[2]	Saltiness[3]	Moisture	Salt
			Pct.	*Lb.*	*Rating*	*Rating*	*Pct.*	*Pct.*
3% pump								
1	3	6	86.5	15.7	6.8	5.0	65.4	2.1
2	4	4	88.5	17.4	6.2	5.9	63.3	2.9
3	6	2	88.5	15.7	5.8	5.2	69.9	1.5
AVERAGE			87.5	16.3	6.3	5.4	66.2	2.2
6% pump								
4	2	2	93.0	21.8	6.3	4.8	68.6	2.3
5	3	3	95.0	16.4	6.8	5.2	63.0	3.0
6	4	4	97.5	17.1	4.3	5.8	62.1	3.7
AVERAGE			95.2	18.4	5.8	5.3	64.6	3.0
10% pump								
7	1	3	91.5	23.1	5.1	4.8	68.2	1.7
8	1	4	90.5	18.8	5.4	4.1	68.0	1.8
9	2	2	91.5	13.4	6.5	4.9	68.6	1.8
AVERAGE			91.2	18.4	5.7	4.6	68.3	1.8

[1] Lower shear scores indicate meat is more tender.
[2] Hedonic scale 1 to 10, with 10 meaning excellent.
[3] Scale of 1 to 10, with 1 being lowest, 10 highest, and 5 most desirable.

Tremendous growth of Charolais × Holstein-Jersey crosses is illustrated by this nursing calf. The photo was made in late July 1967, several weeks before weaning.

Charolais x Holstein-Jersey Calves= Fast Growth and High Returns

T. B. PATTERSON, *Department of Animal Science*
R. A. MOORE and W. W. COTNEY, *Upper Coastal Plain Substation*

ALABAMA had more than 3 million acres of open pasture land in 1960, and the figure is expected to exceed 4 million by 1975. Average farm size is still small, but up from 99 acres in 1950 to 164 in 1965.[1]

A majority of the State's open pasture land is used for beef cattle. But return per acre is low because of low stocking rate (4-5 acres per cow), calf crop of 80% or lower, and weaning weight of about 350 lb. Thus, an average size farm devoted to beef cattle would gross less than $3,000 annually if calves sold for $30 per cwt. Net returns would be considerably less, of course. And these figures are from an assumed 100% marketing with no provision for replacements.

With such low returns, beef cattle show little promise for Alabama's many small farms that have been crowded out of row cropping by labor shortage and land conditions unsuited for mechanization. Much higher income would be necessary for such farms to produce beef.

Hope in the direction of higher income is shown by recent records from the Upper Coastal Plain Substation, Winfield. Dairy cows bred to Charolais bulls have produced fast growing calves that gross more than twice the average beef calf. The abundance of milk from the dairy cows resulted in weaning weights as high as 800 lb. and 1-year-old weights of 1,000 lb. for some calves.

Cows referred to are Jersey-Holstein crosses from a terminated dairy project at the Substation. Five were bred to a Charolais bull and calved in fall 1966 (one cow died from undetermined cause and her calf was not included in the summary). As more cows became available the following year, 13 additional calves were produced by the same matings. This report includes a total of 17 calves for the 2 years.

All calves remained with their mothers from birth. Apparently the cows adjusted rapidly to daily milk intake of the calves and there was no apparent udder damage. Except for a 1,400-lb. cow with a 16,000-lb. milk record, the cows were not hand milked.

The cows and calves had access to wheat pasture when available during winter and were fed corn silage three times per week. Two lb. of 41% cottonseed meal pellets per head were fed daily. In early March the cows and calves were placed on Coastal bermuda pasture that had been overseeded with hairy vetch. They remained there until mid-September when calves were weaned and placed in drylot.

Calves were creep fed a high protein feed. About 3 weeks before weaning, the creep feed was replaced by a blended ration of 30% ground Coastal hay, 60% ground corn, and 10% cottonseed meal (Vitamin A and minerals included).

Weight was recorded for each calf when it reached 365 days old. The calves were slaughtered by groups as they reached market weights and grades.

Birth weights ranged from 55 to 100 lb. and averaged 76 lb., as shown in the table. Six calves exceeded the average, and these had 2.72 lb. weight per day of age at 1 year. The 11 with below average birth weights averaged 2.38 lb. per day of age at 1 year. No apparent difficulties were noted at calving.

The 250-day average adjusted weaning weight of 679 lb. was obtained by adjusting for sex of calf and age differences, to a steer equivalent basis. No adjustments were made for age of dam.

Of particular interest is the average actual weight of 912 lb. at 1 year. At current market prices these calves would bring about $270 per head at 1 year.

Weight of cows averaged 1,192 lb. when they weaned calves the second year. Based on averages, the cows produced calves that were 57 and 76% of their weight at weaning and at 1 year.

The calves were slaughtered at an average shrunk weight of 1,028 lb. Nine of the 17 graded Choice and the other 8 were Good.

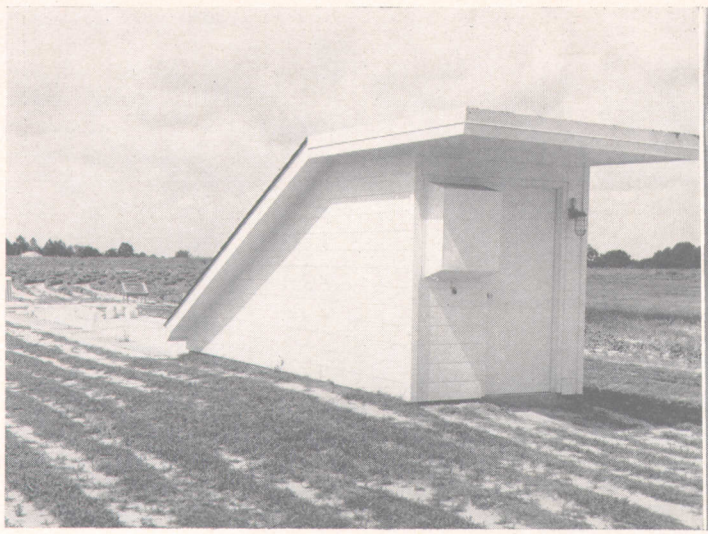
These data suggest possibilities of more than doubling gross income from beef calves by combining (1) growth rate of the calf, (2) milk production of the cow, and (3) supplemental feeding as needed.

PERFORMANCE OF CHAROLAIS × HOLSTEIN-JERSEY CROSSBRED CALVES, UPPER COASTAL PLAIN SUBSTATION, WINFIELD, 1966-68

Performance measurement	Result		
	1966-67	1967-68	Total or av.
Number of calves	4	13	17
Av. birth wt., lb.	85	73	76
Av. adjusted weaning wt., lb.	723	665	679
Av. wt. at 1 year, lb.	1,004	883	912
Av. wt. per day of age at 1 year, lb.	2.75	2.42	2.50
Av. slaughter grade[1]	11.5	11.5	11.5

[1] 11 = high Good; 12 = Choice minus.

[1] From *Agribusiness in Alabama*, June 1968, Alabama Resource Development Committee.



A stairway in the small building (left) leads to the rhizotron. The bin tops can be seen behind the building. At right is interior view from foot of the stairs. Note the vertical faces of the bins on the left and the sloped faces of those on the right.

THE AUBURN RHIZOTRON

J. D. HARWOOD, *Department of Publications*

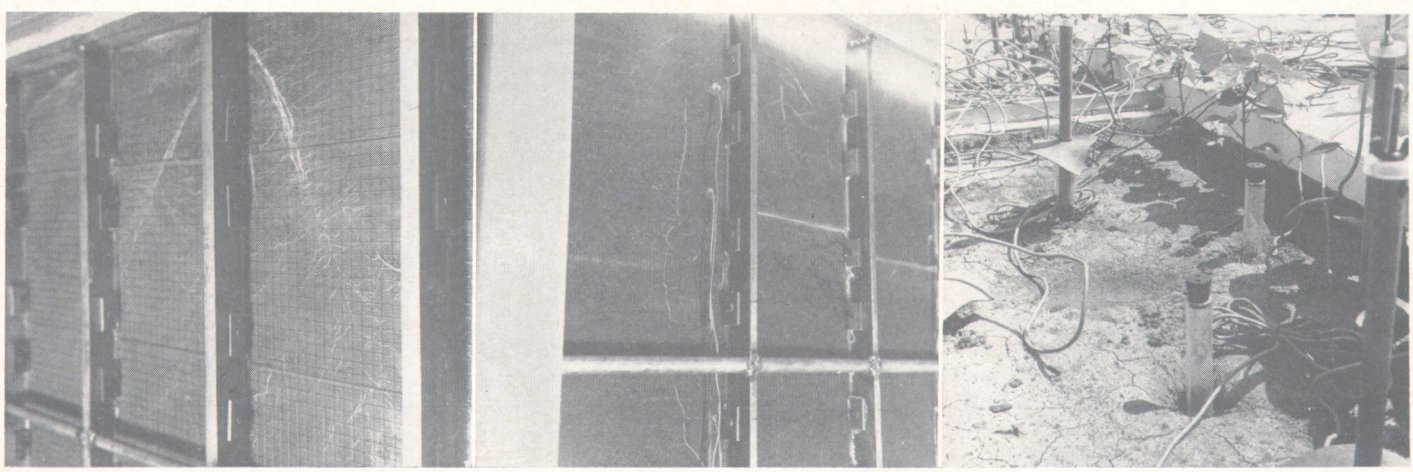
AUBURN UNIVERSITY now has the only major root observation laboratory in the United States and one of only four in the world. The laboratory, or "rhizotron", was built by the Agricultural Research Service, USDA, on land furnished by the Auburn University Agricultural Experiment Station.

The rhizotron is basically an underground walkway fitted on either side with glass walls so that scientists can observe plant roots growing in the soil. It is 72 ft. long, 8 ft. deep, and slightly over 13 ft. wide. There are 20 soil compartments, 10 on each side of the walkway. Each compartment is about 74 in. high and 48 in. wide. The compartments on one side of the walkway are 34 in. front to rear at both the top and bottom, but the compartments on the other side have the glass fronts sloped 10° so that tap roots will stay against the glass.

With completion of the rhizotron researchers can now study the initiation, growth, development, and death of roots by direct observations, by viewing through microscopes, or by serial photography. The facility also has equipment for monitoring and continuously recording oxygen content in aeration studies, soil and air temperatures, and soil-water status at various points within a compartment. Time lapse photography equipment is also available.

Research now underway in the rhizotron is centered on the effects of soil environmental factors such as acidity, aeration, and compaction on root growth. In other studies, the general rooting patterns of soybeans, cowpeas, tomatoes, peanuts, and corn are being evaluated in sandy soil.

In addition to the one at Auburn, other major rhizotrons are located at East Malling, Kent, England; Guelph, Ontario, Canada; and Mount Edgecombe, Union of South Africa.



General development of corn root system is shown at left. Center photo shows temperature and moisture probes in bin containing cotton. Right photo shows oxygen probes in soil surface of same bin as center.

DOES MARKET PRICE REFLECT DEMAND for QUALITY COTTON?

JAMES H. SANFORD and JAMES R. HURST
Department of Agricultural Economics and Rural Sociology

AN INTENSIVE EFFORT was made in 1967 by professional agricultural workers and certain segments of the cotton industry to get farmers to produce the highest quality cotton possible.

The producer was urged to plant new varieties and control quality through production, harvesting, and ginning. Farmers generally accepted this challenge and attempted to improve quality. In many cases, this was at the expense of reduced yield and higher seed cost.

Prices and Quality

Cotton prices were relatively high in 1967. Alabama farmers interpreted the higher prices as a premium for higher quality cotton. Coker 413, the most popular "high quality" variety, increased from 10% of planted acreage in 1967 to approximately 56% in 1968. As the outlook for a larger crop and decreased consumption in 1968 became more apparent, the price began to decrease. The price of "quality" cotton declined also.

The problem of quality determination is complex and includes criteria other than grade, staple, and micronaire as established by USDA cotton classing offices. However, the USDA standards are primary determinants of price received by the producer and he generally looks at these standards as a guide to the quality of his cotton. One of the major differences in "high quality" varieties apparent to the producer is longer staple.

The supply of particular grades and staples of cotton affects the prices received by producers. However, supply or spot market quotations may not be a good indicator of prices expected for any one bale of cotton. Spot market quotations are average prices or in some instances only a "best estimate" by merchants.

Preliminary studies indicate that most farmers in Alabama sell their cotton in round or mixed lots. Analysis of the price of 1,500 bales of "quality" cotton sold in 1968 reveals the relationship between price and class card quality factors.

In a study of price-quality relationships, a stepwise regression technique of multiple correlation was employed to measure the relationship between cotton prices (dependent variable) and grade, staple, bale weight, CCC loan value, and mirconaire reading (independent variables). All five independent variables explained only about 11% of the variation in cotton prices. Likewise, the overall relationship of cotton prices and the independent variables had only a correlation coefficient of .3285, where a perfect correlation is 1.0000. Therefore, the independent variables of grade, staple, bale weight, CCC loan value, and micronaire reading explained very little of the variation in cotton prices.

Loan rates established by CCC do not take into consideration important quality factors such as strength and uniformity that are important to users of cotton and which influence price. But the relationship of CCC prices and grade, staple, and micronaire are definite and can be applied to each individual bale of cotton.

In recent seasons cotton has sold for prices considerably above loan value and factors other than those on class cards have influenced price. With the outlook for a larger 1969 crop to be harvested and decreasing consumption, a large part of this year's crop will probably go into the CCC loan program.

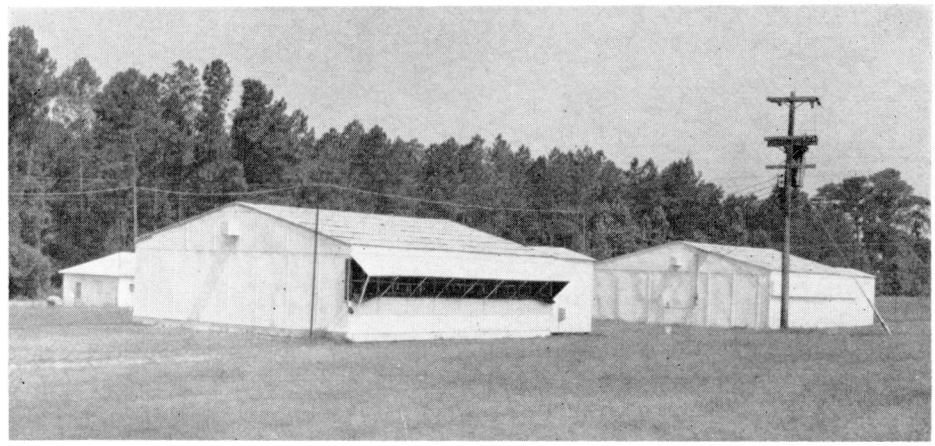
An analysis of cotton varieties at five locations in Alabama during 1968 showed that the decreased yield of some of the leading "high quality" varieties was not offset by increased price for longer staple at present CCC loan levels.

The table shows that cotton varieties ranked in order of yield are almost identical to their ranking in value per acre. Profit is still of paramount importance to cotton producers. They will continue to plant proven high yielding varieties of cotton that give the highest return per acre under present pricing schedules. Planting of such varieties, however, may not be consistent with improving the competitive position of cotton in the market place with manmade fibers.

PERFORMANCE OF COTTON VARIETIES IN SOUTHERN ALABAMA, 1968

Variety	Average yield per acre[1]	Lint characteristics, average all tests[2]				Value per acre based on av. yield, lint characteristics and CCC loan rates[3]	
		Micronaire	Pressley strength	Dig. fibro, length			
				2.5% span	Unif. ratio	Price per lb.	Value
	Lb.	*Units*	*mpsi*	*In.*	*Pct.*	*Cents*	*Dollars*
McNair 1032B	839	4.6	86.1	1.07	48	22.30	187.10
Auburn 56	835	4.3	82.6	1.06	46	22.30	186.20
Hy-Bee 100	805	4.5	84.2	1.10	46	22.85	183.94
Deltapine 45A	804	4.6	82.2	1.10	47	22.85	183.71
Stoneville 213	803	4.7	88.1	1.11	46	22.85	183.48
Hy-Bee 200	797	4.5	83.8	1.09	46	22.30	177.73
Dixie King II	786	4.4	85.1	1.05	46	20.50	161.13
Deltapine 16	785	4.6	81.0	1.13	47	22.85	179.37
Stoneville 7A	783	4.7	88.1	1.11	46	22.85	178.92
Coker 201	778	4.6	86.9	1.12	46	22.85	177.77
TH 149	775	4.4	92.0	1.13	47	22.85	177.09
Auburn M	768	4.1	83.0	1.08	46	22.30	171.26
Coker 413-502	763	4.1	91.6	1.17	45	23.40	178.54
All-in-One	748	4.5	85.6	1.11	45	22.85	170.92
Atlas 66	726	4.6	96.5	1.10	47	22.85	165.89
Coker 4104	724	4.1	83.8	1.16	45	23.40	169.42
Hy-Bee 401	722	4.6	94.1	1.09	47	22.30	161.06
Coker 413-68	715	4.2	87.3	1.17	45	23.40	167.31
Atlas 67	711	4.4	98.7	1.09	48	22.30	158.55
Stoneville 508	682	4.2	82.4	1.16	45	23.40	159.59
Coker 421-7923	667	4.2	88.9	1.14	47	23.40	156.08
Rex Smoothleaf	660	4.1	83.1	1.09	45	22.30	147.18

[1] One year results of variety tests conducted by the Department of Agronomy and Soils at five locations in southern Alabama.
[2] Results of fiber tests conducted by Textile Engineering Department.
[3] The 2.5% span length was converted to staple where .03" = 1/32" and Grade was assumed to be 41 (SLM).



Broiler house at left was insulated only in ceiling. House at right was completely insulated in walls and ceiling.

BROILER HOUSE INSULATION . . . What are the Effects?

C. A. ROLLO, *Dept. of Agricultural Engineering*

G. R. McDANIEL, *Dept. of Poultry Science*

THE VALUE of insulating broiler houses in Alabama has not been fully recognized or accepted by the broiler industry. This lack of acceptance is partly due to insufficient research data on the subject of broiler house insulation under Alabama conditions. The need for this information was the basis for research that was begun in 1968 by Auburn University Agricultural Experiment Station.

Three experimental buildings, each approximately 30 ft. x 30 ft. with an 8 ft. ceiling, were used in these studies. House A was windowless with 3-in. bat type mineral wool insulation in the ceiling and sidewalls. Ventilation was accomplished by using two 24-in. fans that were controlled by thermostats and timers. Air entered through a 4-in. continuous slot along the east wall. Electric heat was used for brooding.

House B had 3-in. bat type mineral wool insulation in the ceiling only and ventilation was accomplished by two fans controlled in the same manner as in House A. The sidewall opposite the fans had a 36-in. opening along the entire length of the house. Except for the top 4 in., this opening was covered with polyethylene film. House B was electrically heated.

House C was uninsulated and had a 36-in. opening down each sidewall. These openings were also covered with polyethylene film except for the top 4 in. The size of these two openings was varied according to the outside temperature. House C was heated with gas brooders and was not mechanically ventilated. After the first test, adjustable porous sidewall curtains were installed on houses B and C.

Each house was stocked with 1,000 day old chicks which were fed a commercial ration. Records were taken on mortality, temperature, humidity, litter moisture, feed consumption, electricity requirements for heating, ventilating and lights, and gas heating requirements.

The data in Table 1 show that a fully insulated house may reduce the heat load as much as 100% when compared with a house insulated in the ceiling only and as much as 400% when compared with an uninsulated house. Table 1 also shows that feed efficiency was best in an insulated house. The feed efficiency in Test 1 is not a good indicator because of the high mortality that occurred in all three houses.

One of the most important things discovered during these tests was the additional heat requirement when the house temperature was maintained above 70°F during the brooding period. As shown in Table 2, Test 1, room temperatures of 78.3°F, 75.3°F, and 76.0°F, were maintained for house A, B, and C, respectively, at an outside temperature of 64.4°F. If the room temperatures are adjusted to 70°F, which is the recommended temperature for broiler production, the Btu requirements are reduced by approximately one half. A temperature only 4 or 5 degrees above the desired 70°F can mean several million more Btu's required to produce the extra heat.

From the two tests conducted during the winter of 1968 it was determined that there are several benefits to be derived from insulating broiler houses. These are: fuel savings, more uniform house temperature, better feed conversion, greater utilization of chicken body heat, better control of condensation, and better litter conditions.

There is one important point that should be stressed and that is close supervision must be given to ventilation control if the benefits are to be realized.

The benefits of insulation during summer months are being studied at the present time.

TABLE 1. HEATING REQUIREMENTS, HOUSE TEMPERATURE, AND FEED EFFICIENCY IN THREE TYPES OF BROILER HOUSES, AUBURN, ALA.

Test/ house	Heat req.	Av. hse. temp.	Lb. fd./ lb. lv. wt.
	Btu.	*°F*	*Lb.*
Test 1			
Hse. A	3,049,595	78.3	2.47
Hse. B	6,249,450	75.3	2.52
Hse. C	16,050,000	76.0	2.53
Test 2			
Hse. A	6,567,045	73.6	2.19
Hse. B	8,008,175	69.4	2.23
Hse. C	13,200,000	71.5	2.38

Av. outside temp.:
Test 1—64.4°F
Test 2—50.6°F

TABLE 2. EFFECT OF OVERHEATING ON BTU REQUIREMENTS FOR BROODING PERIOD, AUBURN, ALA.

Test/ house	Av. hse. temp.	Heat requirements	
		Unadj.	Adj. to 70°F
	°F	*Btu.*	*Btu.*
Test 1			
Hse. A	78.3	3,049,595	1,222,980
Hse. B	75.3	6,249,450	3,116,285
Hse. C	76.0	16,050,000	7,727,805
Test 2			
Hse. A	73.6	6,567,045	5,504,845
Hse. B	69.4	8,008,175	8,265,811
Hse. C	71.5	13,200,000	12,257,140

Processed garbage proved to be a good mulch for ornamental plants in Auburn tests. Note characteristic texture of material.

PROCESSED GARBAGE — *Useful Mulch for Ornamental Plants*

KENNETH C. SANDERSON, HENRY P. ORR, and WILLIS C. MARTIN, JR., *Dept. of Horticulture*

THE SMELLY GARBAGE CRISIS facing the nation could wind up smelling like a rose!

Research at Auburn University Agricultural Experiment Station has revealed that processed garbage is a suitable material for mulching ornamental plants. These experiments, under a grant from the U.S. Public Health Service, found processed garbage mulches to be as effective as many other commonly used mulching materials.

There are several points favoring processed garbage mulches: (1) they are effective for more than 1 year; (2) they influence soil moisture, temperature, pH, and nutrition; (3) while being resistant to erosion, processed garbage mulches do not pack or mat; and (4) weed growth is reduced and plant response greatly improved by using this mulch material.

Abundant Supply Available

Each year the average American disposes of 1,600 lb. of solid wastes, primarily cloth, rubber, paper, metal, glass, and wood. Few cities attempt to reclaim any of these materials. In some cities the reusable materials, such as paper, rags, and metals, are being salvaged. The remaining refuse is ground and composted for use as a soil amendment, fertilizer, or mulch.

Auburn's research has used a compost produced by the City of Mobile. This processed garbage has a dark brown color, with large amounts of flexible and rigid plastic apparent. All glass is ground to a size that does not present a problem in handling. Overall texture of the product is somewhat granular. It is difficult to ignite with a match.

Chemical analysis (Spurway) of processed garbage shows nitrates of 2-5 p.p.m., phosphorus of 0-1 p.p.m., potassium of 20-40 p.p.m., and calcium of 150-300 p.p.m. The pH is 8.6 and highly resistant to change. It has a high salt content (solubridge reading — 1:5 dilution — has averaged 70 mhos), but the salts are easily leached.

Good Mulch Results

Interest that generated experiments with processed garbage mulch was because of the large quantities of the material available that could be used in park and highway plantings. And these mulches have proved successful on numerous plant species.

No apparent differences were observed in the growth of petunias and garden chrysanthemums mulched with either processed garbage, sawdust, or pine straw. Leaf and flower color and plant size were comparable in all the mulches. Kurume azalea, forsythia, shore juniper, pfitzer Chinese juniper, burford Chinese holly, Chinese holly, harland box, pyramidal arborvitae, and burkwood viburnum have grown well when mulched with processed garbage.

Soil moisture and temperature under a processed garbage mulch have been comparable to results with other mulches. Monthly moisture and temperature readings during May to July 1968 of 48 plots on a highway slope showed the following averages:

Mulch	*Available moisture, per cent*	*Temperature, degree F.*
None	78.8	79.3
Turffiber	90.1	78.1
Pecan hulls	92.4	78.3
Pine straw	94.8	76.5
Sawdust	92.5	77.4
Processed garbage	91.7	78.3

Processed garbage mulches were also found to enrich the soil. Marked increase in pH, phosphorus, potassium, and calcium 1 year after mulching were shown by these soil test results:

Mulch	*pH*	*Element, lb. per acre*			
		P	*K*	*Ca*	*Mg.*
None	5.8	21.4	101.1	882.0	105.8
Turffiber	5.7	20.1	89.5	901.0	105.0
Pecan hulls	5.6	22.1	208.8	851.0	111.0
Pine straw	5.8	21.5	85.4	899.0	111.8
Sawdust	5.6	15.9	88.5	951.0	102.0
Processed garbage	6.6	31.5	230.5	1,204.0	118.5

Soil Temperature Affects Peanut Stands

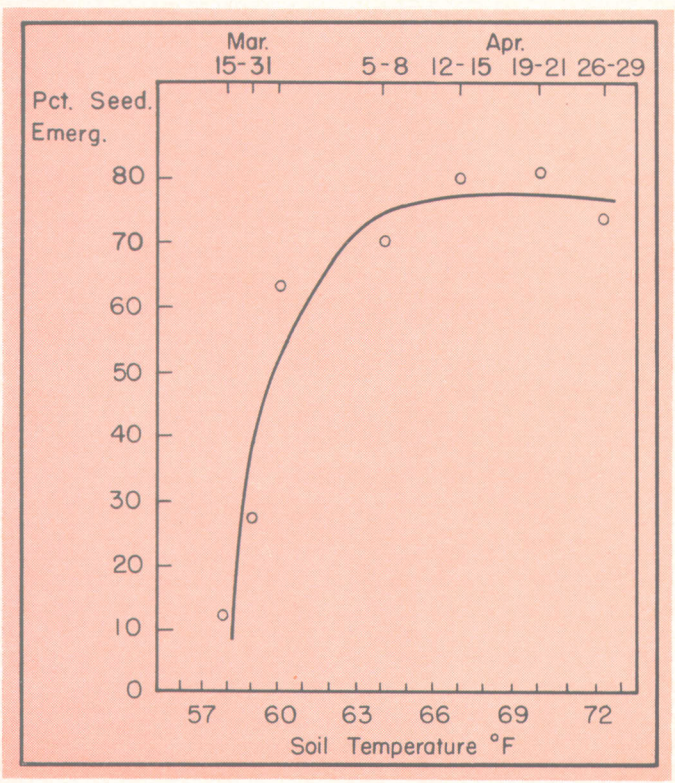
AUBREY C. MIXON, CR, ARS, USDA
E. M. EVANS, *Dept. of Agronomy and Soils*
PAUL A. MOTT, *U.S. Weather Bureau*

OBTAINING A STAND OF PEANUTS is a major problem of the Alabama growers. Although a number of factors are involved, the primary weather elements are soil temperature and moisture. Since soil temperature varies from day to day, we need to know its influence on seed germination and seedling emergence under field conditions.

To determine the effect of soil temperature on emergence and establishment of a stand of peanuts, an experiment was conducted at Auburn University Agricultural Experiment Station for a 5-year period from 1964 through 1968. The soil was prepared by turning with moldboard plow to a depth of 6 to 8 in. and disking prior to the first planting each year. A rotary tiller was used to prepare a level seedbed before planting. Seed of 'Early Runner' variety with germination in excess of 85% were used. Seed were planted 6 in. apart and 2½ in. deep at weekly intervals beginning approximately March 17 of each year. Each plot consisted of 2 rows, 24 in. apart and 20 ft. long, with each planting on a given date replicated four times.

Seedling emergence was recorded each week for 3 weeks following each planting. Maximum and minimum soil temperatures at 1, 2, 4, and 8 in. below the soil surface were recorded daily. Since soil temperature at the 4-in. depth was affected less by abrupt changes in air temperature and other weather variables, daily maximum temperatures at this depth for 10 days prior to each planting date were used. The 8-in. depth was thought to be too far below the planting zone of the peanut seed.

A summary of the results of this study is presented in the graph. Results indicate that the 10-day average maximum and minimum soil temperature 4 in. below the soil surface should be 65°F or above for satisfactory seedling emergence. This average temperature usually occurred about April 5 through 8 at Auburn.



Peanut seedling emergence as affected by soil temperature at the 4-in. depth on a sandy loam soil at Auburn.

In the peanut area of Alabama the U.S. Weather Bureau maintains observing stations at Headland, Geneva, and Enterprise that record daily maximum and minimum soil temperatures at the 4-in. depth. This information may be obtained by listening to those local radio and television stations in the peanut area that cooperate with the Weather Bureau Agricultural Service. The approximate dates when the soil temperature reached an average of 65°F or above at the 4-in. depth during the past 4- or 5-year period at the above locations were as follows:

Enterprise	*Geneva*	*Headland*
March 22-April 7	*March 20-April 13*	*March 18-April 7*

If a farmer needs to know the approximate soil temperature of a particular field, he may obtain it with almost any reliable thermometer. The thermometer should be inserted 4 in. into the soil at several locations within the field. The average of the readings will give the field temperature. A temperature obtained in this manner around 10:00 a.m. on a clear day should approximate the daily average soil temperature.

Low soil temperature can result in uneven stands of peanuts.

Some ECONOMIC and LEGAL ASPECTS of FARM LEASING

HOWARD A. CLONTS and JAMES R. HURST

Department of Agricultural Economics and Rural Sociology

LAND OWNERSHIP is not essential for successful farm operation. This was affirmed in a recent contest for outstanding farmers in which a majority of the entries rented a substantial part of the land they operated.

Alabama farmers traditionally have attempted to increase their farm operations by purchasing land as opposed to renting additional acres. Throughout the Southeastern States renting has been associated with "tenants" and "sharecroppers." However, in recent years purchases of farmland have become economically prohibitive to many farmers because of high interest rates and price inflation. Consequently, leasing is becoming commonplace in certain areas of agricultural production, such as cotton and soybeans, and the "sharecropper image" of farmers who rent is rapidly diminishing as a barrier to farm leasing.

The 1964 Census Indicated

The 1964 Census of Agriculture indicated that only 20% of all Alabama farmers were full tenants. The proportion of Alabama farmers renting (leasing) part of the land they farm is increasing, and in 1964, 20% of the farmers were considered part-tenants and part-owners. However, the 40% of Alabama farmers operating under a lease agreement is still low when compared with some Midwestern States where 60% of the farms are operated under leases.

In addition to increasing land prices and interest rates making leasing more attractive to farmers seeking to expand the size of their operations, renting land releases capital for acquiring more machinery and other technological resources to increase efficiency. Leasing is also attractive to landowners as a means of increasing income from under-utilized land. As a result, the farm lease has new importance and acceptance in modern agriculture.

Legal Aspects

In a legal sense anyone who uses the land of another and pays a rent, whether the payment is in cash or kind, is a tenant. In the Southeast, the word tenant has been associated with a sharecropper, and there is a distinction between these two classes of tenants in some states. However, a "sharecropper" in Alabama is merely a tenant who pays rent in crops, not cash, and has the same legal status as a cash renter. "Sharecroppers" are rapidly decreasing and today's tenant is typically a relatively efficient farm operator. The modern tenant has the managerial ability to employ his limited capital in acquiring the combination of resources that will yield the highest return – often through leasing.

A farm lease is a legal agreement between the landlord and tenant which specifies their rights and responsibilities. The traditional lease has been an oral agreement for 1 year. Oral leases for 1 year or less are legal and binding upon the parties but increase chances for misunderstanding terms of the lease. Written leases can eliminate many of the problems of miscommunication and are a legal necessity for a lease of more than 1 year. Because additional investment in machinery, equipment, and land treatment not recoverable in 1 year is necessary, leases for periods longer than one year often are desirable. Longer term leases also facilitate farm planning and adjustment. For legal and practical reasons leases should be in writing.

Requirements of a Legal Lease

A written lease to be legal and binding must contain:

(1) Names of parties (landlord and tenant)

(2) Description of property to be leased (legal description)

(3) Time of lease period (beginning and ending dates)

(4) Amount of rent and time schedule for payment of rent

(5) Signatures of parties to the lease.

Terms of Lease

In addition to the basic legal requirements of a lease, other terms stating specific rights and responsibilities of the parties should be included. In the absence of contractual agreement between the parties, certain rights may be misunderstood and determined by operation of law as specified in the *Code of Alabama*[1]. It is good management to have a written agreement on any matter that may give rise to misunderstanding and possible legal proceedings.

It is not possible for laws to cover all possible situations, so to secure equity for both the landlord and tenant the terms of a lease should go beyond legal aspects of a lease. The cash lease is more practical and is becoming more widely used than share leases because of its simplicity and aid in budgeting and planning. The terms of a cash lease pertain mostly to amount and method of payment of rent and to certain farming practices related to maintenance and productivity of the land and improvements.

Farm leases equitable to both landlord and tenant can increase the land available to efficient farmers and provide a satisfactory return to both parties.

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[1] Lewis, W. O., et al. eds. 1959. *The Code of Alabama,* 16:31:78-117.

A History of Agronomy and Soils at Auburn University

L. E. ENSMINGER, *Department of Agronomy and Soils*

AGRONOMY WAS FIRST listed as a separate teaching unit in the 1916 catalog of Auburn University (then Alabama Polytechnic Institute). It was one of five departments in the College of Agricultural Sciences. The staff consisted of Professor J. F. Duggar, who was also Director of the Agricultural Experiment Station and Extension Service, Associate Professor M. J. Funchess, and Instructor Frank Boyd. All three staff members held the Master of Science Degree.

The Department of Crops and Soils was created in 1919 with Professor M. J. Funchess as Head. Although the Department was not formally organized until 1919, agronomic research was first activated by an act of the 1911 Legislature that made funds available for cooperative field experiments with farmers. J. T. Williamson was hired in 1911 and put in charge of conducting fertilizer experiments throughout the State. He also established Experiment Fields at Atmore, Hackleburg, and Gastonburg. Much valuable information resulted from these early agronomic experiments conducted under his supervision.

In 1931 the name of the department was changed to Department of Agronomy and Soils. By this time the teaching and research staff numbered 13, with M. J. Funchess serving as Head Professor as well as Director of the Agricultural Experiment Station. Dr. J. W. Tidmore was appointed Head effective July 1, 1935, and served in that capacity until his death as the result of an automobile accident in July 1941.

The Department earned national recognition for its early work in soil chemistry and soil fertility. Besides the staff members already mentioned, the following scientists contributed toward this early recognition: Dr. W. H. Pierre, Dr. F. W. Parker, Dr. L. D. Baver, Dr. N. J. Volk, Dr. G. D. Scarseth, and Dr. Anna Sommers.

Dr. Pierre's classical research on residual acidity or basicity of fertilizers was first published in 1928. This work was the basis of the method adopted by the Association of Official Agricultural Chemists for determining the equivalent acidity or basicity of fertilizers. The research program in soils has remained strong with the addition to the staff since World War II of many other well trained soil scientists.

During the early years of the Department the emphasis was on soils and fertilizers. Since 1940 the crop research program, including plant breeding, crop production, and turf management, has been greatly strengthened. Crop scientists of the Department have made a number of important contributions.

Homer Tisdale developed and released Auburn 56 cotton in 1955. This variety is still used to some extent as a variety, and it has been used extensively as a genetic base for many new varieties.

Regal clover, developed by Drs. P. B. Gibson, E. D. Donnelly, and W. C. Johnson, was released in 1962. Because of its many good qualities, Regal has become widely used in the Southeast.

Dr. Donnelly has developed improved varieties of sericea and a reseeding vetch that is ready for release. The introduction of zoysia matrella in 1927 by Dr. D. G. Sturkie was a significant contribution to the Southeast.

In 1946, Dr. C. F. Simmons, now Associate Dean of the School of Agriculture and Assistant Director of the Agricultural Experiment Station, became Head of the Department and served until January 1, 1951. Dr. Howard T. Rogers became Head on July 1, 1951, and served in that capacity until, because of ill health, he accepted a position in the Department with less responsibilities on January 1, 1966.

Dr. Rogers was responsible for organizing a soil testing laboratory in 1954, with Dr. C. M. Wilson as its first director. Upon Dr. Wilson's resignation in 1957, Dr. R. D. Rouse assumed direction of the laboratory. He remained as director of the laboratory until his appointment as Associate Director of the Agricultural Experiment Station and Assistant Dean of the School of Agriculture on July 1, 1966. Dr. J. T. Cope, Jr., is presently in charge of the soil testing laboratory, which is now analyzing about 35,000 samples annually.

Upon completion of Funchess Hall the Department moved from Comer Hall into Funchess in 1962, along with the departments of Botany and Plant Pathology, Horticulture, and Zoology-Entomology. Agronomy and Soils now occupies most of the second floor of Funchess Hall, as well as space for the soil testing laboratory on the first floor.

Although the laboratories in Comer Hall were well equipped, laboratory space was not adequate and office space was entirely inadequate. The Department now has the space and equipment necessary to carry on research programs in almost all phases of crop and soil sciences. Three growth chambers in Funchess Hall and one in the basement of Comer Hall are used in research.

For a number of years the Department has operated an agronomy farm located on the southern edge of the campus. Here several experiments of historical importance, some dating back prior to 1900, are still underway. The research program was further strengthened in 1946 by the purchase of a 400-acre Plant Breeding Unit near Tallassee. This unit was originally used for plant breeding research, but in more recent years work has been expanded to include other agronomic research as well. While Head of the Department, Dr. Rogers organized a foundation seed stocks program with a headquarters farm near Thorsby. This farm was acquired in 1954 and is being used for producing, processing, and storing of foundation seed and for cooperative field research with USDA-ARS.

An undergraduate major is offered as well as graduate work at both the master's and doctoral levels. The first master's degree was awarded about 1925, and some 100 such degrees have been awarded since that time.

The doctoral program in the Department was initiated in 1959 and the first Ph.D. awarded in June 1962. A total of 20 doctorates has been awarded to date. Thirteen members of the Department are also on the Graduate Faculty of Auburn University.

Dr. L. E. Ensminger was appointed acting Head on January 1, 1966, and became Head July 1, 1966. At present there are 31 professional staff members, 19 of whom have Ph.D. degrees. In addition, there are 10 USDA-ARS professional research workers attached to the Department. There are 30 research projects in the Department covering most phases of crops and soils.

VIRUS INFECTION of GRASSES

JAMES V. CANERDAY and ROBERT T. GUDAUSKAS

Department of Botany and Plant Pathology

Several viruses infect many important grain and forage crops.

These infections are known to reduce quality and quantity but the effects of such infections on growth and yield of many grasses are unknown.

Maize dwarf mosaic virus (MDMV) is a damaging pest of corn in Alabama and at least 19 other states. The virus also infects many other grasses. In studies at the Auburn University Agricultural Experiment Station, the susceptibility of many grasses to MDMV was determined and effects of the virus on performance of some were investigated.

Grasses were grown in pots in the greenhouse and inoculated in the seedling stage by rubbing leaves with a cheesecloth pad saturated with sap from an MDMV-infected corn plant. An equal number of plants of each grass were inoculated with sap from healthy corn to serve as controls. Plants were observed for symptom appearance for 5-6 weeks following inoculation. Grasses showing questionable or no symptoms were retested, and back inoculations to corn were made from symptomless plants.

Reactions of some grasses to MDMV are given in the table. All sorghums and sudangrasses tested were susceptible, as were 32 of 34 sorghum-sudangrass hybrids. Gahi 1 pearl millet was susceptible while four other pearl millets were not. Johnsongrass has long been known to be susceptible and is recognized as an important natural reservoir of MDMV. All infected grasses showed the symptom typical of MDMV infection in corn, i.e., a mottle or mosaic pattern that appeared first at the base of youngest leaves. Some non-susceptible grasses included bahiagrass, Goar fescue, Boone orchardgrass, and Italian ryegrass.

Effects of MDMV infection on performance of johnsongrass and a sorghum-sudan hybrid were studied in additional experiments. The grasses were grown in the greenhouse and inoculated as before. Cuttings of healthy and MDMV-infected grass were made periodically after inoculation and yield, protein contents, and digestibilities were measured. Protein contents were calculated from nitrogen analyses; digestibilities were determined with fistulated steers.

MDMV infection had no apparent detrimental effect on protein content or digestibility of johnsongrass or the sorghum-sudan hybrid. In fact, protein content and digestibility of infected johnsongrass were slightly higher than those of healthy, Figures 1 and 2. Similarly, yield of johnsongrass was unaffected, however, yield of the sorghum-sudan hybrid was reduced by 40% at the second cutting and 12% at the third, Figure 3. Much of the reduction appeared to be due to die-off following the first cutting.

Susceptibility Of Some Grasses To MDMV

Susceptible			*Non-Susceptible*
brown top millet	sudangrasses		
johnsongrass	Cumberland	Trudan I	bahiagrass
pearl millet, Gahi-1	Monarch	Trudan II	canarygrass, Auburn Reed
sorghums	RP Su I	Trudan III	centipedegrass
Beefbuilder	NK 300	sorghum-sudangrass hybrids	tall fescue, Goar
F-101	NK 315	Big H	koleagrass
Funks 2615	NK 318-S	Captain Die	orchardgrass, Boone
FS 15	NK 320	DeKalb SX-11	pearl millets
FS 22	NK 330	DeKalb SX-12	Millex 22
Ga 615	Pioneer 931	DeKalb SX-16	NK-X-1002
H 6354	Pioneer 940	Funks 77F	Pearlex 21
HOK	Rudy Patrick 55F	Funks G-78F	Pearlex 22
Husky	Silomaker	Golden Sue	ryegrass, Italian
LEH 4031	Su Chow 2	Grazemaster	sorghum-sudangrass hybrids
LEH 4048	Titan R	Grazer-A	Gro-N-Graze
Yieldmaker		Green Graze	HG-12
		Greenlan	
		Green M	
		Hidan 37	
		Hidan 38	
		Leafy Sue	
		Trudan I	
		Trudan II	
		Trudan III	
		3 little Indians	
		Milkmaker	
		Orbit	
		Pioneer 950	
		Pioneer 980	
		Pioneer 985	
		Pioneer 988	
		RP Mor Su	
		Southern Cross	
		Su Chow 35	
		Su-4	
		Sucrosse	
		Summergrazer	
		Sure Grazer	
		Sweet Sioux	
		Thunder Bird	

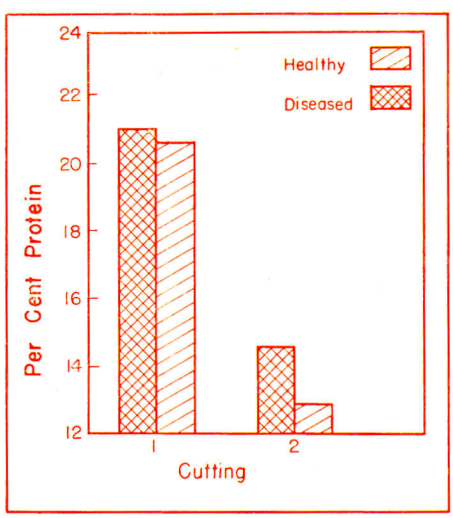


FIG. 1. Protein content of healthy and MDMV-infected johnsongrass.

FIG. 2. Digestibility of healthy and MDMV-infected johnsongrass.

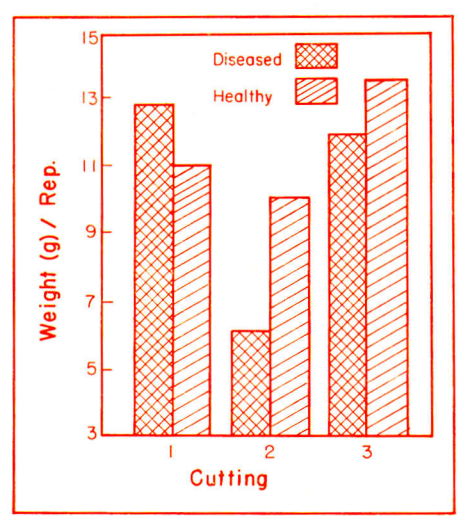


FIG. 3. Yield of healthy and MDMV-infected sorghum-sudan hybrid.

UNUSUAL FRUIT ROT Found in ALABAMA

ARCHIE J. LATHAM, *Department of Botany and Plant Pathology*

AN UNUSUAL PATTERN of rot was found in July Delicious apples in a basket of discard fruit in a fruit packing shed in Central Alabama in July 1967.

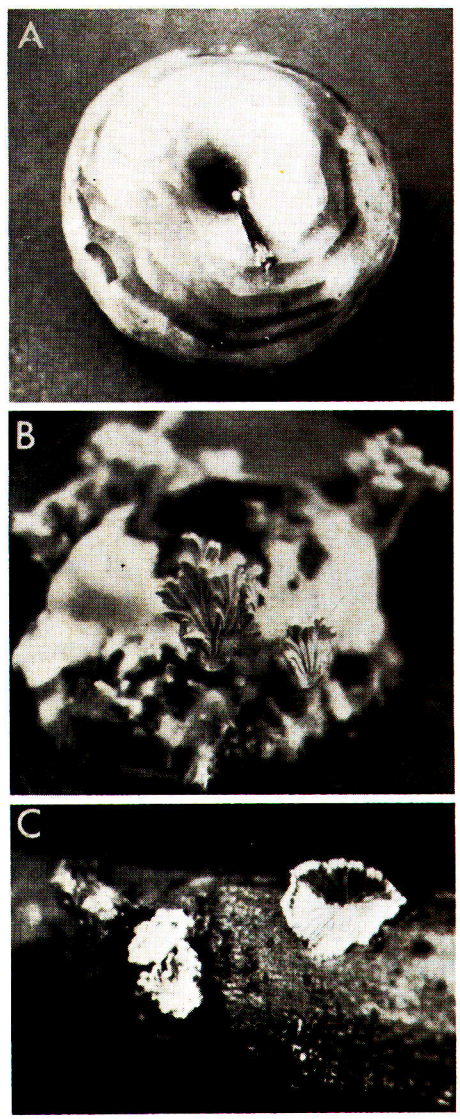
The diseased apples were incubated in culture dishes on a laboratory table for 6-8 weeks at 22-33°C. During the incubation period a zonate-like rot spread over the apple surface, Figure 1A, and small tufts of white mold developed randomly from the fruit. The tufts of mold continued to form and spread until the entire apple surface became covered with a felt-like mat. After 8-weeks incubation, the cultures were removed to a darkened shelf and allowed to incubate for 30 days. Mushroom-like structures (basidiocarps) were observed on the rotted fruit at the end of the 90-day incubation period, Figure 1B. The fungus has been identified as *Schizophyllum commune*.

Only two other reports of *S. commune* occurrence on apple fruit have been found in a literature search. The first report came from Oregon in 1931 when the basidiocarps of *S. commune* were observed on green apples thinned from trees early in the growing season. The other report was in 1961 when the basidiocarps were also found on fallen apples and pears in an orchard in northern Italy. However, the Italian researchers were unsuccessful in clearly establishing causal relationships with *S. commune*. Failure to reproduce basidiocarps on artifically inoculated apples was attributed to an inability to produce proper environmental conditions and possible genetic variability of *S. commune*.

Preliminary investigations were conducted to determine the temperatures at which optimum growth of the fungus occurred, and to develop information relative to light requirements for proper fungal development. Subsequently, the following apple varieties were inoculated: Golden Delicious, Red Delicious, Jonathan, Rome, Red Steele, Winesap, and Red York. A mycelial agar disc cut from actively growing cultures of *S. commune* was inserted into a hole aseptically cut into the fruit. The hole was sealed with Scotch tape, the apples were placed in plastic refrigerator cups enclosed in plastic bags and subsequently incubated at 21, 24, 27, 30, or 33°C. Four apples of each variety were used at each temperature. Optimum rate of rot development occurred at 30 to 33°C. Golden Delicious and Red York apples rotted fastest and became completely enveloped by rot within the first 18 days incubation. After 8 weeks incubation only two basidiocarps of *S. commune* were observed though the cultures had received the previous determined minimal incandescent light exposures. Therefore one apple of each variety was removed from the 30 and 33° incubators to a shelf where minimal daylight could be received by the vegetative mycelium of the fungus. After 14 days incubation, typical basidiocarps of *S. commune* had formed on these apples, thereby establishing convincing evidence for pathogenicity.

Other research has shown that *S. commune* infects apples through wounds or natural openings into the fruit, such as at the calyx end of the apple.

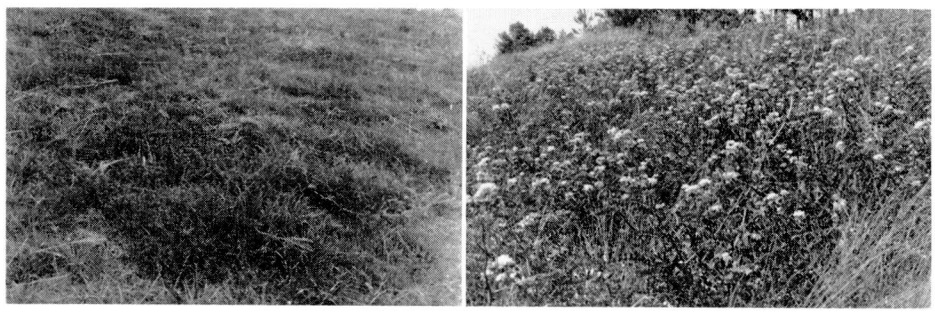
S. commune occurs worldwide as a common wood rotting fungus. It has shown preference for apple wood upon which its fruiting structures may be found, Figure 1C. The paucity of reported studies on apple fruit may be an indication of the lack of importance of this apple fruit disease or the failure of investigators to successfully identify the causal agent. However, the occurrence of *Schizophyllum* rot on apple fruit exemplifies the need for practicing sanitation in producing orchards. The elimination of dead wood and its destruction is essential to remove potential sources of inoculum to ripening fruit by *Schizophyllum* and a multiplicity of other fungi.



Shown here are identifying features of Schizophyllum apple rot. A. Zonate symptoms on rotted fruit. B. Basidiocarps formed on rotted fruit. C. Schizophyllum basidiocarps on apple twig.

Plant Mixtures for Establishing Crownvetch

D. G. STURKIE, *Dept. of Agronomy and Soils*



Crownvetch and weeping lovegrass planting on roadside. Left photo shows site on May 5 of year of planting. Right photo shows same site on May 15, 3 years later.

Crownvetch (*Coronilla varia* L.) is a perennial legume valuable for vegetating fills and cuts on highways and strip-mine areas. The seeds germinate slowly and the seedlings require several weeks to become established. To produce a cover quickly and reduce erosion effectively, it is desirable to use a companion crop with crownvetch. To determine the value of certain species for planting with crownvetch, tests were conducted in 1964 in northern Alabama at Adamsville and in 1965 and 1966 in central Alabama at Auburn.

Adamsville Tests. An area of truncated Pottsville soil was selected for the test. Dolomite at a rate of 3,000 lb. and fertilizer to supply 120 lb. N, 54 lb. P, and 100 lb. K (120 lb. each N, P_2O_5 and K_2O) per acre were broadcast on January 27, 1964, and turned under. The area was ripped with a motor grader and disked on April 9, 1964, and was disked again on April 16. Seed were broadcast on April 17 and covered with a corrugated roller. Hay mulch at the rate of 2 tons per acre was applied after seeding. The plants used and rates of seeding were: weeping lovegrass, 5 lb.; crownvetch, 20 lb.; Kobe lespedeza, 40 lb.; browntop millet, 25 lb.; and a mixture of weeping lovegrass, 2 lb.; Kobe lespedeza, 20 lb.; Ky. 31 tall fescue, 20 lb.; Pensacola bahia, 20 lb. Three varieties of crownvetch, Chemung, Emerald, and Penngift, were used in the test.

Auburn Test. An area of Chesterfield sandy loam soil was used. Basic slag at a rate of 4,000 lb. and muriate of potash at a rate of 200 lb. per acre were broadcast and the area disked and smoothed for seeding. Corn, millet, and sudangrass seed were sown broadcast and the seed covered by rototilling prior to planting crownvetch. The seed of Kobe lespedeza, sericea lespedeza, bahiagrass, weeping lovegrass, Ky. 31 tall fescue, and Emerald crownvetch were sown broadcast and covered by a roller. A ½-in. layer (about 2 tons per acre) of pine needle mulch was applied. No watering was done. No attempt to control weeds was made.

Table 1. Plants of Crownvetch/sq. ft. as Affected by Companion Species[1], Adamsville, Alabama, March 1966

Crownvetch variety	Companion crop					
	None	Weeping love	Kobe lespedeza	Browntop millet	Mixture[2]	Average
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
Emerald	4.6	4.0	4.5	4.7	2.1	4.0
Chemung	3.0	1.9	2.6	2.5	1.0	2.2
Penngift	0.8	1.8	0.1	1.2	0.5	0.9
Av. all var.	2.8	2.6	2.4	2.8	1.2	2.4

[1] Planted April 17, 1964.
[2] Weeping lovegrass, 2 lb.; Kobe lespedeza, 20 lb.; Ky. 31 tall fescue, 20 lb.; and Pensacola bahiagrass, 20 lb.

Adamsville. All varieties of crownvetch had good stands on May 12, 1964. Crownvetch stands varied from 6 to 12 plants per sq. ft.; browntop millet, 20-25 plants; Kobe lespedeza, 30-50 plants; and weeping lovegrass, 60-80 plants per sq. ft. Stands of bahia and tall fescue could not be determined.

Emerald and Chemung crownvetch had better stands than Penngift 2 years after planting, Table 1. The companion crop made little difference except that the seed mixture resulted in a poorer stand of crownvetch. In all cases a satisfactory stand remained. By the end of 1967, crownvetch was the dominant plant on practically all plots.

Auburn. A good stand of the companion crops was obtained in all cases. Best stands of crownvetch were obtained with no companion crop, with corn, Kobe, and sericea, Table 2.

Table 2. Plants of Emerald Crownvetch/sq. ft. as Affected by Companion Species, Auburn Alabama, March 1968

Mixture with crownvetch	Year planted[1]		Average
	1965	1966	
	No.	*No.*	*No.*
None	4.0	3.9	4.0
Corn	6.8	2.6	4.7
Kobe lespedeza	4.6	4.3	4.5
Weeping lovegrass	2.1	2.6	2.4
Sericea lespedeza	5.3	3.0	4.2
Ky. 31 tall fescue	1.7	3.9	2.8
Millet	....	4.5	4.5
Sudangrass	....	3.4	3.4
Pensacola bahiagrass	....	3.2	3.2

[1] Planted April 1, 1965, and April 25, 1966.

All crops tested in these studies have been compatible with crownvetch, but they all do not establish themselves rapidly. Bahiagrass and sericea lespedeza grow slowly, hence require considerable time to become established. The best perennial for planting in the summer has been weeping lovegrass. It germinates quickly, grows rapidly, and is compatible with crownvetch, bahiagrass, or sericea lespedeza. Tall fescue is the best perennial for planting in the fall and winter because it is easily established. Corn is one of the best summer annuals to plant with crownvetch. It germinates quickly, produces a dense root system, grows rapidly, and helps suppress summer weeds and grasses. It produces enough shade to be beneficial to crownvetch, sericea, lovegrass, and bahiagrass.

Hatchery Management and Sanitation Affects Poultry Profits

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MANY ERRORS in hatchery management and sanitation that had a detrimental effect on poultry production were revealed in a recent 3-year study by Auburn University Agricultural Experiment Station. In most companies, usually not one but several factors were responsible for losses, but sometimes one serious error accounted for most.

The most important faults encountered in hatcheries were reported in an earlier issue of *Highlights of Agricultural Research* (Vol. 13, No. 3).

Faults affected production in two ways: (1) in hatchability, and (2) in quality of chicks and their subsequent performance as broilers or layers, or in breeder flocks. Most problems affecting hatchability were found to be mechanical: infrequent or improper gathering and casing eggs hot, breaking or cracking eggs, holding eggs at temperatures too high or too low and for too long, and setting cull eggs. Such errors did not affect chick quality greatly.

Other factors, such as poor egg sanitation, were detrimental to hatchability and were evidenced by "exploders," dead-in-shell embryos, dead pipped embryos, early chick mortality, and weak, infected chickens that died early or were stunted.

* Resigned.

Although certain diseases were egg-transmitted, they are not covered in this report. High microbial contamination at one or more locations in hatcheries had no effect on hatchability, but was detrimental to chicks and their performance.

Diseases most often associated with poor egg or hatchery sanitation included:

(1) **Aspergillosis.** Severe infections caused brooder pneumonia and early chick mortality. If low grade, there was less mortality, or none, but some birds were stunted and there were some deaths as infection progressed. Some birds died later from toxins or fungus growth.

(2) **Omphalitis.** This was caused by *Escherichia coli*, coliforms, *Staphylococcus, Proteus,* or other agents and resulted in stunting and early deaths.

(3) **Salmonellosis** (mostly paratyphoids). This resulted in some deaths and stunting.

Exposure of newly hatched chicks to high microbial contamination on surfaces or in the air lowered chick quality and performance of chickens.

Correction of errors by several broiler companies resulted in considerable improvements in hatchability. This is shown by results in table from some firms.

An efficient broiler producing company, such as A, that was already averaging above 85% hatchability of all eggs set had only slight improvement – from 85.4 to 87.7%. Companies B, C, D, E, and F experienced much greater improvement – 8 to 18%.

Company B's improvement resulted almost entirely from (1) improving egg and hen house sanitation, and (2) discontinuing improper washing of hatching eggs so that only clean or dry cleaned eggs were set. Clean eggs were attained by improving breeder flock management.

In the case of Company C, improvement was mainly from reducing egg cracking or breaking at gathering and traying, by repair or replacement of warped egg trays and buggies that caused breakage, and by reducing breakage at transfer.

Company D, a white leghorn operation, improved by correcting egg gathering, setting only clean or dry cleaned eggs, and reducing inside hatcher temperatures of some machines from 104-105° to 99°F.

Improvement by Company E resulted entirely from proper scheduled setting of eggs so that none were over 4 to 5 days old when set. Previously some were held more than 14 days before setting, and at improper temperature.

Company F's problem was caused by duct work on setters that caused hot and cold pockets. This resulted in some embryo deaths during incubation and uneven hatching so that many chicks were not pulled.

After correction, all six companies were setting less than 1% cull eggs of all types, and these improvements were averages for 6 to 12 months. All companies had several flocks each that hatched above 92% of all eggs set sometime during the period of lay.

The best 6- to 12-month efforts of 15 broiler companies show that at least 90% hatchability of eggs can be reached. Two companies averaged within 2.5% of this potential. An average of 93-94% hatch should be attainable for commercial egg strains.

Although increased hatchability is highly important, other advantages from hatchery and breeder flock improvement are equally profitable. In the case of one company, these additional advantages included (1) a reduction in runts from 1 to 5% down to nearly zero at market age, (2) 2.5% less mortality, (3) 2% lower condemnation, and (4) greatly reduced drug bill – worth far more than the hatchability increase.

AVERAGE HATCHABILITY IN SIX HATCHERIES, BEFORE AND AFTER CORRECTING ERRORS

Company	Cracks or cull eggs	Infertile eggs	Embryo deaths during incubation[1]			Hatch
			1-7 days	8-18 days	19-21 days	
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Company A						
Before correction	1.5	8.1	3.0	0.5	1.6	85.4
After correction	1.0	8.0	1.5	.5	1.3	87.7[2]
Company B						
Before correction	1.0[3]	9.9	5.0	9.5	5.0	69.6
After correction	1.0	8.0	2.0	.5	2.5	87.2
Company C						
Before correction	11.3	9.2	2.0	0	3.0	74.5
After correction	1.0	9.3	1.0	3.5	2.0	86.0
Company D						
Before correction	1.0	8.0*[4]	2.0	0	10.0[5]	79.0
After correction	1.0	7.0*	2.0	0	2.0	88.6[6]
Company E						
Before correction	8.0	----	----	----	----	78.0
After correction	1.0	8.0	1.6	.4	1.6	86.0
Company F						
Before correction	1.0	9.0	2.0	6.0[6]	6.0[6]	76.0
After correction	1.0	9.0	2.0	0	2.0	86.0

[1] Includes pipped and weak and cull chicks.
[2] June to November.
[3] In addition, slightly more than 5% of hatching eggs were lost in cracks, and this was reduced to less than 2%.
[4] * indicates that figure was calculated.
[5] Some hatches were 50-60% with many weak chicks.
[6] Failure to pull all chicks because of uneven hatches.

RADIOS Keep Track of WILD TURKEYS

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One of the gobblers studied. Note the identification streamer attached to his wing.

WILD TURKEYS are one of Alabama's favorite game birds. Are you one of the many hunters who see a large flock of these birds just before the spring or fall hunting season and wonder if they will be in the same area on opening day? The Alabama Wildlife Research Unit is also trying to answer this question by determining the seasonal movements and activities of wild turkey gobblers.

Since September 1968, twelve gobblers have been captured for use in this study. Each turkey was leg-banded, wing-banded with individually colored streamers, fitted with a small radio transmitter, and then released at the point of capture.

The transmitters used in the study had a life of about 4 months and sent out a beeping signal that could be detected at ½ mile. Rubber tubing around the wings and a loop antenna that was placed under the breast feathers and beard held the transmitters in place. The signals emitted by the transmitters allowed location and observation of the turkeys at any time.

A minimum range and maximum distance traveled was computed for each gobbler by plotting each location on a map of the study area and compiling all of the locations recorded during each month.

The average minimum range and maximum distance traveled from the release site for each month from October 1968 through May 1969 are shown in the table. These data indicate that gobblers normally do not range over a large area and that they do not move more than 2 miles from the point of release. If gobblers can find their daily and seasonal requirements such as adequate food, adequate cover, and protection from poaching, then they probably will remain in the area of release. The turkeys that are originally released on a suitable area tend to associate themselves with the release site and remain near it. These turkeys serve as a breeding nucleus which expands as they reproduce. The population increases rapidly and some of the turkeys restock any surrounding areas that will support them. This explains why recent restocking efforts of the Alabama Department of Conservation have been so successful. By making numerous small releases of wild-trapped turkeys in good range over the past few years, they have brought about a recovery of wild turkey populations.

MINIMUM RANGE AND MAXIMUM DISTANCE TRAVELED BY ADULT AND IMMATURE GOBBLERS, OCTOBER 1968-MAY 1969, ALABAMA

Month	Adult		Immature	
	Range av.	Dist. av.	Range av.	Dist. av.
	Acres	*Miles*	*Acres*	*Miles*
Oct.	125	.75	185	.69
Nov.	257	1.06	281	1.19
Dec.	533	1.19	533	1.09
Jan.	126*	.69	150*	1.10
Feb.	**	**	104	.61
Mar.	379	1.80	141	.54
Apr.	84	.54	84	.54
May	121	.67	121	.63

* Range for 2-week period.
** No transmitters operating.

Food availability and courtship activities appear to be the factors that control seasonal movements of gobblers. During late spring, summer, and early fall the study gobblers ranged in and around open fields and pastures where they fed on grass, grass seeds, and insects. During late fall, winter, and early spring most of their time was spent in wooded areas where they fed primarily on dogwood and oak mast.

One other important shift in range is the spring dispersal. The adult gobblers in this study moved an average of 1.14 miles from their last flock location to establish gobbling and strutting territories in April.

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