HIGHLIGHTS

of agricultural research

VOL. 18, NO. 3/FALL 1971

Agricultural Experiment Station
AUBURN UNIVERSITY

DIRECTOR'S COMMENTS

E. V. Smith

SOME 500 TO 700 farm and community leaders from 14 Southern States will assemble in Alabama's port city of Mobile early in November. They will be attending the Southern Agricultural Science and Education Workshop, sponsored jointly by the National Agricultural Research Advisory Committee, the United States Department of Agriculture, and the Southern Land-Grant Colleges.

Those in attendance will be divided into 18 interest groups representing major farm commodities and rural community concerns. The interest groups are as follows: (animal industries) – beef, pork, poultry, dairy; (plant industries) – vegetables, fruits and nuts, rice, tobacco; (plant industries) – corn and feed grains, soybeans and peanuts, cotton, forage and pasture; (human resources) – family and youth, low income rural people, emerging economic opportunities; (natural resources) – ornamental crops and turf, community development, forestry and natural resources.

After a brief welcome and orientation session on the morning of November 5, the group will hear an address on opportunities for farming and agribusiness in the South. At 10:30, they will break into work sessions representing the 18 interest groups. Each work session will be led by four lay advisors appointed by Secretary of Agriculture Hardin.

Each interest group will spend most of the remainder of the day surveying the opportunities and needs of their particular commodity or area and discussing research and educational programs needed to solve problems. Since every work group will be composed of people from many states and having varied backgrounds, it is anticipated that the day will be marked by lively discussion.

A committee representing each work session will take the gist of that group's suggestions and prepare a report on needed research and extension programs. Much of the morning of the 6th will be spent as a committee of the whole listening to committee reports and in discussion. It is planned that every participant will have an opportunity to make a full input into the recommendations of his interest group.

Other features of the 2-day workshop will be a dinner address by the noted agricultural economist, Dr. Don Paarlberg, and a concluding luncheon program.

The objectives of the workshop are (1) to bring together a group of farm and rural community leaders from across the Southern Region, and (2) from them obtain "grass roots" suggestions for new, expanded, or redirected research and extension programs for the USDA and Southern Land-Grant Colleges.

look for these articles

may we introduce . . .

Dr. Floyd R. Gilliland, Jr., author of the article on page 16. He is project leader for the Experiment Station's research on control of insects attacking cotton in Alabama. As such, he has been personally responsible for much of the work reported in his article. Gilliland, a member of the Department of Zoology-Entomology faculty, also has teaching responsibilities in addition to his research work.

Gilliland, a native of Cotter, Arkansas, joined the Auburn faculty in 1967, following completion of his Ph.D. studies at Mississippi State University. Prior to that he received the B.S. degree from Arkansas Polytechnic College and the M.S. from University of Arkansas. His research for both graduate degrees was concerned with the boll weevil.

The author of numerous articles on cotton insect control, he is also a member of a Southern regional committee investigating cotton insect problems. Earlier this year he was promoted to the rank of Associate Professor.

HIGHLIGHTS of Agricultural Research

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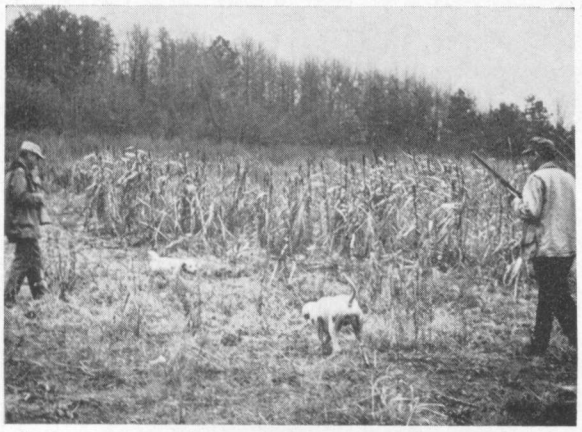
ON THE COVER. The boll weevil is the number 1 pest of cotton. A relatively new method of controlling the boll weevil is described on page 16.



HUNTING PRESERVES IN ALABAMA

L. HOWARD CLARK and E. W. McCOY
Department of Agricultural Economics and Rural Sociology

As available acreage for public hunting decreases because of extension of urbanized areas and increased posting of private farm and forest lands, the pressure on remaining hunting lands increases greatly. The average hunter finds it increasingly difficult to find hunting areas within a reasonable distance.

In Alabama, part of the hunting demand is presently met by enterprising land holders who operate public and private hunting preserves. During the 1970-71 hunting season there were 11 licensed hunting preserves in Alabama. For study purposes these were divided into three groups.

For management comparison purposes two license holders were omitted since their operations were of a nature which could not be compared with that of other operators. In general, license holders managed and provided quail and pheasant hunting.

Locations of licensed hunting preserves and management areas in Alabama.

Of the nine remaining licensed preserves, three were operated primarily for day-hunts with a set fee per person for each day's hunt; four were operated primarily on a club basis involving membership with a yearly fee; and two were operated as private preserves.

Many private hunting areas exist without licenses. The two licensed private preserve owners cited the State law on the length of the hunting season as their reason for being licensed. By licensing they were able to release pen-raised birds and extend the hunting season to a maximum of 6 months so long as they harvested no more than 80% of the number of birds released.

Average experience of all operators previous to beginning operation was limited. Most operators were avid hunters and dog handlers and liked the idea of preserve operation from the standpoint of availability of good hunting for personal use. The hunter can shoot more than the legal limit where released birds are used.

On the day-hunt preserves the hunter can expect to pay $30 to $35 per half-day hunt with a guarantee of at least enough shots to bag 10 quail. If he wishes to continue hunting after bagging his 10 quail he usually must pay $2.50 to $3.00 each for additional birds. Additional pheasants are higher at $5.00 per bird.

On club preserves the hunter pays from $350 to $1,500 or more per year for his hunting privilege. Rates vary greatly as a result of acreage and number of birds available, number of members in the club, and services which the members receive. Charges are higher where guides, dogs, and horses are furnished and where large numbers of birds are released.

The most economical method to provide additional hunting for persons who desire a season much longer than State game laws allow may be establishment of a private preserve or hunting club. To establish a hunting club requires land adaptable to hunting. This land can be acquired by several means. One of the most feasible would be a long-term lease of hunting rights from a landowner. Additional costs would involve the purchase or rearing of game; feeding or providing cover feeds; labor and equipment for cover management; dog kennels and dog maintenance; preserve license fees; liability insurance; depreciation on buildings, vehicles, and equipment; and possibly feed, veterinary, and replacement costs of horses as well as interest on the total capital investment. The total costs for developing a preserve for private use and use by invited guests can easily range from $2 to $5 thousand for establishment of an adequate hunting area of a few hundred acres.

The cost of establishing a preserve would be prohibitive for the casual or irregular hunter with an average income. For the minimum investment in a hunting preserve the casual hunter could purchase about 60 half days of hunting at a day-hunt preserve. If more days of hunting were desired then the private preserve would be more feasible.

In addition to the 11 licensed hunting preserves and numerous hunting clubs in Alabama, the State Game and Fish Division manages 29 areas for public hunting in the State. The 29 areas include more than 650,000 acres of land. Big game and small game are available on most areas while a few areas include hunting for waterfowl. The figure shows the location of public and private areas.

The private licensed hunting preserves in Alabama do not at present greatly relieve hunting pressures. The small number of these operations in light of the great demand for hunting indicates a low level of profit in operation. State management areas as well as private lands are used for the majority of the hunting which occurs.

Overseeding Sericea With Winter Annual Grasses

C. S. HOVELAND and E. L. CARDEN[1], *Department of Agronomy and Soils*

SERICEA IS DORMANT and unproductive in winter, so it should be possible to produce late winter forage by overseeding with a winter annual grass in autumn. The open growth pattern and early autumn dormancy of sericea should be favorable for establishment of winter grasses.

An experiment was conducted for 3 years on sandy loam soil at Auburn to determine the forage production of several winter annual grasses on sericea and the effect of these grasses on stands and productivity of sericea. Wren's Abruzzi rye and common rescuegrass were seeded in 12-in. drill rows and rescuegrass and Gulf ryegrass were broadcast on previously established Serala sericea. Plantings were made on the same area late in October or early in November each year. Nitrogen at 100 lb. per acre was split into two equal applications. Sericea and grasses were hand separated to determine the production of each species.

Rye was the only winter grass to produce appreciable forage by March 20, Figure 1. The 3-year average yield of 1,280 lb. per acre was not high but supplemented the productive season of sericea. In only 1 year was there sufficient forage to harvest in January. Most of the winter production occurred late in February and in March. Average 3-year yields by March 20 for rescue and ryegrass were low with little or no production during 2 years. Rescuegrass gave low yields on both the broadcast and drilled plots.

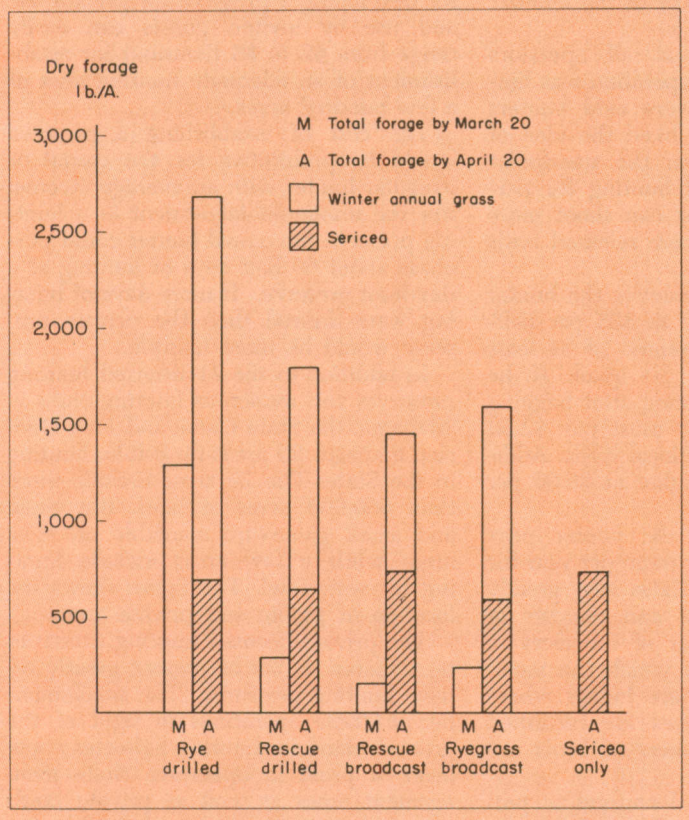


FIG. 1. Three-year average winter forage production by sericea-annual winter grass mixtures.

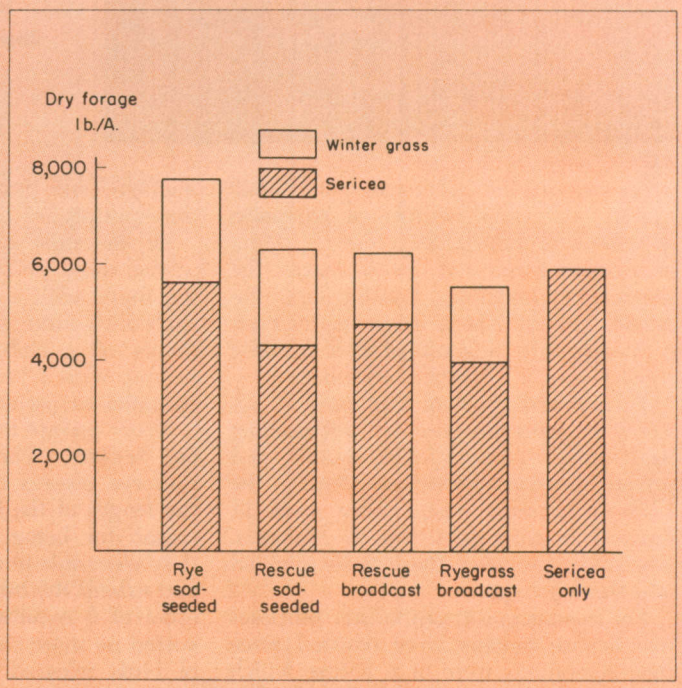


FIG. 2. Three-year average total forage production by sericea-annual winter grass mixtures.

Forage production from March 20 to April 20 was similar for all the winter grasses. During this period sericea alone yielded about 50% of what the plots with winter grasses overseeded on sericea produced. The mixtures contained little sericea by April 20, indicating that the winter grasses delayed spring growth of sericea.

Total annual production of sericea alone averaged 5,900 lb. per acre for the 3-year period, Figure 2. Rye increased the total production over that of sericea alone but rescue and ryegrass did not. Rescue and ryegrass competition delayed spring growth and reduced total annual production of sericea.

Seeding of annual grasses had no adverse effect on sericea stands. Live stem numbers were the same at the end of 3 years as at the beginning of the experiment.

Rye seeded on sericea increased total yields about 1 ton per acre. It is likely that higher yields would be obtained on a less droughty soil than was used in this experiment. Seeding of rye on sericea can be useful in extending the pasture season to furnish high quality forage for an additional 2 months when other grazing is limited.

[1] Now Superintendent, Brewton and Monroeville Experiment Fields.

Income Tax Changes Important To Farmers

J. H. YEAGER, *Department of Agricultural Economics and Rural Sociology*

TAXES ARE IMPORTANT to everyone – to people who pay them and to those who receive government benefits.

From a national standpoint, the Federal income tax is the most important one. It has been a part of the tax structure since passage of the 16th Amendment to the Constitution in 1913.

The individual income tax accounted for over 45% of Federal tax receipts in 1970. Adding corporate income taxes brought the total up to 64% from income taxes.

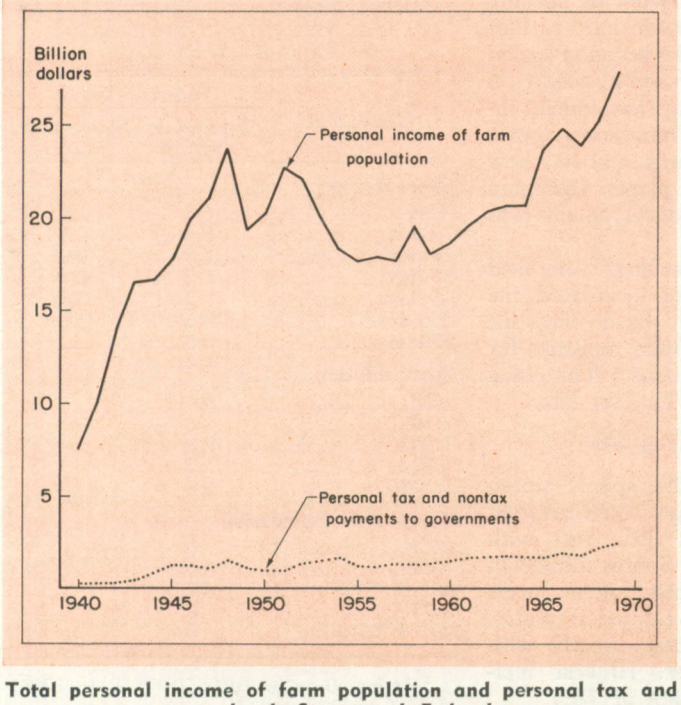
Farmers are increasingly concerned about taxes, and with good reason. Growing demands for public programs and services are likely to result in new or increased tax revenues.

A comparison of income and taxes from year to year is revealing. Both have changed considerably since 1940, as shown by the graph.

Total personal income of the U.S. farm population from all sources has increased rather consistently since 1959. From 1948 to 1957, however, there were several years in which total personal farm income registered decreases.

Taxes paid by the farm population to Federal, State, and local governments have not fluctuated greatly since 1940. However, there has been a consistent tax increase over the 30-year period, both in dollar value and on the basis of proportion of total personal income accounted for by total tax and nontax payments to all levels of government. This rise is well demonstrated in the graph and by these figures:

From 1940 to 1942, tax payments were 1% of income.
From 1943 to 1952, the proportion varied from 3% to 6%.
From 1953 to 1968, it was 7% to 8% of income.
In 1969, the all-time high of 9% was reached.



Total personal income of farm population and personal tax and nontax payments to local, State, and Federal governments are contrasted here for the United States during 1940-69.

And the proportion of taxes to income of farm families is likely to go even higher.

With rising income of the farm population, changes in tax laws and regulations become increasingly important. The Tax Reform Act of 1969 provided major changes in Federal income tax regulations that affect farmers. Some of these are briefly described here:

Limitation on Farm Losses. Tax regulations in the past have permitted certain taxpayers with nonfarm income to use farm losses to offset income. This gave high-bracket taxpayers an advantage.

Beginning with tax years after December 31, 1969, total farm losses can still be deducted, but procedures are different. For taxpayers with nonfarm adjusted gross incomes above $50,000, the excess of farm losses above $25,000 would be placed in a special "excess deductions" account. In future years the amount in the excess deductions account would be reduced by farm income or capital gains on sale of property. Use of the excess deductions account may be avoided by tax reporting on an accrual rather than a cash basis.

Hobby Losses. The new law disallows losses from activities in which the taxpayer is "not engaged for profit." If the taxpayer has profits in 2 of 5 years (2 of 7 years if breeding, training, showing, or racing of horses), he is presumed to have been engaged for profit.

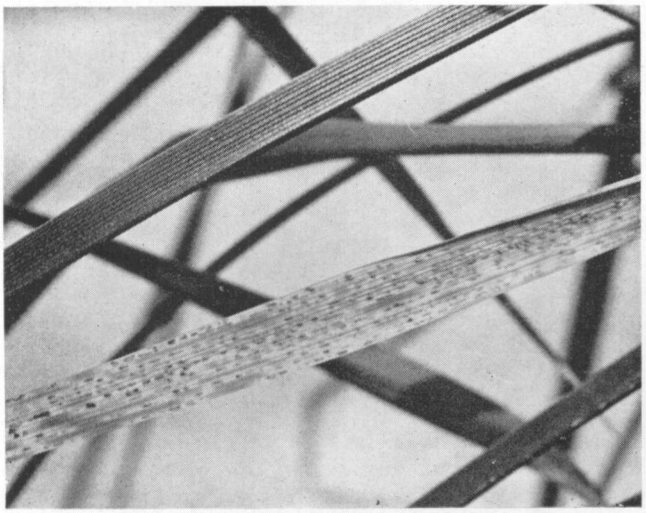
Holding Period for Livestock. Previous regulations allowed gain on the sale of livestock held for draft, breeding, or dairy purposes to be treated as capital gain if the animal was held 1 year or longer. The new law requires that horses and cattle be held 2 years to qualify for capital gains treatment. Other livestock remain subject to the old 1-year holding period.

Recapture of Livestock Depreciation. The Tax Reform Act of 1969 requires that gain on sale of livestock be treated as ordinary income up to the full value of previous depreciation deductions. This applies to years after 1969 and only to depreciation taken after 1969.

Recapture of Soil and Water Conservation Expense. The new law provides for the recapture of soil and water conservation and land-clearing expenditures made on farmland under two previous sections of the law. Presently, gain on sale of farmland will be treated as ordinary income until such gain exceeds soil and water conservation expenses taken after December 31, 1969. If farmland is held 10 years or longer after December 31, 1969, there is no recapture. When sold within 5 years, the recapture is 100%. If the farmland is sold between 6 and 9 years after acquisition, recapture varies from 80% to 20%.

There are other important tax changes, too. Generally, many of the new provisions are for "tightening up" on previous regulations.

The new regulations tend to make it less advantageous for nonfarmers to invest in farms. This may reduce the bidding up of farmland prices by nonfarm investors. New regulations also call for increased attention to tax management by farmers.



Healthy (top) and rusted (bottom) leaves of Goar tall fescue.

Rust Resistance Sought for Goar Tall Fescue

CHARLES D. BERRY, *Dept. of Agronomy and Soils*
ROBERT T. GUDAUSKAS, *Dept. of Botany and Microbiology*

GETTING RUST resistance into Goar tall fescue could make this crop even more important in Alabama. This variety makes more winter growth than the widely-grown Kentucky 31 variety, providing a more uniform grazing season. However, it has the disadvantage of being susceptible to crown rust caused by the fungus, *Puccinia coronata* var. *coronata*.

There are some 800,000 acres of fescue in Alabama. In fact, it is grown in every county. Fescue is one of few available cool-season perennial grasses that fits a year-round grazing program, and the only one that can be grown successfully throughout the State. If properly managed, this grass can provide grazing most of the winter when forage is scarce. Wintering of beef brood cows on fescue pasture is often cheaper than with a hay feeding program.

Kentucky 31 fescue has had few severe insect and disease problems in Alabama. However, observations indicate that it, too, has crown rust to a limited degree. The big problem is with Goar, the improved variety, so efforts by Auburn University Agricultural Experiment Station are directed towards this variety.

Disease Easy to Spot

Characteristic signs of crown rust are the "rusty" masses of yellow to red spores, primarily on leaves. Severe rust occurs from early May to frost, anytime there is sufficient moisture to promote infection by the fungus. It has been found on Goar in all areas of Alabama.

During warm, moist weather, more than half of leaf surfaces of infected plants frequently are covered with rust. Such heavy infections not only reduce plant vigor, they also damage stands the following season. Quality of forage accumulated in late summer and early fall also suffers. To take full advantage of Goar's mid-winter productivity rust must be controlled and development of resistant varieties offers the most hope.

Breeding Program Underway

An Experiment Station breeding project begun in 1968 is aimed at development of a rust-resistant variety of Goar tall fescue. Problems that had to be solved to carry out the project included devising techniques to screen large numbers of plants for resistance and to determine conditions necessary for artificially establishing rust on test plants.

Rust spores were collected by shaking infected Goar plants over hard-surface paper. These spores were stored in sealed glass vials at 40°F and used as needed to determine (1) how long they remain infective in storage, (2) how many spores are needed to infect plants, and (3) how best to apply spores to plants. Optimum temperature for rust development was also measured.

Six-week-old Goar seedlings were used as test plants. After being inoculated, the plants were enclosed in plastic bags for 16 to 24 hours to maintain moisture for development of infections. Rust incidence was determined 12 days later.

Spores Have Long Life

Plants inoculated with spores stored for as long as 246 days were severely rusted, but there was little rust with spores stored 270 days. Spores diluted in talc produced consistently higher levels of infection than those diluted in water. Level of infection varied directly with concentration of spores. Highest incidence was on plants kept at 75°.

Based on these findings, large numbers of seedlings are being screened by the following procedure: 6-week-old seedlings are inoculated with spores diluted 1:40 in talc, placed in a moist chamber for 16-24 hours, and kept in greenhouse until rated for resistance 12 days later.

To date, 4,000 seedlings have been inoculated and 81 rust-free plants identified. Seedlings showing no rust, or very low incidence, will be transplanted to the field for checking forage production and quality. Resistance of selected seedlings will be verified and these and other resistant plants will be used in developing improved tall fescue varieties.

EFFECTS OF SPORE STORAGE AND DILUTION AND POST-INOCULATION TEMPERATURE ON RUST INCIDENCE IN INOCULATED GOAR TALL FESCUE

Treatment	Rust incidence[1]	
	Spore-talc mixture	Spore-water mixture
Spore storage		
None	6.4	1.2
7 days	5.4	3.8
14 days	4.3	0.1
27 days	8.3	2.7
55 days	7.2	3.5
246 days	3.5	----
270 days	0.6	----
Spore dilution		
1:20	4.2	
1:40	2.8	
1:80	2.3	
1:100	1.1	
1:1000	0.4	
Temp. after inoculation		
60°F	0	
75°F	8.4	
60° + 75°F[2]	8.7	
90°F	0	
90° + 75°F	0	

[1] Rating: 0 = no rust; 10 = 91 to 100% of leaf surface rusted.
[2] Successive 12-day exposures at each.

Fat-Lean Ratio of Beef Measured by Yield Grade

W. E. POWELL[1] and D. L. HUFFMAN, *Department of Animal and Dairy Sciences*

FAT MEANS WASTE to the average meat buyer, so beef with a lot of fat is usually passed over in the grocery store. Therefore, relationship between fat and lean of carcasses is of major concern to beef producers and packing plant operators.

Being able to evaluate carcasses on basis of yield of salable lean meat is of primary importance in meeting market demands. The USDA yield grade is one tool available for this purpose, and it proved accurate in tests at Auburn University Agricultural Experiment Station.

Fifteen 600-lb. carcasses were selected to give three representative of the lower end of each of the five yield grades. The carcasses were graded and the right side separated into the five standard wholesale cuts (chuck, rib, loin, rump, and round) for study. Each wholesale cut was weighed, outside fat trimmed to about 0.2 in., and then reweighed. The remainder of the carcass (flank, hind and fore shank, plate, and brisket) went into the miscellaneous category. Each cut from the carcass was separated into a bone and a fat-lean portion and individual weights recorded.

The fat-lean portion of each carcass side was ground into a homogeneous mixture and a sample taken for chemical analyses of moisture, fat, and protein. Percentages of boneless trimmed wholesale cuts, fat trim from the wholesale cuts, carcass bone, and miscellaneous portion were calculated for each carcass.

[1] Now with Cooperative Extension Service, Auburn University.

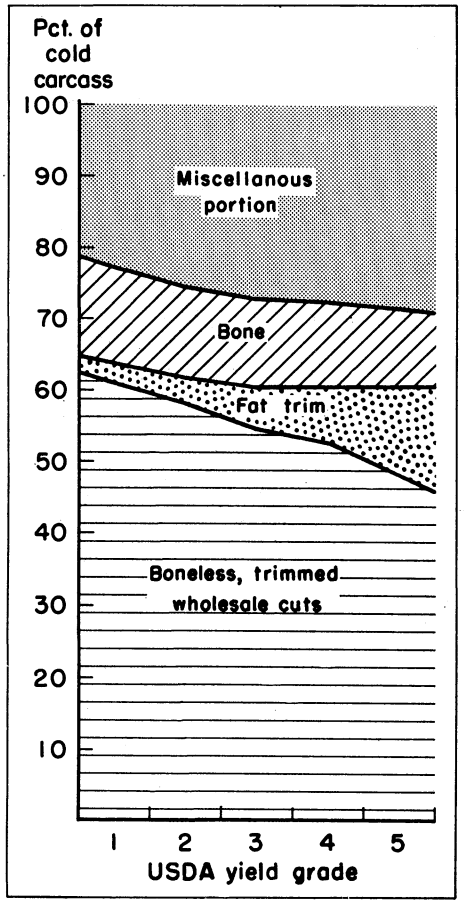


FIG. 1. Physical components of beef carcasses by USDA yield grades.

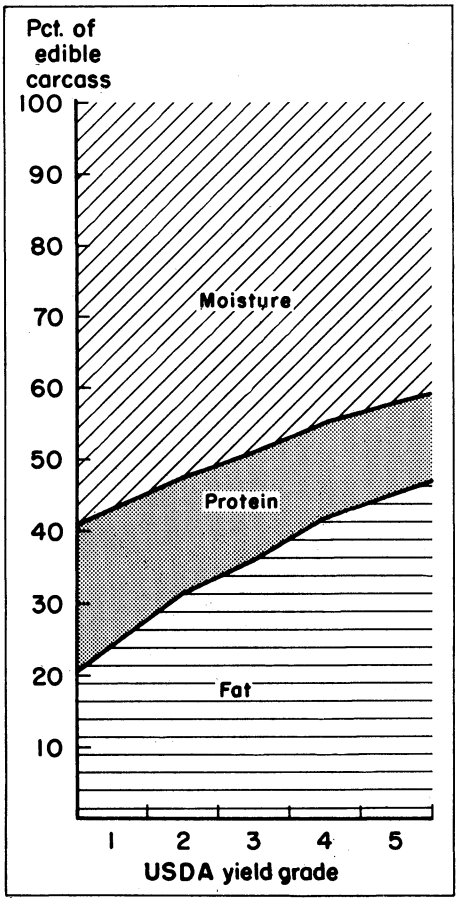


FIG. 2. Chemical composition of beef carcasses by USDA yield grades.

Differences in physical components between yield grades, from Figure 1, show a wide variation in percentage boneless trimmed wholesale cuts and fat trim. The boneless trimmed wholesale cuts decreased progressively from 61% for yield grade 1 to 49% for yield grade 5. There was essentially a 3% decrease in boneless wholesale cuts with each additional yield grade. Conversely, amount of fat trim from the five wholesale cuts increased from 2% for yield grade 1 to 11% for yield grade 5. The increase between yield grades was greater as carcasses became fatter (yield grades 3, 4, and 5).

As expected, there was little variation in percentage bone regardless of yield grade. Carcasses in yield grade 1 had an average of 13% bone, those in yield grade 5 had 12%.

There was a steady increase in percentage fat in the edible carcass as yield grade increased from 1 to 5, Figure 2. The marked difference in fat content between yield grade 1 and 5 carcasses can be seen from this graph alone. Fat increased from 24% to 45% as yield grade went from 1 to 5 – **an increase in fat content of 88%.**

Protein decreased from 19% for carcasses in yield grade 1 to 13% for those of yield grade 5. The greatest decrease in percentage protein was between yield grade 1 and 2.

Moisture followed essentially the same pattern as protein, decreasing from 57% for yield grade 1 to 42% for yield grade 5 carcasses. The decrease was about 4% for each yield grade, except for yield grade 5 it was only 2%.

There were definite relationships between USDA yield grade and carcass composition determined by chemical methods. This was true for percentages of moisture, fat, and protein. In fact, yield grade alone accounted for more than 83% of the variation in carcass composition.

These results indicate that USDA yield grade is an accurate tool for determining amounts of lean and fat in a beef carcass. Since this method is easy to use and requires no extra handling or cutting of the carcass, it has wide application for the livestock and meat industry.

New Site for Herbicidal Action Pinpointed

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Department of Agronomy and Soils
MASON C. CARTER, *Department of Forestry*

Pesticides benefit mankind tremendously by reducing crop losses.

The development of organic pesticides has had another, rarely recognized benefit. Once the mechanism of action of a pesticide is known, the pesticide may become a valuable tool or aid in studying the normal functions of plants and animals. For example, scientists have known for many years that organophosphate and carbamate insecticides produce their toxic effects by inhibiting the function of a certain enzyme. This enzyme (choline esterase) is a vital component of the nervous system of most animals. The use of organophosphate insecticides to inhibit the enzyme has contributed greatly to man's knowledge of nerve action as well as enzyme function in general. Several herbicides show promise of becoming equally valuable tools for the plant biochemist.

Aids Study of Photosynthesis

The *s*-triazine herbicides (such as atrazine and simazine) and substituted ureas (such as fluometuron and diuron) are potent inhibitors of certain aspects of photosynthesis. For several years these herbicides have been used by scientists studying the mechanism of photosynthesis because these herbicides block one phase of photosynthesis without interfering with other phases. Much has been learned about photosynthesis through the use of these pesticides. Much more can be learned when their specific site of action is determined.

Recent work at Auburn University has provided the plant biochemist with another tool which may prove valuable. It had been observed that the herbicides amitrole (3-amino-s-triazole), dichlormate (3,4-dichlorobenzyl methylcarbamate), and pyriclor (2,3,5-trichloro-4-pyridinol), while chemically dissimilar, produced similar effects on sensitive plants. These effects are characterized by the almost total absence of chlorophyll in new growth following treatment. Aside from the absence of chlorophyll, the plants appear normal. Several scientists have attempted, without success, to discover some inhibition in the synthesis of chlorophyll or chloroplast development which might explain the action of these herbicides.

Inhibits Carotenoid Production

In studies at Auburn, it was noted that plants treated with amitrole, dichlormate, or pyriclor and grown in darkness produced about the same amount of chlorophyll precursor as untreated plants and the precursor was converted to chlorophyll upon illumination. But most significant was the observation that treated plants failed to produce normal carotenoids. Instead, one or more precursors of B-carotene accumulated in the treated plants. Carotenoid-like pigments that did accumulate in treated plants were unstable and disappeared upon exposure to bright light. Normal carotenoids are not destroyed by light.

Subsequent investigation led to the discovery that B-carotene, the principal carotenoid in most normal plants, was not produced in normal quantities by plants treated with amitrole, dichlormate, or pyriclor. Studies by other workers have indicated that the primary function of B-carotene is to protect chlorophyll against photooxidation in strong light. To investigate this, wheat was treated with one of the herbicides and exposed to very low illumination. In this dim light, treated plants formed chlorophyll as did untreated plants, but when light intensity was increased, the chlorophyll in the treated plants disappeared.

Light treatment	*Chlorophyll (mg./plant)*			
	Control	*Amitrole*	*Pyriclor*	*Dichlormate*
144 hr./60 ft.c.	31	14	15	28
144 hr./60 ft.c. + 24 hr./4,000 ft.c.	36	4	8	16

Thus, it appears that amitrole, dichlormate, and pyriclor inhibit B-carotene synthesis, not chlorophyll synthesis. The pronounced chlorosis which follows treatment with these herbicides results from the photodestruction of chlorophyll in plants lacking B-carotene.

More Study Needed

B-carotene is a large molecule and its synthesis involves numerous steps. Amitrole, dichlormate, and pyriclor do not appear to inhibit the pathway at the same point because different precursors accumulate depending upon the herbicide applied. B-carotene is utilized to form vitamin A, and two other essential vitamins, E and K, are synthesized from carotenoid precursors in plant tissue. The influence of amitrole, dichlormate, and pyriclor on the synthesis of these latter vitamins is not known.

But the discovery of the mechanism of action of these herbicides may materially aid our progress toward understanding isoprenoid and carotenoid metabolism in both plants and animals. This is in addition to providing a better understanding of how herbicides exert their effect. Hopefully, this will lead to development of more effective herbicides.

[1] Now with Cooperative Extension Service, Auburn University.

CHANGE IN... consumer income, farm food prices, retail food prices

MORRIS WHITE, *Dept. of Agricultural Economics and Rural Sociology*

CLOSE BEHIND WEATHER as a conversation topic is "high prices at the food store." Although weather is beyond the individual's control, he can do something about high prices. Most people take no action – they just complain, pay the prices, and ask for a wage increase.

The 1960's was a period of loud complaints, much paying, and a lot of asking. Evidently most of the askings were successful since total disposable income increased 88%. Population increase was only 11%, so per capita income rose 71%.

Not all segments of the economy got their share of the increase in disposable income. Like farmers, for example. Most people realize that farmers do not punch a time clock, but it is not generally understood how their income varies according to prices and yields, with little relation to hours worked.

One thing that limits farm sales and income is the limited opportunity for increasing per capita use of agricultural products. Since today's high level of living provides most people with the foods they want, little of an income raise will be spent for food.

Civilian consumption of farm produced foods in the United States increased about 18% between 1961 and 1970. But two-thirds of the increase resulted from population growth. Thus, per capita use of farm produced foods increased 6% while per capita disposable income was rising 71%.

Expenditures for farm foods were 57% greater in 1970 than in 1961. This raise went mainly to pay for more desirable, high quality foods and for increased processing, packaging, and other consumer services. Only a small part of the increase went to producers.

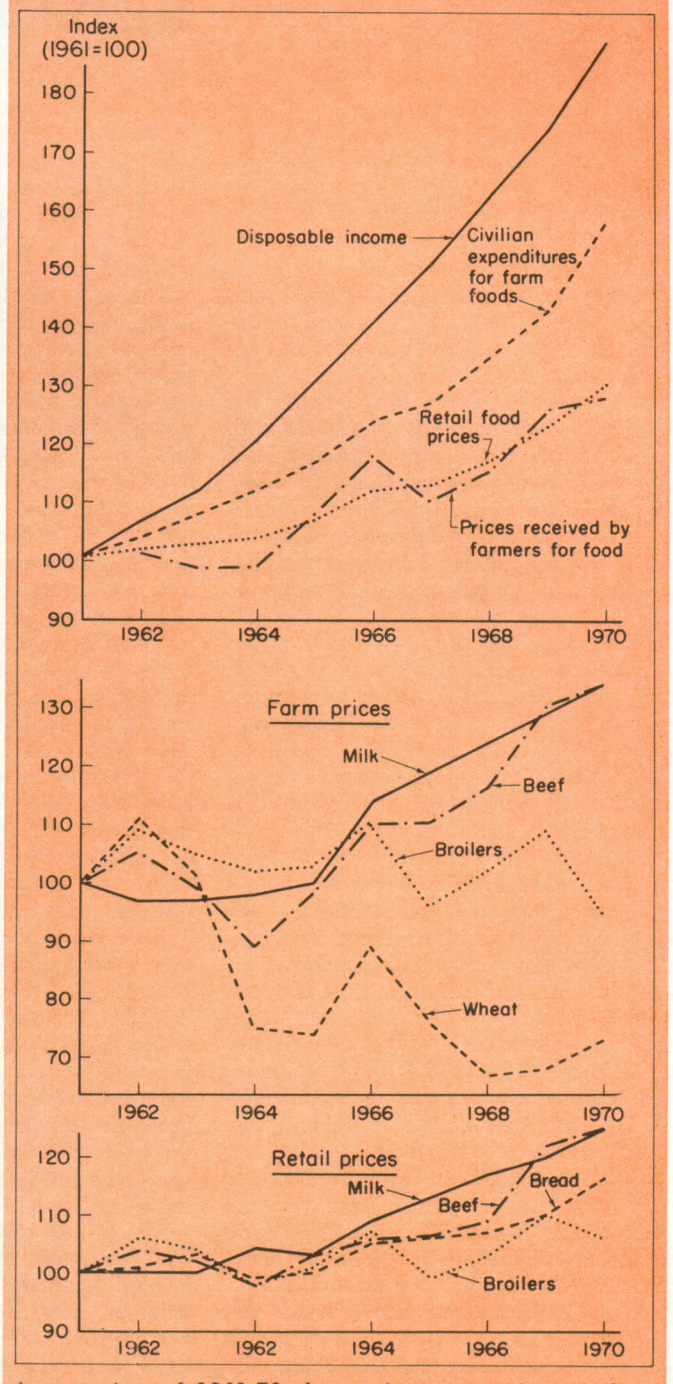
Retail food prices rose continuously during the past decade and were 29% higher in 1970 than 1961. Prices received by farmers fluctuated more than retail food prices, but they rose 27% between 1961 and 1970. Although this is almost the same percentage increase as for retail prices, actual dollar and cents differences were greater. For example, average price received by beef cattle producers went up 34% between 1961 and 1970, an actual increase of 6.8¢ per lb. During this same time, retail beef prices went up only 25% – but this averaged 19.5¢ per lb. Thus, the farm price increase for cattle was only one-third of the retail price rise.

During the first half of the 1961-70 period, average prices received for agricultural products rose little. Most increases were in 1965, 1966, 1968, and 1969. All farm commodities did not share alike in the overall price rise, just as all consumers did not share equally in the increased disposable income.

Examples of price variations among commodities is illustrated by price changes for beef, milk, broilers, and wheat. Except for 1967, beef prices went up each year after 1964. Milk producers received small increases between 1962 and 1965 and rapid rises during the last 5 years. Broiler prices fluctuated through a range of 10% above and 5% below the 1961 level and were at the lowest in 1970. Wheat prices dropped to a low of 33% below 1961 prices and were 27% lower in 1970.

Although prices received by farmers for food products went up during the 1960's, the spread between farmer and consumer prices continued to widen. Retail prices of milk, bread, beef, and broilers increased rather consistently from 1964 to present.

Price changes have important effects on producers and consumers, as well as on the many in-between industry members. These changes will continue, of course, and help to regulate production and consumption.



A comparison of 1961-70 changes in consumer income, farm food prices, and retail food prices illustrates the widening gap between prices received by farmers and prices paid by consumers.

Aspirations and Family Progress

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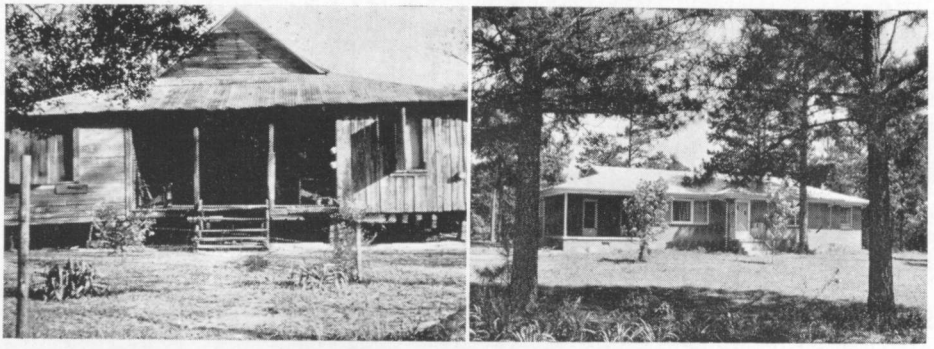
Dept. of Agricultural Economics and Rural Sociology



Many rural families aspire to go from the type house shown at left to the type shown at right.

LIFE IN RURAL AREAS often appears static and unchanging. Things seem to go on much as they have in the past. To some this is interpreted to mean that rural people are satisfied with life as it is. However, recent studies suggest that many rural families hold strong aspirations for socio-economic progress and actually make considerable change.

One study revealing this dynamic aspect was conducted during 1960-66 with a sample of rural families located in 5 low-income Alabama counties. In 1960, 152 families with working male heads were interviewed. A follow-up study was made in 1966 among these same families to determine the extent of socio-economic change. Only 64 of the 152 families (42%) were relocated and interviewed in 1966. Many of the families had moved from rural areas, while others were either unable to work or were no longer complete family units because of death, divorce, or separation. Heavy losses during the 6 years demonstrate that rural areas are far from "static" places.

Aspirations of 64 family heads residing in rural areas in 1966 were considered in terms of how they had reacted in 1960 to a hypothetical opportunity in which they were offered new jobs at twice their current income, but under a set of intervening limitations, see table. A seven item aspiration scale was constructed from these items. Resulting aspiration scores ranged from a low of 0 to a high of 7. Twenty-three per cent had low aspiration scores (2 or below) compared with 41% with high aspiration scores (6 or 7). On every scale condition the male family heads still residing in rural areas in 1966 aspired somewhat lower than did the original sample in 1960.

Some 11% of these family heads felt the need to improve their socio-economic situation so intensely that they were willing to accept higher paying employment even if it threatened to endanger their health. Similarly, 33% were willing to move their families around the country. More than half were willing to "work harder," "give up their spare time," "move to a new community" and "work at night" for an improved life style.

The scale used to determine level-of-living in both 1960 and 1966 considered whether the family possessed a refrigerator, range, kitchen sink, running water, bath, or vacuum cleaner. A comparison of family level-of-living at both points in time revealed that 43% had improved their level-of-living while the others had a level consistent or lower than that existing in 1960. Since some families (25%) had a high level of living originally, it was not expected that all families would show improvement over the study period.

No other measure of change in family socio-economic situation provided any meaningful differentiation among these rural families. Job and residence change were both considered. Almost all (88%) of the family heads had changed jobs at least once between 1960-66, but only a few had made any change in occupation or skill level. Conversely, only a few (14%) of the families were living in a different house from that 6 years before.

A very logical question then is to what extent do aspirations for socio-economic progress lead to the realization of family change? An answer was sought by relating the aspiration of the head in 1960 to the observed socio-economic progress indicated by level-of-living improvement between 1960-66. It was expected that the higher the head's aspiration the more likely the family would be to realize an improved level-of-living.

These data revealed that 41% of families improving their level-of-living were headed by males with high aspirations, whereas, only 20% of families that did not improve were headed by high aspiring heads. The mean aspiration score of those heads of families not experiencing socio-economic improvement was 2.90 on the scale compared with a mean aspiration of 4.41 among heads whose families had experienced progress. Although these data are not conclusive in themselves, they suggest that a high aspiration for socio-economic improvement in one's job-income situation is an important aspect in the realization of an improved life.

Additional analysis revealed that aspiration operates as an independent factor in predicting family socio-economic progress. Selected characteristics of heads and families commonly used to indicate "potential" for progress were considered in relation to aspiration and change. When the characteristics of age, education, residence, race, dependency, income satisfaction, and life outlook were considered, the relationship was still consistently maintained between aspiration and level-of-living improvement. Thus, prediction of family progress cannot adequately be made without considering the aspiration for socio-economic improvement of the family head.

MEASURE FOR DETERMINING ADULT SOCIO-ECONOMIC ASPIRATION AND THE DISTRIBUTION OF FAVORABLE RESPONSES TO THE LIMITING CONDITIONS ASSOCIATED WITH OBTAINING THE GOAL IN 1960

Conditions	Favorable reactions 1960 (basis for aspiration scores)	
	152 respondents interviewed 1960	64 of 152 respondents reinterviewed 1966
	Pct.	*Pct.*
. . . working at night instead of daytime?	72	63
. . . leaving your family for some time?	50	41
. . . moving family around country a lot?	43	33
. . . leaving this community?	70	59
. . . giving up your spare time?	78	69
. . . endangering your health?	11	11
. . . working harder than you do now?	56	53

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Crop Yield as Related to Soil Enzyme Activity

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Soil characters that favor growth and high yield of crop plants are also favorable for maintaining a rich population of soil microbes. Therefore, attempts have been made to relate soil fertility and numbers of microorganisms present.

Numbers of soil microbes are usually assessed by a dilution plate technique. A small amount of soil is suspended in water, and a portion of this suspension is mixed with a nutrient agar medium. After a suitable incubation period, numbers of bacterial or fungal colonies that grow on the agar are counted. Although the approximate numbers of bacteria and fungi per gram of soil can be estimated by this method, the technique is time consuming and tedious. Also, the results show a great deal of variability. Recently, attention has been directed to assessing soil microbial activity by measuring chemical activity rather than population.

All living organisms possess special protein molecules, called enzymes, which are the chemicals responsible for a cell's chemical transformations. Each chemical reaction involved in growth and development of a cell has its own particular enzyme. Since such enzymes are usually associated with living organisms, their occurrence in soil can be taken as indicating the presence of living cells. In other words, the higher the level of enzyme activity, the greater the numbers or activity of the cells present.

One enzyme which can be detected in soil is called catalase. This enzyme decomposes hydrogen peroxide (H_2O_2) to produce water (H_2O) and oxygen (O_2).

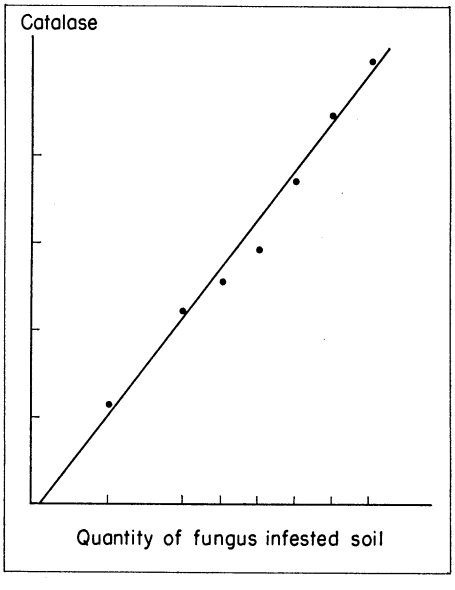

FIG. 1. Relationship between quantity of a fungus-infested soil and catalase activity.

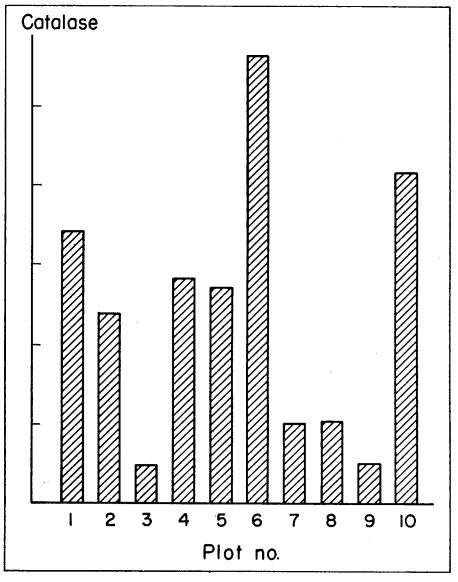

FIG. 2. Differences in catalase activity of soil samples from 10 experimental field plots at Auburn.

In the past, catalase activity of soils was usually measured by adding a known amount of hydrogen peroxide to the soil and then, after a suitable time period, measuring the remaining hydrogen peroxide by a chemical procedure. This technique was not very good and it could give misleadingly low estimates.

In recent research at Auburn University Agricultural Experiment Station, a technique for rapid, accurate measurement of soil catalase has been developed. In this technique a small amount of soil is suspended in water, a known amount of hydrogen peroxide is added, and the amount of oxygen released is measured directly with a special electrode which detects changes in the oxygen concentration of the water.

The method was tested by measuring the catalase content of different quantities of soils which had been inoculated with fungi and incubated until the soil became infested with the fungi. Results for one of these fungus-infested soils is shown in Figure 1. The amount of catalase detected was directly proportional to the amount of soil. This means that a measure of catalase can be used as an indirect measure of the soil's fungal content.

The technique was used to measure catalase in soil samples taken from 10 experimental plots at Auburn. Each plot had been maintained under a different fertilizer regime for at least 10 years. These plots were planted to cotton in 1968.

The catalase content of soil from these plots is shown in Figure 2. It is evident that the different plots showed very different catalase levels, indicating different amounts of biological activity.

The table shows the measured catalase activity and the cotton yield obtained from the plots. Statistical analysis of these data showed that there was a significant correlation between catalase activity and yield. In other words, a low catalase value was generally associated with a low yield and vice versa.

Catalase assay alone cannot be used to predict cotton yield with certainty, but it could indicate the probability of obtaining a high, medium, or low yield on a particular soil. If equally reliable methods were developed for other soil enzymes, analysis of soil for several enzymes could give a body of information which might be used to predict the yield potential of particular soils.

Recorded Catalase Activity and 1968 Cotton Yield of 10 Experimental Plots, Auburn

Fertilizer regime	Legume in rotation	Units of catalase	Cotton yield*
			Lb./A.
LPK	Yes	29.86	2,468
LPK	No	25.76	1,066
None	No	18.05	195
LPKN	No	27.56	2,907
LKN	Yes	27.07	1,700
LPKN	Yes	38.88	2,508
LP 1⅓ KN	Yes	20.34	1,795
LPN	Yes	20.34	86
PKN	Yes	18.21	1,683
LPKN + minor ele.	Yes	32.98	2,703

* Data courtesy of E. M. Evans, Dept. of Agronomy and Soils, Auburn University.

Yuchi arrowleaf clover on bahiagrass sod April 15 was 12 in. tall when planted on 1-in. stubble (right), but there were only small clover plants on 6-in. grass stubble plots (left).

Summer Grass Residue Affects Growth of Winter Legumes Under Sod

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GROWTH OF WINTER annual clover and vetch in summer grass sod is affected by amount of grass stubble left. But the effect varies among summer grasses and winter annual legumes.

Yuchi arrowleaf clover grew better than crimson at all stubble heights tried in Alabama tests. Pensacola bahia was much more restrictive to clover growth than Coastal bermuda, regardless of stubble height. Vetch seedlings can penetrate tall stubble, so this crop showed little difference because of grass stubble heights.

In the Auburn study, Coastal and bahia sods were mowed to various heights in mid- to late October before broadcast seeding with scarified clover or vetch seed. Diazanon was applied for cricket control. The sod was left undisturbed to simulate natural reseeding conditions. Legume growth was separated from grass at harvest for yield determination.

How Coastal bermudagrass stubble protected vetch and resulted in greater seedling survival and more winter growth is illustrated by data in Table 1. Burning the grass left no protective residue during germination, and 44% of all seed sprouted and died. The grass stubble served as an insulator and reduced daily extremes of temperatures, an advantage in seed germination and seedling growth. Maximum temperatures at the soil surface on October 25 were 95°F where stubble was burned, 85° with 1-in. stubble, and 77° under 6-in. stubble. In contrast, low soil surface temperatures on December 11 were 31° on burned sod, 32° with 1-in., and 46° with 6-in. stubble.

On Pensacola bahia, stubble height had little effect on vetch germination or growth. Even with short stubble or burning, a dense bahia sod remained that protected the vetch seed and resulted in better germination than on bermuda sod.

Results with small-seeded clovers were generally different than for vetch in a 2-year experiment at Auburn. Crimson clover stands and forage yields increased slightly with taller Coastal stubble, Table 2. However, Coastal sod was thinner than usual for this grass.

On a dense sod of Coastal, some yield reduction probably can be expected with a tall grass stubble. At the Alexandria Experiment Field, crimson clover yields were reduced from 1,590 lb. of dry forage per acre on 1-in. Coastal sod to 970 lb. on 6-in. stubble.

Under close-clipped grass sod at Auburn, Yuchi arrowleaf yielded about twice as much as crimson clover, Table 2. Coastal bermuda stubble height generally had little effect on total clover yields. High grass stubble generally delayed spring growth of clover (see photo).

Both clovers showed drastically reduced yields from high stubble of bahiagrass, Table 2. Crimson clover produced only one-third to one-half as much as Yuchi arrowleaf. Clover stands were reduced some, but to a lesser extent than yields. Poor clover growth under 6-in. bahia stubble was probably caused by reduced light penetration and matting of the sod in comparison with Coastal. This reduced early spring growth.

These results show that leaving a 6-in. stubble on thin stands of Coastal bermuda may furnish protection and improve clover and vetch growth. However, heavy bermuda sod can be expected to reduce late winter and early spring growth of clover unless the stubble is removed.

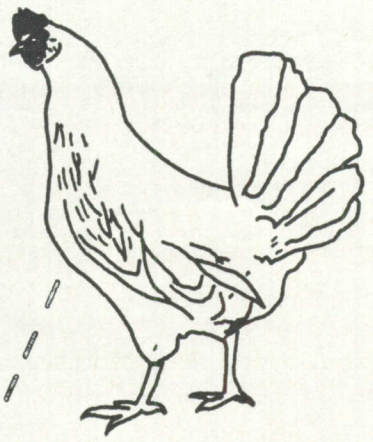
Bahia sods are usually dense, so close cutting or grazing is required for good clover growth. In contrast, vetch seedlings are able to penetrate tall stubble and seed germination may actually be improved.

TABLE 1. EFFECT OF COASTAL STUBBLE HEIGHT ON VETCH STANDS AND GROWTH AND ON SOIL SURFACE TEMPERATURE

Stubble height	Plants/sq. ft.		Dry yield per sq. ft.		Av. soil temp. 10/20-12/31	
	11/4	11/18	12/29	2/14	Max.	Min.
	No.	*No.*	*G.*	*G.*	*Deg. F*	*Deg. F*
6 inches	6.1	8.2	2.4	6.6	65	48
3 inches	4.6	4.9	2.2	5.0	70	44
1 inch	3.6	5.6	1.5	2.6	73	42
Burned	2.4	1.4	0.3	0.9	78	42

TABLE 2. EFFECT OF STUBBLE HEIGHT ON CLOVER STANDS AND YIELDS, 2-YEAR AVERAGE

Clover and stubble height	Plants/sq. ft. December	Dry forage yield/acre
	No.	*Lb.*
Pensacola bahia sod		
Yuchi arrowleaf		
1-in. stubble	17	2,290
3-in. stubble	16	1,620
6-in. stubble	14	1,350
Autauga crimson		
1-in. stubble	25	1,070
3-in. stubble	24	780
6-in. stubble	20	430
Coastal bermuda sod		
Yuchi arrowleaf		
1-in. stubble	20	2,930
3-in. stubble	29	2,890
6-in. stubble	30	2,800
Autauga crimson		
1-in. stubble	27	1,540
3-in. stubble	34	1,620
6-in. stubble	31	2,020



Social Behavior of Chickens

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Department of Poultry Science

Social organization is necessary for the survival of the species and all animals, whether domesticated or not, live by some form of social organization.

In birds this social structure is of the hierarchal type. In this type structure an individual bird exercises the right to peck all others of lower rank and so on through the flock until there is one individual in the flock which is pecked by all. Once the social order or the "peck order" has been established and is not upset by outside influences, each individual in the flock will recognize its social position in relationship to others and live in a relatively peaceful manner.

The development of the social organization begins as early as 6-8 weeks of age in males and 11-12 weeks of age in females; however, it is not fully established until maturity. During the development of the peck order a certain amount of aggression must occur depending upon the amount of competition for floor, feeder, and water space. This aggressive behavior can range from fighting and physical damage to the birds to a simple threat and avoidance between individuals. Fighting and physical harm is much more prevalent in males than in females, especially where competition is high. The aggressive behavior may result in considerable death losses around 18-20 weeks of age unless good management practices are used to reduce fighting. Males are dominant over females; however, they usually do not peck females unless competition for survival is high.

After maturity chickens will complete their social organization and physical contact between individuals is reduced. Aggression continues through vocal expression or posture stances. Since the head and appendages are the primary recognition factors in chickens, subordinate birds keep their heads lower than their dominant neighbors. Relaxation of this submissive posture acts as a stimulus for dominant birds to attack.

Although physical harm may not result from the development of the social order, there is always a certain amount of "social stress" upon the birds. High social stress will result in (1) reduced growth rate, (2) lack of uniformity in flocks, (3) less resistance to diseases, (4) lowered egg production, and (5) low fertility in the breeding flock.

The development of the peck order in the flock cannot and should not be prevented. Social stress and death losses can be lessened, however, by reducing competition for food and water and by not allowing the social order to be disrupted once it has been established.

Reducing social stress during the growing period is most difficult since aggression is highest during this period. By observing some of the following basic management practices, the flock owner can reduce social stresses to a minimum.

1. Prevent overcrowded conditions.

2. Have growing pens uniform as to light, ventilation, and temperature so that birds will be evenly distributed throughout the pens.

3. Have sufficient feeder and water space evenly distributed over the growing area. This is very important where a restricted feeding program is used.

4. Avoid having more than one age group within a pen.

5. Do not attempt to combine pens after 10-11 weeks of age.

Debeaking of birds and the use of low intensity light during the growing period are common practices. These practices will reduce physical harm which results from pecking; however, they will not eliminate social stress. It has been shown that interactions are higher in birds which have been debeaked as compared with those that have not.

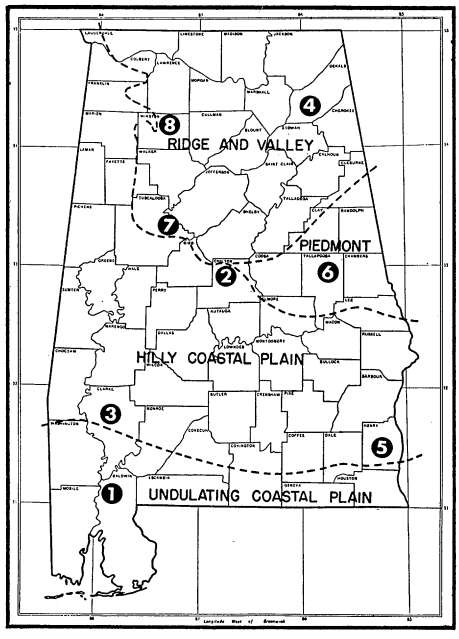
After the social order has been established, management practices which will upset the peck order, such as the combining of pens, should be avoided. Also, social stress can be held at a minimum by supplying plenty of feeder and water space evenly distributed throughout the pens. Ventilation and light intensity should be uniform throughout the laying house in order to prevent birds from crowding into certain areas.

An understanding of the social behavior patterns of chickens will enable producers to apply correct management procedures in reducing overall losses due to aggression and social stress.

LOBLOLLY PINE SEED SOURCES in ALABAMA

KEITH D. LYNCH, JAMES F. GOGGANS, and GEORGE I. GARIN

Department of Forestry



Seed source and plantation locations. Key to seed sources and plantations. No. 1—Baldwin, 2—Chilton, 3—Clarke, 4—DeKalb, 5—Henry, 6—Tallapoosa, 7—Tuscaloosa, 8—Winston.

Seed source is an important factor in determining rate of height and diameter growth, survival, resistance to southern fusiform rust (*Cronartium fusiforme*), and various other economic traits. This has been substantiated by numerous studies of loblolly pine (*Pinus taeda* L.). Most seed source investigations have dealt with large geographic areas resulting in small numbers of samples from any one area. These studies have not provided foresters in Alabama with information on desirable seed sources for specific areas of the State.

In the spring of 1961 a study was begun by the Auburn University Agricultural Experiment Station to test loblolly pines from 8 seed sources within Alabama. Eight replicated plantings were established, one in each county that was used as a source of seed, see map Figure. In this way, trees from each seed source were allowed to compete with trees from each of the other 7 seed sources both in their area of origin and in the 7 other seed source areas.

Measurements were taken on the 8 plantations at the end of the seventh growing season. Overall analyses included plantations at all locations except Henry County where there was an accidental fire. These analyses indicated that a number of traits were influenced by seed source. Among these traits were height growth, diameter growth, and rate of infection by fusiform rust. No differences in survival rate among seed sources were noted.

Average heights of trees from each seed source at the 7 planting locations are presented in the table. Trees from the Henry County seed source attained the greatest height, 17.70 ft. Trees from Baldwin County and Clarke County sources were essentially the same as Henry County trees with heights of 17.41 and 17.30 ft., respectively. These three southernmost seed sources produced trees that were among the fastest growing in most planting locations. The seed source which produced trees having the slowest height growth was Winston County. Trees from this source averaged 15.40 ft.

Diameter growth followed approximately the same pattern as height growth. The Henry County seed source produced trees with the greatest diameter growth, 3.13 in., followed by trees from Baldwin and Clarke counties. Winston County trees, with an average of 2.78 in., showed the least diameter growth.

Considerable variation in amount of infection by fusiform rust was noted among seed sources. In general, trees from the more northern sources had less infection than those from the southern sources. Winston County trees, with an average infection rate of 4.73%, were least infected by rust while Clarke County trees, with an infection rate of 9.09%, were most infected. Trees from Baldwin and Henry counties had rust infection rates nearly as high as those from Clarke County. The tendency for faster growing trees to be more susceptible to fusiform rust has also been reported by other investigators. Rates of infection experienced in this study were lower than those normally experienced.

In general, the three southern seed sources produced trees with the most rapid growth in both height and diameter. Trees from the northern sources, while having slower growth rates, were more resistant to infection by southern fusiform rust. It appears from these early results that Baldwin, Henry and Clarke counties would be desirable sources of seed for reforestation programs in wide areas of Alabama.

Average Heights of Loblolly Pines After Seven Growing Seasons

Planting location	Seed source							
	Baldwin	Henry	Tuscaloosa	Clarke	DeKalb	Tallapoosa	Chilton	Winston
	Ft.	*Ft.*	*Ft.*	*Ft.*	*Ft.*	*Ft.*	*Ft.*	*Ft.*
Baldwin	11.05	11.51	11.50	9.95	10.82	9.80	11.54	10.54
Tuscaloosa	13.53	14.16	13.03	12.70	11.52	12.03	11.84	11.73
Clarke	14.00	13.71	12.75	14.81	12.39	13.08	12.88	12.11
DeKalb	20.02	19.61	18.13	19.93	17.60	18.05	17.40	17.11
Tallapoosa	24.52	26.16	23.81	25.84	22.55	23.50	23.67	21.20
Chilton	18.04	17.78	16.74	17.29	16.19	16.84	16.92	15.61
Winston	20.70	21.00	20.25	20.58	19.77	19.32	20.18	19.63
Average	17.41	17.70	16.60	17.30	15.83	16.09	16.35	15.40

IMPLICATIONS of ALTERNATIVE LAND RETIREMENT PLANS in ALABAMA AGRICULTURE

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Department of Agricultural Economics and Rural Sociology

MOST GOVERNMENT PROGRAMS for agriculture have a primary goal of maintaining farm income by supporting farm commodity prices. Usually farmers have been required to withdraw land from production to qualify for benefits.

Different land retirement programs have been in effect for several years. These programs varied from long-term cropland reversion or retirement programs to 1-year programs tied to specific commodities. More current programs are specific-commodity oriented. However, the Conservation Reserve Program provided for long-term retirement.

Although cropland retirement plans were geared to stimulate higher prices, secondary effects have been equally important. Under some programs farmers have shifted marginal land from crops to more suitable long-term uses. In other situations maximum land use was necessary to protect historical allotment bases. Finally, most commodity programs contained provisions that encouraged farmers to continue to produce various commodities in order to be eligible for maximum program benefits. One result of these various activities was a reduction in the rate of off-farm migration.

Major Alternative Programs[1]

In the 1970's, land retirement programs will likely involve either plans to retire whole farm units or to continue plans to retire parts of farms through land diversion or set-aside procedures. Program participation likely will be voluntary in the sense that price support is guaranteed only if all requirements of the program are satisfied. An individual operator will be free not to comply with the requirements, but in doing so will forfeit all possible benefits. In either situation, government payments will be influenced by acres withdrawn from production.

Implications for Alabama

The effect of any Federal program on Alabama farmers depends largely on what crops receive the most control and payment limitations. Generally, major crops produced in the State have high market values relative to present retirement payments as compared with other U.S. production regions. For this reason any plan to retire portions of farm acreage annually or permanently will not greatly affect production. Farmers will merely retire marginal land and increase production on better land as much as is economically possible.

Controls on crop production, on the other hand, may have significant effects in Alabama. Assuming that a government program were introduced that established equal funds to retire cotton, wheat, and corn land in the major crop regions, more cotton acreage could be retired than either of the other crops. Cotton has a higher cost of production per dollar of net return than corn or wheat. Hence, it would be retired first. A low payment restriction, say $50 per acre, would reduce the effectiveness of a cotton control program since net returns normally exceed that amount.

The difference in effects of part or whole farm retirement plans would depend also on whether acreage or production criteria were used. Generally, under either acreage or production controls, whole farm retirement plans would tend to remove large amounts of pasture and other cropland from production. As a result, significant acreages of crops not specifically controlled may be withdrawn along with the controlled crops. However, it is possible that whole-farm retirement will affect the less productive lands first unless acreage payments are set at very high levels.

Minor Control Measures

Several other plans are available that could be used to control acreage in production. At present these are classified as minor, but under given conditions they may become quite important. Among these proposals are government purchase of long-term crop-limiting easements, mandatory land adjustments, and use of regulatory and taxation powers in states and local communities. Mandatory controls appear the least likely.

These minor plans are limited largely to local areas and at present have few general applications. However, it is conceivable to consider large scale tax control in future years.

General Effects

As with any plan to raise or maintain prices, there would be a strong tendency for increasing production on land remaining in use. A general cropland retirement program provides more incentive to cultivate new lands than annual or part-time reductions. The amount of new land cultivated depends on relative prices and costs for alternative crops.

Also a long-term program and whole farm retirement would enable many marginal farmers to leave farming. One consequence, however, is a hardship on tenant farmers unless retirement programs are restricted to operators. Without such a provision tenants would be forced to bid against the government for land use, thus raising rents significantly. This situation could greatly affect Alabama farmers since a large proportion rent at least part of the land they farm.

The larger burden of long-term adjustment costs would be on the non-farm sector. However, secondary effects of a reduction in agricultural activity could greatly affect communities highly dependent on farm-related businesses.

Changes in agricultural programs are inevitable. Unfavorable publicity in recent months plus development of technological substitutes for some crops will accelerate the change. Farmers must be aware of alternatives open to them and be prepared to adapt and adjust.

[1] Zepp, G. A. and Jerry Sharples, General Cropland Retirement—*Analysis of Four Alternatives*, ERS, USDA Bull. 462, April 1971.

DIAPAUSE CONTROL of BOLL WEEVILS

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Dept. of Zoology-Entomology

THE BOLL WEEVIL is the key to cotton insect control in Alabama and most of the southeastern United States. It is estimated that $85 million is spent annually in this country to control this cotton pest. Almost one-third of all insecticides used in the United States is used on cotton — mostly for boll weevil control. Despite such expenditures for protection of the cotton crop, the loss from boll weevil damage still exceeds $150 million in most years.

In addition to the obvious direct economic importance of this pest, the boll weevil is important from another aspect. Insecticides applied during June and July for boll weevil control also kill many of the beneficial arthropods that are present in cotton fields at that time. Thus, other pest insects, especially the bollworm, that normally are controlled effectively by the beneficial insects may develop economically important populations long before they otherwise would be expected to occur.

One new approach in the effort to lessen the importance of the boll weevil is commonly referred to as diapause control. Diapause is a term used to describe a physiological state of dormancy boll weevils achieve to survive the cold winters that occur in most of the cotton belt. Diapause initiation is a response to certain environmental conditions, mainly day-length, temperature, and food conditions. Diapausing adults may be found as early as July, but typically they occur during the latter part of September and October. By this time, regular-season insecticide applications have usually been terminated so the weevils have plenty of time to feed and achieve a "firm" state of diapause before cold weather destroys their food source. Diapause control, therefore, is a method designed to kill boll weevils before they can attain diapause and enter hibernation quarters.

During 1969, a diapause control program was conducted in the Coosa River Valley area of Alabama. Approximately 11,000 acres of cotton in Shelby, Talladega, and St. Clair counties were included in the test area. A cotton-free buffer zone of 15 to 50 miles surrounded the test area. The control program consisted of three ULV applications of an organophosphate insecticide (azinphosmethyl) applied by airplane at a rate of 0.25 lb. per acre. The first application was made September 15 with subsequent applications made on September 25 and October 8.

The diapause control program resulted in a considerable reduction in the number of boll weevils attaining diapause and surviving the winter. The success of the program was first indicated by small weevil catches on traps baited with a synthetic boll weevil sex attractant. The traps were placed around each cotton field in the test area at a rate of approximately one trap per acre. The average trap catch of only 0.13 weevil per trap per week indicated an extremely low population of emerging boll weevils.

Sampling of boll weevil infestations in representative fields throughout the test area further verified the success of the diapause control program in reducing the overwintered weevil population. A comparison of punctured square counts made in the test area in 1970 and counts made during the period 1965-68 clearly indicates the smallness of the overwintered population, see table. The relatively harsh winter of 1969-70 contributed to the low spring population of overwintered weevils. However, weevil populations in nearby areas that experienced similar winter weather did not reach the low levels found in the diapause control area.

The overall objective of reducing insecticide usage for cotton insect control also was achieved. During the past 5 years, cotton in the test area had received an average of nine insecticide applications per year. During 1970, however, 7,800 of the 11,200 acres did not require a single application of insecticide. The remaining 3,400 acres averaged only two treatments.

BOLL WEEVIL INFESTED SQUARES IN THE COOSA RIVER VALLEY DIAPAUSE CONTROL AREA

	1965-68	1970
	Pct.	*Pct.*
July (wk.)		
1	34.8	3.9
2	23.4	5.9
3	-----	4.0
4	22.4	5.9
Aug. (wk.)		
1	24.0	9.1
2	-----	12.7
3	-----	18.3
4	-----	-----

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