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In this issue . . .

On the cover. Cold weather played an important role in the testing of fifth-generation plants from the reseeding vetch breeding project. Most lines planted in this nursery at the Main Station, Auburn, were killed by last winter's −1° low temperature. However, the lines that survived were vigorous and produced heavy yields of hard seed in the spring of 1963. In effect, the cold weather eliminated lines that were cold susceptible. The remaining lines, which combine cold hardiness with vigor and hard seed, hold promise for successful development of reseeding vetch varieties in the near future.

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Auburn, Alabama

New and Timely PUBLICATIONS

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

Bul. 327. Establishment and Maintenance of White Clover-Grass Pastures in Alabama.

Bul. 329. Planting Dates for Oats for Forage and Grain.

Bul. 335. Crimson Clover in Alabama.

Bul. 345. Father-Son Farming.

Bul. 346. Effect of Seed Size on Vigor and Yield of Runner Peanuts.

Cir. 144. Meat Buying and Preparation Practices of Professionally Employed Women.

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

Leaf. 67. Arrowleaf Clover.

Leaf. 69. Performance of Peach Varieties in Alabama.

Prog. Rept. 86. Performance of Sorghum Silage Varieties.

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PROSPECTS GOOD for RESEEDING VETCH

E. D. DONNELLY, *Dept. of Agronomy and Soils*

A GOOD HARD SEEDED vetch variety could be useful in several ways. It could be used as a reseeding winter grazing crop, to supply nitrogen to summer grass sods, as a commercial seed crop, for cover on road shoulders and idle areas, and as wildlife feed. Following a good seed crop of a reseeding variety, it may be possible to get one or more crops of green manure without replanting.

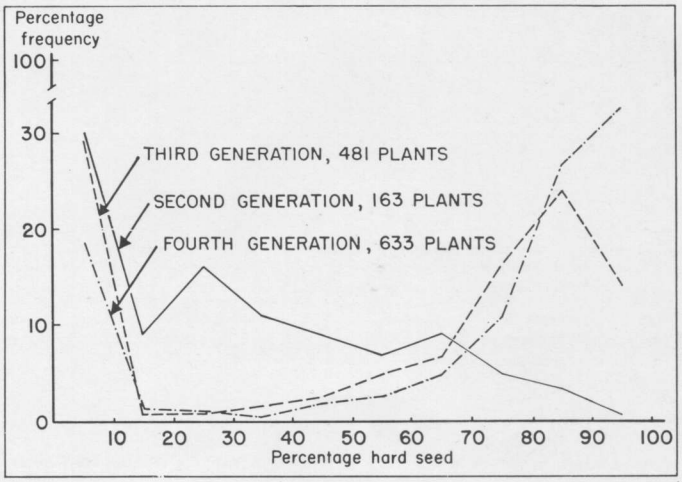
Present hard seeded vetches, such as narrowleaf (*Vicia angustifolia*) and grandiflora (*V. grandiflora*), have two major problems: shattering of seed, as shown in photo 1, and non-uniform seed ripening. These problems prevent commercial seed production and, hence, restrict use of these vetches on a large scale.

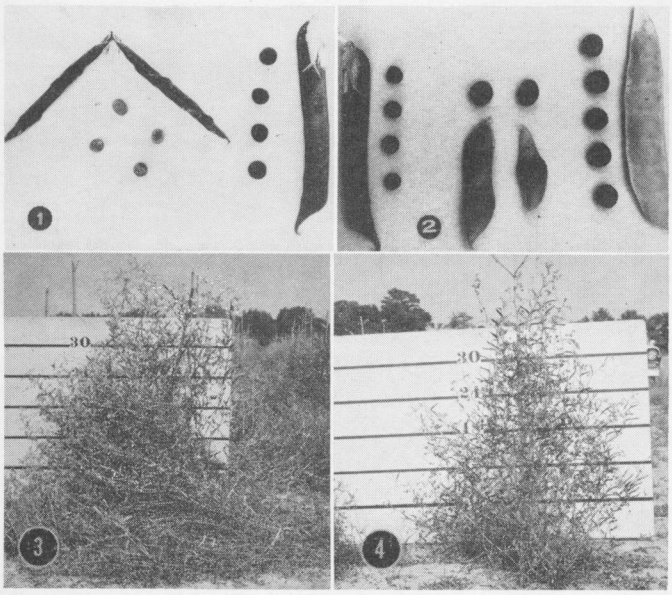
The breeding program to develop a productive, non-shattering, hard seeded vetch was begun in 1951 at Auburn University Agricultural Experiment Station. Numerous attempts were made to cross vetch species to combine desirable characteristics.

In 1958 a species hybrid was obtained – common vetch (*V. sativa*) X narrowleaf vetch (*V. angustifolia*). This cross was described in an earlier issue of HIGHLIGHTS (*Developing New Vetches*, Vol. 8, No. 3, 1961). The female common vetch parent, Ala. 1894, produces good yields of forage and seed in Alabama. However, it has a low percentage of hard seed. The male narrowleaf vetch parent, introduction 121275 from Turkey, is low in vigor but has a high percentage of hard seed. Both parents are non-shattering, bruchid or weevil resistant, and both mature seed uniformly.

More than 11,000 third, fourth, and fifth-generation plants from the species cross have been studied. In each generation, emphasis was placed on selecting plants that were vigorous, non-shattering, and good seed producers. Percentage hard seed was determined and the following generation was obtained from plants that produced high percentages of hard seed.

This graph shows frequency distribution of second, third, and fourth-generation plants from cross between Ala. 1894 (common vetch) and P.I. 121275 (narrowleaf) by percentage hard seed.





Here are pods and seeds of parents and first and fourth-generation plants of a vetch species cross. Photo 1: Narrowleaf vetch parent (right) is non-shattering, but the familiar form of the same species (left) shatters its seed. Photo 2: Pods of the female common vetch parent (right) and the narrowleaf male parent (left) were well filled with seed; pods of the highly sterile first-generation plants (center) contained only 1 or 2 seed per pod. Photo 3 shows desirable common vetch type and Photo 4 is of intermediate type, both of which were selected in the fourth generation.

First-generation plants were highly sterile and produced relatively few seed, photo 2. Many second and third-generation plants also produced only a few seed. However, many third-generation plants produced excellent yields of seed.

In the fourth generation, two general types of plants were found. One resembled the narrowleaf parent, yet some of these plants were intermediate between the two parents in vigor, photo 4. A second type, photo 3, resembled the common vetch parent. Within each of these types, plants were selected that were vigorous, non-shattering, good seed producers, and hard seeded.

The number and frequency distribution of second, third, and fourth-generation plants by percentage of hard seed are shown in the graph. A large increase in number of plants with a high percentage of hard seed was made with each successive generation.

Most fifth-generation plants were killed by the extremely low temperatures of the past winter. However, certain lines survived −1° F. at Auburn in bahiagrass and bermudagrass sod. Some of the lines that survived were vigorous and produced heavy yields of seed in the spring of 1963. Thus, these lines combine cold hardiness with vigor and hard seed.

Results of the Auburn research continue to indicate that productive, non-shattering, reseeding vetch varieties can be developed.

Modern milking equipment was used in milking beef cows on test. Here Jerry Caldwell does the milking of one of the test cows.

MILK PRODUCTION of BEEF COWS

R. R. HARRIS, W. B. ANTHONY, V. L. BROWN,
J. G. STARLING, E. L. MAYTON, and L. A. SMITH[1]

How much milk does a beef cow produce? What effect does nutrition have on production? Are pastures commonly used in Alabama adequate to support lactation of most beef cows? These questions have been studied by researchers of the Auburn University Agricultural Experiment Station System since 1958.

Production Records Kept

Milk production records were obtained through use of a technique developed by the Station. Cows were separated from their calves and milked dry with the aid of oxytocin ("let-down" hormone). A portable milking machine was used followed by hand stripping. Calves were penned away from their dams overnight and in the morning cows were again milked with the aid of oxytocin. The milk was weighed and butterfat content determined. Milk production was adjusted to a 12-hour, fat-corrected milk (FCM) basis. Since daily (24-hour) milk production is more meaningful to cattlemen, the 12-hour values were multiplied by 2 for this report.

Data collected from several herds within the State, including purebred cows and those with varying degrees of beef breeding, indicate that most beef cows produce 8 to 9 lb. of milk daily. Maximum production is apparently about 30 lb., whereas minimum output is about 3 lb. Rate of decline with progress in lactation (persistency) varies greatly among beef cows. Most cows reach their peak milk production by the time the calf is 30 days old and essentially maintain this level until about 90 days of lactation. From the 90th day to weaning (250 days) there is a gradual decline in milk output. Butterfat content of milk from beef cows is variable and values range from 3 to 6%, but the mean appears to be near 4%.

Table 1. Influence of Level of Winter Feeding on Milk Production and Calf Performance of Beef Cows, Lower Coastal Plain, 1958-1960

Feed	Begin winter Nov. 1[1]	End winter April 1[1]	Calf weaning weight[2]
	Lb.	*Lb.*	*Lb.*
Good hay, 2 lb. CSM pasture browse	11.66	9.18	442
Confined to sod lot, hay only	10.82	6.02	415

[1] Values are 3-year mean, 24-hour FCM.
[2] 6-year mean, 250-day weights.

Data reported in Table 1 from the Lower Coastal Plain Substation indicate that milk production of beef cows on restricted winter feed declined materially during the period of restricted feeding. This had some effect on calf weaning weights as shown in Table 1. Calves from the more liberally fed dams were 27 lb. heavier at weaning than those from cows on the restricted feeding plan. Cows on the restricted feeding regime were kept in a sod lot during the winter and were full fed on inferior quality grass hay, salt and water.

Results from a 3-year study at the Wiregrass Substation, Table 2, show that well-fertilized Coastal bermudagrass pasture is satisfactory to support lactation of most beef cows. Supplemental grain improved milk production only slightly.

Cows of mixed dairy-beef breeding were used to evaluate abilities of different swards to support milk production on Piedmont soils. Most cows in this study milked 10 to 14 lb. daily and the level of milk production did not appear related to the sward that the animals grazed. The nutritive value of all test swards (oats, sericea; vetch, clover, Coastal; vetch, clover, bahia; orchard, clover, dallis; vetch, sorghum almum) apparently was adequate for these beef cows.

Based on 1 year's results at the Black Belt Substation, there was little difference in milk production of beef cows grazing white clover, dallisgrass pastures (with and without nitrogen); caley peas, johnsongrass; or sod-seeded oats and dallis. All swards adequately supported milk production of 8 to 15 lb.

These studies have provided valuable information on the quantitative aspects of milk production in beef herds and on factors influencing milk production. Data collected show that after the beef calf reaches about 90 days of age, the quality of pasture or other feed is of prime importance in the continued rapid growth to weaning. After 90 days of age over 50% of nutrients consumed by the beef calf comes from some source other than milk.

The quantity of forage, harvested or grazing, was adequate at all times. All pastures were well fertilized and a favorable forage-animal ratio was maintained throughout the grazing season. Milk production of cows grazing these same swards would probably be different if pastures were overstocked.

Table 2. Effect of Supplemental Feed Upon Milk Production of Cows Grazing Coastal Bermuda Pasture Wiregrass, 1960-1962

Item	Control-no feed	Cow fed[1]	Calf fed[2]	Cow & calf fed
	Lb.	*Lb.*	*Lb.*	*Lb.*
3-year mean daily milk production	9.28	11.16	7.24	9.42

[1] Cows hand fed 4 lb. of high-grain mixture daily.
[2] Calves creep fed grain mixture ate 4-6 lb. daily.

[1] Assistant professor, animal science; professor, animal science; superintendent, Lower Coastal Plain Substation; assistant superintendent, Wiregrass Substation; superintendent, Piedmont Substation; and superintendent, Black Belt Substation, respectively.

DATE *of* PLANTING RYE *for* SEED PRODUCTION

COOPER KING
Department of Agronomy and Soils

Good seed yields of rye can be produced in Alabama by planting at the proper time.

USE OF RYE as a temporary winter grazing crop in Alabama has increased 5 fold – from 15,000 to 75,000 acres in the last 5 years.

The acreage probably would have increased even more if ample supplies of good seed had been available. One reason for the short seed supply has been low seed yields under Alabama conditions. Yet, research results show that rye will produce good seed yields in this State if planted at the proper time.

Experiments on dates of planting rye were conducted during 1958-1963 by Auburn University Agricultural Experiment Station at Auburn. The tests were designed to determine the best time to plant rye for maximum seed production. Forage production was not measured.

Rye was planted on a Norfolk sandy loam that had been fallowed during the summer. The area was in a 3-year rotation. Phosphorus, potassium, and lime were applied according to soil test. Nitrogen was applied as a topdressing about March 1 at the rate of 50 lb. of N per acre. Seeding dates were September 30, October 20, November 10, November 30, and December 20. Wren's Abruzzi rye was seeded at the rate of 100 lb. per acre on each planting date.

The highest yields of grain were obtained from the September 30 and October 20 dates of planting. (See table.) Later planting dates produced much lower yields. Lodging was not severe nor was there any pattern of lodging as a result of seeding date. Excellent stands were obtained at all dates of seeding in all years, except the December 20, 1962, planting. Birds were responsible for destroying 50% of the seedlings of this planting date. No stand reduction from winter killing occurred at any seeding date in any year except December 20, 1962 seeding. This planting suffered a moderate amount of winter killing during the 0°F. temperature in January, 1963. Date of planting did not affect the height of Wren's Abruzzi at maturity.

The 1/10-headed stage was used as a measure of maturity. Plots planted September 30 reached the 1/10-headed stage March 13 on the average, but ranged from as early as March 6 to as late as March 23. Each 20-day delay in seeding date resulted in a delay of approximately 1 week in reaching the 1/10-headed stage. The early dates of heading indicate that when rye is being used for both grazing and grain, grazing should be stopped by early to mid-February if high levels of grain production are desired.

An often expressed objection to planting rye early for seed production is that some plants often head out in early January. This was encountered with the September 30 and October 20 plantings. The early heads were invariably killed by freezing temperatures. Even with this loss the yields of grain harvested from the September 30 and October 20 seedings were consistently superior to those of later planting dates, which did not show early heading.

Recommended Planting Dates

To obtain maximum yields of grain in central Alabama, rye should be planted in late September to mid-October. Because of climatic differences, rye probably should be planted from 1 to 2 weeks earlier in northern Alabama and from 1 to 2 weeks later in southern Alabama than the recommended planting date for central Alabama.

GRAIN YIELDS AND OTHER CHARACTERISTICS OF RYE WHEN PLANTED AT DIFFERENT DATES, 1958-63

Date of planting	Yield of grain in bushels per acre						Lodged 5 tests	Stand 5 tests	Winter killed 5 tests	Height 5 tests	Date 1/10[1] headed, 4 tests
	1958-59	1959-60	1960-61	1961-62	1962-63	Average					
							Pct.	*Pct.*	*Pct.*	*Inches*	
September 30	42.5	45.6	58.8	37.2	33.3	43.5	12	100	0	57	March 13
October 20	40.2	48.7	39.3	36.0	38.4	40.5	9	100	0	59	March 20
November 10	29.5	38.8	39.4	21.3	27.2	31.2	16	98	0	57	April 1
November 30	27.6	26.6	34.4	9.0	11.1	21.7	11	97	0	57	April 8
December 20	26.5	22.9	27.1	8.5	3.0[2]	17.6	14	83	7	58	April 15

[1] Date at which 1/10 of the plants have produced heads.
[2] Birds destroyed 50% of stand by pulling up plants as they emerged.

TYPES of FARMS DIFFER

J. H. YEAGER
Department of Agricultural Economics

LAND, labor, capital, and management make the economic differences among farms!

Analysis of records kept by farmers in 1961 revealed these major differences. The study was made jointly by the Auburn University Agricultural Experiment Station and Cooperative Extension Service. Farms included in the study are above average in the State. To be classified as a special type of farm, receipts from one enterprise must have amounted to 50% or more of the total.

Size and Capital Investment

Beef cattle farms were largest in total acres operated. (See table.) In terms of capital investment and cash receipts, dairy farms were largest. Both dairy and beef farms had average capital investments of over $50,000. The smallest in terms of acres operated were the hog and commercial egg (layer) farms.

Dairy farmers reported an average of 53 dairy cows, while beef cattle farmers averaged 79 brood cows. Thus, total capital investment was almost $1,200 per cow on dairy farms as compared with $700 per brood cow on beef cattle farms.

One measure of volume of business is the PMWU (productive man work unit) or a man-day of work on crop and livestock enterprises. Dairy and cotton farms were largest by the PMWU measure. Based on business volume per man equivalent, cotton, dairy, and layer farms ranked high in relation to hog and beef farms.

On beef cattle farms, there was a capital investment in land, buildings, machinery, equipment, livestock, and feed inventory of $14.85 for each dollar of net farm income. However, on hog farms the investment was only $5.55 per dollar of net farm income. For each man-equivalent (one man full time for a year) of labor, there was an investment of over $29,000 on beef farms as compared with slightly over $10,000 on cotton farms. Layer and hog farms did not differ greatly in capital investment matched with a man-equivalent of labor.

Income and Expense

As an average, dairy farms had the highest net farm income and operator's labor income. Although average net farm income was over $3,700 on beef farms, interest charged at 5% on the average capital investment resulted in a labor income to the operator of less than $1,000. Cash receipts, net farm income, and operator's labor income were second highest on layer farms.

Farmers who operated layer farms averaged 4,400 hens, with 14.6 doz. eggs sold per hen per year. Hog farmers reported an average of 10 sows and 13.7 market hogs sold per sow per year. Average milk sold per cow on the dairy farms was 6,800 lb. per year, and the average calf crop on beef farms was 89%. Cotton farmers had 46 acres of cotton and an average lint yield of 495 lb. per acre.

Differences in cash expenses as a percentage of cash receipts were not great among farm types. Hog and cotton farms were below others in expenses for each dollar of receipts.

Implications

Economic characteristics should be taken into account when selecting and making adjustments in farm enterprises. Personal preference by the farm operator for a particular enterprise is an important factor to consider, but economic characteristics can be more important.

Farmers with limited land area generally should select enterprises that will provide a large volume of business with little land. Those with limited capital as compared with labor should consider enterprises through which labor can be sold with little matching capital. Farmers with large areas of land and those in a stronger capital position may find enterprises that require a large capital investment per unit of labor or per dollar of net farm income satisfactory.

Land, labor, capital, and management are the resources used in farming. A part of the job of a good farm manager is to distribute resources among farm enterprises to take advantage of economic characteristics, or he may concentrate resources in only one enterprise. Taking into account economic differences among enterprises can mean dollar gains in net income.

COMPARISONS AMONG TYPES OF FARMS, ALABAMA, 1961

Item	Type of farm				
	Cotton	Dairy	Hog	Beef	Layer
Number of farms	105	73	32	22	21
Acres operated	228	330	173	666	144
Investment	$27,281	$62,887	$20,013	$55,664	$28,420
Investment per dollar of net farm income	$ 6.69	$ 7.65	$ 5.55	$ 14.85	$ 5.81
Investment per M.E.[1]	$10,104	$23,291	$13,342	$29,297	$14,210
Cash receipts	$12,758	$25,654	$ 8,968	$12,816	$17,065
Cash expenses	$ 9,450	$20,931	$ 6,238	$10,228	$14,116
Expenses as % of receipts	74	82	70	80	83
Net farm income	$ 4,079	$ 8,224	$ 3,608	$ 3,748	$ 4,895
Operator's labor income	$ 2,715	$ 5,094	$ 2,608	$ 965	$ 3,474
Total PMWU's	643	776	322	461	501
PMWU's per M.E.[1]	242	292	217	209	247

[1] M.E., man-equivalent of labor used on the farm.

CONTROLLED ENVIRONMENTS Produce Better Broilers

J. R. HOWES, *Department of Poultry Science*
WALTER GRUB and C. A. ROLLO, *Department of Agricultural Engineering*

GROWING BROILERS in controlled environments is on the increase, especially in northern Alabama.

Improved growth, feed efficiency, and lowered condemnation have been reported by growers using partial environmental control. At present complete environmental control is not anticipated for economic reasons. However, it is possible that the advantages of carefully controlled environments may be practical in the future.

During 1961 and 1962, a series of experiments were conducted to evaluate effects of controlled environment on broiler production. A total of 12 environment chambers at the Auburn University Agricultural Experiment Station was utilized. Arbor Acres strain sexed broiler chicks were used in all experiments. Chicks were started at 90°F. and the temperature reduced 2°F. every other day on all treatments until the treatment temperature was reached. Three controlled temperature regimes, 60°, 75° and 90° plus or minus 2°F., were used with a relative humidity of 60 plus or minus 2½%. A ventilation rate of 1.0 plus or minus 0.2 c.f.m. per bird and a light regimen of declining length and intensity during the growing period were used. All birds were allotted 1 sq. ft. of floor space covered with shavings. Eighty birds were raised in each pen in each experiment and there were at least 2 pens of each sex receiving the same treatment in each experiment. On all occasions an equal number of similar pens of broilers were raised under variable farm conditions for comparative purposes.

In a previous report it was shown that high temperature depressed growth but improved feed efficiency in both sexes of broilers. Birds in the variable environments had a growth rate and feed efficiency similar to those raised in the 75°F. environment. It was also found that birds raised at the high temperature gave best dressing percentages, least feathers and blood, and least digestive tracts. These processing factors were less desirable in the birds raised under farm conditions.

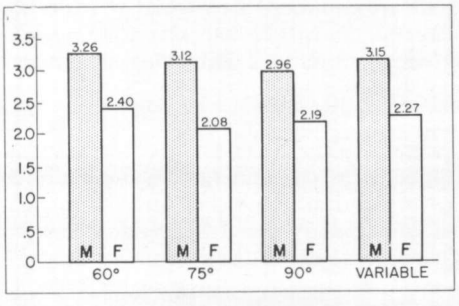


FIG. 1. Above are 8-week dressed weights, in pounds, of carcasses of male and female broilers raised in three controlled environments, 60, 75, and 90°F. and for similar birds grown under variable farm conditions.

The average dressed carcass weights for these 8-week-old broilers of both sexes are presented for all four environments in Figure 1. The carcasses of the birds raised in the 60°F. environment were heaviest for both sexes, followed closely by birds raised in the variable environment. The carcasses of the females weighed almost 1 lb. less than males. Feed efficiency based on carcass weight was in favor of birds raised at 90°F. The average per cent bone in the carcass of the four treatments in all experiments is presented in Figure 2. The per cent bone was greater in males than females for all treatments. The differences between the three controlled environments with respect to bone were negligible. The amount of bone in carcasses from birds raised under variable conditions was significantly greater in both sexes than in any of the controlled environments. This indicates that a pound of broiler carcass raised in a controlled environment contains more edible meat than a pound of broiler raised under farm conditions. Most of the carcass, other than bone, may be considered edible. The giblets and neck were not included in this evaluation.

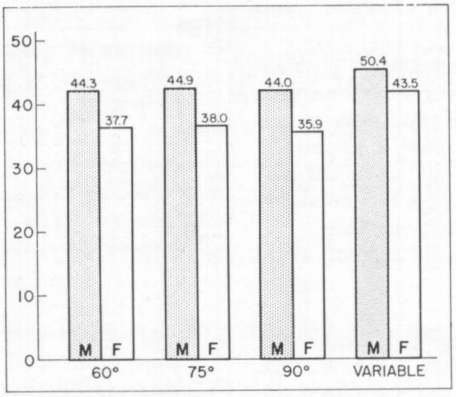
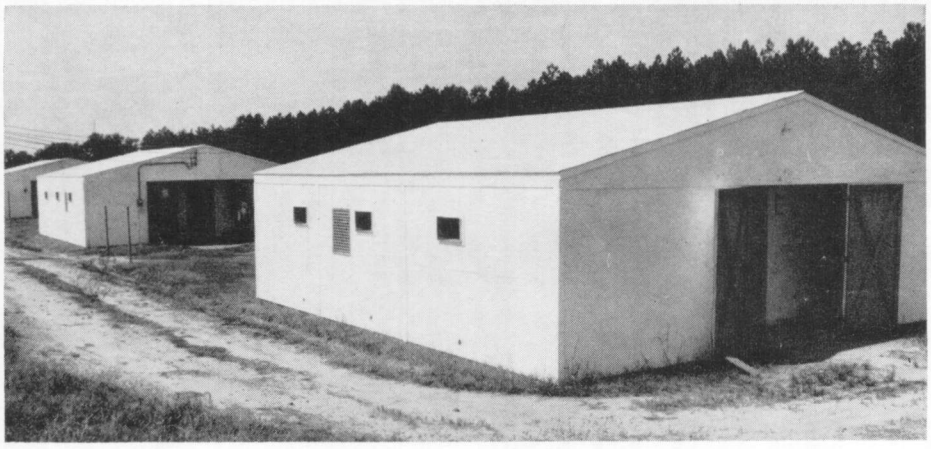


FIG. 2. The mean percentages bone in the carcasses described in Fig. 1 are given in the above chart.



Houses such as these were used in experiments on controlled environments for broilers.

Flavor, juiciness, and tenderness as estimated by a trained taste panel indicated that carcasses from controlled environments were superior especially those from the 90°F. environment. Body fat was less in carcasses raised at 60°F. as compared with those from the 75°F. environment. However, no increase in body fat was obtained at 90°F.

These data indicate that all controlled environments (60, 75, and 90°F.) not only produce a better dressing percentage, but also a better quality carcass than farm conditions. An increase of 2% in dressing percentage will cover the costs of environmental control within practical limits. Therefore, environmental control in broiler houses would provide less condemnation and better carcass quality for virtually no extra cost.

Stunting of peanuts as a result of sting nematode damage is shown by comparison between infested plants at left and nematode-free plants. (Photo courtesy J. R. Christie, Gainesville, Fla.)

NEMATODES and PEANUTS

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N. E. McGLOHON, *Cooperative Extension Service*

NEMATODES CAN REDUCE yields and lower quality of peanuts. Controlling these soil pests by fumigation or rotation can prevent the loss and result in markedly increased crop value.

Experience shows, however, that it is not always possible to predict whether nematode losses will occur from one year to the next in a particular field. Obviously producers would like to know well in advance of planting time if nematode damage is likely to occur, particularly if the need for soil fumigation is a consideration. This points up the need for ways to determine the nematode situation in advance. Auburn studies now underway are directed at putting soil assay for nematodes on a sound basis.

Last year a comparison was made of two different techniques for detecting low numbers of root-knot nematodes from field samples collected during winter. The Auburn University Extension Service collected 85 soil samples from 85 peanut fields in 8 counties. These samples were examined at the Nematology Laboratory of the Agricultural Experiment Station.

Each small soil sample (about 1 pt.) was thoroughly mixed and divided into two parts. One part was tested by placing in a small plastic pot along with a single nematode-free Rutgers tomato seedling. This variety of tomato was used as an indicator plant because it is susceptible to all root-knot nematode species in the Nation.

The 85 pots of soil being tested were kept in the greenhouse for 30 days. Then the plants were removed, washed free of soil, and roots examined for the characteristic root swelling caused by root-knot nematodes. As an extra check, the root systems were made transparent and specially stained for microscopic examination to reveal any nematodes within the tissues.

An advantage of using a test plant is that root-knot nematode eggs in the soil will have time to hatch and the larvae infect plant roots before examination. The method has disadvantages, too. It requires a month's waiting period, and, since only root-knot nematodes cause root galls, other kinds of peanut parasitic nematodes may escape detection.

The second half of each of the 85 soil samples was assayed by processing on a special apparatus that can wash or extract nematodes from soil. This process permits identification and counting of nematodes within 2 days. Another advantage is that all the different kinds of parasitic nematodes can be detected, except those in egg form. Not being able to identify nematodes that are present only in egg form is a major disadvantage since the pests may overwinter in the egg stage.

Comparison of the two assay methods showed that the soil washing technique was as good as the plant test. In the latter test, examining stained roots gave more reliable results than root gall counting alone.

It was found that larger soil samples were needed when sampling was done in the winter when nematode populations are relatively small. It is best to sample about harvest time when plants are still alive and nematodes are more numerous.

First step for the grower is to examine during the fall fields being considered for peanuts the following year. Visible effects of nematodes on peanuts and other plants are stunting, yellowing, unthriftiness, and increased drought susceptibility. All of these are symptoms of an impaired root system and indicate the possibility of fields being infested with nematodes. Further checking is necessary to verify the presence of nematodes and to identify the kinds present.

Presence of root-knot nematodes is easily recognized in the field by the root knots or galls on infected plant roots. If the plants having galled roots are peanuts, then the same condition can be expected next year. However, if infected plants are not peanuts, next year's peanut crop may not be damaged. This is because peanuts are highly resistant to three of the five root-knot nematodes in Alabama.

It is important that growers collect galled roots of plants other than peanuts to send with soil samples to the Nematology Lab. If the galls are produced by species that do not damage peanuts, no treatments will be necessary. Exact laboratory identification can determine if damaging nematodes are present.

In addition to root-knot nematodes, other root-parasitic types are pests of peanuts. These include root-lesion and ring nematodes that infect pegs and damage developing nuts. The sting nematode can be destructive in sandy soils. Microscopic examination is necessary for definite identification of these nematodes since symptoms they produce may be mistaken for worm, insect, or disease damage to the roots.

Results of the Auburn study point up the importance of making sure about nematodes before planting peanuts. And now is the best time for taking the necessary samples to be examined at Auburn.

Recordings of soil and air temperatures, net radiation, and rainfall are used to determine factors affecting rates of population increases or decreases of cotton insects under field conditions.

WEATHER RESEARCH PROGRAM *for* AGRICULTURE

J. T. COPE, JR. and PAUL A. MOTT*

WEATHER DETERMINES success or failure of many farm operations. It is the major factor affecting production over which farmers have no control. Therefore, there is great need for knowledge about how farmers can produce profitably in spite of unfavorable weather.

A new cooperative program designed to help farmers live with the weather has been started between Auburn University Agricultural Experiment Station and the U.S. Weather Bureau. This program is a part of the Tri-State Agricultural Weather Project which includes 14 counties in southeastern Alabama and sections of southern Georgia and northwestern Florida. The program was established as a result of efforts by interested citizens and groups in the Tri-State area.

This service is designed to meet five basic requirements for letting weather and weather information work for the farmer. These are: (1) frequent detailed weather reports and forecasts, (2) advisory services relating farm operations to weather conditions, (3) research on the effects of weather on crop and livestock production, (4) establishment of a network of agricultural weather observing stations, and (5) a communications system that will provide weather information to farmers.

Perhaps the function of the program that will contribute most to agriculture in the future is the research phase. While great advances have resulted from research in farm chemicals, fertilizers, varieties, mechanization, and other areas, comparatively few technical studies have been made on the effects of weather on agriculture. Some of the problems on which technical studies are needed in Alabama follow:

(1) Effect of soil temperature and moisture on germination and establishment of crops;

(2) Effect of humidity on harvest efficiency and seed viability, especially of crops such as cotton and soybeans;

(3) Emergence, survival, and reproduction of various insects in relation to temperature and moisture;

(4) Effect of temperature on cotton defoliation;

(5) Effect of rain following application of specific insecticides, fungicides, defoliants, and herbicides on pest control;

(6) Effect of environment on animal and plant diseases;

(7) Effect of extremes in temperatures and moisture at different stages of growth on crop development and yield;

(8) Effects of temperature and moisture on residues left in the soil by farm chemicals; and

(9) Effect of direct sunlight on quality and germination of peanuts in the windrow.

These are but a few examples of problems on which research is needed. The U.S. Weather Bureau has recently stationed an agricultural meterologist at Auburn to assist Experiment Station staff members in doing research on these and other weather-related problems. He will be supplied with instruments needed for detailed measurement and automatic recording of temperature at specific points in the atmosphere, in the soil, and in plant tissues when needed. Other instruments supplied will measure rainfall, humidity, wind direction and velocity, evaporation, solar radiation, and additional weather components and effects. Research has already been started on some of these problems, and other research projects will be started as soon as funds become available.

Weather observation stations are being set up throughout the area to measure weather components that affect agriculture as a basis for detailed weather forecasting. Stations on the Agronomy Farm at Auburn and on the Wiregrass Substation at Headland will have specialized equipment for making measurements not normally made at regular weather bureau stations. Data from these stations are already being reported regularly to agricultural weather forecasters in the area. The forecasters prepare frequent forecasts of weather conditions that will affect farm operations including degree of probability of rain. Agricultural weather summaries and recommendations on farm practices that are affected by weather are issued regularly. These include the time to prepare land; to plant various crops; to cut hay; to irrigate; to spray for insect, weed, or disease control; to plow up peanuts; to operate cotton pickers; to harvest vegetables or other crops; and other practices that can be related to the forecasts.

These forecasts are transmitted on a teletype network that has been established to cover all parts of the Tri-State area. This teletype service is available to all radio and television stations and newspapers.

This new specialized agricultural weather service should be a great aid to Alabama farmers, especially in southeastern Alabama. All farmers in the State will benefit from the research program as new information is obtained on which to base recommendations.

* Professor of agronomy and advisory agricultural meteorologist, U.S. Weather Bureau.

COTTON GROWN *on* GRAY, SANDY SOILS NEEDS MAGNESIUM

FRED ADAMS, *Department of Agronomy and Soils*

If your cotton land is a gray, sandy soil, about 30 lb. of magnesium will pay off in increased seed cotton yields.

Magnesium is lost from soil either by crop removal or leaching. Annual removal of magnesium from soil by crops generally ranges from 5-30 lb. per acre. As yield levels for the various crops are increased, rate of crop removal of magnesium from soil is also increased. However, the greatest loss usually results from leaching. Such losses increase as the soil becomes more acid. Thus, any practice that increases soil acidity, such as use of ammonium fertilizers, results in an increased loss of soil magnesium.

The native supply of magnesium in Alabama soils is frequently inadequate for maximum yields of cotton. However, general use of dolomite filler in mixed fertilizers in the past has prevented widespread occurrence of magnesium deficiencies.

A high grade dolomite contains about 12% Mg (magnesium). Thus, 500 lb. per acre of a fertilizer containing 400 lb. of dolomite filler per ton would add approximately 12 lb. of Mg per acre to the soil. However, the trend is toward high analysis and acid-forming fertilizers that contain no dolomite.

Research on magnesium has been conducted periodically by the Auburn University Agricultural Experiment Station for more than 30 years. Field experiments on the Mg requirement of cotton were first begun in 1930 with a cotton-corn-legume rotation at four widely separated sites by comparing dolomitic and calcitic limestones. These early tests showed no advantage for dolomite.

Recent Research

Additional research on availability of soil Mg was started in 1958. A primary objective of the greenhouse experiments was to determine deficient levels of Mg in the plant and in the soil. Deficient levels of Mg can be measured by plant analysis or by soil analysis. The data from greenhouse experiments show that adequate Mg was usually supplied plants by sandy soils containing more than 50 lb. of exchangeable Mg per acre.

Results from field experiments conducted since 1958 have shown significant increases in cotton yields on some soils following the addition of Mg. Data in Table 1 show that the gray, sandy soils were relatively low in Mg and that the addition of magnesium sulfate to these soils resulted in average seed cotton yields being increased up to 360 lb. per acre. On the other hand, additional Mg had no effect on cotton yields on Decatur clay loam, a soil relatively high in Mg.

Magnesium rates of 0, 30, and 120 lb. per acre were used in the experiments at Alexandria, Monroeville, and Brewton, Table 1. Yields were about the same from the 30- and 120-lb. rates. A subsequent experiment with rates of 0, 10, 20, and 40 lb. of Mg per acre from magnesium sulfate was established at the Sand Mountain Substation in 1960. The average seed cotton yield for the 1960-62 period was increased 400 lb. per acre where 40 lb. of Mg per acre was added annually, Table 2.

Since 30 lb. of Mg was adequate at Brewton and Monroeville and 20 lb. was inadequate at Sand Mountain Substation, it appears that Mg should be added at a rate of about 30 lb. per acre annually for cotton.

Magnesium sulfate and magnesium-potassium sulfate are satisfactory water-soluble sources that may be used on any Mg-deficient soil. Only water-soluble sources should be used on calcareous soils (high pH) and on soils that cannot be limed.

Table 1. Yield Increase of Seed Cotton From Addition of Magnesium Sulfate at Four Locations, 2-Year Average

Location and soil type	Soil magnesium*	Yield increase
	Lb./A.	*Lb./A.*
Alexandria, Decatur c.l.	110	0
Monroeville, Magnolia f.s.l.	40	80
Crossville, Hartsells f.s.l.	28	280
Brewton, Kalmia s.l.	20	360

* Exchangeable.

Magnesium from Dolomite

The data in Table 3 show that agricultural-grade dolomite is an excellent source of Mg on acid soils. The only significant difference between the limestones was the Mg content of the dolomite. The data show the soils at Brewton and Monroeville to be deficient in Mg. The greatest response to Mg was at the higher soil pH values. There was no response to lime or Mg at Prattville.

In addition to neutralizing soil acidity, dolomite supplies magnesium as well as calcium. Each ton of dolomite contains about 250 lb. of Mg and is by far the cheapest source of Mg available. Magnesium deficiency will be avoided by a liming program in which dolomite is used at every other application.

Since Mg is released from dolomite only when the acid soil and dolomite react, dolomite must be finely pulverized for it to be a good source of Mg. Coarse dolomite is equally worthless as a liming material or as a source of Mg.

Table 2. Effects of Rates of Magnesium on Yields of Seed Cotton at Sand Mountain Substation, 1960-62 Average

Rate of Mg	Yield	Yield increase
Lb./A.	*Lb./A.*	*Lb./A.*
0	2,270	------
10	2,440	170
20	2,550	280
40	2,670	400

Table 3. Effect of Kind of Limestone on Yield of Seed Cotton at Various Soil pH Levels, 1960-61

Location and kind of limestone	Soil pH range		
	5.3-5.5	5.6-5.8	6.2-6.4
	Lb. of seed cotton/A.		
Brewton			
Dolomite	1,520	1,770	2,070
Calcite	1,580	1,710	1,650
Monroeville			
Dolomite	1,370	1,630	1,800
Calcite	1,260	1,370	1,530
Prattville			
Dolomite	2,490	2,270	2,230
Calcite	2,400	2,380	2,270

LAND REQUIREMENTS for a $5,000 INCOME

GARY C. JONES, *Department of Agricultural Economics*

How large should a farm be to provide a given net return to operator labor and management?

This question is the topic of a study being conducted in the Wiregrass Area by the Department of Agricultural Economics, Auburn University Agricultural Experiment Station. Budgets based on utilization of advanced technology and recommended production practices have been developed for eight crop and three livestock enterprises.

Enterprises Selected

Crops selected were cotton, peanuts, corn, grain sorghum, soybeans, oats, wheat, and Coastal bermuda. Peanuts are restricted to a 1 year in 3 rotation. Per acre yields used in the program are cotton, 594 lb.; peanuts, 0.9 ton; corn, 55 bu.; and Coastal bermuda, 5 tons. In some situations, crop yields and product prices are varied in order to study the effect of their variability on optimum organization.

The livestock operation includes hogs, a cow-calf beef enterprise, and steers. Hog production is on a 2-litter-per-year basis. Sows are on millet pasture in the summer and oats and rye in the winter. Market hogs are self fed on pasture. The steer feeding operation begins with the purchase of good and choice calves weighing around 400 lb. Calves are in the feedlot from December 1 to April 30 on a ration consisting of corn silage and 2 lb. of concentrate per day. They are transferred to Coastal bermuda pasture from May 1 to July 15. The steers are then returned to the feedlot for 120 days and marketed.

Optimum Farm Plan for Two Income Levels, One-Man Labor Force, Advanced Technology, Base Prices, Wiregrass Area of Alabama

Item	Unit	$5,000 income	$7,000 income
Open land required	acre	105.5	147.8
Crops:			
Cotton	acre	12.8	18.0
Peanuts	acre	17.6	24.7
Corn for feed	acre	22.3	31.3
Coastal bermuda	acre	44.6	62.5
Pasture for hogs	acre	8.2	11.3
Livestock:			
Hogs	sows	7	10
Seasonal labor hired	hour	663	818
Gross receipts less	dol.	14,302	18,286
Operating expense	dol.	7,103	7,915
Land charge[1]	dol.	659	924
Seasonal labor[2]	dol.	398	491
Fixed overhead	dol.	1,142	1,956
Net return to operator labor and management	dol.	5,000	7,000

[1] $6.25 per acre.
[2] $0.60 per hour.

Linear Programming

Linear programming techniques are used to determine the combination of these enterprises that will provide the desired income with a minimum amount of land. Fifty-eight per cent of the open land was assumed to be available for row crops. An additional 28% was plowable, but not suitable for row crops. Each acre of land has a 12.2% cotton allotment and a 16.7% peanut allotment. Wheat is restricted to 15 acres per farm.

Open land is valued at $105 per acre with an annual charge of $6.25 per acre to cover interest and taxes on this investment. Operating capital was charged at 6% interest. Also a fixed overhead expense was charged to cover machinery overhead and interest, telephone, insurance, bookkeeping and tax service, and pickup truck operation.

Farm Plans Compared

The table summarizes the optimum farm plan for two income levels. The remaining discussion deals with possible enterprise combinations that yield a $5,000 net return to operator labor and management. Given current conditions, the optimum program includes 106 acres of open land, 13 acres of cotton, 18 acres of peanuts, 45 acres of Coastal bermuda, and 7 sows. The hog enterprise requires 22 acres of corn for feed and 8 acres of pasture.

When the market price for hogs is increased from 16¢ to 18¢ per lb., the optimum farm size is 95 acres. More corn and hogs are produced and the acreage of Coastal bermuda is reduced. The farm plan is composed of 12 acres of cotton, 16 acres of peanuts, and 30 acres of Coastal bermuda. The hog enterprise is enlarged to nine sows. Twenty-seven acres of corn for feed and 10 acres of pasture are required.

If the corn yield is increased and hogs sell for 16¢, the hog enterprise is expanded and Coastal acreage reduced. The result is a decrease in total land requirement. With a yield of 60 bu. per acre, the plan calls for 103 acres of open land. Similarly, the optimum program with 70-bu. yield is 96 acres. In each case, the cotton and peanut acreage remains at the full level of allotment. With 60 bu. yields, the organization includes 10 sows, 30 acres of corn, and 32 acres of Coastal. If the yield is 70 bu., the best program is 11 sows, 28 acres of corn, and 28 acres of Coastal bermuda.

If only crop enterprises are considered, 110 acres of land are required. Of this total, 24 acres are planted in corn for sale. Approximately 1,300 bu. will be sold at a price of $1.05 per bu. The other crop enterprises included are 14 acres of cotton, 18 acres of peanuts, and 55 acres of Coastal bermuda.

In all cases studied, cotton and peanut acreage came into the program at the full level of allotment. As corn yields increase or if hog prices increase, the hog operation becomes larger and less Coastal bermuda is planted. Both of these changes lead to reduced land requirements for a given net return.

Left: Correct framework of branches of a young Southern Magnolia is shown. Center: The ideal orchard tree produces clean, well-shaped foliage on multiple salable branches from buds on stubs of previous year's growth. Right: Two named varieties of Southern Magnolia are Glen St. Mary (left) and Margaritta; both produce dark green foliage with heavy brownness underneath.

Southern Magnolia Produces Valuable Foliage

HENRY P. ORR and TOK FURUTA, *Dept. of Horticulture*

FEW PLANTS SURPASS the Southern Magnolia (*Magnolia grandiflora*) in size and beauty of flowers. This beauty is accented by the dark green background provided by the foliage.

Flowers of Southern Magnolia are easily bruised and have limited use for decorative purposes, but the foliage is durable and ranks among the best for cut purposes. Homeowners, as well as florists, prefer the dark green leaf form over most other foliages for backgrounds in set designs and in floral arrangements. Since its popularity and sales value are proved, sources are needed for consistently available, high quality foliage.

Today, as in the past, almost all marketed leaves and cut branches of Southern Magnolia are gathered from native stands. Quality of foliage from such stands is variable, often being poor because of burning or flooding of forests. Although few insects and diseases have been serious problems, some damage has occurred. Also, so-called physiological disorders, such as whitening of edges of leaves in native stands, have reduced quality of leaves for fresh or preserved use.

Quality difficulties, combined with expanding demand, increased labor costs, and remoteness of native sources from processing plants have resulted in establishment of orchards for future supplies. Studies aimed at learning cultural practices for economic production of Magnolia foliage have been underway at Auburn University Agricultural Experiment Station for several years.

Source of Plants

Southern Magnolia seedlings vary tremendously in the habit of the plant, shape, size, color and pubescence (brownness underneath) of leaves, and character of the flowers. The thicker, dark green above and pubescent underneath leaves are of higher quality and more desirable for cut purposes than are the lighter green, thinner leaves. Unless selections are made and propagated asexually, quantities of the desirable quality of foliage cannot be maintained. Among the named varieties possessing desirable characteristics are Glen St. Mary and Margaritta.

Often plants with desirable foliage types can be selected from a group of 3 to 5-year-old seedlings. Foliage characteristics may not be stable enough for selection before that age. After the initial selection, continued observations for commercially desirable characteristics should be made for final selection of trees to plant in orchards.

Production Methods Described

A deep, friable soil is ideal for Magnolias and the site should be protected from severe winter winds. Foliage quality can be seriously damaged in open sites by cold, drying winter winds. A good source of water for irrigation, spraying, and processing of finished product is essential.

In orcharding studies at Auburn, rapid growth of Southern Magnolia plants in Norfolk sandy loam resulted from using cover crops and fertilizing heavily. The combined effect was greater than from either practice alone.

More heavy, commercially salable branches were produced by 2,000-lb. per acre applications of 8-8-8 than when 1,000 lb. per acre applications were made. Two 2,000-lb. applications – in April and June – were as effective as seven applications spaced throughout the growing season.

Cover crops grown were common bermuda and reseeding crimson clover. The clover was allowed to mature each spring, then clipped or mowed and spread around trees as a mulch. The bermuda was mowed twice – July and September – and also left as a mulch.

Although the Southern Magnolia will grow to a large-tree size, the trees can be maintained to a small size for ease of harvesting. In the test orchard, plants are being retained at a height of 6 to 8 feet. As they mature and reach a marketable size (12 in. or longer), the branches are cut to a stub leaving two buds for further development. Marketable branches should be available on 5-year-old selected seedlings or in the second year from grafts on 3 to 4-year-old vigorous seedling understock.

Plants can be spaced as close as 10 ft. apart. Use of machinery will affect spacing, since convenience of mechanization must be considered.

ATTITUDES OF RURAL RESIDENTS TOWARD CHANGING JOBS

J. E. DUNKELBERGER, *Department of Agricultural Economics*

PROGRAMS TO IMPROVE social and economic conditions in low-income rural areas almost always involve industrialization. But does industrialization really help rural residents in the labor force who need aid the most? And, do these people have the desire and the necessary qualifications for entering industrial employment?

Results of a 1961 study in four low-income counties in Alabama supply information about the attitudinal and social potentials of the people for factory jobs. In this study 145 male heads of rural households, 18 to 65 years of age, and physically able to work were contacted.

Three Attitude Types

From the data collected on attitudes it was possible to identify three types of individuals in terms of their willingness to change to industrial jobs: (1) those totally favorable, (2) those conditionally favorable, and (3) those totally unfavorable.

Assuming that a favorable attitude toward industrial employment is an indication of aspiration, it can be concluded that there is a highly receptive attitude toward industrialization among rural residents in low-income areas of Alabama. However, this is only half of the picture. Do these men have the social characteristics sought by industry? Presence or absence of these characteristics is revealed in detailed information about the people holding these three types of attitudes.

CONTRASTING CHARACTERISTICS OF MEN MAKING UP GROUPS TOTALLY FAVORABLE AND TOTALLY UNFAVORABLE TO CHANGING JOBS

Selected characteristics	Status, by groups	
	Totally favorable	Totally unfavorable
Residence	nonfarm	farm
Home tenure	nonowner	owner
Color	nonwhite	white
Age	18-29 yr.	50-64 yr.
Education	under 12 yr.	over 12 yr.
Occupation	blue collar	white collar
Income, family	$750-3,999	over $4,000
Homemaker's employment	no, or earning under $1,500	no, or earning over $1,500
Living level	low	high
Household size	mixed	1-4 persons
Outlook	pessimistic	optimistic
Satisfaction	dissatisfied	satisfied
Values	job	church

NOTE: Characteristics of each type were chosen on the basis of percentages, rather than actual numbers. For example, there were only 36 respondents for whom job was the most important value, but a high proportion (56%) had a conditionally favorable attitude toward changing jobs.

Totally favorable. This group, making up 42% of the total sample, would change jobs regardless of conditions — even if it meant moving to a new community. Men of this opinion are most likely to be nonfarm residents, non-home owners, and employed in "blue collar" jobs (skilled, semi-skilled, or unskilled).

Total family income is usually less than $4,000 per year from all sources. The wives are either not employed or employed only on a part-time basis with annual earnings of less than $1,500. The family consists of either a recently married couple or a young couple with several pre-school age children. A low level of living usually exists, as measured by such household conveniences as running water, indoor bathroom, refrigerator, and vacuum cleaner.

Personal characteristics of men with this attitude show they are more likely to be nonwhites, 18 to 30 years old, and have less than 12 years of schooling (48% had completed fewer than 8 years of school). These men tend to be more pessimistic about their chances in life and to be dissatisfied with their present job and income situation. Moreover, they place a high value on their job as a source of personal satisfaction.

Totally unfavorable. At the opposite extreme are 15% of the men interviewed who would not, under any circumstances, change to a factory job. These are most likely to be farm residents and home owners having a high level of living. Men employed in "white collar" jobs with a total family income exceeding $4,000 per year usually are of this attitude. Their wives are either not employed or are steadily employed and earning more than $1,500 annually. Family size is one to four persons.

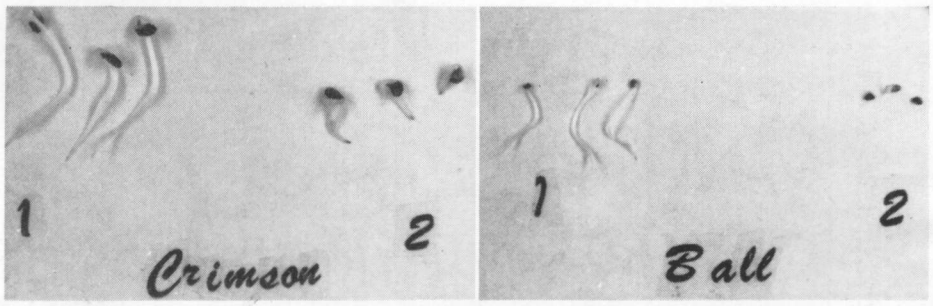
This group is made up mostly of white men 50 to 64 years of age who have completed 12 or more years of school. They are generally optimistic and satisfied with present job and income. They tend to find their greatest satisfaction in church and related activities.

Conditionally favorable. The third attitude group, accounting for 43% of the sample, falls between the two extremes. Men with this attitude have fewer distinctive characteristics and show greater variation. They are most likely white, 30 to 49 years old, with families larger than four persons, including children of all ages. This tendency to have large families is reflected in a strong value placed on family as the greatest source of satisfaction in life. Men employed either full-time or part-time in farming are most likely to hold this attitude. The same is true of families in which the homemaker has steady employment paying more than $1,500 annually.

Differences Are in Degree

These descriptions show that the main differences between men of the three attitude groups are in their degree of commitment to the rural neighborhood and their present level of socio-economic adjustment. Such ties as farm or home ownership, a good job including farm and nonfarm work arrangements, and steady employment for the wife create a less favorable attitude toward job change. On the other hand, failure to make such adjustments causes dissatisfaction with the present situation and a greater willingness to attempt any change that offers the possibility of improvement.

Educational levels are seen to be major limiting factors from industries' point of view. Those with the more favorable attitudes were colored men with low levels of education. However, this is offset by their favorable attitudes and relatively young ages (under 50). These characteristics must be considered as rural development programs are designed for low-income areas.



Seed numbered 1 were germinated in distilled water, whereas those numbered 2 show effects of germination in johnsongrass root extract.

Germination of Clover Seed Affected by Grass Root Extracts

C. S. HOVELAND, *Department of Agronomy and Soils*

GETTING GOOD STANDS of clovers is often a problem. Seriousness of this problem is shown by the importance of clovers on Alabama farms.

All possible environmental factors are being examined in Auburn University Agricultural Experiment Station studies aimed at solving clover stand problems. In a recent project, effects of plant residues on germination have been studied.

In these studies fresh roots of Coastal bermudagrass, Pensacola bahiagrass, dallisgrass, johnsongrass, Sorghum almum, and tall fescue were ground and a 1:10 water extract prepared. This extract was then used to moisten filter paper in petri dishes containing scarified seed of white, ball, crimson, and arrowleaf clovers. Germination was at 70°F. Sprouted seed were counted after 2 and 4 days and sprout lengths were measured to estimate vigor.

As shown in the table, germination of ball and crimson clovers was good when distilled water was used. However, using root extracts of certain grasses instead of distilled water sharply reduced germination of ball clover. Sorghum almum, johnsongrass, and Coastal bermudagrass extracts resulted in lowest germination of ball clover. In contrast, crimson germination was unaffected by the extracts.

Sprout vigor of both ball and crimson clovers was sharply reduced by root extracts of Sorghum almum, johnsongrass, and Coastal. Pensacola bahiagrass and dallisgrass had less effect. Tall fescue did not injure germination but slightly reduced sprout lengths of ball and crimson. Sprout length of the clovers was reduced even when the johnsongrass extract was diluted to one-fourth of its original strength.

White clover response to the grass extracts was similar to that of ball clover, but arrowleaf suffered less. Harmful effects of the extracts were evident even in dilute solutions, mainly as retardation of growth.

In other tests, root extracts of Coastal bermuda and johnsongrass injured the germination of common vetch. Alfalfa seed were found to be highly resistant to the root extracts.

Harmful effects of the root extracts were not permanent and could be alleviated in pure water. When sprouted seed were transferred from johnsongrass extracts to distilled water they began rapid growth.

Ground root material was also used in place of the water extract, with similar results. When johnsongrass root residue was placed in a petri dish and covered with moist filter paper, clover seed placed on top had reduced germination and vigor.

Results of these experiments cannot be directly applied to field conditions. In the case of permanent grass sods, it is doubtful if the concentration of inhibitor from the grass roots would be high enough to cause injury to reseeding clovers. Further studies are being done to determine if incorporated grass residues can injure small seeded clovers.

GERMINATION AND SPROUT VIGOR OF CLOVER, 4 DAYS AFTER TREATING WITH ROOT EXTRACTS

Grass root extract	Ball clover		Crimson clover	
	Germination	Sprout length	Germination	Sprout length
	Pct.	*Mm.*	*Pct.*	*Mm.*
Distilled water	95	19	96	33
Coastal bermudagrass	42	6	94	11
Pensacola bahiagrass	90	9	95	20
Dallisgrass	72	7	94	16
Johnsongrass	44	3	92	9
Sorghum almum	22	3	93	11
Tall fescue	95	13	96	26

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