highlights
of agricultural research

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Agricultural Experiment Station
R. Dennis Rouse, Director

Auburn University
Auburn, Alabama

Director's Comments

During the last few years Integrated Pest Management (IPM) has become a familiar term. Those employed by the Environmental Protection Agency have written extensively concerning the subject and The National Academy of Sciences has commissioned a series of study panels whose reports are voluminous. The USDA and State Agricultural Experiment Stations are conducting intensive programs of research in IPM. These are funded through the usual state and federal funding authorities under which we work, with the National Science Foundation (NSF) and the EPA having also provided support. This year the Cooperative Extension Service in all 50 states has IPM programs on some important commodities.

R. Dennis Rouse

Many who have used the term IPM envision elimination of the need for chemical pesticides in agriculture. Those learned or experienced in matters of the biological world in which we live recognize this as an unrealistic approach to feeding mankind on this earth. However, with greater attention to all factors affecting the impact of pests on production, they do see some hope that the amount of certain chemical pesticides used can be reduced without a serious adverse affect on the quantity, quality, or economics of production.

In 1972 the Council on Environmental Quality (CEQ) explained that "IPM involves maximum reliance on natural pest population controls, along with a combination of techniques that may contribute to suppression—cultural methods, pest-specific diseases, resistant crop varieties, sterile insects, attractants, augmentation of parasites or predators, or chemical pesticides as needed." Its innovativeness lies in the fact that it is an inclusive rather than an exclusive concept.

Because of the potential it offers, the various concepts that abound, and especially the differences between IPM as a concept and IPM as it can currently be implemented, the Congress of the United States has requested that the Food Advisory Committee of its Office of Technology Assessment evaluate the potential and problems for successful implementation of IPM. I was honored to be asked to serve as chairman of this effort. To keep the program in reason we have selected seven major commodities across the United States and will limit consideration to major crop areas.

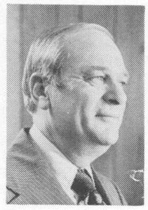
We are asking some of the top scientists in the nation to assist us in this study. Serving with me in coordinating this evaluation are 18 men and women from across the nation representing a cross section of disciplines. Hopefully this study will provide Congress with valuable information as they look at funding and legislative needs in pest management research, extension, and regulation to ensure the safety of food and the environment, yet retain our capacity to produce.

The implementation of pest management strategies in Alabama and across the nation that will achieve the goals of IPM is indeed worthwhile! It must be approached with objectivity and the understanding that this concept is complex and can only be successful with a strong research and education base.

This Station has investigated many components of pest management in addition to chemical control. Although we haven't been able to do adequate research in production systems, the new main station, the E. V. Smith Research Center of the Alabama Agricultural Experiment Station, will give us the capability to conduct a program of research, both at the center and outlying units, that encompass the total system of crop and animal production. Thus, we will be able in our research to give greater attention to all aspects of crop and animal protection.

may we introduce . . .

Dr. C. C. King, Professor in the Department of Agronomy and Soils, who is author of the story about white clover-grass combinations on page 3. A joint teacher-researcher, King teaches both undergraduate and graduate courses in agronomy and soils and conducts research dealing with forage crops management.



A native of Leighton, Alabama, King attended Florence State University and received his B.S. degree from Auburn University in 1952. His M.S., also from Auburn, was awarded in 1954, and he received his doctorate in crop production from North Carolina State University in 1964.

King first joined the Auburn staff as a Graduate Research Assistant in 1952. He has been at Auburn since that time except for 1954-56 military leave, 1963-64 doctoral study, and for a short time in 1960. He was appointed to the Graduate Faculty in 1971 and promoted to Professor in 1975. He has numerous Experiment Station and professional journal publications reporting results of his Auburn research.

King holds membership in Phi Kappa Phi, Gamma Sigma Delta, and Sigma Xi. He is president-elect of the AU general faculty.

HIGHLIGHTS of Agricultural Research

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ON THE COVER. Including fescue improved productivity of dallisgrass-clover pastures in Black Belt test. See story on page 3.

combinations of DALLISGRASS REGAL WHITE CLOVER KY 31 TALL FESCUE for yearling steers

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DALLISGRASS-WHITE CLOVER PASTURES have been the mainstay of Black Belt cattlemen for decades. However, there is room for improvement. Adding tall fescue to dallisgrass-clover pasture programs improved pasture productivity and boosted beef gain on grazing in Auburn University Agricultural Experiment Station tests at the Black Belt Substation.

Three pasture combinations of dallisgrass, Regal white clover, and Kentucky 31 fescue were evaluated on Eutaw soil with yearling beef steers over a 4-year period. The pasture combinations were (1) dallisgrass-white clover, (2) half paddock of dallisgrass-white clover and half paddock of tall fescue-white clover, and (3) a mixed sward of dallisgrass-tall fescue-white clover.

Paddock size for each forage combination was 2 acres, and each was stocked at the rate of one steer per acre (two steers per paddock). Each of the three pasture treatments was grazed with and without grain supplementation. Only the data obtained on pastures without supplementary feeding will be presented here.

Yearling steers weighing 450-500 lb., purchased each fall, were allotted to treatments about November 1 each year. At this time the animals were given an ear implant of a 24-mg stilbesterol pellet. Throughout the winter period, steers on all treatments had free access to a liquid protein-mineral-vitamin supplement. When forage was insufficient on any of the paddocks, hay was fed. On March 15, steers were given a second stilbesterol ear implant. At this time the liquid supplement was discontinued for all treatments. The grazing season was terminated in mid-September each year and the steers sold off pasture for slaughter.

Soil test recommendations were followed each year to reach and maintain P, K, and pH at recommended levels. In addition, nitrogen was applied at the rate of 60 lb. N per acre in early fall and repeated in early spring to areas containing tall fescue. Areas containing only dallisgrass-white clover got no nitrogen. Surplus forage was harvested for hay to provide roughage during the unproductive pasture season (approximately December to March).

The half paddock of dallisgrass-white clover and half paddock of tall fescue-white clover were separated by a fence. Normally, the steers were not allowed to graze the fescue-clover portion from about September 1 to December 1.

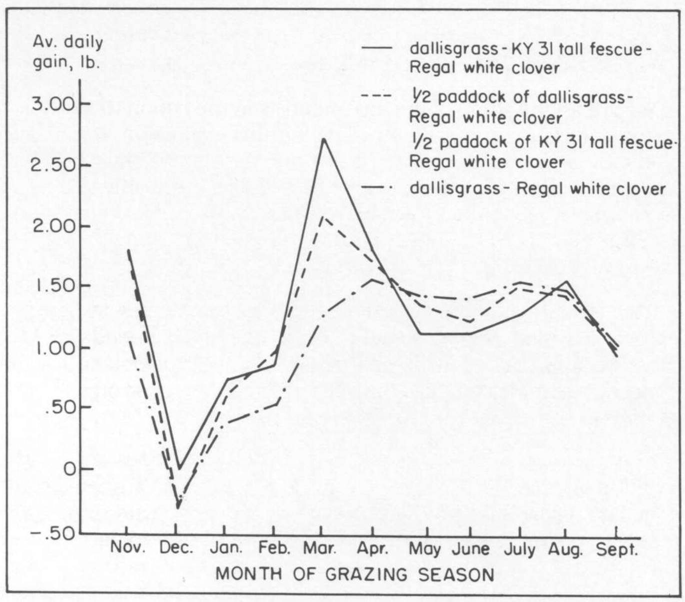
The 4-year average gain per steer (or per acre) over the 11-month grazing season was 334 lb. for the dallisgrass-white clover pasture. The two pastures containing tall fescue produced about 20% more gain per steer than the standard dallisgrass-white clover pasture, as shown by the 4-year averages given below:

Pasture treatment	*Gain per steer, lb.*				
	1971	*1972*	*1973*	*1974*	*Av.*
Dallisgrass-Regal white clover	361	326	315	334	334
Half paddock dallisgrass-clover, half paddock fescue-clover	427	369	344	447	397
Dallisgrass-fescue-clover	468	379	396	384	407

The advantage of having tall fescue in the system was consistent. Each year the dallisgrass-white clover pasture produced lower gains per steer than either of the pastures containing fescue. The cost of nitrogen topdressing vs. white clover would enter into any economic comparisons, however.

Average distribution of grazing during the grazing season, shown in the graph, illustrates the advantage of having tall fescue in pastures during November to April. This is particularly evident for November and March. The dallisgrass-white clover pasture showed a slight advantage during May, June, and July, but beef gains in August and September were virtually the same for all treatments. Generally poor performance of all three systems during December, January, and February reflects the lack of forage and the inadequacy of the hay used in this experiment to meet the energy requirements for satisfactory growth.

Adding tall fescue to dallisgrass-white clover pastures consistently improved animal gains in the test reported. It is noted, however, that animal gains were too low during the winter months.



Distribution of grazing during the grazing season illustrates the comparative performance of each pasture mixture in the test.

Forecasting peanut harvest dates in Alabama

BY THE ARGININE MATURITY INDEX

W. D. BRANCH and J. D. WEETE, Dept. of Botany and Microbiology

EACH YEAR peanut growers are faced with the problem of when to harvest to obtain maximum yield, grade, and price return. Selecting the optimum harvest date is a problem because peanuts produce varying proportions of immature and mature kernels throughout the harvest season. Digging them early results in too many immature kernels and reduced yields. If harvested late, older pods detach from the pegs during harvest, resulting in excessive pod loss and again reduced yields.

In the past, growers have relied on subjective methods like the popular Shellout Technique. This technique involves opening each pod from a representative sample of plants, classifying the stage of maturity by the degree of internal hull darkening, and estimating the harvest date based on the grower's judgment of time needed to obtain at least 60% mature pods for Florunner peanuts.

Recently, a new method called Arginine Maturity Index (AMI) was developed in Georgia as an objective procedure to take some of the guesswork out of forecasting peanut harvest dates. The AMI is an analytical approach based on the inverse relationship between the ratio of pod free arginine (amino acid) to percent dry matter content and maturity. All pods are removed from three representative subsamples per field taken at approximately 2 and 4 weeks prior to estimated maturity and the AMI values determined. The average AMI value for each sampling field is compared to a plot of predetermined AMI values (AMI curve) which serves as a guide to determine the number of days to harvest. One advantage of this method is that it gives a 1- to 2-week advance notice of harvest dates.

In 1977, a study was conducted at the Wiregrass Substation to test the effectiveness of the AMI method in forecasting peanut harvest dates in Alabama by comparing it to the commonly used Shellout Technique with Florunner peanuts. A third harvest (Early) was arbitrarily selected 1 week prior to the AMI determined harvest date. The average peanut yield and price return from plots harvested according to the AMI procedure was significantly higher than that of peanuts harvested at the Early date, see table. Although the values were generally higher for peanuts harvested according to the AMI method, there was no significant difference between the Shellout and Early harvest or the AMI and Shellout methods for yield and price return. The grade of peanuts harvested according to the Shellout Technique was significantly higher than that of peanuts harvested by the other two procedures.

SUMMARY OF RESULTS FROM MATURITY PLOTS AT THE WIREGRASS SUBSTATION AND PARTICIPATING GROWERS IN THE AMI PROJECT-1977[1]

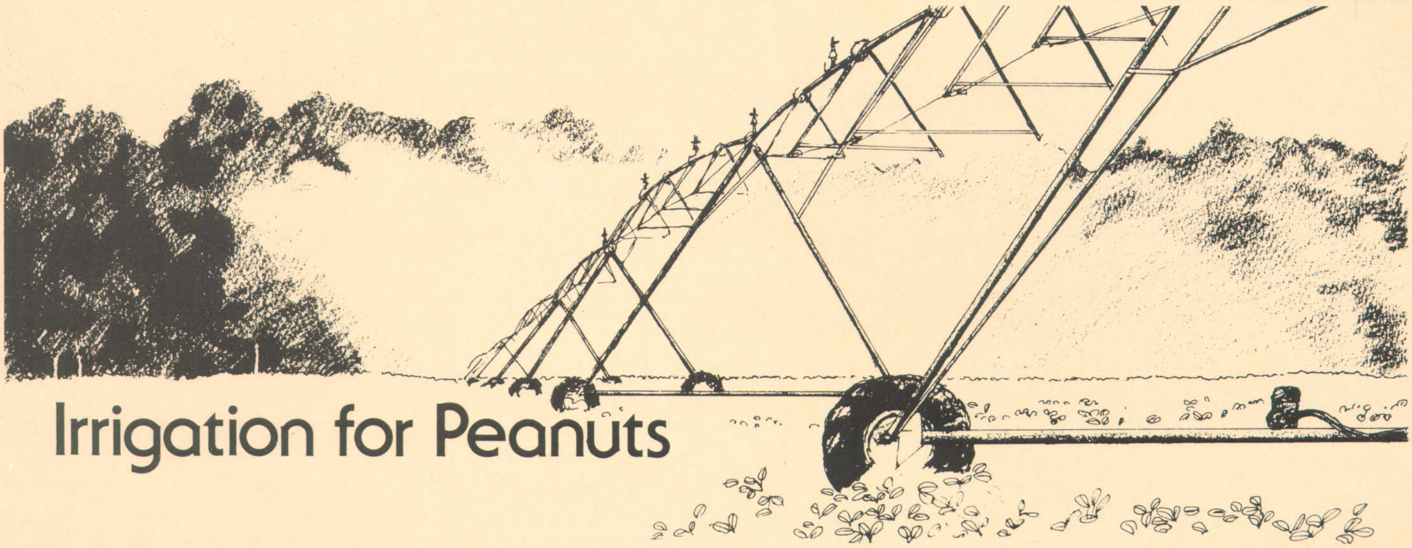
Type of harvest	Maturity plots			Participating growers		
	Yield (lb./A)	Grade (%TSMK)	Return ($/A)	Total acreage	Yield (lb./A)	Grade (%TSMK)
Early	4,035a	69a	860a	—	—	—
Shellout	4,222ab	71b	917ab	—	—	—
AMI	4,413b	69a	940b	754	3,274a	73a
Others[2]	—	—	—	4,448	3,149a	72a

[1]Values within columns with a common letter are not different at the 0.05 significance level according to Duncan's New Multiple-Range Test.

[2]Includes the following: shellout, AMI, days from planting, sagging vine, boiling, or any combination at the growers discretion.

The AMI method was also used to determine harvest dates for peanuts of participating growers in five southeastern Alabama counties. Yield and grade of peanuts harvested by the AMI were compared to that of peanuts from adjacent fields harvested at the growers discretion. No significant differences in yield and grade were noted between peanuts harvested according to the AMI and by other methods, see table.

The Shellout Technique must be conducted in a systematic and quantitative manner to be as effective as the Arginine Maturity Index method for determining optimum harvest dates of peanuts. Otherwise, the AMI method will be the best approach because of its proven accuracy and the advance notice of harvest.



Irrigation for Peanuts

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E. W. ROCHESTER and S. C. YOUNG, Dept. of Agricultural Engineering

THE DROUGHTS of 1976 and 1977 provided interesting contrasts for irrigation research in peanuts. The 1976 drought could be characterized as a late season drought, with the moisture stress period occurring from pegging through harvest. In contrast, the drought of 1977 was earlier and the moisture stress period was from cracking to pegging. These dissimilar situations allow comparisons of the damage caused by early and late season droughts, and of the benefits of irrigation under each of these conditions.

The data for the late season drought of 1976, see table, indicate that the addition of only 4.3 in. of water increased yields 1,469 lb. and the value of harvested product was increased by $393 per acre. Some of the yield improvement was due to a greater kernel: shell ratio (SMK) and to a lower frequency of shrivels. Both values indicate that non-irrigated peanuts did not fill as well as irrigated peanuts. Disease values in 1976 were slightly higher for irrigated peanuts than for non-irrigated, indicating that the yield potential for irrigated peanuts could have been even greater had diseases been controlled more effectively.

The drought of 1977 continued from emergence to late July, a period of about 90 days. Normally, peanuts flower, peg, and begin to set pods between 50 and 70 days after planting, but this was not the case for non-irrigated peanuts in 1977. Peanuts that were irrigated proceeded much more rapidly through pod development than did non-irrigated peanuts (table, days to maturity). Non-irrigated peanuts did not set a significant number of pods until rains came in late July. However, rainfall thereafter was sufficient and the non-irrigated peanuts produced a crop almost as large as that from the best irrigation treatment. SMK and kernel quality (value per ton) were very similar for all irrigation schedules. However, the diseases white mold (caused by *Sclerotium rolfsii)* and peanut leafspot (caused by *Cercospora arachidicola)* were more severe in irrigated plots.

Comparisons of the 2-year data indicate that early season drought (pre-pegging) was much less damaging to peanut yields than was a late season drought. Application of water to peanuts in a pre-pegging drought enables them to proceed to maturity on a normal schedule, and avoids leaving peanuts in the ground for the 160-180-day period required to mature non-irrigated peanuts. Late season drought is much more damaging, because the peanut plant already has pods (and their water demands) set on the vine. Insufficient water at this time is much more likely to cause premature plant death rather than to prolong their maturity period. Farmers should be aware that irrigation water intensifies the severity of peanut disease. This occurs because irrigation water washes off some of the leafspot fungicide, and creates an environment more conducive to leafspot and white mold development. Leafspot fungicides should be applied on a shorter interval when irrigation is frequently used, and fungicides for white mold control will probably be needed more frequently in irrigated fields.

EFFECT OF IRRIGATION PROGRAMS ON PEANUT DISEASE, YIELD, CROP QUALITY, VALUE AND MATURITY DATE

Irrigation treatment[a]		No. appl.	In. water	% Leafspot defoliation[b]	White mold[c]	Yield lb./A	SMK	$ Value per ton	$ Value per acre	Days to maturity[d]
1976										
None	dry	0	0	35.0[a]	4.6	3,404[a]	62.6[a]	358	610	156[e]
60 cb	↓	5	3.0	41.0[b]	6.0	4,660[b]	66.5[ab]	378	880	156
40 cb	wet	7	4.3	40.0[b]	7.3	4,873[b]	72.3[b]	412	1,003	156
1977										
None	dry	0	0	22.6[a]	1.8	3,447[ab]	76.1[a]	450	775	167
60 cb	↓	7	4.9	35.6[b]	5.0	3,366[a]	77.5[a]	463	779	156
40 cb		10	7.5	34.8[b]	6.2	3,283[a]	77.6[a]	461	770	156
20 cb	wet	13	10.6	38.9[b]	5.4	3,836[b]	75.3[a]	458	878	148

[a]Treatments were scheduled by tensiometers set at 6 and 12″; treatments were triggered when soil moisture tension reached the value in centibars recorded in the treatment column.
[b]Data within columns of the same year followed by the same letter are not significantly different at the 5% level of probability.
[c]Dead peanut crowns with signs of *S. rolfsii* per 100 ft. (30 m) of row.
[d]Determined by Arginine Maturity Index (AMI).
[e]Severe drought in 1976 prevented delaying harvest to optimum maturity for non-irrigated plots.

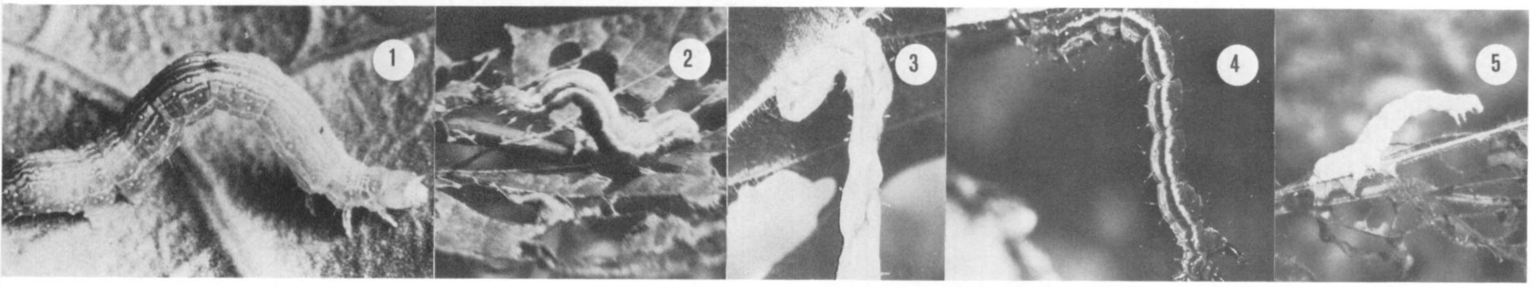

FIG. 1. The cabbage looper and FIG. 2. the soybean looper look exactly alike. When larvae die from the insect disease *Emtomophthora* they become either compressed, wrinkled, and yellow, FIG. 3, or glossy black, FIG. 4, or if they die of the disease *Nomuraea,* they remain in a more or less natural position on the leaf and at first appear white, FIG. 5.

The SOYBEAN LOOPER Appearances, Diseases and Control

MAX H. BASS, Department of Zoology-Entomology

THE SOYBEAN LOOPER has become an increasingly important problem for soybean growers over the past 10 years. Lately it has been the most serious insect pest facing many soybean growers. The problem is compounded by confusion concerning the identity of the soybean looper and by the fact that it is one of the more difficult insects to control.

Appearance

To the untrained eye, the cabbage looper, figure 1, and the soybean looper, figure 2, look exactly alike. However, research at the Auburn University Agricultural Experiment Station, has shown that "loopers" appearing on soybeans are almost always the soybean looper. Some confusion exists about whether the soybean looper has black legs or not. (Soybean loopers are sometimes referred to by the local name "black-legged looper.") The black legs do not mean much. The cabbage looper never has black legs, but the soybean looper may or may not have black legs. In some populations all soybean loopers may be black-legged. In others, black-legged individuals may appear at random in a field population; and in other fields with large looper populations no black-legged individuals may be present. Leg color is apparently just a genetic variation and there is no evidence of differential susceptibility to insecticides based on this color variation.

Diseases

Although the soybean looper is difficult to control with insecticides, chemical control is frequently unnecessary because of naturally occurring diseases. According to Dr. James Harper, researcher of insect diseases at the Station, the most important disease of this insect is caused by fungus in the genus *Entomophthora.* When larvae die from this disease they become either compressed, wrinkled, and yellow, figure 3, or glossy black, figure 4. In either case they hang head-down from a leaf or stem. Another disease frequently seen in the field is caused by a fungus in the genus *Nomuraea.* When larvae die of this disease they remain in a more or less natural position on the leaf and at first appear white, figure 5, then 3 to 5 days later become velvety green. Of the two diseases, the one caused by *Entomophthora* is much more important and frequently destroys soybean looper populations, especially when those populations become dense.

Control

During the past two summers considerable research effort has gone into the development of insecticidal control measures for this insect. The following insecticides were tested: methomyl (Lannate® or Nudrin®), methyl parathion, toxaphene-methyl parathion, acephate (Orthene®), Ambush®, Pydrin®, CGA 15324, leptophos (Phosvel®), encapsulated methyl parathion (Penncap-M®), Bay 92114, dimethoate (Cygon®), carbofuran (Furadan®), Bolstar®, Mobil 9087, ethoprop (Mocap®), CGP 9646, parathion, chlorpyrifos (Lorsban®), carbaryl (Sevin®), trichlorfon (Dylox® or Proxol®), and *Bacillus thuringiensis* (Dipel® or Thuricide®).

Only methomyl, acephate, *Bacillus thuringiensis,* Ambush®, and Pydrin® reduced looper populations adequately to be of use to farmers in their control programs. Of these, methomyl at 1 lb., Dipel® or Thuricide® at 1 lb., and Ambush® at 0.2 and 0.1 lb. active ingredient per acre reduced populations by 80% or more, see table.

Advice

It must be remembered that, with our present knowledge, diseases are unpredictable and the farmer must keep himself informed of the soybean looper population, the damage being done to his crop, and the insecticides available for use when needed. If the farmer doesn't have the time or knowledge to keep abreast of the insect populations in his soybeans and isn't sure when to use insecticides or which insecticides to use, he may be well advised to seek the aid of a commercial soybean scout.

PERCENT CONTROL OF THE SOYBEAN LOOPER WITH INDICATED INSECTICIDES

Insecticide[1]	Control, by rate of insecticide used per acre						
	1 lb.	0.75 lb.	0.5 lb.	0.25 lb.	0.2 lb.	0.1 lb.	0.05 lb.
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Methomyl	91	61	45	27	—	—	—
Acephate	66	49	11	0	—	—	—
Bacillus thuringiensis	84	78	70	49	—	—	—
Ambush ®	—	—	—	—	84	85	60
Pydrin®	—	—	—	—	73	70	27

[1]All materials were applied as sprays using ground equipment which delivered 10 gal. of mixed spray per acre.

Coal Surface-Mine Reclamation

E. S. LYLE, Department of Forestry

SEVERAL COUNTIES in the northern half of Alabama have coal deposits that are being mined by a method known as strip or surface mining. In the past, this method has usually left an unproductive, water polluting, ugly land area after coal was removed. Over the past few years methods have been developed by researchers in Auburn University's Agricultural Experiment Station to avoid or remedy most of the problems caused by surface mining.

A new federal law will require that much of the technology developed be used to restore these mined areas. This new law will not only require reclamation of present and future mines, but it also provides for the needed reclamation of older ones. Under the new law, topsoil from mined areas must be preserved and replaced on the surface after returning the mine to its approximate original contour. This topsoil will make re-vegetation easier but it also will be highly erodable; thereby, requiring immediate re-vegetation.

When topsoil is replaced, the landowner will probably be able to use the land for new crops, pastures, forests, or any other type of vegetation that will prevent erosion and produce an economic return. This will be an opportunity for the landowner to start with cleared land and without the expense of land clearing. Under these circumstances, the landowner can follow the same procedures that any farmer or forester uses when growing a crop. If the aim is to grow row crops or pasture, then the landowner should have his soil analyzed and recommendations for fertilization made by the Soil Testing Laboratory at Auburn University. The recommended lime and fertilizer can then be applied and disked into the soil. After this, the usual farming techniques can be used to produce the desired crops.

If the landowner wants to grow trees, he can plant a cover crop before or at the same time he plants tree seed or seedlings. The cover crop prevents soil erosion until the trees are large enough to hold the soil in place. Most of the coal mining area in Alabama is presently in forest and will probably be returned to forest. If the landowner does not manage for row crops or pasture, nature will eventually return the mined land to forest. However, this forest produced by nature probably will not yield as much economic return as a planted forest.

FIG. 1. Southern pine established by nature on old Alabama surface mine in Walker County, Alabama.

FIG. 2. Common bermuda-sericea after 3-month growth on surface mine in Winston County Alabama.

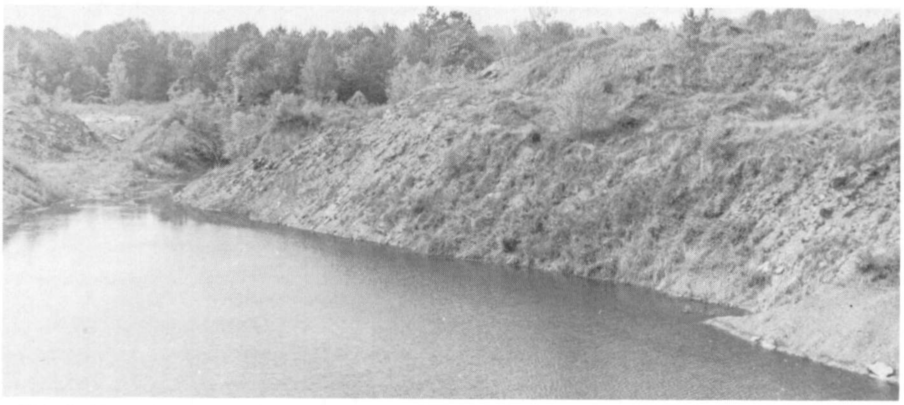

FIG. 3. Unreclaimed surface mine in Walker County Alabama shows no revegetation.

When an old mine is reclaimed and topsoil cannot be replaced, the mine soil probably cannot be used for row crops. However, the old mined area can still be used for pasture or forest production. The same procedure should be followed for pasture production as was described for mines that have topsoil. The table lists most of the plants that have been successfully used to revegetate surface mines in Alabama. There are probably many others that can be used for re-vegetation, although limited or no success with several other plants has been attained by Auburn researchers.

When a forest is desired and topsoil is not replaced, the acidity of the mine soil should be determined before anything is planted. Southern pines probably can be planted successfully if the mine soil pH is between 4.0 and 6.5. If the pH is below 4.0 the mine soil should be limed to bring the pH up to approximately 5.5. If the pH is above 6.5 there is a strong possibility that Southern pines will not survive or grow well. One of the hardwood tree species should be planted on mine soils above pH 6.5. All experimental work done at Auburn has shown the phosphorus in these high pH soils to be unavailable. Therefore, a phosphorus fertilizer should be added to these high pH mine soils when planting any crop. It was also found that nitrogen fertilizer increases the early height growth of many planted hardwoods, but tests have not determined if the nitrogen fertilization is economically worthwhile.

PLANTS THAT HAVE BEEN USED SUCCESSFULLY IN ALABAMA FOR RE-VEGETATING COAL SURFACE MINES WITHOUT TOPSOIL

Quick cover	Legumes	Shrubs	Perennial grasses	Trees
Rye	Alfalfa	Autumn olive	K-31 fescue	Loblolly pine
Sudangrass	Crimson clover	Sawtooth oak	Common bermuda	Longleaf pine
Alfalfa	Sweet clover	Arnot locust	Coastal bermuda	Slash pine
Wheat	Sericea		Dallisgrass	Virginia pine
Pearl millet	Kobe lespedeza		Weeping love grass	Shortleaf pine
Browntop millet	Bicolor lespedeza		Johnsongrass	Sycamore
Sorghum			Redtop grass	Catalpa
Sorghum-sudan			Pensacola bahia	Hybrid poplars
				European black alder

PRICKLY SIDA vs. COTTON

time of competition determines effect

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Department of Agronomy and Soils

ANY LIST OF IMPORTANT COTTON WEEDS is almost certain to include prickly sida (*Sida spinosa* L.). While prickly sida is not as competitive on a per plant basis as sicklepod, common cocklebur, or morningglory, it occurs throughout the cotton belt and generally ranks among the 10 most troublesome weeds in cotton.

Repeated use of Treflan (trifluralin) and other dinitroaniline herbicides has been associated with increases of this and other *Sida* species. Because of the increasing populations, research on this specific weed was begun in 1968 by Auburn University Agricultural Experiment Station. The research at the Tennessee Valley Substation was designed to determine (1) the weed-free requirement and tolerance of cotton to competition by pure stands of prickly sida, and (2) the influence of selected densities of prickly sida on yield and other factors of cotton production.

Stoneville 213 cotton was planted in 42-in. rows on Decatur clay loam soil that was heavily infested with prickly sida. Trifluralin was applied preplant incorporated at 1 lb. per acre for control of annual grass weeds. Weed species other than prickly sida that were not controlled by the herbicide were removed by hand hoeing.

In the first series of tests, cotton was maintained free of prickly sida for various intervals and then left uncultivated for the remainder of the growing season. Yields were not measurably reduced when the cotton was kept free of prickly sida for at least 5 weeks after emergence, figure 1. Although maximum yield levels differed by a factor of about two in 2 years, the weed-free requirement was the same each year. This illustrates that prickly sida is not highly competitive if cotton is given a 5-week head start. Cotton maturity was not affected in any year by the interval of weed-free maintenance.

A different approach was tried for the second phase of the test. Prickly sida emerged with cotton and was allowed to compete for various intervals before removal. Throughout these experiments, prickly sida that was removed by the seventh week after emergence did not reduce cotton yield, figure 2. Based on these results, a cotton grower has ample time to control prickly sida either by mechanical or chemical means if the weed becomes established.

Most years there were no measurable effects on cotton maturity even with full-season weed competition. In 1 year, however, prickly sida competition for 8 or more weeks substantially delayed maturity of cotton.

Critical periods of weed competition and the weed-free requirement in cotton were similar when either prickly sida alone or a mixed population of grass and broadleaf weeds competed with cotton.

Several additional studies during the same period revealed that prickly sida was much less competitive on a per plant basis than certain other weed species, such as sicklepod, cocklebur, or morningglories. Fewer than 8 prickly sida plants per 50 ft. of row caused no cotton yield reduction in any experiment. In only a few instances did densities of 8 to 32 sida plants per 50 ft. of row significantly reduce yield. In similar comparisons, 15 sicklepod, cocklebur, or morningglory plants per 50 ft. of row consistently reduced cotton yields by 20-40%.

In contrast to certain other broadleaf weeds, prickly sida competition with cotton depends on a relatively high weed population. The percentage of trash in machine harvested cotton was not increased by weed densities up to 32 per 50 ft. of row. However, substantially more sparse densities of prickly sida reduced efficiency of harvest with mechanical pickers by about 1%. Weed density had no effect on cotton grades or staple length.

Two basic findings resulted from the experiment: (1) cotton yields were not affected by prickly sida which emerged 5 weeks after the cotton; and (2) there was no yield loss if prickly sida plants which emerged simultaneously with cotton were removed by the seventh week.

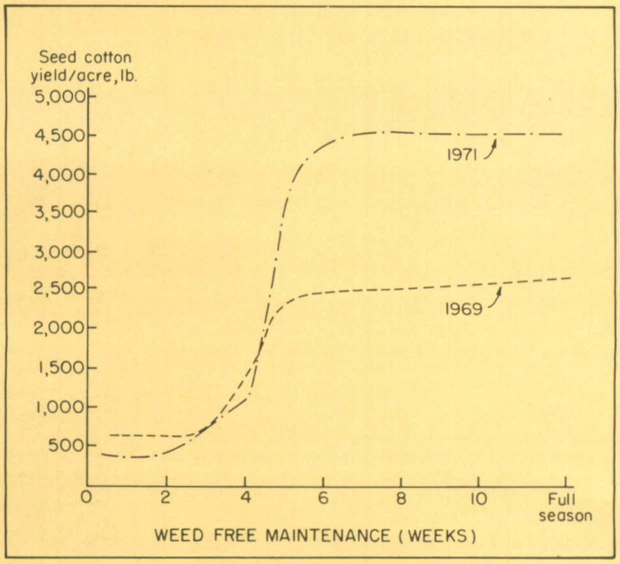


FIG. 1. Yields were not reduced when cotton was kept free of sicklepod for at least 5 weeks after emergence.

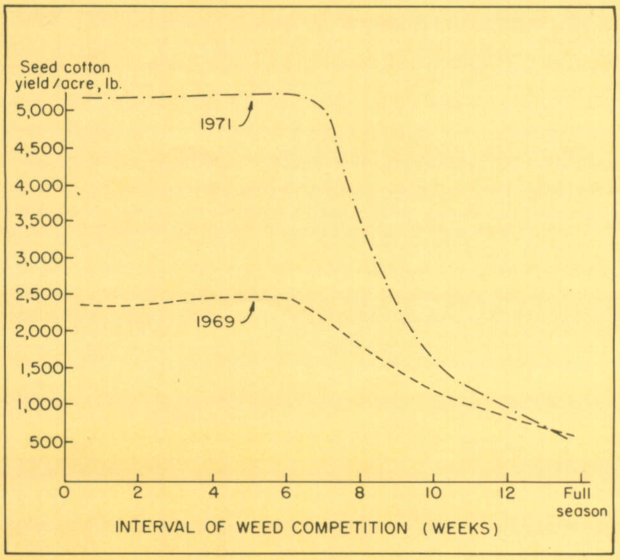
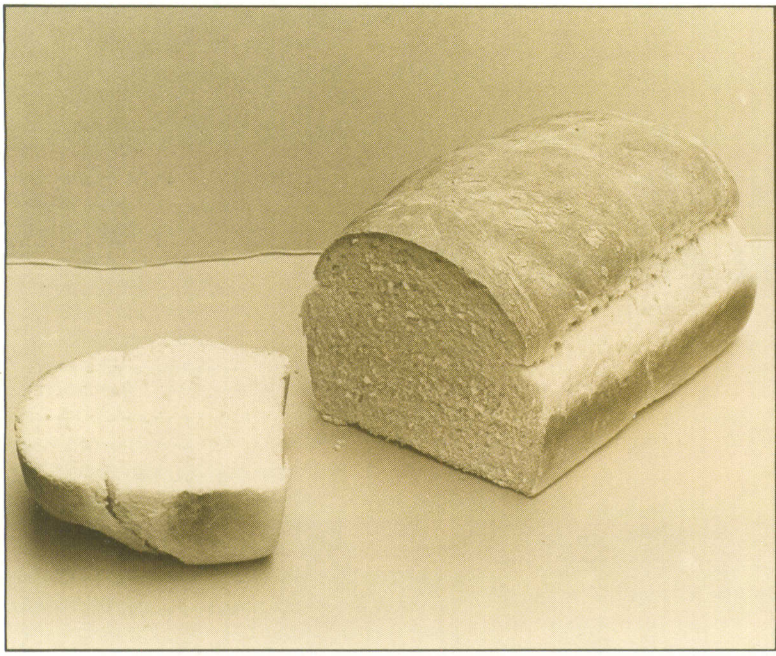
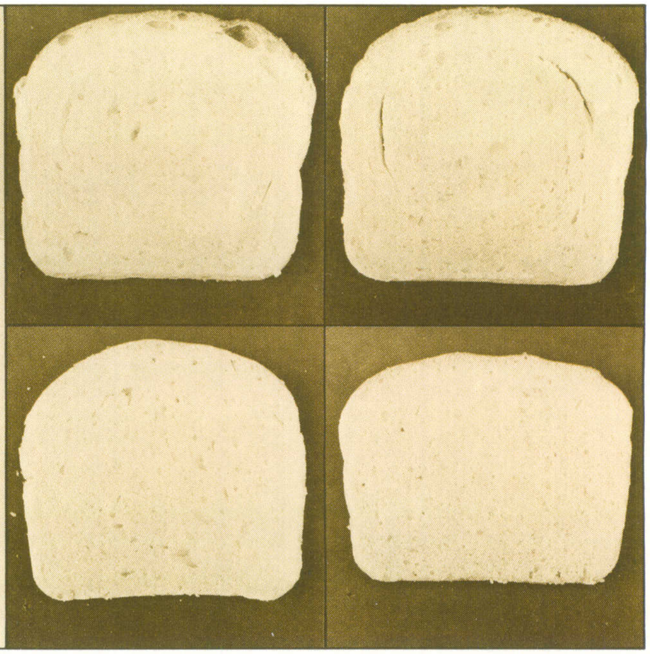


FIG. 2. Removing prickly sida from cotton by at least 7 weeks after emergence did not reduce yields.





Flour containing 15% southernpea flour was used to make the loaf of bread shown. Texture of bread resulting from use of varying proportions of southernpea flour is illustrated by the four slices: Top left, no southernpea flour; top right, 10%; bottom left, 15%; and bottom right, 20% southernpea flour.

New Foods from Southernpeas

DURWARD A. SMITH, Department of Horticulture

SOUTHERNPEAS ARE GETTING close attention in food processing research by Auburn University Agricultural Experiment Station. Current efforts are aimed at developing new food products to take advantage of the nutrient potential in southernpeas (*Vigna unguiculata*).

Southernpeas are high in protein, high in minerals, and low in fat content, as noted in the following table:

Component	*Content in flour, pct.*	
	Deskinned	*Whole*
Moisture	12.32	12.95
Protein	22.43	20.30
Crude fat	1.87	1.88
Minerals as ash	4.27	4.19
Crude fiber	1.63	5.00
Starch, sugars, and acids	57.48	55.68

As a nutrient bonus, southernpeas are relatively abundant in the essential amino acid, lysine. Wheat, peanuts, and most varieties of corn have insufficient amounts of lysine, which limits the human body's ability to utilize the protein in these foods. Researchers have for many years tried to fortify wheat flour with low cost lysine, primarily with soy flour. This has had poor acceptance due to the strong soy flavor. The high lysine content of southernpeas may make it possible to improve the protein quality in many food items.

Production of a high quality southernpea flour should make it possible to incorporate southernpeas in a variety of food items. Due to current interest in dietary fiber, a high fiber flour was thought to be desirable. Since the seedcoat of peas represents nearly 70% of the total fiber content (but only 10% of the weight), incorporating the seedcoat into the flour provides the desired high fiber content. However, eyeless, cream type peas must be used to avoid having tiny, black specks from the eyes dispersed throughout the flour. These black specks would show up in any product in which the flour is used.

An efficient method of removing the seedcoat was needed before a flour of uniform color could be produced from varieties with eyes. A method was devised whereby the peas can be deskinned by pretreatment followed by blanching in a commercial peanut blancher. The deskinned southernpeas were then ground through a 25-mesh screen in a Wiley mill. The resultant meal was milled in a high-speed Alpine impact stud mill to produce a free-flowing, white flour similar in appearance to wheat flour.

Experimental food formulations were tested using southernpea flour to replace varying portions of wheat flour and corn meal. These tests included the production of yeast breads, which are excellent vehicles for testing ingredients because of their sensitivity to functional differences in ingredients. At levels up to 15%, volume, color, and texture of the bread loaf were similar to bread made from all wheat flour. Adding over 15% to bread formulations produced a heavy texture and an undesirable dark color.

Cakes, pies, and cornbreads containing southernpea flour were also tested. Good volume and texture were achieved in chemically leavened products with proportions of southernpea flour as high as 40%.

Flavor acceptance of the food products was good. Incorporating large proportions of southernpea flour was found to impart a bean flavor, but this was not judged objectionable by tasters accustomed to the flavor of peas. Cornbread incorporating high percentages of southernpea flour has been well received by the tasters.

Preliminary Auburn results indicate that southernpea flour may be valuable in improving the nutritive value of certain foods.

Effects of a Pesticide On Antagonistic Soil Fungi

WALTER D. KELLEY and R. RODRIGUEZ-KABANA
Department of Botany and Microbiology

IN AGRICULTURAL practices soil is subjected to various amendments, such as the turning under of green cover crops to provide organic matter and nutrients; additions of fertilizers and lime to increase the amounts of available nutrients; and applications of pesticides to control plant pathogens, nematodes, insects, and weeds. Addition of any amendment can cause a shift in the dynamic equilibrium existing among the microorganisms that inhabit soil. Such shifts can be an advantage (favoring organisms that are antagonistic to plant pathogens) or a disadvantage (favoring one or more plant pathogens).

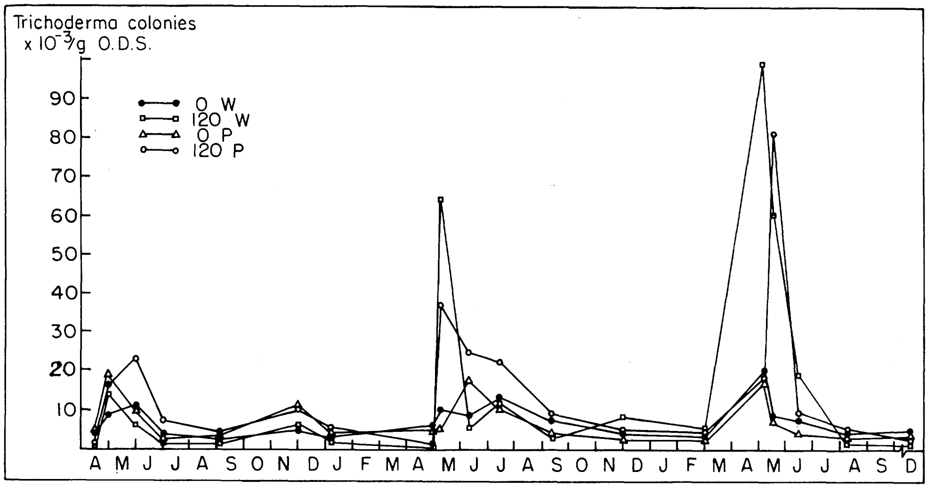
Scientists in Auburn University's Agricultural Experiment Station recently conducted a study involving effects of the broad-spectrum pesticide, sodium azide (NaN_3), on soil populations of antagonistic fungi in the genus *Trichoderma,* well known for their potential for biological control of diseases.

Field plots were established at the Stauffer State Tree Nursery near Auburn and maintained for a 3-year period. Treatments for the various plots for each of the 3 years are shown in the table. A granular formulation of NaN_3 (8G) was applied to the plots in April with a calibrated Gandy and was incorporated to a depth of 6 in. with a tiller. Except for the methyl bromide-treated plot (covered entirely with plastic), all plots were split into plastic-sealed and water-sealed sections; plastic sheets were removed after 10 days.

Populations of soil fungi were determined periodically during the 3-year study by standard isolation procedures. Counts were made of total fungi and of colonies of the genus *Trichoderma.* This fungus was selected because of its known antagonistic qualities toward a number of soilborne pathogenic fungi. During the third year of the study, a medium containing NaN_3 was included in the isolation procedure to determine whether any fungi, particularly *Trichoderma* spp., had developed a tolerance to NaN_3.

Populations of soil fungi initially were decreased by NaN_3, regardless of the amount of pesticide used or the method of sealing. However, with each succeeding year the decrease in populations of fungi following application of NaN_3 became less pronounced, so that by the third year reductions in numbers in response to the chemical treatment were hardly noticeable. This was particularly true with the highest rate of NaN_3. These results indicate that there occurred selective pressures for adaptation or increased tolerance by soil fungi to NaN_3. This is supported by the fact that, during the third year, colonies of *Trichoderma* capable of growing on the medium containing NaN_3 were present in significantly greater numbers from azide-treated plots than from control plots. Also, *Trichoderma* populations in the plots showed a sharp increase immediately following application of NaN_3, see figure. Although the initial response was followed later by a decline to a level comparable to the control, the initial "peaking response" increased in magnitude with each successive annual treatment with NaN_3; the peaking response was most prominent in plots treated annually with 120 lb. NaN_3 per acre.

These data suggest that NaN_3 favors development of fast-growing NaN_3-tolerant antagonists. Thus, the long-range effect of NaN_3 may not be direct toxicity to the pathogens (short-term effect) but may be due to the elimination of pathogens through the creation of an "antagonistic shield" in the treated soil.



DESCRIPTION OF TREATMENTS FOR PLOTS IN THE SODIUM AZIDE STUDY AT THE STAUFFER STATE FOREST NURSERY
ALL TREATMENTS WERE REPLICATED FOUR TIMES

Plot number	Treatment	NaN_3 (lb./acre) 1st year	2nd year	3rd year
1	Control	—	—	—
2	Methyl Bromide	[1]	—	—
3	NaN_3	120	0	0
4	NaN_3	60	0	0
5	NaN_3	20	0	0
6	NaN_3	120	60	0
7	NaN_3	120	60	20
8	NaN_3	120	20	0
9	NaN_3	60	60	0
10	NaN_3	60	20	0
11	NaN_3	120	120	120

[1] Methyl Bromide at a rate of 580 lb/acre was applied the first year only.

BIRDSFOOT TREFOIL— Legume of the Future in North Alabama?

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J. T. EASON and M. E. RUF, Sand Mountain Substation
ELLIS BURGESS, Plant Breeding Unit

BIRDSFOOT TREFOIL may be a strange sounding name, but it's one you may be hearing a lot in the future. It is a promising crop that may fill the need for an improved perennial legume for pasture and hay in northern Alabama. Auburn selections of birdsfoot trefoil now being tested hold out hope for an improved variety in the future.

Birdsfoot trefoil is a broadleaved, perennial legume with bright yellow flowers. Seed pods are arranged in the shape of a bird's foot, hence its name. Among the legume's advantages are: (1) tolerant of acid soil, (2) tolerant of wet soils, (3) persists during drought and grows in late summer when other legumes are generally dormant, (4) produces forage comparable to alfalfa in quality, (5) is not damaged by alfalfa weevil, (6) does not cause bloat in cattle, and (7) reseeds well from hard seed.

One serious disadvantage of this perennial has limited its use: It has poor seedling vigor, making it difficult to establish stands when competitive weeds are present.

How has birdsfoot trefoil performed in Alabama? In Auburn Agricultural Experiment Station tests, varieties from the northern United States have generally had poor stands and made low yields, a result of poor seedling vigor. However, performance of a Brazilian variety, San Gabriel, has been highly encouraging.

Seed of San Gabriel were brought to Auburn from southern Brazil by John Saibro when he came as a doctoral student. The variety was planted in September 1974 at the Sand Mountain Substation for comparison with alfalfa and red clover. Annual forage yields for the trefoil and the best alfalfa varieties were similar, 4 tons per acre over a 3-year period, as shown by data in the following table:

Superior plants of San Gabriel trefoil—those that have survived under Alabama conditions—are being grown for seed production in this row nursery at Tallassee.

Birdsfoot trefoil produces bright yellow flowers and has seed pods arranged in the shape of a bird's foot.

Perennial legume	*Dry forage yield/acre, tons*	*Stand on 3/16/77, pct.*
Gladiator alfalfa	4.0	85
San Gabriel birdsfoot trefoil	4.0	70
Weevlchek alfalfa	3.9	85
Williamsburg alfalfa ...	3.7	72
Arc alfalfa	3.6	78
Kenstar red clover	3.2	55

Trefoil stands remained after 3 years at the Sand Mountain Substation and considerable natural reseeding had occurred in areas around the plots. Further south in Alabama, at the Wiregrass Substation and Plant Breeding Unit, San Gabriel trefoil stands have persisted only 1 or 2 years.

Superior surviving plants of San Gabriel have been grown in row nurseries at the Plant Breeding Unit, Tallassee. Seed from these plants were planted for seed increase and evaluated as AT-1 trefoil. In addition, selections were made from superior plant introductions from Italy and Yugoslavia and tested as AT-U (upright) and AT-P (prostrate type with stolons). Seedling vigor of all these selections is far superior to northern varieties, such as Viking and Dawn. In fall 1977, the Auburn experimental trefoils were 3-5 in. tall 70 days after planting, as compared with 1/2 in. height for Viking, a northern variety.

The Auburn trefoil selections are currently in forage yield trials at nine Alabama locations. If they persist and are productive over several years, a trefoil variety adapted to at least northern Alabama should be available in the near future. **No seed of San Gabriel or the experimental is available** for general planting at present.

PROTEIN for the Aging Hen

DAVID A. ROLAND, SR., Department of Poultry Science

DURING THE HISTORY of commercial layer feeding, nutritionists have developed and used at least five different methods for feeding.

Although there are advantages and disadvantages of each method, the one factor that appears common with each is that nutritionists tend to overfeed protein. Even though excess protein increases feed cost, it is considered necessary as a safety factor to assure maximum production. Excess protein helps the nutritionist overcome the handicap of not always knowing exact feed consumption and numerous factors which could affect protein consumption.

Research at the Auburn University Agricultural Experiment Station was concerned with two questions on feeding protein. First, can some of the excess protein which was fed and accumulated as body reserves during the early stages of production be recalled and utilized during the last stage of production? Second, what would be the lowest level of protein and longest period of time it could be fed to old hens without an adverse effect on egg production?

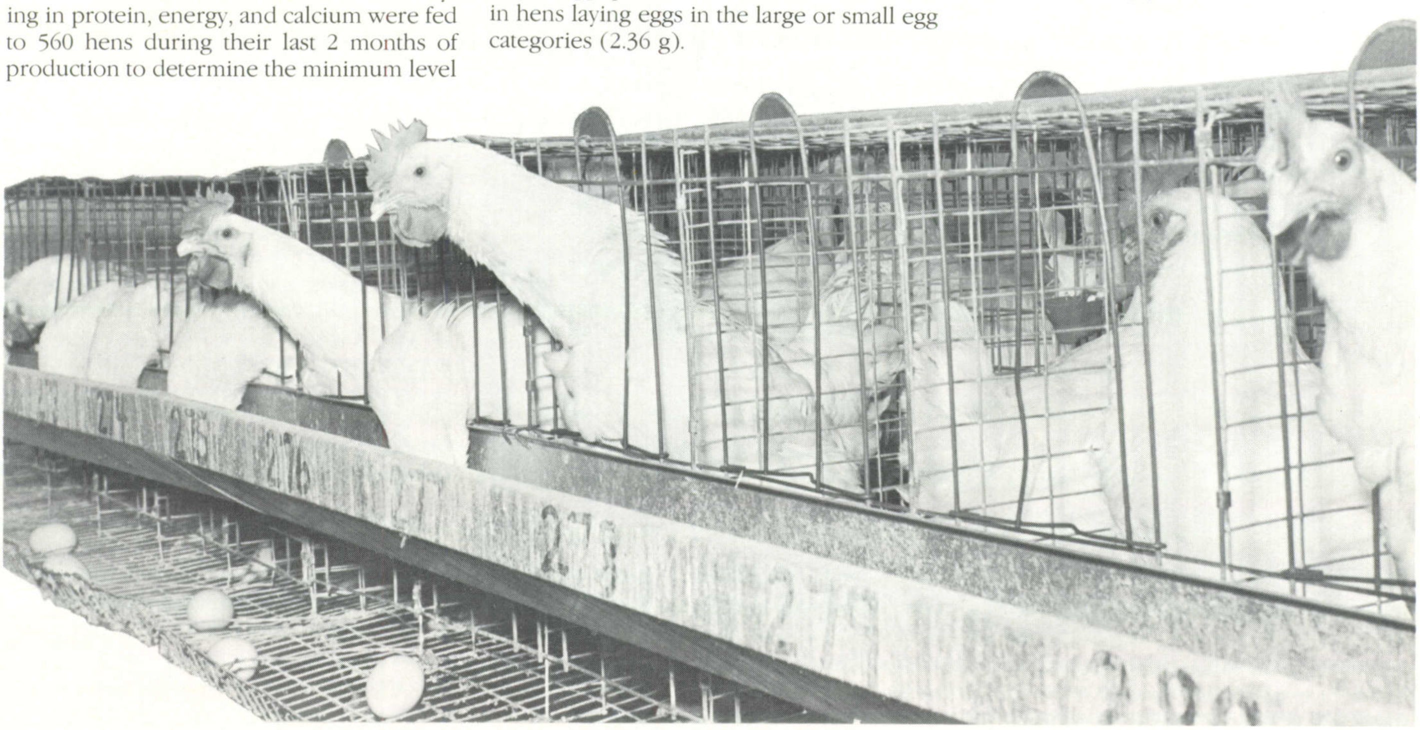
To answer the above questions four experiments were conducted in which diets varying in protein, energy, and calcium were fed to 560 hens during their last 2 months of production to determine the minimum level of protein necessary to maintain production.

Reducing the dietary protein from 16% to 13.5% or to 11.5% in iso-caloric diets did not decrease egg production in experiment 1 or 2. Feed consumption and change in body weight and egg weight were reduced in experiments 1 and 2 when the dietary protein level was reduced from 16% to 11.5%.

When protein content of the diet was reduced from 16% to 11.5% and energy increased from 2.84 to 3.30 M.E. Cal./g. (this would be equivalent to a 10% protein diet) in experiments 3 and 4, egg production was not reduced until the hens had been fed the diets for 6 weeks. Feed consumption varied according to the energy content of the diet. The change in body weight and egg weight was also significantly reduced. Although egg specific gravity was not significantly increased as egg size decreased, it is believed that egg breakage would, because a large egg is more likely to break during handling, with 45% of total breakage occurring in extra large eggs while only 28% occurs in large eggs. Reducing the dietary protein from 16% to 11.5% reduced egg weight (5.01 g) significantly more in the hens laying extra-large and jumbo eggs prior to the treatment than those in hens laying eggs in the large or small egg categories (2.36 g).

The results of these experiments indicate that the protein level of the diet can be reduced to as low as 11.5% in commercial-type corn-soy diets containing 2.84 M.E. Cal./g, 0.42% methionine plus cystine and 0.52% lysine for at least 1 to 2 months prior to hen disposal without adversely affecting egg production. This could result in substantial savings in feed costs since it is well below the 15% protein requirement as stated by the National Research Council and 15-17% protein level typically fed to aged layers.

In summary, a simplified form of a feed restriction program was used to reduce amino acid intake. In these studies the cost of feed was reduced $21.35 per ton and the amount of feed consumed by the hen was reduced 7.9%. After subtracting the loss in profits due to a decrease in body weight, which is very small, a savings of 22.8¢ per bird was realized. Since many factors including temperature, previous protein intake, body weight, general condition of bird, cage density, disease, production, strain, and egg size may influence the protein requirement and minimum level hens could tolerate, much thought is required before initiating such a program. However, a producer could determine the minimum level of protein and maximum length of time the protein level could be lowered with only minimum risk simply by using hens which would be going to market in 1 week and feeding a low level that week. If successful, he could then reduce the protein level for 2 weeks with the next group of hens, and so forth, until he had determined under his particular conditions the minimum level of protein and maximum length of time that protein level could be fed without affecting production.



Predicting Night Time Depletion Of Dissolved Oxygen in Catfish Ponds

CLAUDE E. BOYD and ROBERT P. ROMAIRE, Dept. of Fisheries and Allied Aquacultures

MOST CASES OF dissolved oxygen (DO) depletion in catfish ponds result because DO requirements by fish and other organisms during the night exceed the amount of DO produced by plankton during daylight hours. The amount of DO in pond water at dawn may be defined as,

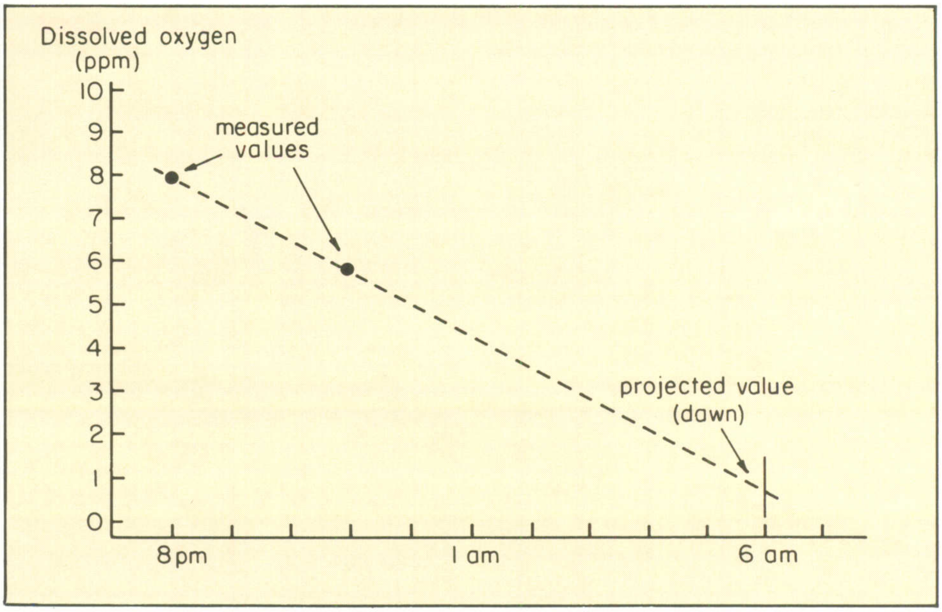
$$\left[\text{DO at dawn} = \text{DO at dusk} \pm \text{DO exchanged with the air above the pond} - \text{DO used by the fish} - \text{DO used by organisms in the mud} - \text{DO used by the plankton}\right]$$

All terms in the equation can be obtained for ponds which do not have "muddy" water from the following: pounds per acre of catfish, Secchi disk visibility[1] of pond water, and the DO concentration and water temperature at dusk[2]. The Secchi disk visibility is the most important term in the equation because it is used to estimate DO consumption by plankton, which is the major loss of DO. Computer simulation proved that the equation successfully predicted DO at dawn, table 1.

In channel catfish ponds, emergency aeration is used if DO falls below two parts per million (p.p.m.). The equation was used to determine for different weights of fish, DO concentrations at dusk, and water temperatures with Secchi disk visibilities corresponding to 2 p.p.m. DO at dawn. Results of the calculations were used to prepare tables which may be used by fish farmers to predict if DO depletion will occur in a particular pond during any given night.[3] Table 2 is an example and serves to illustrate the usefulness of the tables. Suppose a pond containing 2,500 lb. per acre of fish has a water temperature of 82°F, 7 p.p.m. DO at dusk, and a Secchi disk visibility of 8 in. Reference to table 2 gives a critical Secchi disk value of 19 in. Therefore, DO will fall below 2 p.p.m. by dawn. If instead, the pond has a Secchi disk value of 26 inches, DO depletion would not occur.

A graphical technique was also developed for predicting nighttime DO depletion. If the DO is measured at dusk and again after 2 or 3 hours, the two DO values can be plotted versus time and a straight line through the two points projected to estimate DO at dawn, see figure. The graphical procedure was just as accurate as the other method of predicting DO, table 1. The disadvantage of the graphical technique is that estimates of DO decline cannot be made until 2 or 3 hours after dark. However, it is useful in "muddy" ponds where the Secchi disk visibility method cannot be employed.

If either method indicates DO depletion by dawn, emergency measures should be initiated to prevent a possible fish kill. Fresh water may be pumped into the pond from a nearby source or water in the pond may be pumped from a depth of 2 ft. and discharged at an angle against the surface to effect aeration. Mechanical agitators can also be used to aerate pond water. Do not apply potassium permanganate as often recommended because recent research[4] showed this treatment is ineffective in alleviating DO depletion.



Graphical method of calculating DO at dawn.

TABLE 1. COMPARISONS OF MEASURED DO CONCENTRATIONS AT DAWN IN CHANNEL CATFISH PONDS WITH PREDICTED DO CONCENTRATIONS

Measured DO P.P.M.	Calculated DO (p.p.m.)	
	Secchi disk method	Graphical method
6.97	6.35	7.55
4.15	3.18	4.82
4.27	4.00	4.92
2.50	2.72	2.95
2.40	1.85	2.90

TABLE 2. CRITICAL SECCHI DISK VALUES (INCHES) FOR PONDS CONTAINING 2,500 POUNDS PER ACRE OF CATFISH. A SMALLER VALUE WOULD CAUSE DO TO FALL BELOW 2.0 P.P.M. BY DAWN

	DO concentration at dusk (p.p.m.)								
°F	4	5	6	7	8	9	10	11	12
68	S[1]	S	S	S	S	S	S	S	S
72	15	6	S	S	S	S	S	S	S
75	25	17	8	S	S	S	S	S	S
79	33	25	18	11	6	S	S	S	S
82	36	31	25	19	13	9	S	S	S
86	36	36	29	24	19	16	11	7	S
90	36	36	33	28	24	21	17	13	9

[1]S denotes that pond is safe from oxygen depletion.

[1]A Secchi disk is a disk which is 8 in. in diameter and painted with alternate black and white quadrants. The depth at which the disk disappears from view is the Secchi disk visibility. The Secchi disk visibility gives an estimate of plankton density in most ponds.

[2]Boyd, C. E., R. P. Romaire, and E. Johnston. 1978. Predicting early morning dissolved oxygen concentrations in channel catfish ponds. Trans. Am. Fish. Soc. 107 (In press). (3): 484-492.

[3]Available from the Department of Fisheries and Allied Aquacultures.

[4]Tucker, C. S. and C. E. Boyd. 1977. Relationships between potassium permanganate treatment and water quality. Trans. Am. Fish. Soc. 106 (5): 481-488.

Granular Herbicides Work As Well As Sprays

G. A. BUCHANAN, JOE STREET, and BILL BRYANT, Department of Agronomy and Soils
JIM STARLING and HENRY IVEY, Wiregrass Substation

NO NOZZLES to unclog, no water to haul, no retention of herbicide by crop foliage. . . .

These advantages offered by granular herbicides have created lots of interest in using this formulation. Nevertheless, use of granules in many cropping situations remains limited.

Apparently there is no loss of effectiveness when herbicides are formulated as granules, according to results of Auburn University Agricultural Experiment Station research. Granules were just as effective as sprays in controlling weeds in peanuts in 1977 experiments at the Wiregrass Substation.

Several experiments compared the effectiveness of Lasso applied as spray and as granules in preemergence or postemergence (to the crop) treatments. Formulations used were emulsifiable concentrate (EC) and 10% granules (G). Spray solutions were made in water and applied broadcast at 17 gallons per acre. Grass populations included crabgrass, goosegrass, and crowfoot grass. Broadleaves present were morningglory, pigweed, Florida beggarweed, and sicklepod. Particular emphasis was placed on control of Florida beggarweed.

In the first experiment, a standard treatment of Balan preplant incorporated at 1.1 lb. per acre was applied to all plots except the control. This provided some control of grass weeds so that clearer effects of Lasso treatments on broadleaf weeds could be observed.

Broadleaf control was excellent at the early rating, but substantially less at the late rating, table 1. Control of Florida beggarweed was similar to that of other broadleaf weeds. Spray and granular formulations of Lasso performed similarly at the 3- and 6-lb. per acre rates. There was no appreciable phytotoxicity to peanuts or yield reduction associated with any of the treatments.

TABLE 1. CONTROL OF WEEDS IN PEANUTS WITH SINGLE APPLICATION OF LASSO APPLIED PREEMERGENCE[1]

Lasso formulation and rate per acre	Broadleaf control[2]		Florida beggarweed control		Yield per acre[3]
	Early	Late	Early	Late	
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Lb.*
EC, 3 lb. . . .	100	65	100	60	4,874
EC, 6 lb. . . .	100	81	100	75	5,047
G, 3 lb.	96	68	100	70	3,871
G, 6 lb.	98	75	98	68	3,871
Control[4]	0	0	0	0	4,217

[1]Applied over Balan, 1.1 lb. per acre, preplant incorporated.
[2]Early ratings, 3-4 weeks after crop emergence; late ratings, 6-8 weeks after crop emergence.
[3]Taken from cultivated two rows of each plot.
[4]Ratings based on uncultivated portion of each control plot.

The second experiment consisted of repeated Lasso applications: preplant incorporated, preemergence, and early and late postemergence over-the-top. Early postemergence application of Lasso (EC) plus Premerge was compared with Lasso (G) immediately followed by application of Premerge. Both grass and broadleaf weed control were essentially complete at the time of the first rating in all treatments, table 2. Late season ratings indicated less control of grass weeds when applications were terminated at early postemergence. Overall broadleaf weed control was commercially acceptable with the exception of the Lasso (G) treatment terminated at early postemergence. Control of Florida beggarweed was excellent with all treatments.

Lasso in tank-mix with Premerge performed similarly to Lasso (G) followed by Premerge. Early peanut phytotoxicity was greater with the former treatment. There was no noticeable crop phytotoxicity at the end of the season, however, and yields did not differ among treatments.

In the third experiment, Lasso (EC) and Lasso (G) were applied 2 weeks after peanuts had emerged. Grass control was complete at both ratings, table 3. Control of broadleaf weeds (including Florida beggarweed) was excellent at the first rating, but declined by the end of the season. While there was no difference between sprays and granules in control of broadleaf weeds, control of Florida beggarweed was slightly better with granules.

In general, the granular formulation of Lasso performed about the same as sprays. This provides an added measure of versatility for peanut growers.

TABLE 2. CONTROL OF WEEDS IN PEANUTS WITH MULTIPLE APPLICATIONS OF LASSO (EC) AND LASSO (G) FORMULATIONS

Treatment[1] PPI-pre-early post-late post	Grass control[2]		Broadleaf control		Florida beggarweed control		Yield per acre[3]
	Early	Late	Early	Late	Early	Late	
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Lb.*
Lasso-Lasso-Lasso	98	70	100	98	100	98	3,595
Lasso-Lasso-Lasso (G)	100	75	98	63	100	100	3,353
Lasso-Lasso-Lasso-Lasso	100	88	98	95	100	98	3,353
Lasso-Lasso-Lasso (G)-Lasso (G) . .	100	90	100	85	100	100	4,528
Lasso-Lasso-Lasso+Premerge	100	95	100	100	100	100	3,664
Lasso-Lasso-Lasso (G)/Premerge[4] .	100	94	100	100	100	100	4,148
Control	0	0	0	0	0	0	3,215

[1]Application rate, 3 lb. per acre. Early post applications were made 2 weeks after planting and late post applications were made 4 weeks after planting. PPI means preplant incorporated.
[2]Early ratings, 3-4 weeks after crop emergence; late ratings, 6-8 weeks after crop emergence.
[3]Taken from the cultivated two rows of each plot.
[4]Premerge was applied immediately after application of Lasso (G).

TABLE 3. COMPARISON OF LASSO (EC) AND LASSO (G) WHEN APPLIED TWO WEEKS AFTER EMERGENCE OF PEANUTS

Lasso formulation and rate per acre	Grass control[1]		Broadleaf control		Florida beggarweed control		Yield per acre[2]
	Early	Late	Early	Late	Early	Late	
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Lb.*
EC, 3 lb.	100	95	100	65	100	53	5,012
G, 3 lb.	100	98	98	68	95	78	4,010
Control	0	0	0	0	0	0	4,217

[1]Early ratings, 3-4 weeks after crop emergence; late ratings, 6-8 weeks after crop emergence.
[2]Taken from the cultivated two rows of each plot.

CHARACTERISTICS of Alabama Farms and Farmers

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

How large are Alabama farms?

MEASURED IN TOTAL ACRES, the average Alabama farm was, in 1974, 209 acres. For many years Alabama farms have become larger as units were combined and additional acreage added to more fully utilize machinery and equipment and increase volume of production. Alabama's average farm size has approximately doubled since 1950.

What is the size distribution of farms?

About one-third of Alabama's farms were less than 50 acres in 1974. However in 1950, slightly more than half were of this size. Generally, the larger than average size farms have accounted for increasing proportions of the total number in recent years. For example, farms of 500 acres and over accounted for 3% of all farms in 1950 but 8% in 1974.

How disproportionate is the income-generating ability of Alabama farms in terms of cash farm receipts?

In 1974 Alabama farms that had less than $20,000 in cash farm receipts accounted for 81% of total farms but only 16% of total cash farm receipts. In other words, 19% of the farms had 84% of the receipts. This compares to the U.S. with 27% of the farms having 88% of total cash farm receipts in 1974.

Are Alabama farmers getting older or younger as an average?

There is some evidence that the average age of Alabama farmers is declining. In 1974 the Census of Agriculture gave the average age of Alabama farmers as 52.3 years compared with 52.7 in 1964. However, from 72% to 73% of Alabama's farmers were in the 45 and over age category in the 1964, 1969, and 1974 censuses of agriculture.

What is the predominant legal organization of Alabama farms?

The major legal organization of Alabama farms with sales of $2,500 and over is the single proprietorship. This form of business organization accounted for 92.4% of the farms in 1974, while partnerships accounted for 6.5% and corporations 0.9%. Form of business organization was not reported for farms of less than $2,500 sales but no doubt a very high proportion were single proprietorships.

Is tenant farming becoming more or less important in the State?

Tenant farmers have virtually disappeared. As recent as 1964, 21% of all farmers were classified as tenants but in 1974 the proportion dropped to only 7%. A majority of all farmers in Alabama, 71%, were full owners in 1974. Twenty-two percent of the farms in 1974 were classified as part owners; both owning and renting land. This group of part owners accounted for 41% of the land in farms. Part owners operated larger farms as an average than full owners or tenants.

What are the major land uses on farms?

Cropland, woodland, and other (permanent pasture, lots, roads, wasteland, etc.) are the broad uses given by the Census. Although 45% of the land in farms in 1974 was classified as cropland, harvested cropland amounted to a little more than half of the cropland. Woodland accounted for 35% of the total land in farms and other land 20%. Over-all since 1950, land in farms as well as the total acreage of land classified as cropland on farms has declined.

How does Alabama's average farm investment compare to the U.S.?

The average total capital investment of U.S. farms in 1974 was $142,163. Official data are not available on the average total investment per farm for Alabama. However, the 1974 Census of Agriculture reported the average value of land and buildings per Alabama farm was $76,049. If land and buildings are assumed to constitute the same proportion of total investment as for the U.S., the total investment per farm in Alabama in 1974 was $100,300, or 71% of the U.S. average. Obviously total investments have increased substantially since 1974.

How valuable is Alabama farm real estate?

Value is most often reported as market price or value. The average value of farm real estate in Alabama in February 1978 was reported as $452 per acre. Value per acre has approximately doubled in the past 5 years.

Alabama's average value of farm real estate was not greatly different from the U.S. February 1978 figure of $490 per acre. The highest average value of farm real estate, $2,057 per acre, was reported for New Jersey. Averages for Corn Belt states were $1,300 to $1,600 per acre.

Why have farm real estate values and total capital per farm increased so greatly in recent years?

There are several reasons, some within agriculture and others from outside the farming sector. In 1973 the highest U.S. total net farm income ($33.3 billion) was achieved. As a partial result farmers bid for more land to expand production. The farm enlargement process has been a significant factor in increased farm real estate values. As larger tractors and machinery were adopted, a greater acreage was required in order to keep per unit costs of production in line. Farm real estate has also been considered by many as a favorable hedge against inflation. Thus, not only farmers but many groups of nonfarmers have invested in farm real estate. Demands have also been growing for land to go into nonfarm uses, such as housing developments, recreational areas, highways, airports, pipelines, shopping centers, etc.

What has been the level of average cash farm receipts and expenses per farm for Alabama in recent years?

In 1976, the average realized gross income per Alabama farm was $23,407 according to USDA figures. The increase in realized gross income per farm has been rather steadily upward for the past 25 years. However, farm production expenses have also increased substantially. In 1976, production expenses averaged $16,471 per farm, leaving a realized net income per farm of $6,936. Only in one other year, 1973, has the realized income per farm for Alabama been as high.

What about the squeeze of increased costs relative to gross income?

Prior to 1966, production expenses were taking 70% or less of realized gross income per farm. Since 1966 production expenses have taken more than 70% of gross income. An exception was 1973. However, in 1974 production expenses took 81% of realized gross income.

Improved Loblolly and Slash Seedlings Available to Alabama Landowners

JAMES F. GOGGANS
Department of Forestry

THE COOPERATIVE TREE breeding program that was started 14 years ago by the Alabama Forestry Commission and the Auburn University Agricultural Experiment Station has begun to yield limited quantities of seedlings.

In the method of breeding used, individual trees that are outstanding for their volume growth, bole straightness, crown form, and wood specific gravity are selected as breeding parents. These selected parents are propagated by grafting and established in a seed orchard where they can interbreed and produce wind-pollinated seed. Each parent must be progeny tested. Unsatisfactory parents are removed from the orchard and then seed of a tested, improved variety are produced by the orchard.

At present eight varieties of improved pine are being bred on 256 acres of seed orchard Two southern Alabama loblolly pine seed orchards and one Alabama slash pine seed orchard have begun to yield limited quantities of seed. In the spring of 1976 the Alabama Crop Improvement Association approved these three orchards for the production of "Certified Non-Tested Seed Orchard Seed." The first crop of these seeds was collected last fall and they are being used in the Forestry Commission's nurseries to produce the first crop of "Certified Non-Tested Seed Orchard Seedlings."

A very limited number of these seedlings will be available for the next planting season. Improved seedlings should be ordered from the Alabama Forestry Commission. The supply of improved seedlings will increase as trees in the seed orchards grow older. The goal of the tree improvement program is to provide the Forestry Commission nurseries with enough genetically improved seed to allow only the production of genetically improved seedlings.

A total of 640 parent trees has been graded and selected for use in seed orchards. Information concerning the eight improved pine varieties currently being bred is presented in the table.

ESTABLISHED SEED ORCHARD

Variety and species	Location-county	No. of parents	Average age	Acreage
Northern Ala. Loblolly Pine ...	Macon	42	9	17
Southern Ala. Loblolly Pine ...	Geneva	42	8	72
Southern Ala. Loblolly Pine ...	Escambia	20	11	5
Southern Ala. Loblolly Pine ...	Geneva	100	2	62
Ala. Slash Pine	Escambia	20	9	5
Ala. Slash Pine	Geneva	42	8	70
Northern Ala. Longleaf Pine ..	Autauga	20	9	5
Southern Ala. Longleaf Pine ..	Geneva	42	7	20

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