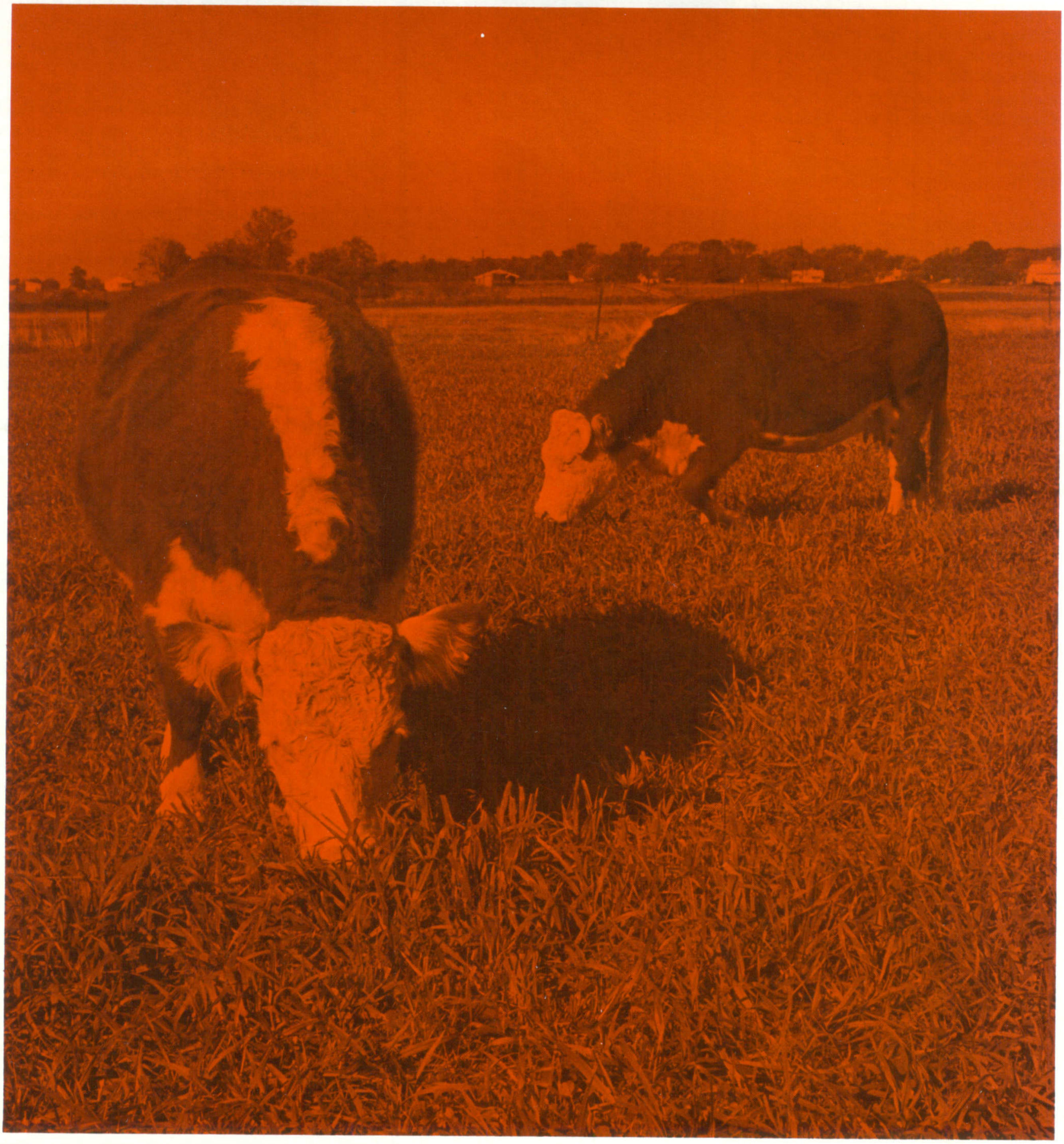
highlights

of agricultural research



Volume 25, No. 3

Fall 1978

Agricultural Experiment Station
R. Dennis Rouse, Director

Auburn University
Auburn, Alabama

Director's Comments

In AMERICA autumn brings thoughts of harvest and of a favorite heritage—the celebration of that first Thanksgiving.

Various modern day slogans about farmers are seen on bumper stickers and elsewhere, but the one I like is "No Farmers—No City Folks." As the popular quote of Sir Winston Churchill goes, "Never in history have so few done so much for so many." This certainly applies to the American farmers. The problem is that too few of the population understand the real cost to farmers of producing and marketing the food we eat. Farmers get the blame for increased food cost, though they are the victims of increased cost of everything they buy and they are the nation's largest consumer. Farmers are always squeezed between those from whom they buy and those to whom they depend on to buy farm products. The Federal government and the news media do too little to correct the popular impression that farmers are to blame for increased cost of food.

R. Dennis Rouse

Every person engaged in agriculture either directly or indirectly has a responsibility to insist that the farmers side be put in its proper perspective before the people. One way is to participate in Farm-City activities this fall in your local community, county, and state.

On November 9, 1978, the State Farm-City Committee will hold the Annual Agricultural Appreciation Day at the new E. V. Smith Research Center of the Alabama Agricultural Experiment Station, which is located half-way between Auburn and Montgomery on I-85. The buildings planned for this unit from the 1973 bond issue, approved by the legislature and Governor Wallace and all the people of this State, will be complete. Although much development remains, we're pleased that the Farm-City Committee accepted our invitation to hold its statewide meeting at this fine new agricultural research facility. We hope readers of this column will join with us on November 9, as we dedicate these facilities to Alabama farmers for a better future in agriculture through research. At the dedication Dean Emeritus E. V. Smith will be honored and these facilities officially named:

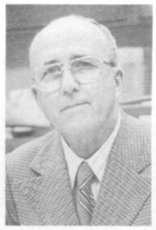
E. V. Smith Research Center
Agricultural Experiment Station
Auburn University

These facilities, together with the structures at Auburn and three substations, constitute the largest single investment in agricultural research facilities ever made by the taxpayers of this State. We invite everyone to share with us in an expression of appreciation for this support and we hope to convey clearly a better understanding what it will mean to all of the people of Alabama. These facilities will be dedicated to the proposition that farmers should receive a fair return from their investment of capital and labor in their effort to meet the food and fiber needs of this nation. The research conducted using this new facility will have, as an overriding objective, reducing uncertainty and increasing productivity of the crop and livestock enterprises of the producers of this State.

I would like to explain to the readers of *Highlights* the philosophy of the Auburn University Agricultural Experiment Station. We believe we exist to provide a dependable point of reference. We strive to be a point of confidence that farmers, merchants, and agribusinessmen feel they can come to or work with in complete honesty and openness, with no motive except that of service as a public supported organization of scientists dedicated to the agricultural industry of this State. The results of our research are open to all. *Highlights* is especially designed for rapid dissemination of results both to the agribusinessmen and to producers. We also like to show a cross section of our work, both basic and applied. When results of evaluation of a material or variety or breed or practice become available, they are presented to the public. In the case of products that show up to be less effective, we hope that company will correct the problem. We stand ready to be of assistance.

may we introduce . . .

Dr. E. D. Donnelly, author of the story about new vetch varieties released on page 3. A professor in the Department of Agronomy and Soils, he serves as both teacher and researcher. His specialty is breeding of forage legumes.



An Alabama native, Donnelly received his B.S. in agricultural science and M.S. in agronomy from Auburn University. His study at Auburn University was interrupted by 4 years in the U. S. Army during World War II. He received the Ph.D. degree in plant breeding from Cornell University. During his 26-year tenure at Auburn University he has released the following vetch varieties: Warrior, Nova, Nova II, Vantage, Vanguard, and Cahaba White. He has released the following sericea lespedeza varieties: Serala, Interstate, Serala '76, and Interstate '76. He also played an important role in breeding of Regal ladino clover.

In 1966 Donnelly was elected a Fellow in the American Society of Agronomy. He also holds membership in the American Society of Agronomy, Crop Science Society of America Alpha Zeta, Gamma Sigma Delta, Phi Kappa Phi, and Sigma Xi.

HIGHLIGHTS of Agricultural Research

FALL 1978 VOL. 25, NO. 3

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Information contained herein is available to all without regard to race, color, or national origin.

ON THE COVER. Timing of N applications was found to affect uniformity of ryegrass forage production. See story on page 5.

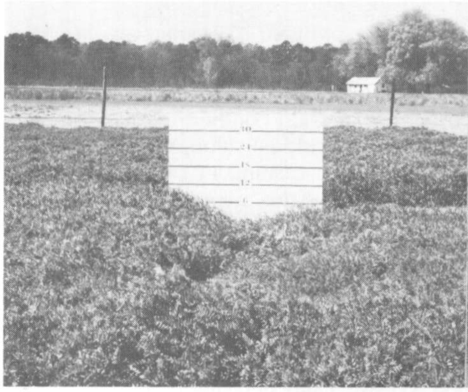


FIG. 1. Herbage produced by the earlier maturing Nova II, left, and hairy vetch, right, on March 16, 1977. Plant Breeding Unit, Tallassee. FIG. 2. Third reseeding stand of Cahaba White in grain sorghum stubble. Plant Breeding Unit, Tallassee. Photo made March 16, 1977, following a very cold winter.

NEW VETCH VARIETIES RELEASED

E. D. DONNELLY, Department of Agronomy and Soils

ALTHOUGH there was a time in the 1950's and 1960's when interest decreased in the development of legumes for forage and green manure because of the advent of "cheap" commercial nitrogen, Auburn University Agricultural Experiment Station continued research and development of improved vetches. This is fortunate, because four new varieties, 'Cahaba White', 'Vantage', 'Nova II', and 'Vanguard', are now available to meet a renewed interest in green manure crops.

In the vetch breeding program, emphasis has been placed on early herbage production, high seed yields, and ability to reseed. To reach these goals, special attention was given to winter hardiness, resistance to the vetch bruchid or weevil (*Bruchus brachalis* Fahr.), resistance to root-knot nematodes (*Meloidogyne* spp.), and a high percentage hard seed.

Variety Development

To combine the desired characteristics into varieties, it was necessary to hybridize vetch species. Cahaba White, Vantage, and Nova II were developed from *Vicia sativa* (Al. 1894) x *V. cordata* (P. I. 121275), and Vanguard from *V. sativa* (Al. 1894) x *V. serratifolia* (P. I. 170017).

Variety Description

Cahaba White and Nova II have white flowers while Vanguard and Vantage have purple flowers. Cahaba White and Vantage are semi-prostrate and compact in growth habit; Nova II and Vanguard are upright and have a more open growth habit.

Variety Performance

Herbage yields of these new vetches were obtained in central Alabama during two unusually cold winters: 1976-77 and 1977-78. In 1977, table 1, Cahaba White, Vantage, Nova II, and Vanguard produced as much herbage as did Warrior when cut at two dates. Warrior is a non-reseeding variety of common vetch, *V. sativa*. All of these five varieties produced more herbage than hairy vetch when cut early (March 16), table 1. Nova II also produced more herbage than hairy vetch when cut April 4 and April 20. In 1978 there was no difference in the herbage yield of Cahaba White, Vantage, Vanguard, and hairy vetch when cut either March 20 or March 31, table 2. However, Nova II produced less herbage than these on both cutting dates. This was due to cold damage to Nova II in 1978; but, it is sufficiently cold hardy for central Alabama most years, see table 1 and figure 1.

TABLE 1. TOTAL YIELD PER ACRE PRODUCED BY VETCH VARIETIES, WHEN CUT AT TWO DATES AT THE PLANT BREEDING UNIT, TALLASSEE, 1976-77

Variety	Dry wt./acre	
	Cut on 3/16/77	Cut on 4/20/77
	Lb.	*Lb.*
Hairy	411 a*	3,870 a
Vantage	1,416 b	4,549 ab
Vanguard	1,598 b	4,384 ab
Warrior	1,648 b	4,241 ab
Cahaba White	1,787 b	4,335 ab
Nova II	1,908 b	4,725 b

*Yields within a column followed by the same letter are not significantly different, P<.05.

Seed yields of these new vetch varieties have been equal to that of Warrior. Thus, they have the potential to produce 1,500 lb. of seed per acre if well supported by cotton stalks, sorghum stubble, or other suitable means.

These four new vetch varieties have a hard seedcoat and reseed well, figure 2. Good reseeding stands can be obtained when mature seed are plowed down in preparing land for crops such as grain sorghum or soybeans.

Advantages

Cahaba White, Vantage, Nova II, and Vanguard are sufficiently cold hardy for a green manure or grazing crop in the southern two-thirds of Alabama. The following are advantages of these new vetches: (1) produce herbage earlier than hairy vetch; (2) produce high seed yields; (3) have a hard seedcoat and will reseed; (4) are resistant to the vetch bruchid or weevil that often destroys 50% of the seed produced by hairy vetch; (5) mature seed 10 days earlier than hairy vetch; (6) are resistant to three of the five root-knot nematode species, while hairy vetch is susceptible to all five (the new vetches act as trap crops for these nematodes); and (7) they are resistant to races 3 and 4 of the soybean cyst nematode.

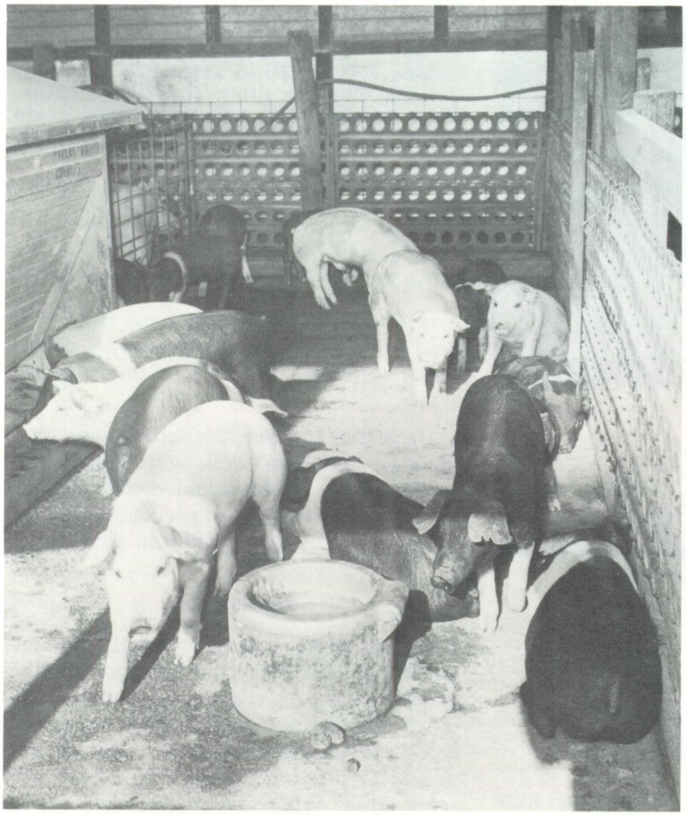
These reseeding vetches can be used for green manure crops, grazing, or seed. They can be used in cropping systems with crops such as cotton, rye, grain sorghum, corn, and soybeans. Or they can be planted annually for temporary grazing crops or for green manure to be turned ahead of corn. When used for green manure, they can produce available nitrogen equivalent to 90 to 120 lb. of fertilizer nitrogen.

Seed are expected to be available on a limited basis in fall of 1978.

TABLE 2. YIELD OF DRY HERBAGE PER ACRE PRODUCED BY VETCH VARIETIES, WHEN CUT AT TWO DATES AT THE PLANT BREEDING UNIT, TALLASSEE, 1977-78

Variety	Dry wt./acre	
	Cut on 3/20/78	Cut on 3/31/78
	Lb.	*Lb.*
Nova II	928 c*	2,549 b
Cahaba White	1,749 ab	3,398 a
Hairy	1,821 ab	3,521 a
Vanguard	1,874 ab	3,286 a
Vantage	2,150 a	3,811 a

*Yields within a column followed by the same letter are not significantly different, P<.05.



PIGS GROW WELL ON HIGH MOISTURE CORN

W. M. WARREN, Dept. of Animal and Dairy Sciences
ROBERT MOORE, Upper Coastal Plain Substation

THERE'S NO QUESTION that corn can be successfully stored when harvested at moisture levels of 25-30%. Storing in air-tight bins or treating the corn with dilute acid when placed in conventional storage will maintain the grain in good condition. Thus, the only question remaining is whether nutritional value of high moisture corn is adequate to make possible cashing in on advantages of harvest time, storage, and drying time that are associated with high moisture harvest.

Information coming out of new Auburn University Agricultural Experiment Station research establishes the nutritional value of high moisture corn treated with dilute acid at storage. Pigs fed high moisture corn had performance equal to others fed conventionally dry corn.

The test at the Upper Coastal Plain Substation used growing-finishing pigs to compare performance on high moisture and dry corn and included a series of six trials conducted from October 23 to August 26. Minerals, vitamins, and antibiotics were provided pigs in all treatment groups.

High moisture corn was treated by the addition of 1.1% acetic and propionic acids and stored in conventional bins. The acid was sprayed on the corn as it was augered into the bins.

Test rations compared were:

Treatment 1—high moisture corn (25% moisture at storage) and a pelleted protein supplement (40% crude protein) free choice.

Treatment 2—dry corn (12% moisture as fed) plus the pelleted protein supplement free choice.

Treatment 3—a 16% crude protein, dry corn-soybean meal ration free choice to 120 lb. average size and a 14% crude protein ration to market weight of 220 lb.

Six-trial averages for daily gain, feed efficiency, days on feed, and backfat probe are presented below by treatment:

Treatment	*Number of pigs*	*Av. daily gain, lb.*	*Days on feed*	*Feed/lb. gain, lb.*	*Backfat probe, in.*
1	86	1.52	100.2	3.66	1.14
2	87	1.52	98.3	3.30	1.17
3	86	1.54	94.6	3.61	1.15

There were no treatment differences in average daily gain or in carcass composition (backfat thickness). Pigs on the acid treated high moisture corn did require more feed per unit of gain (3.66 lb.) than pigs on the dry corn-supplement free choice (3.30 lb.). Much of this difference can be accounted for by corn consumption during the first two trials.

Early in the storage season the moisture content of the acid treated corn was relatively high, 20-25%, but this gradually decreased to a level comparable to the dry corn by the beginning of the third trial. Treatment 2 pigs were only slightly more efficient in utilization of corn than those in treatment 3.

Even though pigs in treatments 1 and 2 were allowed protein supplement free choice, consumption of the supplement was not excessive. The amount of supplement consumed per unit of gain did not differ greatly from that consumed by the pigs in treatment 3 receiving the meal ration.

The addition of 1.1% acid to the high moisture corn cost approximately 3.2¢ per bushel, plus a small amount for additional labor. In comparison, reducing the corn's moisture level from 25% to 15% would cost an estimated 10¢ per bushel. In addition, labor and hauling to and from the drying facility adds to the cost.

In the study reported, pig performance was essentially the same on acid treated and dry corn rations. Also the corn was preserved in a satisfactory condition at some saving in cost and convenience. Thus, it appears entirely satisfactory to add propionic-acetic acids at approximately 1.1% of weight to corn having as much as 25% moisture at storage.

One precaution is advised: Do not walk on the acid treated corn in storage. This causes pockets of mold to develop.

Controlling Seasonal Growth of Rye-ryegrass Pastures

J. W. ODOM and R. L. HAALAND, Dept. of Agronomy and Soils
F. B. SELMAN and E. L. CARDEN, Gulf Coast Sub.

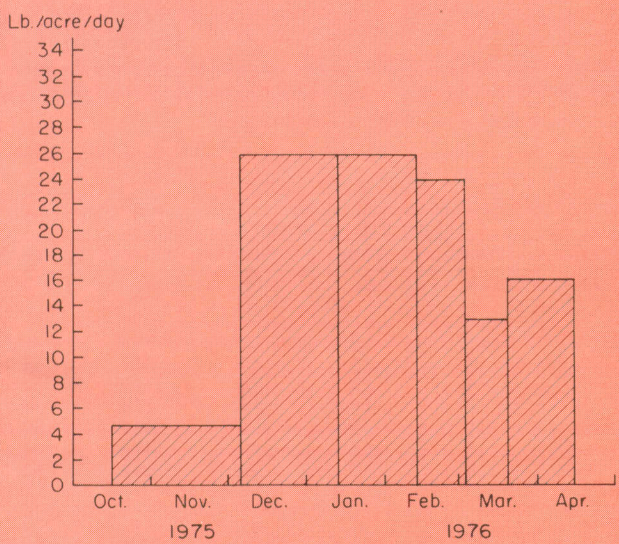


FIG. 1. Average daily forage production with single application of 200 lb. N made in fall.

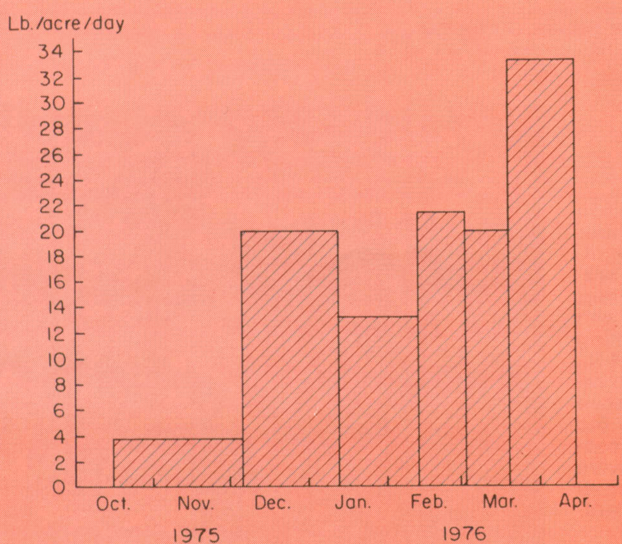


FIG. 2. Average daily forage production with split application of 200 lb. N (100 lb. fall and 100 lb. spring).

Heavy nitrogen application in fall resulted in heavy forage production during December and January. Splitting the same amount of N into equal fall and spring applications reduced December-January forage but gave large increases in March-April production.

GROWTH HABITS of rye and ryegrass largely determine when forage will be available for grazing on pastures of these excellent cool season grasses. But timing of nitrogen application offers a chance to regulate seasonal productivity to help fit individual farm needs, according to results of Auburn University Agricultural Experiment Station research.

How timing of nitrogen application affects uniformity of rye-ryegrass forage production was studied in a small plot experiment at the Gulf Coast Substation, Fairhope. In fall 1975 a mixture of McNair Vita Graze rye (60 lb. seed per acre) and Gulf ryegrass (15 lb. per acre) was sown on an area that had previously been limed according to soil test recommendation.

To make sure that nitrogen would be the only limiting mineral, 120 lb. each of P_20_5 and K_20 was applied along with a commercial mineral mixture. Nitrogen was applied at different times and in different amounts to determine the best combination for improving uniform production over the growing season.

Fall application of 200 lb. of N per acre produced a large amount of forage during December and January, figure 1. Splitting the 200 lb. nitrogen into equal fall and spring applications changed the seasonal distribution of forage, figure 2. The result was reduced forage yield during December and January, along with tremendous increases in March and April. The N rates mentioned are cited to illustrate effects of different application times. **They are not meant as recommended rates.**

It is important to note that nitrogen rates which produce better seasonal distribution may not result in maximum yields. When rye-ryegrass pastures are fertilized with enough nitrogen to produce maximum yield, the distribution of forage production will be controlled by the weather.

Very high nitrogen rates also may result in peaks of forage production that animals may not be able to effectively utilize. On the other hand, when more forage production is needed during December and January than in March and April, heavy fall nitrogen applications are in order.

PLANTING SMALL PECAN TREES OFFERS ECONOMY IN ORCHARD ESTABLISHMENT

HARRY J. AMLING and KAREN A. AMLING, Department of Horticulture

TABLE 2. COST OF PECAN TREES BY SIZE STOCK, 1978

Tree size	Wholesale price/tree (1-10 trees)	
	Cape Fear	Cheyenne
6-12 in.	cull-no price	cull-no price
12-18 in.	$2.70	$3.45
2-3 ft.	4.00	4.75
3-4 ft.	4.60	5.35
4-5 ft.	5.75	6.50
5-6 ft.	6.55	7.30
6-7 ft.	7.35	8.10

ESTABLISHMENT OF PECAN orchards with 11 to 16 trees per acre is no longer economically feasible in Alabama. Today's orchards may have 34 to 150 trees per acre of the new precocious and prolific varieties.

With such dense plantings, cost of trees for planting accounts for a major part of the initial investment. Thus, any chance for savings would be welcome. One potential savings could be from buying smaller trees for planting. And results of new Auburn University Agricultural Experiment Station research indicate that smaller trees quickly make up the size differences and show little loss of production even in early years.

Seven sizes of nursery stock Cape Fear trees were planted in spring 1971 at the Gulf Coast Substation, Fairhope. Sizes ranged from 6-7 ft. down to 6-12 in. in height. A second planting of the same size trees of the Cheyenne variety was made in 1972.

Weeds, insects, and diseases were thoroughly controlled during the experimental time span reported here. All trees were drip irrigated with a 1-gal. per hour emitter per tree on an 8-hour per day schedule during the growing season.

Birds were a particular problem in acquiring Cheyenne yield data in the fifth growing season. This was because of small nut size and the lack of a crop on most other varieties growing on the Substation.

Results emphasize that a high degree of orchard management is necessary for plantings of small trees to succeed. This was particularly evident in weed control and tree training. With tree sizes below 3-4 ft., timing of herbicide sprays in relation to weed height was critical when using directed application of post-emergence herbicides. Training trees so that the lowest limb is high enough to permit operation of harvesting equipment requires a high degree of judgment and foresight when small trees are planted.

Stair-step differences in tree height that existed at beginning of the experiment disappeared by the sixth or seventh growing seasons for the vigorous Cape Fear variety. Neither were there consistent differences in yield because of tree size at planting, table 1.

The less vigorous Cheyenne variety showed results of the planting size differences longer than did Cape Fear, both in tree size and yield. Even with this variety, however, there was no appreciable difference in tree size by the end of the sixth growing season among trees of the top three sizes evaluated. Yield followed the same pattern as tree size.

Potential savings from planting small trees is evident from price data in table 2. With Cape Fear variety, for example, planting the 2- to 3-ft. size tree at a spacing of 32 x 40 ft. (34 trees per acre) could reduce the initial investment by approximately $114 per acre without affecting future yields.

Similar savings are possible with Cheyenne, which is planted as close as 22 x 30 ft. (66 trees per acre). The savings from using 4- to 5-ft. trees instead of 6- to 7-ft. trees could potentially be as high as $105 per acre. Again, there would be no appreciable effect on future yields.

TABLE 1. EFFECT OF TREE SIZE AT PLANTING ON PECAN YIELD THROUGH SEVENTH SEASON

Tree size at planting	Yield per tree, by season after planting					
	Third	Fourth	Fifth	Sixth	Seventh	Accumulated
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Cape Fear variety						
6-12 in.	0.0	0.1	3.3	5.4	36.4	45.2
12-18 in.	0	.2	2.5	3.7	27.1	33.5
2-3 ft.	0	.4	2.2	7.1	34.3	44.0
3-4 ft.	0	.2	1.0	5.8	27.4	34.4
4-5 ft.	0	.1	2.8	6.1	32.2	41.2
5-6 ft.	0	.5	3.3	9.1	41.3	54.2
6-7 ft	0	.8	3.7	9.5	38.8	52.8
Cheyenne variety						
6-12 in.	0	.1	[1]	9.6	[2]	9.7
12-18 in.	.1	1.4		14.2		15.7
2-3 ft.	0	.2		12.4		12.6
3-4 ft.	0	.4		19.1		19.5
4-5 ft.	.6	1.8		23.9		26.3
5-6 ft.	.1	1.4		23.2		24.7
6-7 ft.	.4	3.3		22.1		25.8

[1]Cheyenne crop lost this year because of bird damage.
[2]Cheyenne planted in 1972; thus, no seventh year data.

The stair-step progression down the row in this November 1972 photo shows tree size differences after two growing seasons resulting from different sizes at planting. Beginning with the closest tree, size at planting was 6-7 ft., 5-6 ft., 4-5 ft., 3-4 ft., 2-3 ft., 12-18 in., and 6-12 in., respectively. The size difference had largely disappeared by the sixth or seventh growing season, however, and yields were essentially the same from all trees regardless of size at planting.

YELLOW APHIDS
A Sticky Problem For Pecans

P. M. ESTES, Dept. of Zoology-Entomology

COMMERCIAL PECAN GROWERS usually have problems each year with insect pests. The most common and often the most troublesome pests of pecans are yellow aphids, figure 1. Each year, beginning in early spring, infestations of this insect occur on pecan foliage and continue until late in the fall. Over half of the insecticides applied to pecans in Alabama are for aphid control.

Two similar species make up the yellow aphid group. One is the black-margined pecan aphid, *Monellia caryella,* and the other is the clear-winged pecan aphid, *Monelliopsis nigropunctata.* The immature stages or nymphs of these two species are small, yellow, soft-bodied insects less than 1/16 in. long. They are usually found on the underside of pecan leaves. The two species can be separated in the adult stage. The adult clear-winged aphid has unmarked wings that fold up over the body at rest, whereas the adult black-margined pecan aphid has black lines on the forewings, and the wings are held flat over the body at rest, figure 2. Adult clear-winged aphids are active and readily move or fly when disturbed, while the adult black-margined aphid is rather inactive.

Both species have the same basic life history, figure 3. They overwinter as an egg in cracks and crevices in pecan twigs, stems, and under bark. In the spring eggs hatch and nymphs begin to suck sap from the leaves. In 7-10 days nymphs develop into winged females that give birth (without mating) to living young. Females can produce 40-80 offsprings during her life span of 15-20 days. Nymphal development takes 4-7 days during warm weather and this cycle continues throughout the summer. In early fall some offsprings develop into males and others into wingless females. These two forms mate and the female deposits the overwintering egg.

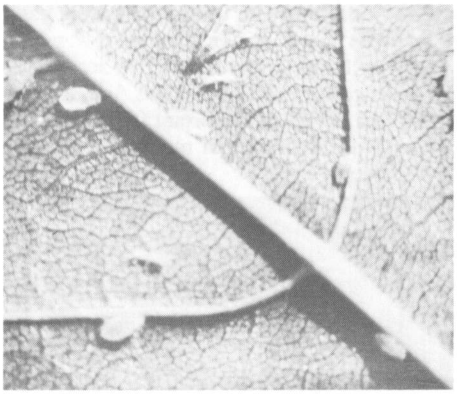


FIG. 1. Yellow aphids on a pecan leaf.

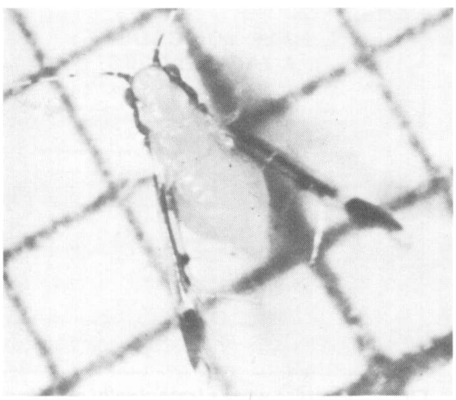


FIG. 2. Winged female of the black-margined pecan aphid.

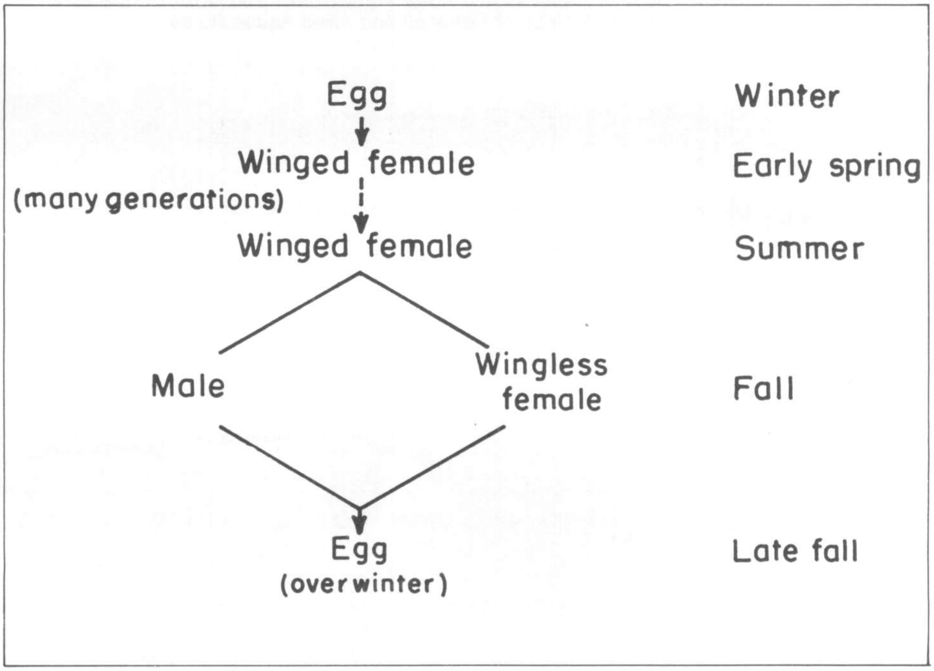


FIG. 3. Life history of the yellow aphid on pecans.

Yellow aphid populations usually have two peaks during the year. In May and June a peak occurs at which time the clear-winged pecan aphid is the most common. During midsummer (July and early August) yellow aphids are usually not abundant. However, in late August, September, and occasionally into October a second peak occurs, and the black-margined pecan aphid is the most common.

Yellow aphids damage pecan trees in three ways: (1) They remove nutrients from trees by sucking sap from leaves; (2) they produce large amounts of honeydew which promotes growth of black sooty mold fungus on the leaf surface, causing a shading effect; and (3) feeding damage by aphids causes premature defoliation of pecan trees. Although all three types of damage are important, honeydew production and sooty mold growth are the most noticeable, especially on yard trees. Large populations of yellow aphids can produce so much honeydew that the ground beneath the pecan trees will become sticky.

Yellow aphids are controlled in commercial orchards with foliar application of insecticides. Application is usually made with a mist blower or air-blast sprayer. Recent research by scientists in Auburn University's Agricultural Experiment Station has shown that either Zolone®, Cygon®, or Trithion®, applied at ¼ to ½ lb. active insecticide per 100 gal. (16 gal. per tree) will control yellow aphids. Care must be exercised to assure good coverage of large trees. High winds, excess sprayer speed (greater than 3 mph), and worn nozzles often contribute to poor coverage and reduce insecticide effectiveness.

Research is currently being conducted on the use of systemic insecticides for aphid control. When these materials are applied to the soil beneath a pecan tree they are transported through the roots and trunk into the leaf tissue, where they collect in amounts toxic to sucking insects like aphids. In a recent experiment, application of 1.0 lb. active Temik® per tree gave excellent aphid control. Other promising systematic insecticides are Furadan® and Thimet.

REWARD: Effect on Tag Returns From A Large Reservoir

W. L. SHELTON, Dept. of Fisheries and Allied Aquacultures and USDI Cooperative
W. M. DAVIES, Dept. of Fisheries and Allied Aquacultures

FIG. 1. Bass were electro-shocked, tagged, and returned unhurt to West Point Reservoir.

THE EXTENT that fishing adds to the total mortality of any fish population is of particular interest to fishery managers. In large bodies of water, management is often limited to regulating the number, weight, or size of fish harvested. Beneficial effects can result when a reduced rate of largemouth bass mortality leads to increased biomass or if restructuring the size composition of the population increases growth. Another benefit of maintaining a relatively high percentage by weight of bass in a body of water is better fishing (greater average size) for other species that bass normally prey upon.

West Point Reservoir has gained nationwide recognition as a potential bass fishing bonanza. Sampling the creel since the reservoir was first impounded suggests that the advanced publicity has resulted in a high rate of fishing pressure and catch. These data alone, however, are not sufficient to determine the effects of fishing on the bass population. Additional information is required to determine the percentage of harvestable size bass in the reservoir that are actually being caught. Information of this type is estimated by the ratio of tagged fish caught to the total number that have been tagged in the population. In tagging studies of this type it is assumed that all tagged fish caught are reported; however, this is not always true.

During 1976, scientists from Auburn University's Agricultural Experiment Station tagged 1,351 bass in West Point Reservoir, figure 1. No reward was offered for returned tags and only 78 or about 5% were reported. Based on estimates of fishing pressure and the number of bass available for harvest, this percentage appeared to be unrealistically low. In 1977, the tagging program incorporated a reward system to stimulate reporting of tagged fish caught. Three tag colors were used. The ratio of different colored tags returned would not only provide information on the most efficient reward system, but give a factor for correcting the estimate of harvest rate. White tags carried no monetary reward, blue tags were valued at $5.00 and red tags had a variable reward ranging from no monetary value to $500.00. For any tag returned, a letter was sent detailing the study and telling when and where the fish was released.

From March to June 1977, approximately 466 fish were marked with each color tag, for a total of 1,398. Posters illustrating the tag and informing the public of the reward system, figure 2, were strategically placed around the reservoir. Frequent talks to fishing clubs, church groups, and civic organizations also helped to publicize the tagging program.

As of September 1977 returns of differently colored tags varied significantly:

	Tag Color		
	White	*Blue*	*Red*
Number of fish tagged	466	468	464
Number of tags returned	47	84	129
Percent returned	10	18	28
95% confidence limits for binomial dist. ..	8-12	16-21	25-31

The return ratios are approximately 1:2:3 for the white, blue, and red tags respectively. Since there is no reason to believe that color alone would influence fishermen to return the tag, the obvious conclusion is that the variable value system, even with a probability of no reward, provided higher incentive than a fixed but modest sum of money and both encouraged higher returns than a system that offered no reward.

These data provide a more realistic estimate of the rate of harvest for bass in West Point Reservoir. Based on the rate of returns for red tags, the estimated rate is approximately 28%. This means that a minimum of 28% of the harvestable size bass were caught by fishermen. For a large body of water such as West Point Reservoir (26,000 acres) a 28% rate is considered high. Thus fishing during 1977 has been an important factor contributing to the total annual mortality of the bass population.

FIG. 2. Posters were strategically positioned around West Point Reservoir, briefly outlining the tagging program.

Infectious Bursal Disease In Young Chickens

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INFECTIOUS BURSAL DISEASE (IBD), formerly called Gumboro disease, is a widespread viral infection of young chickens which can cause high morbidity and mortality. Control of this disease and prevention of its detrimental effects on defense mechanisms of chickens are among the most important current problems confronting the poultry industry.

Although much is known about the short term effects of infectious bursal disease virus (IBDV) on immunity in young chickens, little is known about the effects of early infection on the immune response of adult chickens. Because IBDV causes irreversible damage to the bursa of Fabricius, which is responsible for antibody production, it is possible that this virus in young chickens may permanently alter the immune response if infection occurs at an early age.

In view of the importance of adult breeder vaccination programs for the development of maternal immunity in progeny, it is important to study the effects of early IBDV infection on immune competence of adult birds. This study was undertaken in order to examine the effects of early IBDV infection on immunity to Newcastle disease (ND).

In this study 330 chickens were equally divided into three groups. Group 1 single comb white leghorn (SCWL) chickens were infected with IBDV a few hours after hatching, chickens in group 2 were infected with IBDV at 3 weeks of age, and group 3 served as non-exposed controls.

At 4 and 30 weeks of age, 10 birds from each of the three groups were transferred, separated and vaccinated against ND. Three weeks later all vaccinated birds and 10 unvaccinated birds from each group were bled, challenged with virulent Newcastle disease virus, and sera collected for determining the presence of virus-neutralization antibodies. Sera were taken after the 4 week vaccination and tested for precipitin antibodies against IBDV. The challenge period lasted 3 weeks and daily morbidity and mortality records were kept. All surviving birds were bled, necropsied, and sera collected for the virus-neutralization test.

TABLE 2. EFFECT OF INFECTIOUS BURSAL DISEASE VIRUS (IBDV) INFECTION ON THE IMMUNE RESPONSE OF CHICKENS VACCINATED AGAINST NEWCASTLE DISEASE VIRUS (NDV) AT 30 WEEKS OF AGE

IBDV infection	NDV vaccine	Mean NDV neutralization titers: Pre-NDV challenge	Mean NDV neutralization titers: Post-NDV challenge	Clinical ND	NDV mortality
				Percent	*Percent*
No	No	<10[a]	440[a]	80[a]	60[a]
No	Yes	275[b]	305[b]	0[b]	0[b]
Hatching	No	<10[a]	—	100[a]	100[c]
Hatching	Yes	88[c]	120[c]	20[b]	10[b]
3 Weeks	No	<10[a]	380[a]	70[a]	60[a]
3 Weeks	Yes	232[b]	280[b]	10[b]	10[b]

All values are based on 10 chickens and when followed by different letters within a column differ significantly.

The incidence and severity of IBD was directly related to the age of the bird upon infection. Approximately 11% of the chickens infected with IBDV at hatching displayed clinical disease with 2% mortality occurring from the 4th to 7th days postinfection (PI). In contrast, 40% of the birds infected with IBDV at 3 weeks of age showed morbid signs with 22% mortality. Whereas the majority of IBDV infected chickens tested for precipitating antibodies to IBDV were positive by the agar gel diffusion test, table 1, birds not infected with IBDV did not produce IBDV-specific precipitins.

Chickens infected at hatching and vaccinated for ND at 4 and 30 weeks developed significantly lower post vaccination and post challenge NDV antibody titers than birds not infected, tables 1 and 2. Chickens infected with IBVD at 3 weeks of age had significantly lower post vaccination, but not lower post challenge NDV antibody titers than the non IBDV-exposed chickens. Post vaccination and post challenge antibody titers for chickens infected with IBDV at 3 weeks were not significantly affected at the 30-week vaccinations.

TABLE 1. EFFECT OF INFECTIOUS BURSAL DISEASE VIRUS (IBDV) INFECTION ON THE IMMUNE RESPONSE OF CHICKENS VACCINATED AGAINST NEWCASTLE DISEASE VIRUS (NDV) AT 4 WEEKS OF AGE

IBDV infection	Positive IBDV AGP	NDV vaccine	Mean NDV neutralization titers: Pre-NDV challenge	Mean NDV neutralization titers: Post-NDV challenge	Clinical ND	NDV mortality
	Percent				*Percent*	*Percent*
No	0[a]	No	≤10[a]	—	100[a]	100
No	0[a]	Yes	82[b]	100[a]	10[b]	0[b]
Hatching	80	No	≤10[a]	—	100[a]	100[a]
Hatching	90[b]	Yes	18[c]	70[b]	100[a]	60[c]
3 Weeks	90[b]	No	≤10[a]	—	100[a]	100[a]
3 Weeks	100[b]	Yes	30[c]	120[a]	100[a]	40[c]

All values are based on 10 chickens and when followed by different letters within a column differ significantly.

The depression in NDV antibody responses noted in 4-week-old vaccinated chickens infected with IBDV at hatching or 3 weeks of age correlated with an increased incidence and severity of NDV following challenge with NDV, table 1. In contrast, however, even though chickens infected with IBDV at hatching had significantly lower vaccination responses at 30 weeks of age than the control chickens, they were not more susceptible to challenge with virulent NDV.

Regardless of the time of ND vaccination, unvaccinated chickens infected with IBDV at hatching were more susceptible to challenge with virulent NDV than unvaccinated chickens infected with IBDV at 3 weeks or unvaccinated chickens not infected with IBDV. Clinical ND in young chickens was evidenced by tremors, diarrhea, and paralysis. Adult chickens infected with NDV showed similar signs which were later followed by a drastic drop in egg production.

Data reported herein confirm the hypothesis that early IBDV infection can result in a permanent immunosuppression in ND antibody responses and a permanent increase in susceptibility to NDV. Infection with IBDV at 3 weeks resulted in only a temporary depression in antibody synthesis against NDV and a temporary increase in the susceptibility of vaccinated birds to virulent NDV.

These data confirm the importance of IBDV breeder vaccination programs which provide progeny protection against early IBDV infection and permanent immunosuppression. Also, continual NDV revaccination in laying flocks seems important in light of the fact that NDV immunity can still be established even in chickens in which circulating virus-neutralizing antibody is depressed by an early IBDV infection.

Changes in Properties of Fire Resistant Cotton Fabrics Caused by Washing Treatment

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TWO STANDARDS governing flammability of children's sleepwear were instituted in 1971 and 1974. These standards, now administered by the Consumer Product Safety Commission (CPSC), caused a great upheaval in the textile and apparel industries and ultimately reduced drastically the amount of cotton used in children's sleepwear. Cotton's share of this sleepwear market fell from approximately 85% to an estimated 5-10% during the period 1971-1977.

There were two primary reasons for this decline in the use of cotton. One reason was cost and difficulty involved in applying chemicals that were needed to make cotton flame resistant. The second reason was the sensitivity of these flame retardant finishes to laundering conditions involving hard water and carbonate-built, no-phosphate detergents. Although this latter problem can be avoided by following care label instructions, the possibility of negating the flame resistance of the fabrics was a cause of concern.

A joint study, conducted by Home Economics Research at Auburn University and the University of California, Davis, examined changes in properties of cotton fabric treated with four different flame-retardant organophosphorus finishes. The finishes were: THPOH-NH_3, THPOH-Amide, Pyrovatex CP, and THPC-Urea. The fabrics were laundered 50 times under three different conditions: (a) high phosphate anionic detergent and water; (b) high phosphate anionic detergent and water, with sodium hypochlorite bleach added; and (c) high phosphate anionic detergent and water, with sodium carbonate (washing soda) added. The additive for the latter two conditions might be added in home conditions to boost the cleaning or stain removal power of the laundering, even though at least one additive (bleach) is warned against on care labels for cotton fire-resistant garments.

The effects of the washing treatments on fire-resistant fabrics were evaluated by flammability tests, phosphorus and nitrogen determinations, thermal analysis, and by scanning electron microscopy. The flammability tests were the vertical test (as specified by DOC FF 3-71) and oxygen index. The latter test measures the minimum amount of oxygen required for a material to support combustion. The phosphorus and nitrogen analyses were done to evaluate the loss of the organophosphorus finish, while thermal analysis is useful in detecting chemical changes in the finish itself.

Table 1 shows the effects of washing treatments on the flammability of the fabrics. A char length of 10 in. means that the specimens burned the entire length while a high level for oxygen index (>26) indicates good fire resistance. The data show that normal washing did not affect the organophosphorus finishes. In all cases the vertical test results were very little changed from the unwashed specimens. Except for the THPC-Urea finish the addition of sodium carbonate to the detergent solution did not affect the flammability of the fabrics. The THPC-Urea specimens, however, burned the full 10 in. in half the tests. The sodium hypochlorite bleach added to the detergent solutions caused all four fabrics to completely fail the vertical test. The oxygen index values corroborate these results.

The phosphorus and nitrogen analyses, shown in table 2, give information on the effect that sodium hypochlorite had on the finishes. In all fabrics the loss of phosphorus and nitrogen is large, thus indicating that sodium hypochlorite (a powerful oxidizing agent) is either causing chemical cleavage of the organophosphorus finish molecules from the cotton cellulose or breaking down the large finish molecules into fragments that are easily removed during the washings.

The thermal analysis tests confirmed the chemical changes indicated by the phosphorus and nitrogen analyses. The differential scanning calorimetry (DSC) curves for the fabrics washed 50 times in detergent and bleach were almost identical to those for pure cotton, rather than like the curves for the original fire resistant fabrics. In each case the peak of the DSC curve shifted from an exotherm to an endotherm and from 315° C or less to 330° C or greater.

Scanning electron microscopy revealed the effect of the abrasion from 50 launderings and the oxidizing attack of the sodium hypochlorite. The THPC-Urea finished fabric after 50 washings with anionic detergent and sodium hypochlorite bleach showed extensive damage to the fibers and much fibrillar material. The damage caused by the hypochlorite bleach differs from that caused by abrasion alone in that the fibrillar material is torn out of the fiber surfaces. This may be the result of glycosidic linkage hydrolysis that shortens cellulose chain molecules and makes easier the removal of a fibrillar segment from the fiber surface.

In summary, the destructive effect of sodium hypochlorite bleach on the flammability of fire resistant cotton fabrics is both chemical and physical in nature. The loss of the finish molecules themselves is often accompanied by chemical damage to the cellulose which is manifested in the fibrillation of the individual cotton fibers themselves.

TABLE 1. FLAMMABILITY OF COTTON FABRICS AFTER FIFTY WASHINGS

Finish	Washing solution	Vertical test	Oxygen index
		In.	*Pct.*
None	detergent only	10.0	18.5
THPOH-NH_3	not washed	3.0	30.0
	detergent	3.1	30.0
	detergent and bleach	10.0	18.5
	detergent and sodium carbonate	3.0	29.0
THPOH-Amide	not washed	2.6	32.0
	detergent	3.3	31.0
	detergent and bleach	10.0	18.5
	detergent and sodium carbonate	4.3	30.5
Pyrovatex CP	not washed	4.1	31.0
	detergent	4.0	30.0
	detergent and bleach	10.0	19.0
	detergent and sodium carbonate	3.2	30.0
THPC-Urea	not washed	3.3	30.0
	detergent	4.3	29.0
	detergent and bleach	10.0	19.0
	detergent and sodium carbonate	6.8	28.0

TABLE 2. PHOSPHORUS AND NITROGEN ANALYSES

Finish		Unwashed	Detergent only	Detergent and bleach
		Pct.	*Pct.*	*Pct.*
THPOH-NH_3	P	4.70	4.40	0.45
	N	2.03	1.95	0.00
THPOH-Amide	P	2.83	2.81	0.44
	N	3.96	3.64	0.69
Pyrovatex CP	P	2.03	2.15	0.99
	N	2.04	1.82	0.78
THPC-Urea	P	3.19	2.24	1.02
	N	3.55	2.72	0.00

Meaning of PARITY

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THE WORDS "faith, hope, and parity" associate parity with two great virtues. Farmers in the 1930's cried out for parity prices. Not many months ago the cry on the part of some farmers was for "100% parity".

What is the meaning of parity? Of parity prices? Income? How important is the achievement of parity prices to farmers? What would prices at a level of 100% of parity mean?

History

Gross U.S. farm income in 1920 was $16 billion. By 1932 it had dropped to $6.4 billion. Agriculture had expanded substantially to meet the needs of World War I but did not cut production when war demands no longer existed. Cotton that sold for 37¢ per pound in 1920 fell to 12¢ in 1929 and 6½¢ in 1932. Something had to be done.

In 1933 the Agricultural Adjustment Act was passed which permitted farmers to enter contracts with the government to adjust production of specified commodities in return for benefit payments. Then 1937 brought large crops of cotton, wheat, and low prices. In a large measure this led to passage of the Agricultural Adjustment Act of 1938. It was in this Act that the parity concept was first used in determining price supports.

The concept was that at sometime in the past farmers had received a "fair" return in terms of their purchasing power. At that time the relationship between the prices farmers received and the prices paid for items they bought was considered to be in balance, and farm prices were at 100% of parity. The 1938 Act established 1910-14 as the period when this was true so these years became the base period. For example, if 3 bu. of corn would exchange for a pair of shoes in 1910-14, then 3 bu. of corn should buy a pair of shoes today for the price of corn to be at 100% of parity. Prices of major farm products have been supported by the Government at various levels of parity since 1938.

A departure from the historical parity price concept occurred in 1973. It was replaced by the target price concept. Target prices were to reflect changes in production costs and

productivity, and are set by the Secretary of Agriculture annually. It remains to be seen in the future if the trend will continue away from the concept of parity price as a goal for agriculture.

Calculating Parity Prices

Details for calculating parity prices are set forth in the Agricultural Adjustment Act of 1938 and various acts since that date. Regulations state that the parity price for any agricultural commodity, as of any date, shall be determined by *multiplying the adjusted base price* for such commodity as of such date *by the parity index* as of such date.

The adjusted base price is calculated by taking the average price received by farmers for an individual commodity for the 10 preceding years and dividing this by the average of the index of prices received by farmers for all agricultural commodities for the same 10-year period. The parity index is the index of prices paid by farmers for the current period for which a parity price is calculated. Base for the parity index is 1910-14=100. The parity index reflects the change in farmers' costs in terms of prices paid for items used in production, interest, taxes, and wage rates.

For example, calculation of the parity price of corn based on January 1977 data was as follows:

January 1967 to December 1976 average price of corn was $1.70 per bushel. The 120-month average of index of prices received by farmers was 360 (1910-14=100).

Adjusted base price = $1.70 ÷ 3.60 = $0.503 per bushel
Parity index (1910-14=100) for January, 1977 was 669.

Parity price of corn for January, 1977 = $0.503 × 6.69 = $3.37 per bushel.

Parity prices for various commodities are published each month in the USDA publication *Agricultural Prices.*

Comparisons

In June, 1978, average prices received by U.S. farmers for the commodities indicated in the table ranged from 50% to 82% of the parity price. Although not shown in the table, prices of sweetpotatoes, apples, and certain citrus fruits in June 1978 were above the parity price.

Generally 100% of parity prices as calculated would provide prices well above current market prices in most cases. Due to the efficiencies that have been developed and applied in agricultural production since 1910-14, full parity prices would provide a strong incentive to increase production. Strict production controls would likely be enacted. According to USDA studies, higher agricultural product prices and production limitations would have a significant impact on foreign trade and other segments of the U.S. economy.

Prices vs. Income

In a discussion of parity prices, one of the points often overlooked is that prices received are only one factor in the income equation. The overall equation is price times production minus costs equal net income. A generally recognized goal of agricultural policy is a fair and reasonable stable income to farmers.

There is a great difference between parity prices and parity income. Parity income may be defined as "equal returns" as compared between agriculture and the nonfarm economy. Parity income should provide farmers a return for their labor, management, skill, risk, and investment in reasonable relation to that returned for these factors used in other segments of the economy.

Full parity prices would provide farmers a relatively high income for a short period of time. However, under full parity prices, it is likely *farm income* would soon be affected by a reduction in volume brought about by restricted production, reduced domestic per capita consumption, and loss of foreign markets.

The level of farm prices is extremely important but one should not forget that price is only one of the factors in the income equation.

AVERAGE PRICE RECEIVED BY FARMERS, ADJUSTED BASE PRICE, PARITY PRICE, AND AVERAGE PRICE AS A PERCENTAGE OF PARITY, UNITED STATES, 1978

Commodity	Adjusted base price	Parity price for June 1978	Average price received by farmers in June 1978	Average price as a percentage of parity price
Corn, dol./bu.	.495	3.70	2.27	61
Upland cotton, cents/lb.	12.10	90.40	54.3	60
Soybeans, dol./bu.	1.17	8.74	6.52	75
Beef cattle, dol./cwt.	8.89	62.70	51.30	82
Calves, dol./cwt.	9.68	72.30	59.00	82
Hogs, dol./cwt.	8.21	61.30	47.70	78
Eggs, cents/doz.	11.8	88.1	43.6	50

SOURCE: Compiled from Agricultural Prices, ESCS, USDA, June 30, 1978.

Nematodes Cut Production of Cool Season Perennial Grasses

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NEMATODES ARE A SERIOUS PROBLEM in maintaining productivity and stands of cool season perennial forage grasses on light textured soils in Alabama. These soil pests probably are a major factor limiting the use of these valuable pasture grasses in central and southern Alabama.

Despite the importance of nematodes, chemical control measures are not economical at this time. This is concluded from findings of experiments at the Sand Mountain Substation at Crossville, Tallassee Plant Breeding Unit, and Brewton Experiment Field.

For the three experiments, Kentucky 31 tall fescue, Boone orchardgrass, and AP-2 phalaris were planted in early October on sandy loam soils. Some of the plots were treated with methyl bromide for nematode control and others were left untreated. The grass received 200 lb. of nitrogen annually, split into four applications. Forage was harvested at 4- to 8-week intervals.

Plots treated with methyl bromide for nematode control made the highest yields during the establishment year at all locations, table 1. Tall fescue production in late winter-spring was more than doubled by controlling nematodes. Similar increases were recorded for orchardgrass and phalaris in late winter-spring. Total yields for the season also showed striking increases in forage yields where nematodes were controlled.

Second year production during autumn-early winter was increased 50-90% by controlling nematodes at the Plant Breeding Unit, table 2. Autumn production is important because this growth is vital for winter grazing.

Stubby root, stunt, and lance nematodes are the major culprits responsible for reduced forage growth on the three grasses in these tests. Nematodes drastically reduced the root systems of these grasses on untreated soil. There was a 60% reduction in root weight of tall fescue caused by nematodes. For orchardgrass and phalaris, the root weight reductions were 47% and 30%, respectively.

Grass plants with reduced root systems were able to use only limited amounts of water and nutrients at depths greater than 3-4 in. Thus, nematode attacks made the grasses more susceptible to autumn drought, thereby reducing forage growth and stands. Reduced stands and vigor of these grasses over several years lead to encroachment by weeds and warm season perennial grasses such as bahiagrass and bermudagrass.

Results of the Auburn tests clearly show that yield potential of these grasses is much better than is being achieved on nematode-infested soils. However, treatment with methyl bromide or a nematicide is not economical under current conditions. Nematode-tolerant grass varieties are the practical way to extend the useful range of these grasses. Nematode tolerance in tall fescue is being sought in current Auburn research.

TABLE 1. ESTABLISHMENT YEAR YIELD OF COOL SEASON PERENNIAL GRASSES AS AFFECTED BY NEMATODE CONTROL

Location and grass	Dry forage yield per acre			
	Late winter-spring		Total for season	
	Treated soil	Untreated soil	Treated soil	Untreated soil
	Lb.	*Lb.*	*Lb.*	*Lb.*
Sand Mountain Sub.				
Tall fescue	2,110	880	6,040	4,710
Orchardgrass	790	70	4,540	2,980
Phalaris	2,170	490	6,730	4,680
Plant Breeding Unit				
Tall fescue	1,120	540	6,910	4,950
Orchardgrass	440	170	4,310	3,080
Phalaris	2,600	1,920	7,340	6,600
Brewton Field				
Tall fescue	3,300	1,510	7,380	5,230
Orchardgrass	1,140	440	4,360	3,130
Phalaris	2,330	1,350	5,820	4,830

TABLE 2. SECOND YEAR AUTUMN-EARLY WINTER PRODUCTION OF COOL SEASON PERENNIAL GRASSES AS AFFECTED BY NEMATODE CONTROL, PLANT BREEDING UNIT, TALLASSEE

Grass	Dry forage yield per acre	
	Treated soil	Untreated Soil
	Lb.	*Lb.*
Tall fescue	1,590	830
Orchardgrass	1,380	690
Phalaris	3,130	2,000

MARKETABLE YIELDS OF SNAP BEANS AND CUCUMBERS AS AFFECTED BY IRRIGATION AND APPLIED NITROGEN, 1973-75 AVERAGE

N per acre	Per acre yield by each irrigation treatment			
	None	Intermediate	High	Average
	Lb.	*Lb.*	*Lb.*	*Lb.*
SNAP BEANS				
Spring crop				
None	3,300	3,400	3,400	3,400
60 lb.	5,800	6,400	5,800	6,000
90 lb.	6,700	6,900	6,600	6,700
120 lb.	7,400	7,700	7,500	7,500
AVERAGE	5,800	6,100	5,800	
Fall crop				
None	3,500	5,600	5,300	4,800
60 lb.	5,000	6,300	5,900	5,700
90 lb.	4,600	6,900	6,700	6,100
120 lb.	5,000	6,700	7,200	6,300
AVERAGE	4,500	6,400	6,300	
CUCUMBERS				
Spring crop				
50 lb.	39,400	45,500	39,300	41,400
100 lb.	47,500	48,500	46,000	47,400
AVERAGE	43,400	47,000	42,600	
Fall crop				
50 lb.	14,200	15,800	16,600	15,600
100 lb.	13,900	16,400	15,800	15,400
AVERAGE	14,000	16,100	16,200	

Irrigation + Nitrogen Assures High Yields of Snap Beans, Cucumbers

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ALABAMA'S LONG FROST-FREE season allows production of more than one crop per year of such vegetables as snap beans and pickling cucumbers. However, drought frequently occurs during May-June and again in the fall, at critical times for both spring and fall crops of the two vegetables. Overcoming this drought problem was the object of cooperative irrigation research by USDA-Auburn University Agricultural Experiment Station during 1973-75.

Value of supplemental water showed up in the field studies that included three irrigation treatments (none, intermediate, and high). Four rates of applied nitrogen (0, 60, 90, and 120 lb. per acre) were tried with snap beans and two rates (50 and 100 lb.) with cucumbers—with each irrigation treatment.

Irrigation did not increase snap bean yield when rainfall was normal. When rainfall was only 75% of normal (fall 1973), however, yields were almost doubled by irrigation. There was no yield difference between intermediate and high irrigation. Averages for all years indicated no response to irrigation in the spring, but there was a positive response in the fall because of the dry fall of 1973.

Applied N increased bean yields for both crop seasons, as noted in the table. Yield increase from N was greater for the spring crop than for the fall crop.

Bean yield increase was higher for the first increment of N than for the additional increments. For the spring crops, yield increase from applied N averaged 2,670 lb. per acre for the first increment, 730 lb. for the second increment, and 790 lb. per acre for the third. For the fall crops, yield increases averaged 950 lb. per acre for the first increment of N and 360 and 190 lb. per acre, respectively, for the second and third increments.

Irrigation increased marketable cucumber yields in both spring and fall 1973, but had no effect during the other 2 years. The increase was from the intermediate irrigation only, with no difference between intermediate and high irrigation.

The highest N rate resulted in larger yields of marketable cucumbers for the spring crop, but was no better than the 50-lb. rate in the fall. Marketable yields were considerably higher in the spring than in the fall during all years. Average yields for the 3-year period ranged from 39,400 to 48,500 lb. per acre for the spring crop and from 13,900 to 16,600 lb. for the fall crop. Cucumbers were harvested three times weekly to obtain small-size fruit that brings higher prices. Price drops sharply as cucumber size increases.

Above-normal rainfall during most of the test periods possibly prevented a response to irrigation except for the fall crop of snap beans in 1973 and for both spring and fall cucumber crops in 1973. Tests indicated a beneficial effect from irrigation when rainfall was below average for the season. For snap beans there was a positive yield response from 90 to 120 lb. N per acre in the spring and from 60 to 90 lb. for the fall crop. Cucumbers made higher spring yields from the 100 lb. per acre rate of N. The fall crop showed no yield differences between the 50 and 100 lb. treatments.

Barley Yellow Dwarf

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STUNTED AND DISCOLORED plants are often seen in fields of oats, wheat, and other small grains in Alabama. Such symptoms can result from a variety of adverse chemical and physical factors in the environment. Recently, it has been established that these symptoms can also indicate the presence of a disease known as barley yellow dwarf.

Barley yellow dwarf is a virus disease which wasn't recognized in the United States until the early 1950's. The name is derived from initial discovery of the disease in barley. Occurrence of barley yellow dwarf in Alabama had been suspected for many years but was not confirmed until 1975 when the causal virus was experimentally transmitted from diseased oat and wheat plants.

About 100 members of the grass family are susceptible to infection by the barley yellow dwarf virus. In addition to barley, oats, and wheat, other hosts of the virus include rye, ryegrass, bermudagrass, tall fescue, and many weed grasses.

Symptoms of barley yellow dwarf are variable among the various hosts and within genotypes of the same host. In the cereals commonly grown in Alabama, symptoms are usually most severe in oats, somewhat less in barley, and least severe in wheat. Some stunting occurs in most diseased plants. Leaf discoloration begins at the tips of leaves, and can range from a light chlorosis to a brilliant yellow in barley. Oat leaves may become red or purple, hence the disease is often called red leaf in this crop. Blasting or shedding of flowers and consequent failure to produce grain is common, especially in oats. Depending on susceptibility of the host and the stage at which infection occurs, curling, serration of margins, and other leaf distortions may develop. Similarity of barley yellow dwarf symptoms to those of other, often non-parasitic, disorders frequently makes diagnosis difficult.

The barley yellow dwarf virus is spread by the feeding activities of aphids, of which about 14 different species are known to transmit the virus. Virus particles are picked up by an aphid while feeding on an infected plant and undergo a latent period, circulating through the aphid's body. Once acquired, the virus can be retained 2 to 3 weeks by the aphid and can be transmitted when the aphid feeds on a healthy plant.

Disease Control Studies

In recent years, studies at Auburn University Agricultural Experiment Station have been aimed at determining the feasibility of using insecticides to control aphids and consequently barley yellow dwarf in small grains. The insecticides used, with commercial formulations and per acre rates in parenthesis, were: aldicarb (Temik® 10G, 1 lb.), carbofuran (Furadan® 10G, 1.5 lb.) dimethoate (Cygon® 2.67 EC, 0.5 lb.), and disulfoton (DiSyston® 15G, 1 lb.).[1] Aldicarb, carbofuran, and disulfoton were applied as granules to plots of Elan oats at time of planting; dimethoate was applied as a single foliar spray 3 weeks later.

Data from the test in 1976 showed that incidence of barley yellow dwarf was reduced and yields were increased by all insecticide treatments, table 1. Yields from insecticide-treated plots were 13-45% higher than those from non-treated check plots. The numbers of aphids in insecticide-treated plots were lower than those in the check plots throughout the 40-day period after planting, table 2.

In 1977 and 1978, the insecticides were applied to plots of Elan oats and Arthur 71 wheat. In both years, incidence of aphids and barley yellow dwarf was negligible throughout the test areas; however, yields from plots of insecticide-treated wheat and oats in 1977 were 5-11% and 10-23% higher, respectively, than those of the check plots. Yield increases may have reflected something besides control of barley yellow dwarf since apparent incidence of the disease was generally low.

These results indicate that use of insecticides shows promise for control of barley yellow dwarf, and research is continuing in this area. Other possible avenues for control include planting late to avoid buildup of aphid populations and use of tolerant or resistant varieties when available. Entries in the small grain variety tests conducted by the Department of Agronomy and Soils are evaluated annually for incidence of barley yellow dwarf and several other diseases. Some data from 1978 tests show that incidence of barley yellow dwarf varied considerably between locations and among varieties at the same location, table 3; the latter may reflect differences in susceptibility to barley yellow dwarf, the aphid vectors, or both.

[1]Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product, nor does it imply its approval to the exclusion of other products that may also be suitable.

TABLE 1. INCIDENCE OF BARLEY YELLOW DWARF AND YIELDS FROM OATS TREATED WITH INSECTICIDES

Insecticides	Barley yellow dwarf[1]	Yield
	Pct.	*Bu./A*
Aldicarb	5.3	40.7
Carbofuran	7.0	37.9
Dimethoate	16.7	31.7
Disulfoton	5.7	39.6
Check	28.0	28.0

[1]Percentage of plants showing barley yellow dwarf symptoms.

TABLE 2. INCIDENCE OF APHIDS IN PLOTS OF ELAN OATS TREATED WITH INSECTICIDES

Insecticide	Number of aphids/plot[1]				
	Nov. 3	Nov. 10	Nov. 17	Nov. 24	Dec. 1
Aldicarb	3	12	2	1	2
Carbofuran	87	4	2	0	1
Dimethoate	143	34	4	3	3
Disulfoton	2	5	0	1	1
Check	113	171	58	43	15

[1]From 15 plants/plot.

TABLE 3. INCIDENCE OF BARLEY YELLOW DWARF IN SOME OAT VARIETIES IN 1978

Variety	Barley yellow dwarf[1]		
	Gulf Coast Sub.	Piedmont Sub.	Upper Coastal Plain Sub.
Bob	5	80	T
Carolee	—	T	T
Coker 70-16	—	T	5
Coker 76-16	0	20	0
Coker 76-19	—	50	T
Coker 227	10	15	5

[1]Percentage of plants showing symptoms of barley yellow dwarf; T = trace.

AFTER COLLEGE GOALS of AUBURN UNIVERSITY AGRICULTURAL STUDENTS

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THE NUMBER of farms and farmers in Alabama has declined dramatically over the past 40 years, resulting in a reduced need for farm workers. However, the 1970's have been marked by increasing enrollment in agriculture related curricula at land-grant universities.

Agricultural enrollments at Auburn University reflect this trend with enrollment figures doubling in 7 years. Whereas 713 undergraduate students were enrolled in the various agricultural curricula in 1970, this number had increased to 1,417 by 1976. An enrollment of 1,425 in 1977 may indicate a leveling of the trend.

New challenges to American society and to the world have arisen in the last decade, ranging from the environment, to energy, to a changing structure of agricultural production. These issues and others have expanded the need for trained people in agriculture related occupations and have fostered the development of more varied agricultural courses and curricula. Today students trained in agriculture are finding an expanded range of occupational opportunities.

To assess student views on these developments, a questionnaire was distributed to a sample of undergraduate students enrolled in the School of Agriculture at Auburn University during spring 1977. A sample of 360 students, about 75% of those contacted, completed questionnaires covering several topics. One major line of inquiry focused on the career goals of agricultural students: how much education they wanted; what kinds of occupations they desired; how much income they expected; and where they preferred to live?

Educational Goals

For many people a college diploma is viewed as an end of their formal education. However, more than two-thirds of the Auburn students enrolled in the School of Agriculture aspired to additional education beyond the bachelor's degree. The largest proportion of these (32%) aspired to a masters degree, while the remainder desired professional (16%) or doctoral degrees (22%). Clearly these data do much to dispell any preconceived idea that agricultural students place a low value on advanced academic training.

Expectations are considered the reality dimension associated with goals compared to more ideal aspired goals. The educational expectations of Auburn agricultural students reflect this distinction to some extent. More than half the students (56%) expected to complete their formal education with the bachelor's degree. A downward adjustment of educational goals occurred for all three types of graduate programs, but was most dramatic with regards to the doctoral degree. Here only 5% actually expected to complete such a program as compared with 22% who aspired to do so.

Occupational Goals

Almost three-fourths of the students indicated that they aspired to a professional occupation when asked what kind of work they would like most as a lifetime job. Specific professions attracting large numbers of students included forestry and conservation (12%), veterinary medicine (13%), biological and marine sciences (11%), and agricultural or research sciences (10%). Only 33 students (13%) aspired to be employed in production agriculture either as a farm operator or manager.

Occupational expectations reflected a shifting of the types of occupations some students anticipated actually achieving. The proportion expecting careers in the various professions was less than one-third and revealed a 10% decline from the proportion aspiring to professional occupations. Interestingly, all of the more popular occupations lost some students to other occupations. The greatest differences were among those aspiring to be veterinarians (−7%) and biological and marine scientists (−6%). However, the most surprising defection was among students aspiring to be farm operators and managers, where the difference was almost 6% less. Only 24 students in the sample of 360 actually expected to achieve occupations in production agriculture.

Response to Farm Ownership

Responses to another question, dealing with the possibility that they might eventually own a farm or ranch either alone or with others, provide another view of the occupational goals of agricultural students. Two-thirds (66%) indicated that they expected to at some time own a farm or ranch. This could occur through inheritance or from the purchase of a small farm which might serve as a residence and secondary occupation, or in a number of other ways. Regardless, very few of these students who contemplate farm ownership view farming as their primary occupation for the future.

Income Goal

In these days of inflation there is considerable difficulty inherent in any comparisons of income over time. If each of us were to think back to how much income was expected on our first fulltime job and how much that same job pays a new recruit today, the amount of change might be surprising. Thus, with this note of caution, one might consider the income expectations of Auburn agriculture students for their first fulltime job after completing college.

Their expectations appear to reflect meaningful and realistic income levels. The majority of students (54%) expected beginning incomes ranging from $10,000 to $15,000. Another one-third (36%) expected to earn less than $10,000 but most of these were clustered just under the $10,000 mark. Only a small proportion of these students expected incomes of $15,000 or more.

Residential Preferences

Another important aspect of adult life is selecting a community in which to live. Often this choice is associated with decisions made concerning occupation and income. Rarely is it the primary deciding factor, but it does play an important role in the weighing of alternatives. For this reason students were asked about the kind of community they preferred as a place of residence if free to choose without other considerations.

Residential aspirations were rural oriented for the majority of students. Living on a farm or ranch was most preferred (34%). Only a small proportion (12%) wanted to live in a city of more than 50,000 persons. Nevertheless, the majority of students were interested in the better and more varied services available in a large city and preferred to live within 30 miles of such a place.

Conclusion

Agricultural students at Auburn University are a diverse group with wide-ranging adult goal orientations. Moreover, they are very typical of agricultural students at other land-grant universities throughout the South. They visualize agriculture and rural life as desirable goals around which to plan their lives, but they are not committed to a future in production agriculture.

Species of Amanita: Poisonous Mushrooms

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FIG. 1. Amanita muscaria

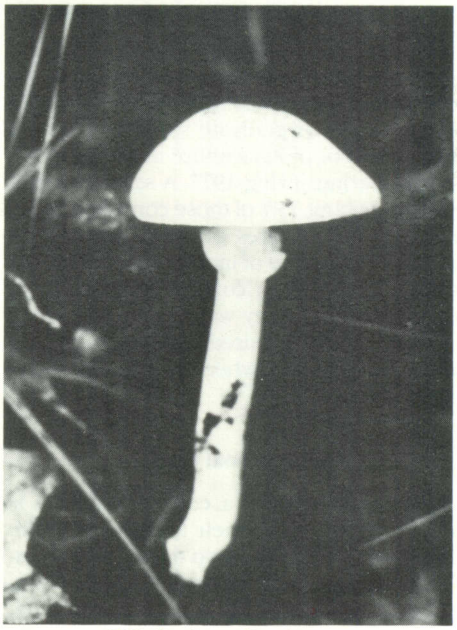

FIG. 2. Amanita virosa.

A CONSIDERABLE INTEREST in mushrooms as a food source has existed for a great many years. This interest has both positive and negative results. Although it is extremely difficult to ascertain how many persons are affected annually by mushroom poisoning, a good many cases are brought to the attention of mycologists every year. Identification is, perhaps, the main cause of mushroom poisoning among adults who look for particular kinds, but children are prone to eat whatever comes to their fancy. Most severe mushroom poisonings occur from a small number of species, of which some are rather common in the United States.

Several species of the genus *Amanita* are among the poisonous mushrooms of Alabama that have been under investigation by scientists in Auburn University's Agricultural Experiment Station. Although there have been relatively few reported cases of serious poisoning, the documentation of their occurrence is considered important.

A poisonous mushroom can be defined generally as one that causes an adverse reaction when ingested. Mushrooms have been classified as major food allergens with the allergic reaction believed to be due to the proteins present. Many mushroom toxins are derived from these proteins.

Members of the genus *Amanita* contain toxins which cause cellular destruction, liver and kidney damage, and even death. These include the deadly cyclopeptide amanitin. Some species also contain toxins that affect the central nervous system, among which is the delirium-causing ibotenic acid muscinol. Poisonous species of *Amanita* commonly found in Alabama are *A. brunnescens, A. citrina, A. flavorubescens, A. muscaria, A. pantherina* and *A. virosa.* Each has medium to large fruit bodies, white gills that are not attached to the stalk, a distinct persistent membranous ring (annulus) on the stalk, and a cup (volva) surrounding the base of the stalk. They differ from one another particularly by size, coloration, and habitat, but microscopic characteristics are also important in their classification.

Field studies in the Auburn area have indicated *A. flavorubescens, A. muscaria* and *A. virosa* to be relatively abundant in the late summer and fall. *A. muscaria* (figure 1) is especially common in open pine woods. *A. virosa* (figure 2) is a fungus of mixed woodlands and is also encountered in lawns. This species is sometimes called the "destroying angel", and is one of the two most deadly mushrooms known. Other species are mainly woodland fungi, but several may occur on lawns bordering wooded areas or on lawns established on recently cleared land.

Recent advance in our knowledge of mushroom toxins has been brought about by spectrophotometric assay by which quantitative measurement of concentrations has been possible. The amanitins are known to have an LD_{50} of 2 mg/kg. Alpha-amanitin, one of six compounds within the amanitin complex, attacks the nucleus of liver cells, fragments the nucleolus, and depletes nuclear RNA. In tests with rats it has been reported to inhibit one of the enzymes needed for the synthesis of RNA. In man it is known to cause both kidney dysfunction and secondary liver damage.

There is no known antidote for amanitin poisoning although several remedies have been tested over the years. Perhaps the most promising to date is thioctic acid which has been demonstrated to be therapeutic in the treatment of liver disease. Thioctic acid occurs in many plants and animals. Several conflicting reports of its effectiveness exist, however, and it has not been released for general use by FDA.

Many edible mushrooms exist in the wild but a thorough understanding of their characteristics remains an essential prerequisite for safe usage as a food source.

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