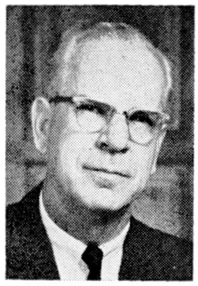
HIGHLIGHTS

of agricultural research

VOL. 17, NO. 2/SUMMER 1970

Agricultural Experiment Station
AUBURN UNIVERSITY

DIRECTOR'S COMMENTS



E. V. Smith

TO MOST OF US in the rural South, spring is a common but recurring experience of green fields, azaleas and dogwoods, and singing birds. Yet, 70% of the people in the United States have jammed themselves into the 2% of the land that constitutes the big cities. For many of the latter such things as green fields and clean air have ceased to exist.

The central cities are afflicted with four blights:

Pollution – Factories, cars, buses, utilities, and even homes "spew out their wastes into the water people drink and the air they breathe."

Slum housing and slum living – Rotting houses stand on row after row of bleak asphalt streets. "Individual hopes and pride crumble with the buildings."

Paralyzed transportation – Expressways become clogged by the time they are built. Traffic in downtown areas moves at an agonizingly slow pace.

Crime – Constant accounts of robberies, rapes, and murders have created an air of fear among many city people.

Although there are green fields and fresher air, all is not well in the country. Rural areas have one-third of the nation's people, yet only one-fourth of the income; must educate more than one-third of the young people; endure half of the nation's poverty; and live in 60% of the substandard housing.

To make the future look even darker, the nation's population is expected to increase 50% by the year 2000. This increase equals the combined current population of 42 of the 50 states!

Appalled by the situation, President Nixon last fall appointed a Task Force on Rural Development. The Task Force has now released its report entitled, "A New Life for The Country." The report calls for a movement back to the country to reverse the migration to the cities. It urges Congress to enact tax incentives to encourage new industries to locate in less congested areas.

It emphasizes that government, citizens, and industry can join together in Rural Development partnership that can "create job opportunities, community services, a better quality of living, and an improved social and physical environment in the small cities, towns, villages, and farm communities in rural America."

At the direction of Secretary of Agriculture Hardin, a State-USDA Rural Development Council has been created in each state. Here in Alabama, the Council, under the Chairmanship of Extension's Dr. Fred Robertson, will work for greater opportunities for rural Alabamians.

look for these articles

may we introduce . . .

W. B. DeVall, author of the article on page 11, has been head of the Department of Forestry for over 19 years. During his tenure many notable advancements have been made by both the Department and the forest industry of Alabama.

Under his leadership, the Department initiated a masters degree program in 1952 and a doctoral program in 1968. The Forestry Alumni Association was organized in 1952 and the Auburn Forestry Foundation was approved in 1960.

Mr. DeVall is a member of the State Board of Registration for Foresters and was the first chairman of the group when it was organized in 1958. He is the immediate Past President of the Alabama Academy of Science. He is also a member of several honorary and professional organizations.

The New York State native received his B.S. in forestry from Syracuse University and his M.S. from University of Florida. He was a member of the staff at University of Florida and also worked with the U.S. Forest Service in Lakeland and Lake City. He joined the Auburn faculty July 1, 1946 as an associate professor of forestry and became department head January 1, 1951.

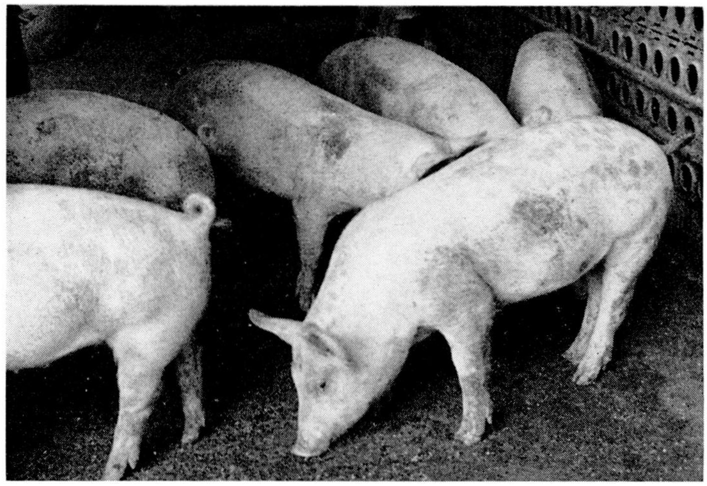
HIGHLIGHTS of Agricultural Research

SUMMER 1970 VOL. 17, NO. 2

A quarterly report of research published by the Agricultural Experiment Station of Auburn University, Auburn, Alabama.

COVER PHOTO. Two phases of Auburn's swine research—feeding growing-finishing hogs and economics of feeder pig production—are reported on pages 3 and 8.

Arsenic in Hog Feed Shows No Value in Alabama Trials



B. G. RUFFIN, *Dept. of Animal Science*

R. A. MOORE, JR., *Upper Coastal Plain Substation*

HISTORICALLY, ARSENIC has been a favorite poison used by murderous wives to dissolve the marriage contract. But there have been many legitimate uses of arsenic compounds, such as an ingredient in hog feed.

In the early fifties it was found that feeding arsanilic acid improved both growth rate and feed efficiency under certain conditions. This was apparently the result of changes in the hog's intestinal microflora, since experimental data show that arsanilic acid effectively controls certain strains of microorganisms that cause swine dysentery.

Arsanilic acid is a toxic material and adding it to feed requires tolerance limits for swine. Pigs fed the arsenic compound retain it in the tissues, and the level of retention is related to the level fed. After removal of the product from feed, tissue arsenic disappears rapidly. Thus, the Food and Drug Administration requires that all market animals be removed from rations containing arsanilic acid 5 days before slaughter. This ensures that meat is within the established safe limits for arsenic.

Because of the interest in feed additives that may increase hog performance, value of arsanilic acid was investigated by Auburn University Agricultural Experiment Station. Findings of the 1969 Upper Coastal Plain Substation project were different from some reports before 1960. Results showed that adding the arsenic compound was of no value in increasing rate of gain or efficiency.

A 14% protein ration, Table 1, with and without arsanilic acid was used in the feeding trial with crossbred pigs. Level of arsenic used in the test was 90 g. of arsanilic acid per ton, the most widely recommended level. It was added as a 20% premix.

Four feeding trials were done, using a total of 248 pigs. Pigs were weaned at about 8 weeks of age and feeding trials begun when they reached 10 weeks. All pigs were thrifty in appearance when assigned to the treatments.

The pigs were self-fed and watered in confinement on concrete floored pens. Most were removed from test at 220 lb. on an individual basis. Those eating the feed containing arsanilic acid were held for 5 days on feed without the additive before they were marketed.

Average daily gains of the two treatment groups from start to market weight (220 lb.) were not significantly different, Table 2. It is important to note that pigs in both groups made excellent gains from start to finish.

No difference was found in number of days on feed from start to 125 lb. or from 125 to 220 lb. Average daily feed intake was approximately the same for the two treatment groups. However, average daily feed intake was about 30% higher for all hogs during the last part of finishing (125 to 220 lb.) than in the period from 54 to 125 lb.

There was a slight advantage in feed efficiency for the pigs getting arsanilic acid in their ration. This difference showed up in the 125 to 220-lb. period, and amounted to a 3.5% difference.

Results of the experiment reported indicate that there is no advantage in average daily gain, days on feed, or feed per cwt. gain when arsanilic acid was fed to pigs under conditions of the test. The one feed efficiency difference noted in the table is too small to be credited to the additive.

TABLE 1. COMPOSITION OF RATIONS

Ingredient	Content: Control ration	Content: Test ration
	Pct.	*Pct.*
Ground yellow corn	78.3	78.2
Soybean meal, 44%	16.0	16.0
Alfalfa meal, 17%	2.5	2.5
Ground limestone	1.0	1.0
Dicalcium phosphate	1.5	1.5
Trace-mineralized salt[1]	.5	.5
Vitamin premix[2]	.1	.1
Aureomycin[3]	.1	.1
Arsanilic acid[4]	0	.1

[1] Content: manganese, 1.0%; zinc, 0.8%; iron, 0.8%; cobalt, 0.01%; salt, 95.5%.

[2] Each lb. supplies the following: vitamin A and D_2, 1,000,000 and 600,000 USP units, respectively; riboflavin, 2,000 mg.; niacin, 9,000 mg.; D-pantothenic acid, 4,000 mg.; choline chloride, 12,000 mg.; vitamin B_{12}, 5 mg.; folic acid, 60 mg.

[3] Aureomycin—10.

[4] Pro-Gen, 90 g. arsanilic acid per lb.

TABLE 2. EFFECT OF ARSANILIC ACID ON GROWTH RATE AND FEED EFFICIENCY

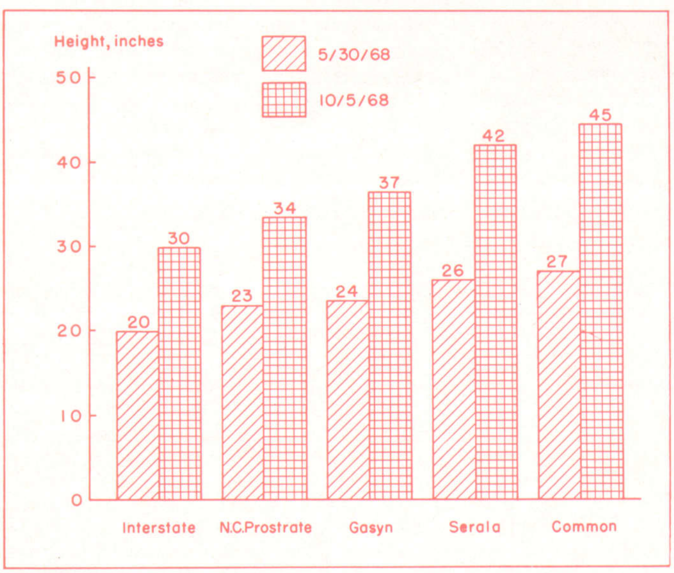
Performance measurement	Start to 125 lb.: Control	Start to 125 lb.: Control + arsanilic acid	125 lb. to 220 lb.: Control	125 lb. to 220 lb.: Control + arsanilic acid	Start to 220 lb.: Control	Start to 220 lb.: Control + arsanilic acid
Initial weight, lb.	53.4	54.0	125	125	53.4	54.0
Final weight, lb.	125	125	220	222	220	222
Days fed	46	46	55	56	101	102
Average daily gain, lb.	1.55	1.55	1.72	1.73	1.64	1.65
Average daily feed, lb.	4.81	4.79	6.96	6.73	5.98	5.86
Feed per cwt. gain, lb.	310	309	404	390	364	356
Number of pigs	*125*	*123*	*125*	*123*	*125*	*123*

Size and texture differences of common (left) and Interstate (right) sericea are illustrated by this I-59 highway planting.

INTERSTATE SERICEA LESPEDEZA

New Variety for A Special Use

E. D. DONNELLY, RAY DICKENS, D. G. STURKIE, and J. D. MILLER, *Department of Agronomy and Soils*



Height differences among varieties of sericea were obvious at two dates in the I-59 plots when the sericea was 3 years old.

A NEW SERICEA VARIETY developed specifically for roadside vegetation has been released by Auburn University Agricultural Experiment Station. Named Interstate, the short growing variety makes uniform growth of fine stemmed foliage of excellent texture and appearance. It also has good seedling vigor and branches profusely.

Interstate Development and Testing

The new sericea resulted from an irradiation breeding program begun in 1957. Seed were treated with ionizing radiation at Oak Ridge, Tennessee, and the result was increased rate of mutation and variability.

In the fourth generation following irradiation, a mutant type was identified that appeared to have traits needed for highway vegetation and similar conservation uses. Selections were made in succeeding generations and progeny were grown and tested at the Plant Breeding Unit, Tallassee. When plant type was stabilized, seed increase was begun in 1968. First certified seed became available in January 1970.

During 1966-69, the experimental variety – then known as "Hi-Way" – was evaluated critically in northern, central, and southern Alabama. It was tested in small broadcast seeded plots on highway backslopes and other sites. Testing also was done by SCS, TVA, state highway department, and state agricultural experiment station personnel in about 18 states from the Carolinas to southern Illinois and westward to Oklahoma.

Appearance Important

Sericea appearance is an important factor along roadways, so apparent height of varieties is more important than actual stem length. This is affected by stem rigidity as well as stem length. Thus, the softer stemmed Interstate appears even shorter than varieties that produce rigid stems of comparable length.

On Highway I-59 in northern Alabama, Interstate averaged 11 in. shorter than common sericea, as shown by the graph. The new variety was the shortest on I-85 backslopes in central Alabama and was one of the shortest on Alabama 225 in the southern part of the State.

Interstate was rated best in overall appearance in southern Alabama when all dates were considered, as shown by the following ratings of 3-year-old sericea (5 = best appearance, 1 = poorest):

Variety	*Average rating*		
	4-24-68	*7-30-68*	*9-12-68*
Interstate	5	5	5
Serala	4	4	3
N. C. Prostrate	3	2	5
Gasyn	3	2	2
Common	2	2	2

Stands of interstate were equal to those of other varieties.

Based on performance and appearance in Alabama, it was concluded that sericea is suitable for roadside vegetation in all parts of Alabama, and that Interstate is superior for this purpose.

Interstate was tested from 1 to 4 years in other states, and 33 cooperators from 12 states replied to a questionnaire. In general, cooperators' observations were the same for stand, height, texture, and appearance as the Alabama findings reported. Many of those who responded thought the variety also had potential for grazing and hay. This potential use is being investigated in current research.

Controlling Granulate Cutworms in Peanuts

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Department of Zoology-Entomology

THE GRANULATE CUTWORM (*Feltia subterranea F.*) has become a serious pest in peanuts in southern Alabama. This cutworm damages peanuts by feeding on the foliage at night. During the day the larvae usually stay beneath dead foliage on the ground or within the top 4 in. of the soil. Five generations occur in southern Alabama, but only three occur during the peanut growing season. The number of cutworms seems to peak in late June, late July, and again in late August.

A high infestation of cutworms in peanuts occurred near the Wiregrass Substation, Headland, Ala., in August 1968. Approximately 13 worms were found per foot of row. An experiment was conducted to evaluate the effectiveness of 13 insecticide formulations in controlling these cutworms. Sprays were applied in a 12-in. band over the row using 10 gal. of mixed spray per acre. Baits or granules were applied in 12-in. bands over the row by shaking the material from paper bags. Twenty-four hours after insecticide application, dead cutworms on the soil surface were counted. The live worms on the soil surface and beneath the soil surface also were counted. From these data the percentage control was calculated, Table 1. Another test, consisting of 16 treatments, was conducted 3 days later. The results of this test are presented in Table 2.

In August 1969, a serious infestation of cutworms in peanuts again occurred near the Wiregrass Substation. Ten insecticidal treatments were evaluated for control of this cutworm. Experimental procedures were similar to those described above except for a modification of the sampling technique. Thirty-six hours after application of materials the live and dead worms on top of the soil were counted. Counting was begun at midnight and completed before dawn. Data from this experiment are presented in Table 3.

Azodrin® at 1 lb. per acre and trichlorfon (Dylox®) bait at 1 lb. per acre gave good cutworm control in each test. Bithion® bait at 1 lb. per acre, included in only one test, resulted in control comparable to that achieved with Azodrin at 1 lb. per acre. Mocap® granules, tested in 1969, also gave good control. Of these materials only trichlorfon bait is registered for use on peanuts in Alabama.

TABLE 1. CONTROL OF GRANULATE CUTWORM 24 HOURS AFTER TREATMENT. TREATMENT 8/12/68. INSECT COUNT 8/13/68

Treatment	Dead worms per row foot	Live worms per row foot	Control
	No.	*No.*	*Pct.*
Trichlorfon B .5 lb./A.	7.1	2.5	74
Azodrin® EC 1 lb./A.	9.2	4.0	70
Trichlorfon B .75 lb./A.	8.0	4.1	66
Trichlorfon SP 1 lb./A.	6.5	4.1	61
Carbaryl SP 1.5 lb./A.	2.4	7.4	25
Azinphosmethyl EC .5 lb./A.	1.7	7.1	20
Endrin EC 1 lb./A.	1.4	8.7	14
Diazinon G 1 lb./A.	1.3	10.0	12
Toxaphene-DDT EC 4-2 lb./A.	.6	8.0	7
Diazinon EC 1 lb./A.	.6	9.6	6
Aldrin EC 1 lb./A.	.4	8.6	4
DDT EC 2 lb./A.	.2	8.5	2
Toxaphene EC 4 lb./A.	.2	8.1	2
Check	0	12.1	0

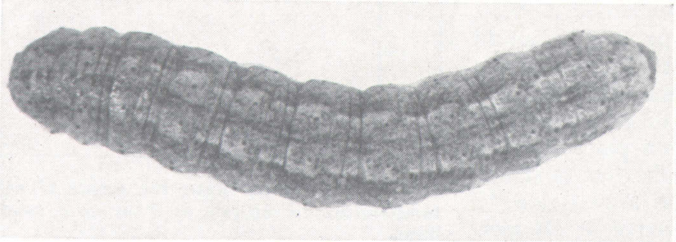
TABLE 2. CONTROL OF GRANULATE CUTWORM 24 HOURS AFTER TREATMENT. TREATMENT 8/15/68. INSECT COUNT 8/16/68

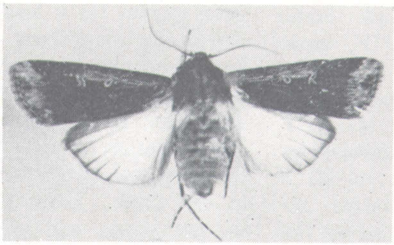
Treatment	Dead worms per row foot	Live worms per row foot	Control
	No.	*No.*	*Pct.*
Azodrin® EC 1 lb./A.	5.2	0.25	95
Trichlorfon B 1 lb./A.[1]	3.1	0.50	86
Trichlorfon B .5 lb./A.[2]	3.5	1.25	74
Azodrin® EC .5 lb./A.	4.2	1.62	72
Trichlorfon B .5 lb./A.[1]	2.4	1.00	70
Trichlorfon B .25 lb./A.[2]	2.3	1.25	64
Ciba 9491 EC 1 lb./A.	1.6	0.88	64
Trichlorfon SP 1 lb./A.	2.1	1.25	63
Parathion-Carbaryl EC 1-.5 lb./A.	2.3	2.12	52
Diazinon G 2 lb./A.	1.5	1.50	50
Methyl parathion, Toxaphene, DDT .5, 2, 1 lb./A.	0.8	1.38	37
Carbaryl SP 1.5 lb./A.	0.8	1.75	31
TDE EC 2 lb./A.	0.3	1.37	18
Thuricide® 1 gal./A.	0.5	3.00	14
Methyl parathion EC .5 lb./A.	0.4	4.00	9
Check	0	3.13	0

[1] Hand-mixed cornmeal bait.
[2] Commercially prepared bait.

TABLE 3. CONTROL OF GRANULATE CUTWORM 36 HOURS AFTER TREATMENT. TREATMENT 8/6/69. INSECT COUNT 8/8/69

Treatment	Dead worms per row foot	Live worms per row foot	Control
	No.	*No.*	*Pct.*
Azodrin® EC 1 lb./A.	1.4	.05	96
Bithion® B 1 lb./A.	1.5	.08	95
Mocap® G 2 lb./A.	.69	.11	86
Trichlorfon B 1 lb./A.	1.2	.22	85
Trichlorfon SP 1 lb./A.	.6	.17	79
Monitor® EC .75 lb./A.	.97	.25	79
Fly Ash D 40 lb./A.	.92	1.25	42
Gardona® SP 1 lb./A.	.31	.69	31
Bithion® EC 1 lb./A.	.28	.61	31
Check	.08	1.58	5





Larva (left) and adult (right) of granulate cutworm. Larva is magnified approximately 3X and adult 2X.

EFFECT of SOIL TEMPERATURE on uptake of ZINC and PHOSPHORUS on CORN SEEDLINGS

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JOHN I. WEAR, *Department of Agronomy and Soils*

There is a definite correlation between soil temperature and zinc deficiency as has been observed frequently in corn on some sandy soils of Alabama.

For the past 10 years fertilization with Zn has been recommended for corn on such soils if they have a pH value of 6.0 or above. The deficiency symptoms are more common in early spring and appear to be associated with cool weather. This study was initiated to determine the relationship between soil temperature and Zn uptake. Phosphorus uptake was also measured because there is a relation between P uptake and soil temperature. Some workers also have reported an antagonistic effect between P and Zn.

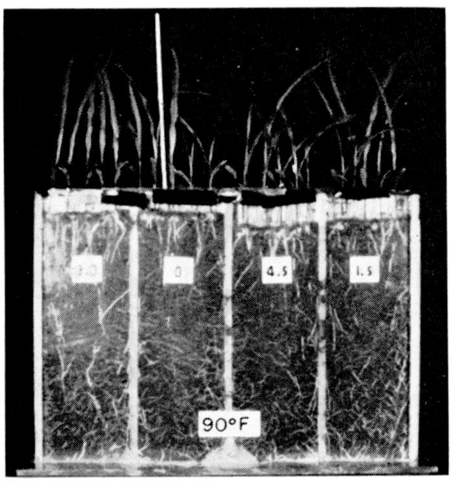

FIG. 1. Glass-front box used in this study, numbers on front refer to p.p.m. Zn. 1.55 p.p.m. is equivalent to 3 lb. per acre.

Corn seed were planted in glass-fronted boxes divided into four compartments, Figure 1. Soil in each compartment had Zn mixed at the rate of 0, 3, 6, or 9 lb. per acre. The soil had a pH of 6.3 and also received N, P, and K. The boxes were insulated and had cooling coils attached to the back. Some boxes were maintained at 60°F, some at 70°F, and some were at the room temperature of 90°F. The boxes at 60°F were below optimum; those at 70°F were at almost optimum temperature for corn root growth; and those at 90°F were above optimum. All boxes remained at room temperature during the first 5 days after planting to establish the seedlings, and then the cooling systems were turned on. The plants were grown for only 10 more days because of the small compartments. When the plants were harvested, the tops were cut off and the soil washed from the roots. The tops and roots were dried, weighed, and analyzed separately for Zn and P.

Although the roots appeared larger, Figure 2, in the boxes grown at 90°F, the weight was similar to those grown at 70°F. The roots were longer and thinner at the higher temperature. Roots and tops grown at soil temperature of 60°F were much smaller than those grown at a higher temperature.

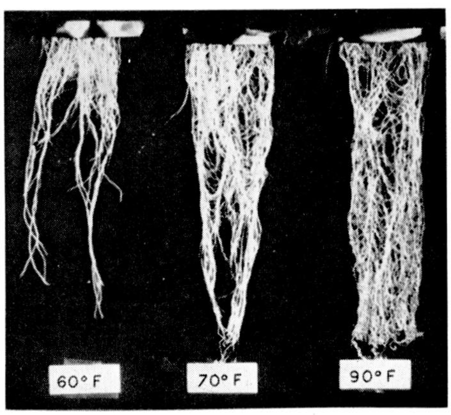

FIG. 2. These corn roots were grown with no Zn added to the soil at three soil temperatures.

Rates of Zn fertilization had no effect on root or top growth. However, total uptake of Zn was closely correlated with root growth, Figure 3. Low temperature reduces root growth and this in turn reduces uptake of Zn. Analyses of top material showed only 30.5 p.p.m. of Zn in the tissue in the 0 Zn, 60°F treatment. Had these plants been grown for a longer period of time, deficiency symptoms probably would have become apparent. Increasing the temperature to 70°F increased Zn concentration in the tops to 41 p.p.m. Zinc concentration in the corn plant also can be increased by Zn fertilization as shown in the table. Even the lowest rate (3 lb. per acre) was effective at all temperatures and in spite of the relatively high P fertilizer rate of 200 lb. P per acre (458 lb. P_2O_5). Zinc uptake increased for each increment of fertilizer Zn added at each temperature level.

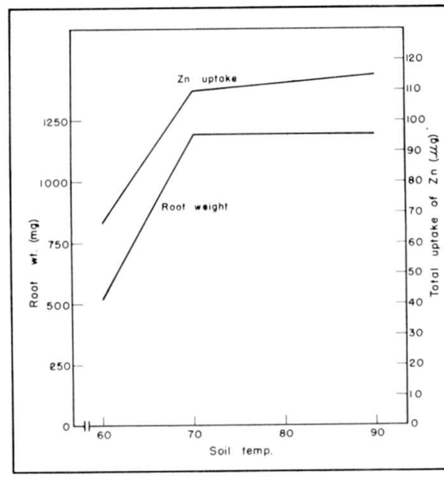

FIG. 3. This chart shows the effect of soil temperature on uptake of Zn by corn seedlings.

Phosphorus uptake was also related to root growth, Figure 4. However, more P was taken up at 90°F than at 70°F even though the weight of roots was the same. This was because the roots were finer at 90°F and permeated more soil. These data indicate that low soil temperatures in the spring limit P and Zn uptake by reducing root growth.

Effect of Temperature and Rate of Applied Zn On Zn Uptake

Zn fert. rate	Temperature		
	60°F	70°F	90°F
Lb./acre	*μg Zn*	*μg Zn*	*μg Zn*
0	51	77	74
3	57	98	107
6	70	122	128
9	85	144	151
Av.	66	110	115

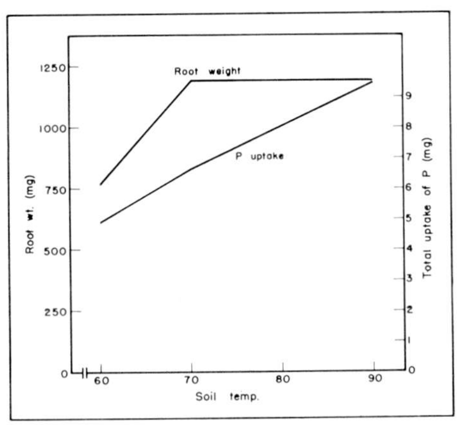

FIG. 4. This chart shows the effect of soil temperature on uptake of P by corn seedlings.

EGGS and BROILERS
Changes in Production and Prices

MORRIS WHITE, *Department of Agricultural Economics and Rural Sociology*

THE HOUSEWIFE who purchased Grade "A" large eggs in January of this year found them priced at 80-85¢ per dozen. Three months later, eggs of the same size and grade could be purchased at the same store for 43¢. The price of eggs had dropped 50%. The housewife could have noted that fluctuations in the price of fryers amounted to no more than 10% during the same time period.

The level of retail prices and fluctuations in those prices during a 3-month period are of concern to producers, but they are not as important as the relative level of egg prices during the productive life of a flock of hens and throughout a period of years.

Production of eggs in Alabama more than doubled during the 1960's, see table, but gross income from eggs rose approximately 80%. Factors having an important influence on returns received for eggs in Alabama are population changes, consumer income, per capita use of eggs, and total quantity of eggs produced in the U.S. During the decade of the sixties, population increased 14% and personal disposable income increased 75%. Per capita use of eggs dropped 6% and total production in the U.S. increased 12%. Prices have fluctuated annually and fluctuations have been more closely associated with changes in production in the U.S. than with other factors. Population, disposable income, and per capita use are relatively slow to change. However, the direction and rates of change in these factors are evidence that without some unusual development which would result in an increase in per capita use of eggs, production will be the major factor associated with annual fluctuations in prices.

The tremendous effect of national egg production on price has been very evident in recent years. In 1967, production in the U.S. was increased by 5.3% and the average price received by producers dropped 20%. Production was decreased 1% in 1968 and 0.5% in 1969. Egg prices rose 9% in 1968 and 16% in 1969. Per capita consumption rose from 313 eggs in 1966 to 323 in 1967 along with the increase in production and 20% drop in price. The rate of consumption dropped to 320 in 1968 and to 315 in 1969.

Egg producers in Alabama have experienced these fluctuations in prices but have offset some of the effects of low prices by continuously increasing production. Gross receipts from eggs increased in Alabama each year during the 1960's except in 1967. These production increases have been possible only because producers in other states have greatly reduced production of eggs. Farmers in the west North Central States produced 25% of the nation's eggs in 1960, but only 14% in 1969. The situation was almost reversed for farmers in the South Central States. Production in this region, as a percentage of the nation's total, changed from 14% in 1960 to 22% in 1969. While this trend may continue (at a slower rate than during the sixties) for a period, there will be a growing need for egg producers in Alabama and other South Central States to make some type of adjustment other than that of continuing to increase the number of laying hens for the production of eggs to continue to be a profitable enterprise.

Broiler growers continued the trend of increasing production during the 1960's. National production in 1969 was 63% greater than in 1960. The increase of 102% in broiler production in Alabama was not quite equal to the 105% increase in egg production during this period, but the increase in broiler production had been great during the previous decade.

Broilers provide a contrast to eggs with respect to consumer use and to price and quantity relationships. In 1969, per capita purchases of eggs were 6% less than in 1960, but per capita purchases of broilers were 50% greater than in 1960. With these situations existing, a proportional increase in output should not have the same effect on the prices of broilers and eggs. When the effect of changes in the consumer price index was removed from the market price, a decrease of 0.47% in the dock or processor's price for broilers was associated with a 1% increase in production in the U.S. during the 1960's. The relationship for egg producers was a drop of 1.5% in price for each increase of 1% in production in the U.S.

National production was the most important factor affecting annual changes in Alabama prices of both broilers and eggs. Seventy-four per cent of the change in broiler prices was associated with the change in national output of broilers, while 93% of the change in egg prices was associated with change in national production.

PRODUCTION AND PRICES OF BROILERS AND EGGS IN THE UNITED STATES AND ALABAMA, 1960-69

Year	Broilers			Eggs		
	Production in U.S.	Production in Alabama	Processors'[1] dock price in Alabama	Production in U.S.	Production in Alabama	Producer price[1] in Alabama
	Mil.	*Mil.*	*Cents*	*Mil. doz.*	*Mil. doz.*	*Cents*
1960	1,794.9	176.7	31.0	5,121.9	111.1	42.5
1961	1,989.6	198.0	26.1	5,188.8	124.2	41.3
1962	2,022.0	214.9	27.6	5,283.7	151.9	39.8
1963	2,100.6	228.0	25.9	5,277.0	167.4	39.4
1964	2,159.8	242.8	24.1	5,418.5	183.3	38.1
1965	2,333.2	285.1	24.4	5,457.8	190.9	36.5
1966	2,570.3	324.1	24.3	5,523.9	198.4	38.4
1967	2,591.4	324.6	22.4	5,818.9	220.4	33.5
1968	2,598.1	328.5	21.6	5,754.8	221.6	32.4
1969	2,821.5	356.1	21.7	5,726.7	228.2	34.8

[1] The quoted prices for broilers and eggs were divided by the Consumer Price Index for All Food (1957-59=100), to remove the effect of general increases in food prices.

Costs and Returns of Feeder Pig Production

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Dept. of Agricultural Economics and Rural Sociology

INTEREST IN FEEDER PIG PRODUCTION has increased in recent years as demonstrated by the increasing number of organized feeder pig sales. These sales have helped improve the quality of feeder pigs while at the same time increasing the price received by producers. The higher prices have stimulated production in many areas of the State.

The primary objectives of this study were to determine the costs, returns, and investment required for feeder pig production. Additional objectives were to illustrate the effects of size and level of management on the cost of producing feeder pigs.

The cost data were based on personal interviews with 14 producers designated as Swine Expansion Demonstrators by the Cooperative Extension Service. These producers sold an average of 451 pigs each in 1967, with almost all of the pigs being marketed through organized feeder pig sales. All of these producers were raising crossbred pigs using permanent farrowing-nursery facilities of various types.

Average costs and returns per pig sold for producers selling fewer than 400 pigs per year, producers selling more than 400 pigs per year, and all producers are shown in the table.

The average gross return per pig sold was $16.41. The average cost of production was $11.92 per pig sold, leaving a net return to labor and management of $4.49 per pig. When the 2.9 hours of labor required per pig were charged at $1.50 per hour, the average return to management was $.14 per pig sold. These producers had an average initial capital investment of $20.18 per pig sold.

Economies of size existed in the production of feeder pigs for enterprises selling up to 1,400 pigs annually. The average cost of production decreased from $15.57 per pig sold for the small producer group to $10.47 per pig sold for the large producer group. Much of this cost advantage can be attributed to better management and selling more pigs per sow, which decreased the cost per pig. After adjusting the cost data for both producer groups to 16 pigs sold per sow, the estimated cost of production per pig sold was $11.69 for the small producer group compared with $9.96 for the large producer group.

The total cost per pig sold decreased very rapidly as the number of pigs sold per sow increased from 8 to 18 annually. This demonstrates the importance of increasing the number of pigs sold per sow annually. Most of the costs incurred in feeder pig production went directly to the care and maintenance of the brood sow. These costs were relatively fixed regardless of the number of pigs raised per sow. Thus, by increasing the number of pigs sold per sow, the costs per pig were reduced. A direct relationship existed between the number of pigs sold per sow annually and the return to management per pig sold. The analysis indicated that more than 15.8 pigs per sow would have to be sold to obtain a positive return to management.

The producers were grouped into low and high cost groups according to their cost of production per pig sold to determine why some producers were more efficient. The lower cost of production of the low cost producer group was due primarily to their enterprises being larger and selling more pigs per sow. This confirms the previous analysis that the more important factors determining the profitability of the feeder pig enterprise are the number of pigs sold per sow annually and the size of the enterprise.

AVERAGE COSTS AND RETURNS PER PIG SOLD FOR FEEDER PIG ENTERPRISES

Item	Producer groups		
	All	Small	Large
No. of producers	14	8	6
Average No. of pigs sold	451.2	224.5	753.5
Average No. of pigs sold per sow	16.0	13.8	17.6
		Dollars	
Gross sales	15.16	14.50	15.42
Inventory change	1.25	3.01	.55
Gross returns	16.41	17.51	15.97
Feed costs			
Corn @ 1.41/bu.	3.51	4.11	3.27
Protein supplement @ 5.39/cwt.	1.55	2.05	1.35
Feed additives	.15	.27	.10
Creep & starter @ 5.75/cwt.	2.38	2.62	2.30
Non-feed variable costs			
Pasture @ 20.06/acre	.54	.79	.44
Replacement stock	.84	1.69	.51
Vaccination & veterinary	.34	.47	.29
Trucking	.15	.21	.13
Electricity	.26	.49	.16
Repairs	.13	.24	.09
Other cash expenses	.09	.10	.06
Interest on operating capital @ 8 %	.39	.51	.35
Total variable costs	10.33	13.55	9.05
Fixed costs			
Capital depreciation	.50	.66	.44
Interest, taxes, insurance	1.09	1.36	.98
Total fixed costs	1.59	2.02	1.42
Total cost	11.92	15.57	10.47
Returns to labor & mgt./pig sold	4.49	1.94	5.50

WATER—Key to High Soybean Yields

HOWARD T. ROGERS and D. L. THURLOW, *Department of Agronomy and Soils*

ALABAMA'S ALL-TIME RECORD soybean yield of 27 bu. per acre in 1967 was next to the highest average ever made in the Southeast. Reason for this record is easy to see: adequate rainfall during the critical period of pod development and bean filling. Despite importance of other production factors, the true "yield barrier" generally is lack of water.

The close relationship between rainfall during pod fill and bean yield is shown by 10-year results on a loamy sand at Auburn. In this experiment that dates back to 1911, soybeans were introduced in 1960 as a double crop after small grain in a 3-year rotation of cotton-corn-oats or wheat. Where fertility levels were adequate for all crops, soybean yields were closely related to rainfall during the 5-week period, August 20 to September 23, as shown by the graph.

Another example of the dominating effect of water during the critical pod-filling stage was in a maximum yield test on the Prattville Experiment Field. The photograph shows an excellent prospect for a bumper crop on August 7, 1969. The beans were in full bloom and plants were 42 in. high. The potential never materialized, however, since there was only 2 in. of rain between August 20 and September 20. The yield was only 22 bu. Two years earlier this same treatment had produced 48 bu. per acre when 6.7 in. of rain fell during the critical period.

In the maximum yield test at eight Alabama locations, soybean yields averaged 44% higher the year of highest rainfall during pod fill (90% more rain) than the average for the 1963-68 period, Table 1.

Economics of supplemental irrigation for soybeans is questionable unless the same equipment and source of water can be used for other crops. In 1968, when only 1.7 in. of rain fell between August 20 and September 20, adding 3 in. of water produced 14 bu. of beans. This was a 47% increase, Table 2. Rainfall during the critical period was adequate in 1967 and 1969, however, and irrigation made only small and unprofitable yield increases.

Soybeans' need for water during the critical pod-filling period is well established, and research is now seeking ways to make more water available to the plants. Some practices appear logical without much experimentation, such as planting on bottom lands and relatively level uplands, controlling weeds to reduce competition, deep plowing where traffic pans exist, and planting adapted varieties at the right time to utilize September rains. Where large acreages are involved, the risk of hitting droughts may be decreased by using more than one variety.

Chances looked good for a high yield when this photo was made August 7, 1969, at Prattville Experiment Field. Plants were 42 in. high and in full bloom, but low rainfall between August 20 and September 20 (only 2 in.) cut yield to 22 bu. per acre.

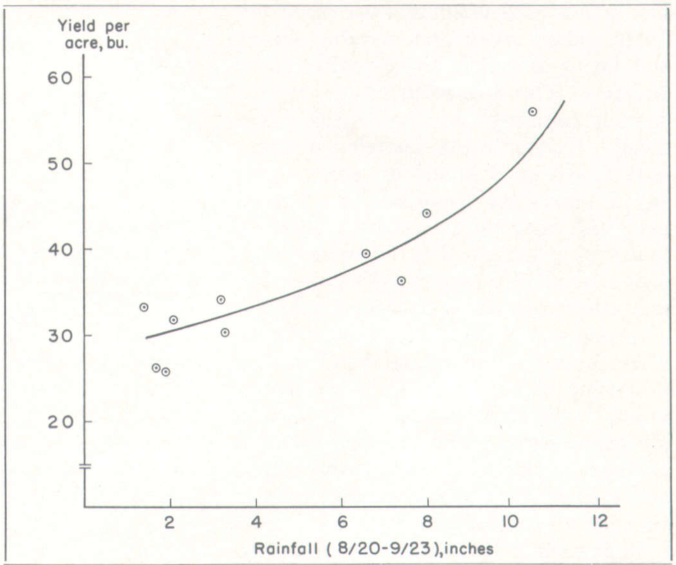
TABLE 1. MAXIMUM AND AVERAGE YIELDS AS RELATED TO RAINFALL, EIGHT LOCATIONS, 1963-68

Location and soil class[1]	High yield year		1963-68 average	
	Yield	Rainfall[2]	Yield	Rainfall[2]
	Bu.	*In.*	*Bu.*	*In.*
Alexandria Field, cl	48	9.6	30	4.7
Agronomy Farm, Auburn, sl	45	10.5	31	3.6
Brewton Field, sl	46	4.7	37	3.7
Monroeville Field, sl	40	8.0	29	4.4
Prattville Field, sl	48	6.7	30	3.5
Sand Mountain Substation, Crossville, fsl	52	6.3	34	4.1
Plant Breeding Unit, Tallassee, fsl	52	5.6	41	3.7
Wiregrass Substation, Headland, sl	39	7.8	27[3]	3.6[3]
AVERAGE	46	7.4	32	3.9
Increase over average	44%	90%		

[1] Abbreviations: cl = clay loam; sl = sandy loam; fsl = fine sandy loam.
[2] Rainfall during 5-week period, August 20 to September 23.
[3] Average for 4 years only.

TABLE 2. RESPONSE OF SOYBEANS TO IRRIGATION UNDER DIFFERENT RAINFALL SITUATIONS, AUBURN, 1967-69

Year	Inches of moisture		Yields per acre		
	Rainfall, 8/20-9/23	Water applied	Not Irrigated	Irrigated	Increase
			Bu.	*Bu.*	*Pct.*
1967	10.5	1.0	49	50	2
1968	1.7	3.0	30	44	47
1969	8.0	2.3	41	45	10



Yield data plotted on this graph illustrate effect of rainfall during pod development during 1960-69 at Auburn on loamy sand.

CONSUMER NUTRITION KNOWLEDGE and PRACTICE

RUTH HAMMETT, *Department of Agricultural Economics and Rural Sociology*

WHITE RATS, family pets, and farm animals can be provided with scientifically combined food nutrients for optimum health and weight gain. However, the human family places a multitude of physiological and psychological factors ahead of perfect nutrition.

In general, the homemaker is responsible for selection, preparation, and service of the food eaten by her family. The homemaker's aim of "balanced meals" is the practical application of the professional's nutritional adequacy measurements. Studies in consumer behavior involving 7,000 Alabama urban respondents sought to determine the use of nutrition knowledge in food selection.

The table shows the relationship of the homemaker's formal education and nutritional knowledge. Per capita income or per capita meal cost information would show similar relationships of greater knowledge and increased income or expenditures for food.

Homemakers with a grade school education more often classified bread and potatoes with fat (fattening), but so did a fourth of the better educated homemakers. Knowledge about the major nutrient in chicken, tomatoes, and cantaloupe was related to education level. The source and nutrient least often correctly paired were concentrated energy and fat, and quick energy with carbohydrates. This was surprising in view of "calorie counting" and soft drink advertising. Nutritional knowledge scores were based on 3 points for correct pairing, 2 points for a partially correct answer, and none for an incorrect selection. Scores ranged from 0 to 36, which were then ranked into four classifications used as a measurement of consumer behavior.

In one study, homemakers were asked to evaluate the nutritional equivalent of a serving of broiler meat with one of beans, beef, pork, or milk. A third of the respondents rated broiler meat as relatively equal to beef or pork, a third said beef or pork was the most nourishing, and the remainder had no opinion.

Broiler meat has about the same protein content as beef or pork but less fat and calories. Milk and dry beans have more calcium, pork has more thiamin, beans and the red meats have more iron, milk has more riboflavin. Broiler meat is highest in niacin and contains some of the vitamins and minerals mentioned.

Users of a product were more likely to mention nutritional values than non-users. Homemakers who served cottage cheese said it was an inexpensive food, low in calories, high in protein, minerals, and vitamins. Non-users said it was a milk product presumably good for you. Three-fourths of these homemakers said cottage cheese was a healthful food, but only a third of the white and an eighth of the Negro families used the product.

Homemakers who drank milk with meals more often suggested milk, especially low fat forms, as a suitable beverage with the bacon and tomato sandwich for a "weight-watcher" lunch. They said it was a nourishing drink that rounded out the meal. Higher income homemakers more often drank milk or used cottage cheese.

Knowledge did not necessarily lead to practice. Three-fourths of the homemakers whose families were consuming less than half the amount of milk products needed for good nutrition knew that milk was a good source of protein. Knowledge of the B vitamin content was nearly as high among low as above-average users of dairy foods. Actual use of eggs or milk was about three-fourths of the amount suggested by homemakers as necessary for health.

When respondents were asked what should be included in family meals every day, meat, milk, or green vegetables were usually mentioned first. Meals are planned around food products rather than nutrients. They recognized that a food may be "good for you" but other factors determine its use in family meals.

Family preferences were the major factor in food purchases. Higher income consumers were concerned about quality or variety, with nutritional value mentioned third or fourth. Women of lower income groups mentioned price or "specials" first, preferences second. Size of the food budget as related to total income, menu patterns, need for variety, size of household, or age, sex, and health condition of family members are factors to be considered in food selection.

Better educated homemakers with higher incomes have the knowledge and means to make use of nutritional information. They observe and remember news about nutrition in all media. The Cooperative Extension Service is currently working with families on public assistance to improve nutritional levels. Many homemakers and their families could benefit from a practical knowledge of nutrients necessary for physical and mental well being. If food costs continue to rise, the general public may become aware of the fact that good nutrition has several price tags.

PERCENTAGE OF HOMEMAKERS, BY FUNCTIONS OR SOURCE OF NUTRIENTS AND EDUCATION OF HOMEMAKERS, 3,325 FAMILIES, THREE ALABAMA CITIES

Function or source of nutrients correct answers	Proportion in each education of homemaker group				Average
	Under 9 yr.	9-11 yr.	12 yr.	13 yr. or more	
	Pct.	Pct.	Pct.	Pct.	Pct.
General good health-protein, vitamins	89	94	96	96	94
Bacon-protein, fat	86	95	85	93	93
Cottage cheese-protein, vitamins	69	78	82	87	79
Cantaloupe-carbohydrates, vitamins	68	79	83	88	80
Chicken-protein, vitamins	64	71	85	93	79
Pecans-protein, fat	79	82	83	88	83
Growth and repair-protein, vitamins	76	83	80	82	80
Tomatoes-vitamins	58	65	72	83	70
Potatoes-carbohydrates, vitamins	36	48	60	77	56
Bread-carbohydrates, vitamins	31	42	56	74	51
Quick energy-carbohydrates	34	33	45	59	41
Concentrated energy-fat	14	18	23	26	21
Nutritional knowledge ranked score					
0-2 (very low)	69	25	16	7	27
3 (low)	25	38	27	18	27
4 (average)	5	26	37	43	29
5 (high)	1	11	20	32	17
Per cent of homemakers	22	21	34	23	----
Number of homemakers	740	690	1,115	780	----

A History of Forestry at Auburn University

W. B. DeVALL, *Department of Forestry*

FORESTRY AT AUBURN really began in 1927. It was then that three species of southern pine were planted, experimentally, on badly eroded farm land to control erosion. These plantations stand today as a living memorial to this early venture.

During 1932-33, extensive experiments with four southern pines were started. Nearly 80 acres of pine plantations on the university campus, the results of these experiments, have been visited and studied by thousands from all parts of the country.

The first graduate forester to be employed by the University reported in 1935. In 1940 a second graduate forester was employed to develop course work leading to a degree in agriculture with a major in forestry.

During the 1940's four experiment forest areas were acquired, one each in Fayette, Autauga, Coosa, and Barbour counties. Field studies are conducted on these forests.

Interest in forestry education began to rise in 1944 when a brief titled "Forestry Presents Its Own Case" was prepared and placed in the hands of some key people in the State. A bill providing for a degree course in forestry, expansion of research, and funds to support each was prepared for the 1945 legislature. Friends of forestry came to the support of the bill and it was introduced to the legislature in May 1945. The negative faction argued that there were already enough forestry schools that young men could attend. Supporters countered that Alabama should educate its own foresters. Standards set up by the Society of American Foresters were cited as justification for the funds requested.

A degree course in forestry and an expanded program of research were assured and financed by an appropriation of $25,000 for each of these functions with the enactment of Act 294. By agreement $150,000 was made available for a building and $50,000 for equipment. The President of Alabama Polytechnic Institute was authorized to proceed with plans for forestry in a letter dated February 20, 1946. Funds for the building were approved May 18. On May 21 the Governor released funds for operation.

Dr. R. H. Westveld was employed July 1, 1946 to plan a curriculum and a building. The curriculum that was adopted had three options or majors – Forest Management and Administration, Wood Utilization, and Business Forestry. Dr. Westveld and Professor L. M. Ware headed up the joint Department of Horticulture-Forestry. On July 1, 1947 forestry became a separate department within the School of Agriculture and Agricultural Experiment Station.

During the period 1947-1950 the Department of Forestry was under the successive administration of Dr. Westveld and Dr. T. D. Stevens. In 1948, after the department moved into its new building, plans were made that would lead to accreditation. A committee of the Society of American Foresters conducted an on-site inspection late in 1950. Based on its findings and the material previously supplied to the committee, accredited status was announced in January 1951.

After the Department was accredited and following the appointment in January 1951 of W. B. DeVall as department head, plans were made to offer graduate work at the master's level. The graduate program was approved in 1952 and the first M.S. degree was awarded at the December 1953 commencement. A Ph.D. program in forestry was approved in 1967 for implementation in Fall Quarter 1968.

The first class graduated in 1948 when 14 received degrees. From 1948 through March 1970, 500 B.S. and 28 M.S. degrees were awarded. The average number of graduates per calendar year has been 25.

Progress in forestry education at Auburn can be measured by several standards. In addition to those already mentioned are budget and staff. Records for the first academic year of the Department's operation (1947-'48) show seven budgeted, part-time teaching positions and a total teaching budget of $30,000. For the last academic year (1969-'70) there were nine professional teaching positions budgeted while the teaching budget was more than $110,000.

The full-time and part-time research staff now numbers 21. These men serve as leaders and assistant leaders for 26 formal research projects. The meager budget for forestry research in 1926 of $80 may be compared with the nearly $300,000 now devoted to forestry research.

A history of forestry at Auburn would not be complete without reference to certain individuals, projects, and programs. Early leadership was provided by Professor L. M. Ware, now retired. Although a horticulturist by profession, he had visions of the roles trees would play in the rural development of Alabama.

M. J. Funchess, Dean and Director, School of Agriculture and Agricultural Experiment Station, endorsed the development of a forestry program and was the first to administer the programs of this new department.

Dr. E. V. Smith, Dean and Director, School of Agriculture and Agricultural Experiment Station, provided early leadership when a regional project in forest genetics and tree improvement was initiated in 1954. He also provided leadership that led to the formation in 1955 of another regional project dealing with forest insects and in providing the first full-time researcher on forest insects and forest insect problems at any southern agricultural experiment station. More recently, research in forest pathology was made possible.

Early in the decade of the sixties an agreement was signed that made possible the location of a forest engineering research laboratory at Auburn. The Southern Forest Experiment Station, U.S. Forest Service, designated this as the Auburn Forest Engineering Research Laboratory.

The most recent sign of progress in forestry at Auburn is the completion in 1970 of a 2-story wing on the Forestry Building. This facility provides space for both the teaching and research programs.

Effect of

SOIL TEMPERATURE ON GREENHOUSE TOMATO PRODUCTION

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GROWING GREENHOUSE TOMATOES is one of the most intensive forms of all agricultural enterprises. In the controlled environment of a greenhouse, large yields of tomatoes can be produced during fall, winter, and spring when supplies of good quality, fresh tomatoes are low and prices are high.

Within the last few years there has been a substantial growth of the greenhouse tomato industry. Plastic covered houses have also become more popular during this same period, because of their lower cost than the traditional glass greenhouse.

Normally two crops are grown annually, one in fall and another in the spring. Some growers also produce a winter crop to ensure a continuous supply of vine ripe fruit. The fall crop is planted in the greenhouse around August 15-September 1. Harvest period ranges from mid-October through December. The spring crop is planted in early January and harvested from mid-March through May. When a winter crop is grown, it is planted in early November and harvested mid-January through March.

In the early 1960's, greenhouse tomato growers noticed reduced plant growth and yields from fall and winter crops. When the plants were examined, their appearance was typical of a phosphorus deficiency. Soil temperature was checked and found to be in the 50-60°F range.

Previous research had demonstrated that phosphorus is not absorbed by seedling tomato roots at temperatures below 59°, so this was suspected to be the trouble. After preliminary research, a study was begun to determine how soil temperature affects phosphorus uptake, as well as growth, yield, and quality of greenhouse tomatoes.

Results of the preliminary studies showed that green weight, dry weight, and phosphorus content of tomato plants increased as root zone temperature was increased to 65° and 75°F. The temperature effect was greater at the higher rates of phosphorus (53 and 106 lb. of P per acre) than at the lower rates.

The effect of increasing root zone temperatures to 65° and 75° at P levels of 0, 35, 70, and 106 lb. per acre was evaluated in greenhouse experiments. (Electric heating cables were used to heat the soil.) Nitrogen was applied to all plots at the rate of 240 lb. per acre.

Tomato plants were grown for 135 days. Phosphorus content of leaves, stem diameter, and plant height were determined when largest fruit on the first cluster were ½ to 1 in. in diameter and again when first plant tops reached the top of the trellis. Number and weight of marketable and unmarketable vine ripe fruit were recorded.

There was a marked increase in fruit yield, fruit size, stem diameter, plant height, and P content with increasing soil temperature and with increasing amounts of P, Tables 1 and 2. Temperature had the greatest effect on plant height where no P was applied. In fruit yield, fruit size, and P contents, the temperature effect was greater at high rates of P than at low rates.

Because of the important effect of soil temperature on greenhouse tomato production, the best possible air circulation is needed within the greenhouse. This will prevent low temperatures at ground level and cold spots within the greenhouse.

Further research is needed on the cost of various methods of controlling soil temperature. Some growers have used various innovations, such as raised beds, for a small increase in temperature.

TABLE 1. YIELD OF VINE RIPE TOMATOES FROM DIFFERENT SOIL TEMPERATURES AND PHOSPHORUS RATES, AUBURN, 1965-69

P/acre, lb.	Yield per plot at different temperatures[1]		
	Unheated[2]	65°F	75°F
	Lb.	*Lb.*	*Lb.*
0	48.0	67.2	105.1
35	74.7	84.9	116.3
70	78.7	95.9	128.8
106	82.1	104.3	140.1

[1] Plot size was 30 sq. ft., with 10 plants per plot.
[2] Temperatures dropped below 59°F for long periods.

TABLE 2. SIZE OF VINE RIPE TOMATOES FROM DIFFERENT SOIL TEMPERATURES AND PHOSPHORUS RATES, AUBURN, 1965-69

P/acre, lb.	Average fruit weight at different temperatures		
	Unheated[1]	65°F	75°F
	Lb.	*Lb.*	*Lb.*
0	0.138	0.165	0.196
35	.190	.222	.244
70	.199	.248	.254
106	.203	.301	.315

[1] Temperatures dropped below 59°F for long periods.

SICKLEPOD vs. SOYBEANS — New Research Findings May Even the Battle

GALE A. BUCHANAN, D. L. THURLOW, and
HOWARD T. ROGERS, *Department of Agronomy and Soils*

SICKLEPOD, OR COFFEEWEED as it is sometimes called, is one of the most serious weed problems plaguing soybean growers in the Southeast. Because of the seriousness of this problem, numerous preemergence and postemergence herbicide treatments have been evaluated during the past 5 years by Auburn University Agricultural Experiment Station on a sandy loam soil at the Gulf Coast Substation. The test area was heavily infested with sicklepod.

Earlier research had revealed chloroxuron (Tenoran) plus surfactant applied postemergence to be effective against sicklepod. The major drawback was its lack of consistent activity against the weeds when they get 3 in. high or taller.

Linuron (Lorox) has been extensively evaluated for sicklepod control since 1967. Rates as low as 0.5 lb. per acre as post-directed sprays have usually given control, Table 1, but the 1-lb. rate has been more consistent.

Although there has been some soybean injury, yields usually have not been affected. An exception was in 1968 when the 4-lb. linuron rate damaged the crop. However, this is approximately 4 times the amount required for weed control. The relatively severe injury of some treatments was the result of contact action of the herbicide on lower portions of the soybean plant. In directed postemergence spray application, it is impossible to prevent contact of the herbicide with the lower foliage. Therefore, herbicides that have strong contact action must be used carefully to keep contact with soybean foliage to a minimum.

Few preplant or preemergence herbicides available for soybean use will control sicklepod. Trifluralin, amiben, and vernolate are commonly used ones that fail to satisfactorily control this weed. Sicklepod control with linuron as a preemergence herbicide is usually erratic, especially by end of the season, Table 2. Early season control was effective in a number of experiments, but 3 to 4 lb. per acre was required in 2 out of 3 years.

Of several other preemergence herbicides evaluated for controlling sicklepod, only a few have shown any promise. In 1969, Sandoz 6707 and MBR-4400 looked promising, Table 2. Both were still giving above 90% control at time of last rating, September 5 (early rating was made July 10). Yield of soybeans was not reduced by either 2 or 4 lb. per acre of Sandoz 6707 and only slightly by 4 lb. of MBR-4400. Further research will be required with these two experimental herbicides.

GS-16068, an experimental herbicide, has controlled sicklepod extremely well. Several treatments were in a 1969 experiment to determine how weed size affects susceptibility, Table 3. Control was effective only when sicklepod plants were less than 4 in. high.

TABLE 1. EFFECT OF POST-DIRECTED APPLICATIONS OF LINURON ON SICKLEPOD CONTROL, SOYBEAN INJURY, AND YIELDS

Linuron rate per acre, lb.[1]	Sicklepod control[2]		Soybean injury[3]		Yield of cultivated rows/acre[4]
	Early	Late	Early	Late	
					Bu.
1968					
0.5	85	92	3	3	42
1.0	100	100	16	0	46
2.0	100	96	50	33	44
4.0	100	91	80	78	20
Check	0	0	0	0	30
1969					
0.5	86	64	0	----	49
1.0	93	83	0	----	53
2.0	97	80	10	----	42
4.0	0	0	0	----	44

[1] All treatments included ½% surfactant. Check treatment was cultivated but got no herbicide.
[2] 0 = no control; 100 = complete control.
[3] 0 = no injury; 100 = complete kill.
[4] Both herbicide treatment and cultivation.

TABLE 2. EFFECT OF PREEMERGENCE HERBICIDE ON SICKLEPOD CONTROL, SOYBEAN INJURY, AND YIELDS

Herbicide rate per acre, lb.	Sicklepod control[1]		Soybean injury[2]		Yield of cultivated rows/acre[3]
	Early	Late	Early	Late	
					Bu.
1967					
Linuron, 1.0	90	70	2	0	65
Linuron, 2.0	95	72	22	2	67
Check	0	0	0	0	55
1968					
Linuron, 0.5	40	7	0	0	49
Linuron, 1.0	50	10	2	0	47
Linuron, 2.0	47	5	0	0	46
Linuron, 3.0	88	22	0	0	49
Check	0	0	0	0	49
1969					
Linuron, 1.0	78	27	10	0	36
Linuron, 1.5	77	13	3	0	40
Linuron, 3.0	85	60	3	0	40
Linuron, 4.0	97	44	82	40	21
Sandoz 6707, 2.0	91	90	0	0	43
Sandoz 6707 4.0	94	92	10	0	43
MBR-4400, 3.0	96	99	13	0	41
MBR-4400, 4.0	99	100	37	20	34
Check[4]	0	0	0	0	37

[1] 0 = no control; 100 = complete control.
[2] 0 = no injury; 100 = complete kill.
[3] Both herbicide treatment and cultivation.
[4] Cultivated but got no herbicide.

TABLE 3. EFFECT OF OVER-THE-TOP APPLICATIONS OF GS-16068 AT THREE STAGES OF WEED GROWTH ON SICKLEPOD CONTROL, SOYBEAN INJURY, AND YIELD, 1969

Application rate/acre, lb.[1]	Sicklepod control[2]		Soybean injury[3]	Yield per acre
	Early	Late		
				Bu.
Weeds 2-4 in. tall[4]				
1.0	97	75	10	44
2.0	97	69	25	45
Weeds 6-8 in. tall				
1.0	60	10	0	52
2.0	95	56	44	50
Weeds 8-12 in. tall				
1.0	12	10	8	36
2.0	20	18	28	39
Check	0	0	0	42

[1] All treatments got ½% surfactant. Check treatment was cultivated but got no herbicide.
[2] 0 = no control; 100 = complete control.
[3] 0 = no injury; 100 = complete kill.
[4] Size of soybean plants at specified weed sizes: 2- to 4-in. weeds, 8-in. soybeans; 6- to 8-in. weeds, 16-in. soybeans; and 8- to 12-in. weeds, 24-in. soybeans.

HERBICIDES may Check Buildup of PLANT PATHOGENS

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HERBICIDES applied to soil may have beneficial effects other than weed control. Fundamental research at Auburn indicates such a possibility.

When an organic herbicide is applied to field soil the microbial population may respond in two ways: (1) Some organisms utilize the chemical compound as a nutrient source and are thereby stimulated in growth; (2) other organisms are inhibited because the compound is either directly toxic to them or stimulates organisms nearby to produce toxic substances.

Some economically important plant-root disease fungi are subject to these influences from soil-applied herbicides. *Sclerotium rolfsii*, the Southern blight fungus, lives its entire life cycle in the soil and attacks a wide range of crop plants. *Sclerotinia trifoliorum*, which causes crown rot of leguminous plants, also spends most of its life in the soil. Therefore, most herbicides applied to soils in the Southern region are likely to come in contact with one or both of these fungi. Both fungi produce small, hard, resistant bodies called sclerotia, which can survive for long periods in soil until susceptible host plants are available. The tiny brown sclerotia of *S. rolfsii* are spherical, averaging less than 1/16 in. in diameter. They germinate in soil, when conditions are favorable, and directly infect plant roots or stems at the soil line. Sclerotia of *Sclerotinia* are black, irregular in shape, and average about 1/4 x 1/10 in. in size. They do not infect plants directly but produce tiny, stalked, cup-like structures (apothecia), which in turn produce spores that cause new infections. Thus, the soil-borne sclerotia of these fungi constitute a major inoculum source for disease occurrence.

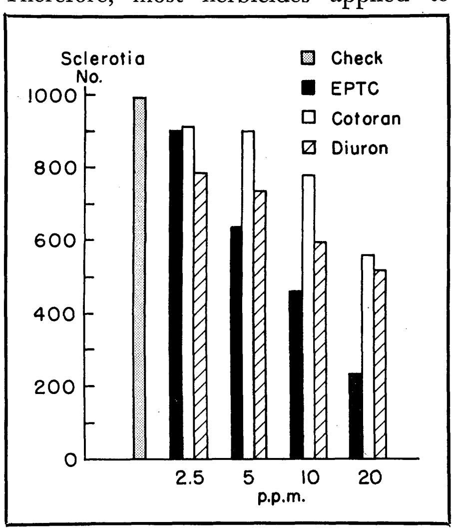

FIG. 1. Sclerotia production by S. rolfsii **was inhibited by all levels of herbicide.**

Five years of investigation at Auburn has revealed that certain herbicides may suppress growth of specific plant pathogens while other herbicides stimulate growth. In recent experiments five herbicides were tested against *S. rolfsii* and *S. trifoliorum*. The herbicides tested were Karmex (diuron), Paraquat, Caparol (prometryne), Eptam (EPTC), and Cotoran (fluometuron).

Flasks of sterilized soil were separately inoculated with the two fungi, and after 24 hours of growth the soil was treated with the herbicides in quantities to provide concentrations of 2.5, 5, 10, and 20 parts per million (p.p.m.). The lowest concentration was near recommended field rates, if it is accepted that most of the herbicides applied in the field are incorporated or concentrated in the upper 3 inches of soil, where fungal pathogens are also more active. The excessively high concentrations were tested to determine maximum rates required to obtain a significant effect. Since alcohol was used as a solvent for the herbicides, some flasks were treated with alcohol alone to serve as checks. The cultures were incubated in a controlled environment until the two fungi produced mature sclerotia. Production of sclerotia was recorded as either total numbers or dry weights.

All of the herbicides tested reduced the number of sclerotia produced by *S. rolfsii* as compared with the herbicide-free check. Diuron and EPTC reduced the number of sclerotia by nearly 50% or more in treatments of 5-20 p.p.m., Figure 1, and Cotoran was significantly inhibitory at 10 and 20 p.p.m. Generally, the inhibitory effect became greater as the herbicide concentration increased. Paraquat and prometryne were only slightly inhibitory and are not shown in Figure 1.

In Figure 2, sclerotium production by *S. trifoliorum* is expressed as dry weights. Compared with the herbicide-free check, the trend for treatment effects was quite similar to that seen with *S. rolfsii*. Diuron and EPTC reduced sclerotium production considerably at all treatment levels, while Cotoran was most inhibitory at levels above 2.5 p.p.m. Certain concentrations of paraquat and prometryne (not shown in graph) induced slight increases in sclerotium production above the alcohol check.

These results indicate only the effects of herbicides on pathogens in pure cultures. It is not yet known how this picture might be altered in natural soil with other microorganisms present. This investigation is being extended to studies of herbicide effects on germination of sclerotia and spores of pathogenic fungi and on severity of plant disease in natural soils.

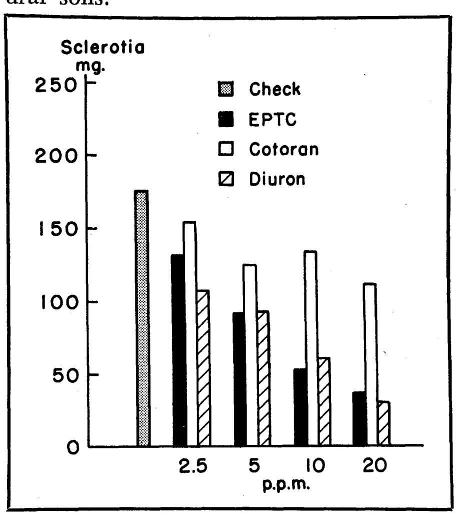

FIG. 2. Sclerotia production by S. trifoliorum **was also inhibited by herbicides.**

INCREASING FARMER KNOWLEDGE about the FUTURES MARKET

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PRODUCERS, merchandisers, exporters, feeders, and processors who deal with unprocessed agricultural commodities accept risk as a normal part of their business.

The most serious risk is the possibility of loss from fluctuations in price. The time interval between production decisions and sale or between a purchase and a sale increases the possibilities of loss from unfavorable price changes. While there may be ways producers and handlers may attempt to compensate for this risk, such as in contracting, the futures market is the only organized market that is designed to provide an opportunity for reducing or offsetting price risks.

Many agribusiness firms have successfully "hedged" on the futures market for many years to assure themselves of a price that covers costs and provides an acceptable net return. Hedging is a means of using futures contracts to reduce price risks of actual commodities stored or processed. On the other hand, farmers generally have not used the futures market. Based on the number of articles on futures trading appearing in popular farm magazines and trade journals, there is a growing interest on the part of farmers in the futures market. Commodity brokers now actively solicit farmers as customers.

Futures markets are more complex than usual marketing outlets used by farmers. Trading in futures means buying and selling of futures contracts. A futures contract is a legal agreement to deliver or receive specified quantities of a particular commodity during a designated month at an agreed price; it is a binding contract for both buyer and seller. For example, a December live beef cattle futures contract is one providing for the delivery or acceptance of delivery of a minimum number of cattle at a stated grade and weight in the month of December. The contract can be entered into as much as a year prior to the contract month. While the contract can be fulfilled by taking or making delivery, contracts are almost always fulfilled by making an offsetting, opposite futures transaction before the delivery month. All that is necessary in such cases is a settlement of price differences. Most farmers would be interested in the buying and selling of futures contracts, presumably to hedge. Although the mechanics of hedging is important, this article primarily concerns a study made by the Department of Agricultural Economics in 1968 on knowledge possessed by farmers about the futures market and an attempt to increase that knowledge. Farmers participating in the survey were large farmers in a six-county area of east central Alabama. Questionnaires, consisting of a series of statements requiring agree, disagree, and do not know answers, were mailed at different time intervals. A sample of these statements is shown in the table.

Answers to individual statements revealed only in a general way the amount of knowledge possessed. There was a greater number of incorrect answers than correct answers in half of the statements. In statements that concerned purely speculative aspects, answers revealed a considerable lack of knowledge.

After the first response to the questionnaire, a further study was made to determine if knowledge about the futures market could be improved. Farmers were divided into two groups. One group was used as a control group while the other group was mailed educational materials on the futures market at weekly intervals for a 3-month period. After this test period, all farmers were again mailed questionnaires as before. Answers were scored so that a numerical value could be assigned that would measure an increase in knowledge. Scores for the control group did not change between the two periods, averaging 34.5 and 34.6, respectively. The average score of the experimental group improved from 33.4 for the first questionnaire to 41.5 for the final questionnaire, indicating an increased knowledge of the futures market from the materials.

Those farmers not using the futures market, but who are interested, need more knowledge about futures trading. Response by farmers to a limited mailed educational program was good. Moreover, the program was effective in that knowledge about futures was significantly increased. The possibility of other kinds of programs for enhancing knowledge about futures should be explored, including discussion meetings or workshops.

SAMPLE OF FARMER RESPONSES TO SELECTED STATEMENTS ABOUT THE FUTURES MARKET

Statement	Correct answer	Percentage of correct answers
		Pct.
The risk of loss in buying and selling futures contracts is greater than the risk of loss by holding the commodity in storage	Disagree	38
Changes in prices of futures contracts are the result of large scale manipulation by speculation	Disagree	35
Hedging in the commodity futures market is a form of gambling	Disagree	44
Hedging is a sale or purchase of a futures contract to offset a purchase or sale in the cash market	Agree	77
Being "long" in the futures market means that a sale has been made with no subsequently offsetting purchase	Disagree	23
The buyer of a futures contract is not required to take delivery	Disagree	30
A "bull" is one who believes prices are heading lower	Disagree	57

• SOYBEANS, • DDT, and • WILDLIFE

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WILDLIFE BIOLOGISTS are constantly on the alert for new situations developing in the area of insecticide-wildlife relationships. One such developing situation is the relationship of game species to insecticides used in the production of soybeans. Expansion of the soybean market during the past few years has led to large increases in acreages devoted to this crop in Alabama and other southeastern states. Many Alabama soybean fields are found in areas supporting high populations of white-tailed deer, rabbits, and bobwhite quail. During the 1963-1969 growing seasons DDT was used in some soybean fields to control insects.

It was assumed that deer, rabbits, and quail associated with these fields would consume DDT during their normal activities. A study was conducted by researchers at Auburn University to determine the occurrence and magnitude of DDT contamination in deer, rabbit, and quail feeding in or adjacent to DDT-treated soybean fields.

During the summer of 1968-1969, landowners in various Alabama counties were contacted to determine whether or not DDT had been used in their soybean fields, and if so, in what amount. Those fields treated with DDT alone or in combination with other insecticides and located in good game habitat were selected for study. Control areas were located in good game habitat with little or no history of DDT treatment.

Animals for the study were hunted from September to November under a special scientific permit issued by the Alabama Department of Conservation. Collected specimens were returned to the Auburn University campus and prepared for analysis. Residue analyses were performed at the Alabama Pesticide Residue Laboratory at Auburn.

A total of 22 deer, 31 rabbits, and 20 quail was collected in or near DDT-treated soybean fields. Twenty-one control deer, 17 control rabbits, and 17 control quail were collected in areas with little or no DDT treatment within the last 12 years.

Results of analyses of treatment and control animals are presented in the table. Total DDT residues (technical DDT plus metabolites) in the fat of deer from treated areas averaged 3.00 p.p.m with residues ranging from undetected to 18.80 p.p.m. Rabbits averaged 2.47 p.p.m. with a range from undetected to 18.00 p.p.m. The amount of DDT in the fat of quail from treated areas averaged 17.08 p.p.m. with a range from 2.07 to 46.40 p.p.m. This was considerably higher than that detected in the fat of deer and rabbits.

Animals collected from areas not recently treated contained considerably lower quantities of DDT than those collected from treated fields. Deer averaged 0.35 p.p.m., rabbits 0.15 p.p.m., and quail averaged 1.43 p.p.m. with a range of 0.60 to 3.10 p.p.m.

When reporting results such as these, the wildlife biologist is challenged to explain the management implications of DDT residues in these games species. The questions are many and are still largely unanswered. Several investigators have suggested closing hunting seasons in areas where questionable DDT contamination occurs. The Federal Food and Drug Administration has suggested closing hunting seasons in areas where DDT residues in game animals are appreciably in excess of the 7 p.p.m. tolerance level in domestic meat. Action of this nature could conceivably affect many areas in Alabama. Before such measures are considered, further studies are needed to establish meaningful insecticide residue tolerance levels for game species. The difference between such tolerance levels and safety levels should be clearly explained so the consumer could make a meaningful decision as to the safety of utilizing game animals from heavily treated areas. Because no such figures exist, the public is exposed to unfounded speculation about the relative safety of consuming game animals containing insecticide residues.

There is presently no evidence to indicate that the levels of DDT detected in the animals analyzed in this study pose any acute hazard to people utilizing them as food.

DDT RESIDUES IN WHITE-TAILED DEER, RABBITS, AND BOBWHITE QUAIL COLLECTED FROM DDT-TREATED SOYBEAN FIELDS AND FROM AREAS WITH LITTLE OR NO DDT TREATMENT

Animals		Residue (fat basis)	
		Range[1]	Av.
	No.	*p.p.m.*	*p.p.m.*
From treated areas			
Deer	22	U-18.80	3.00
Rabbit	31	U-18.00	2.47
Bobwhite quail	20	2.07-46.40	17.08
From untreated areas			
Deer	21	composite sample	0.35
Rabbit	17	composite sample	0.15
Bobwhite quail	17	0.60-3.10	1.43

[1] U = undetected at sensitivity level.

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PUBLICATION—Highlights of Agricultural Research 6/70 10M

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