FIFTY-THIRD ANNUAL REPORT

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OF THE

Agricultural Experiment Station

OF THE

Alabama Polytechnic Institute

AUBURN

M. J. FUNCHESS, *Director*
AUBURN, ALABAMA

Alabama Polytechnic Institute

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W. H. Weidenbach, B.S., Assistant to Director
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Mary E. Martin, Librarian
*Sara Willeford, B.S., Agricultural Librarian

Agricultural Economics

B. F. Alvord, M.S. ..... Head, Agricultural Economics
*W. K. McPherson, M.S. ..... Agricultural Economist (Coop. TVA)
*P. E. Jones, M.S. ..... Associate Agricultural Economist
J. N. Mahan, M.S. ..... Associate Agricultural Economist
A. H. Harrington, M.S. ..... Assistant Agricultural Economist
**B. T. Lanham, Jr., M.S. ..... Assistant Agricultural Economist
*W. F. Lagrone, B.S. ..... Junior Economist (Coop. USDA)
*J. W. Lester, M. S. ..... Graduate Assistant
E. E. Mansfield ..... Statistical Clerk

Agricultural Engineering

J. H. Neal, Ph.D. ..... Head, Agricultural Engineering
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I. F. Reed, M.S. ..... Agricultural Engineer (Coop. USDA)
O. A. Brown, Ph.D. ..... Associate Agricultural Engineer (Coop. USDA)
**E. G. Diseker, M.S. ..... Associate Agricultural Engineer
A. T. Hendrix, M.S. ..... Associate Agricultural Engineer (Coop. USDA)
F. A. Kummer, M. S. ..... Associate Agricultural Engineer
D. A. Parsons, B.A. ..... Project Supervisor (Coop. USDA)
A. W. Cooper, M.S. ..... Assistant Agricultural Engineer
J. O. Laws, B.S. ..... Assistant Soil Conservationist (Coop. USDA)
**C. C. Morgan, Jr., M.S. ..... Assistant in Agricultural Engineering
*Norval Stoltenburg, B.S. ..... Junior Soil Technologist (Coop. USDA)

Agronomy and Soils

N. J. Volk, Ph.D. ..... Head, Agronomy and Soils
D. G. Sturkie, Ph.D. ..... Agronomist
H. R. Albrecht, Ph.D. ..... Associate Agronomist
J. B. Dick, B.S. ..... Associate Agronomist (Coop. USDA)
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E. L. Mayton, M.S. ..... Associate Agronomist
**J. A. Naftel, Ph.D. ..... Associate Soil Chemist
**R. W. Pearson, Ph.D. ..... Associate Soil Chemist
Howard T. Rogers, Ph.D. ..... Associate Soil Chemist
A. L. Sommer, Ph.D. ..... Associate Soil Chemist
H. B. Tisdale, M.S. ..... Associate Plant Breeder
G. W. Volk, Ph.D. ..... Associate Soil Chemist
J. T. Williamson, B.S. ..... Associate Agronomist
H. W. Reuszer, Ph.D. ..... Agent (Coop. USDA)
H. R. Benford, M.S. ..... Assistant Agronomist
F. E. Bertram, B.S. ..... Assistant Agronomist
*C. L. Breedlove ..... Assistant in Agronomy
E. C. Richardson, M.S. ..... Assistant Agronomist (Coop. USDA)
J. W. Richardson, B.S. ..... Assistant Agronomist
**E. H. Stewart, M.S. ..... Assistant in Agronomy

*Resigned.
**On leave for Military Service.
***On leave.

**J. I. Wear, M.S.	Assistant in Soils
*B. L. Collier, B.S.	Graduate Assistant
J. T. Cope, B.S.	Graduate Assistant
*P. B. Gibson, B.S.	Graduate Assistant
*J. C. Rice, B.S.	Graduate Assistant
*C. M. Wilson, B.S.	Graduate Assistant

Animal and Poultry Husbandry

J. C. Grimes, M.S.	Head, Animal Industry
D. F. King, M.S.	Poultry Husbandman
W. D. Salmon, M.A.	Animal Nutritionist
W. E. Sewell, M.S.	Animal Husbandman
J. D. Capps, Ph.D.	Associate Animal Nutritionist
G. J. Cottier, M.A.	Associate Poultry Husbandman
R. W. Engel, Ph.D.	Associate Animal Nutritionist
**C. J. Koehn, Ph.D.	Associate Animal Nutritionist
**W. C. Sherman, Ph.D.	Associate Animal Nutritionist
P. D. Sturkie, Ph.D.	Associate Poultry Husbandman
**M. J. Burns, B.S.	Graduate Assistant

Botany and Plant Pathology

J. L. Seale, Ph.D.	Head, Botany and Plant Pathology
E. V. Smith, Ph.D.	Associate Botanist
J. R. Jackson, Ph.D.	Assistant Botanist
T. R. Wright, M.S. (Fairhope)	Assistant Plant Pathologist (Coop. State Dept. of Agri., and Ala. Ext. Service.)

Horticulture and Forestry

L. M. Ware, M.S.	Head, Horticulture and Forestry
C. L. Isbell, Ph.D.	Horticulturist
E. W. McElwee, M.S.	Associate Horticulturist
K. A. Brinkman, M.S.	Junior Forester, Forest Service (Coop. USDA)
**E. R. Toole, Ph.D.	Junior Forest Pathologist (Coop. USDA)
O. A. Atkins, M.S.	Assistant Horticulturist
W. R. Boggess, M.F.	Assistant Forester
**F. E. Johnstone, Ph.D.	Assistant Vegetable Breeder
**J. E. Bryan, Jr., B.S.	Assistant in Horticulture
Hubert Harris, M.S.	Assistant in Horticulture
H. A. Nation, M.S.	Assistant in Horticulture
W. A. Johnson, B.S.	Laboratory Technician

Special Investigations

J. F. Duggar, M.S.	Research Professor of Special Investigations

Zoology-Entomology

J. M. Robinson, M.A.	Head, Zoology-Entomology
L. L. English, Ph.D.	Entomologist (Spring Hill, Ala., Box 81)
H. S. Swingle, M.S.	Fish Culturist
**F. S. Arant, Ph.D.	Associate Entomologist
R. O. Christenson, Ph.D.	Associate Parasitologist
A. M. Pearson, Ph.D.	Associate Biologist (Coop. USDI and State Department of Conservation)
J. T. Griffiths, Jr., Ph.D.	Assistant Entomologist
*H. H. Earle, B.S.	Graduate Assistant
J. M. Lawrence, B.S.	Graduate Assistant

Substations

Black Belt — Marion Junction, Dallas County, Alabama

K. G. Baker, B.S.	Superintendent
**J. W. McClendon, B.S.	Assistant Superintendent

Gulf Coast — Fairhope, Baldwin County, Alabama

Otto Brown, M.S.	Superintendent
Harold Yates, B.S.	Assistant Superintendent

Sand Mountain — Crossville, DeKalb County, Alabama

R. C. Christopher, B.S.	Superintendent
S. E. Gissendanner, B.S.	Assistant Superintendent

Tennessee Valley — Belle Mina, Limestone County, Alabama

Fred Stewart, B.S.	Superintendent
J. K. Boseck, B.S.	Assistant Superintendent

Wiregrass — Headland, Henry County, Alabama

J. P. Wilson, B.S.	Superintendent
**C. A. Brogden, B.S.	Assistant Superintendent
R. P. Goggans, B.S.	Assistant to Superintendent

*Resigned.
**On leave for Military Service.

CHANGES IN STATION STAFF DURING 1942

Appointments

H. R. Benford, M.S.	Assistant Agronomist
J. D. Capps, Ph.D.	Associate Animal Nutritionist
B. L. Collier, B.S.	Graduate Assistant
J. T. Cope, B.S.	Graduate Assistant
J. T. Griffiths, Jr., Ph.D.	Assistant Entomologist
A. H. Harrington, M.S.	Assistant Agricultural Economist
P. E. Jones, M.S.	Associate Agricultural Economist
H. T. Rogers, Ph.D.	Associate Soil Chemist

Resignations

C. L. Breedlove	Assistant in Agronomy
B. L. Collier, B.S.	Graduate Assistant
H. H. Earle, B.S.	Graduate Assistant
P. B. Gibson, B.S.	Graduate Assistant
P. E. Jones, M.S.	Associate Agricultural Economist
J. W. Lester, M.S.	Graduate Assistant
W. F. Lagrone, B.S.	Junior Economist (Coop. USDA)
W. K. McPherson, M.S.	Agricultural Economist
J. C. Rice, B.S.	Graduate Assistant
Norval Stoltenburg, B.S.	Junior Soil Technologist (Coop. USDA)
Sara Willeford, B.S.	Agricultural Librarian
C. M. Wilson, B.S.	Graduate Assistant

NEW PUBLICATIONS

Experiment Station Publications

(Bulletins, Circulars, and Mimeographed Reports)

Koehn, C. J. — **Practical Dog Feeding.** Bul. 251: 1-23. (1942).

Blackstone, J. H., and Inman, B. T. — **Food Habits of Consumer Groups in Small Towns of Alabama that Affect Farmers' Markets.** Bul. 252: 1-68. (1942).

Albrecht, H. R. — **Vetch Varieties for Soil Improvement and Seed Production in Alabama.** Bul. 253: 1-15. (1942).

Swingle, H. S., and Smith, E. V. — **Management of Farm Fish Ponds.** Bul. 254: 1-23. (1942).

Sherman, W. C., and Albrecht, H. R. — **Edible Soybeans.** Bul. 255: 1-16. (1942).

Lanham, Ben T., Jr., and Lagrone, W. F. — **Increasing Incomes and Conserving Resources on Cotton-Corn Farms in Marion County, Alabama.** Bul. 256: 1-23. (1942).

McPherson, W. K. — **A General Appraisal of the Livestock Industry in the Southeastern States.** Bul. 257: 1-32. (1942).

Sturkie, D. G., and Fisher, H. S. — **The Planting and Maintenance of Lawns.** Cir. 85: 1-20. (1942).

Brinkman, K. A., and Swarthout, P. A. — **Natural Reproduction of Pines in East-Central Alabama.** Cir. 86: 1-12. (1942).

Albrecht, H. R., and Sturkie, D. G. — **Blue Lupine Culture in Southern Alabama.** (1942).

Boggess, W. R. — **An Effective Method of Poisoning Trees, Stumps, and Sprouts.** (January 1942).

Isbell, C. L. — **Storing and Drying Vegetables on the Farm.** (February 1942).

Isbell, C. L. — **Vegetable Gardening.** (Revised 1942).

Kummer, F. A. — **Shredding Equipment for Drying Sweet Potatoes.** (January 1942).

Lanham, Ben T., Jr., and Lagrone, W. F. — **Labor Requirements for Field Crops in the Southeastern Coastal Plains Farming Area of Alabama.** Special Report. (February 1942).

Ware, L. M. — **Drying Sweet Potatoes.** (January 1942).

Ware, L. M. — **Sweet Potatoes for Livestock Feed.** (June 1942).

Ware, L. M. — **Producing Sweet Potatoes for Livestock Feed.** (June 1942).

Ware, L. M. — **Gross Returns, Cost of Production, and Net Returns from Sweet Potatoes Produced for Livestock under Different Conditions.** (July 1942).

Ware, L. M. — **Instruction for Preparing a Sweet Potato Drying Surface with Road Priming Oil.** (October 1942).

Articles in Scientific Journals

Albrecht, H. R. — **Earliness of Maturity as a Factor Influencing Seed Production in Vetch.** *Amer. Soc. Agron. Jour., 34: 662-667. (1942).*

Albrecht, H. R. — **Effect of Diseases upon Survival of White Clover,** *Trifolium repens* L., **in Alabama.** *Amer. Soc. Agron. Jour., 34: 725-730. (1942).*

Albrecht, H. R. — **Varieties and Methods of Planting Vetch for Seed Production.** *Assoc. South. Agr. Workers Proc., p. 82. (1942).*

Albrecht, H. R. — **Disease Studies with White Clover in Alabama.** *Assoc. South. Agr. Workers Proc., p. 48. (1942).*

Arant, F. S. — **Effectiveness of Derris and Cubé in Pickleworm Control.** *Jour. Econ. Ent. 35: 870. (1942).*

Arant, F. S. — **Relative Effectiveness of Several Rotenone-Containing Insecticides Against Various Insects.** *Jour. Econ. Ent., 35: 873. (1942).*

Butler, R. L., and Christenson, Reed O. — **A Simple Apparatus for Determining the Validity of Embryonated Helminth Ova.** *Jour. Parasitol., 28: 131-134. (1942).*

Christenson, Reed O., Earle, H. H., Butler, R. L., and Creel, H. H. — **Studies on the Eggs of** *Ascaridia galli* **and** *Heterakis gallinae. Amer. Micro. Soc. Trans., 61: 191-205. (1942).*

Christenson, Reed O., and Creel, H. H. — **Soil Temperatures and Soil Moisture as Factors in the Seasonal Incidence of Certain Animal Parasites in Alabama.** *Jour. Ala. Acad. Sci., 14: 30-33. (1942).*

Christenson, Reed O., and Creel, H. H. — **Soil Temperature and Soil Moisture as Factors Governing the Seasonal Incidence of Certain Parasitic Worms.** *Jour. Tenn. Acad. Sci., 27: 341. (1942).*

Cooper, A. W., and Neal, J. H. — **A Method for Determining the Velocity of Runoff Water.** *Jour. Am. Soc. Agr. Engin., 23: 385-387. (1942).*

Engel, R. W. — **Choline Deficiency in Rats of Various Ages.** *Soc. Expt. Biol. and Med. Proc., 50: 193-196. (1942).*

Howell, Henry H. — **Bottom Organisms in Fertilized and Unfertilized Fish Ponds in Alabama.** *Amer. Fisheries Soc. Trans., 71: 165-179. (1942).*

Kummer, F. A. — **Machinery for Processing Sweet Potatoes for Livestock Feed.** *Agr. Engin. 23: 215-216. (1942).*

Naftel, James A. — Soil Liming Investigations: VI. **Response of Crimson Clover to Boron and Lime on Coastal Plain Soils.** *Amer. Soc. Agron. Jour., 34: 975-985. (1942).*

Smith, E. V., and Swingle, H. S. — **The Use of Fertilizer for Controlling Several Submerged Aquatic Plants in Ponds.** *Amer. Fisheries Soc. Trans., 71: 94-101. (1942).*

Swingle, H. S., and Smith, E. V. — **The Management of Ponds with Stunted Fish Populations.** *Amer. Fisheries Soc. Trans., 71: 102-105. (1942).*

Volk, Garth W. — **Waste Pond Phosphate Compared with Rock Phosphate and Superphosphate.** *Amer. Soc. Agron. Jour., 34: 823-829. (1942).*

Volk, N. J. — **Relation of Exchangeable Potassium in Alabama Soils to Needs of the Cotton Crop.** *Amer. Soc. Agron. Jour., 34: 188-189. (1942).*

Ware, L. M., Brown, Otto, and Yates, Harold. — **Residual Effects of Phosphorus on Irish Potatoes in South Alabama.** *Amer. Soc. Hort. Sci. Proc., 41: 265-269. (1942).*

Ware, L. M., and Darling, H. M. — **Value of the Alabama Potato Seed-Testing Program.** *Amer. Potato Jour., 19: 216-223. (1942).*

Ware, L. M., and Darling, H. M. — **Some Possibilities of the Irish Potato in North Alabama.** *Amer. Potato Jour., 19: 48-59. (1942).*

Articles in Popular Journals

Atkins, O. A. — **Wild Pea, a Good Legume.** *Progressive Farmer. (November 1942).*

Grimes, J. C. — **Potatoes Meet Feed Tests.** *Progressive Farmer. (June 1942).*

Isbell, C. L. — **Storing and Drying Vegetables for Home Use.** *Farm for Victory. (June 1942).*

McPherson, W. K., Mahan, J. N., and Alvord, B. F. — **Distribution of Income from Alabama Farms, 1939.** *The Auburn Forum. (April 1942).*

Volk, Garth W. — **Experiment Station Gives Report on Various Phosphate Fertilizers.** *This Month in Rural Alabama. (February 1942).*

Volk, N. J. — **The Importance of Fertilizer in Meeting the War Production Goals of Food and Feed in the Southeast.** *The Yearbook of Commercial Fertilizer. (1942).*

Ware, L. M. — **Increasing Fertility in the South.** *Market Growers Journal. (October 1942).*

Ware, L. M. — **Potatoes Beat Corn as a Feed Crop.** *Progressive Farmer. (February 1942).*

Ware, L. M. — **Can Beat Iowa's Corn Yields.** *Progressive Farmer. (March 1942).*

Ware, L. M. — **Sweet Potatoes Dried on the Farm.** *Farmers Digest* (A condensation of articles in *Progressive Farmer, September 1942).*

AGRICULTURAL ENGINEERING

Soil Crust Formation and Its Relation to Crop Stand. (F. A. Kummer and A. W. Cooper). — Cotton was planted in tubs containing Cecil clay. In order to determine the effect of bacterial action on crust formation, one series of tubs received a mixture of sugar and casein to stimulate bacterial development. Artificial rainfall was applied to all tubs at the rate of 2.87 inches per hour for one hour. It was found that the un-

treated tubs produced satisfactory cotton stands and no serious crust formation was observed. The tubs treated with sugar and casein, however, produced poor cotton stands and very tough crusts. These crusts proved to be extremely waterstable, a property uncommon to Cecil clay under normal conditions.

Development of the Use of the Sweetpotato Shredder. (F. A. Kummer and A. W. Cooper). — The use of the sweetpotato shredder was expanded further by preparing construction plans and directions for adjustment and operation of the shredding machine previously reported. Local machine shops and vocational agricultural shops were contacted and advised as to construction procedure and placement of machines. According to reports from six Southern States, approximately 100 shredding machines were constructed during 1942 from plans and specifications furnished by this Station. Priorities were obtained for essential materials needed in the construction of these machines. A simple knife sharpener was designed, and plans were prepared for distribution to local shops, in order to reduce time and material losses to a minimum. Arrangements were made with manufacturers to establish a definite quota for shredding knives to be used exclusively for this purpose.

In addition to sweetpotatoes, this machine was used successfully to shred Irish potatoes, cabbage, and turnips. Upon request of the Eastern Regional Research Laboratory, a quantity of canaigre roots was shredded and dried preparatory to the extraction of tannic acid.

Community-Size Mechanical Dehydrator. (F. A. Kummer and A. W. Cooper). — In order to determine cost items involved in artificial dehydration of sweetpotatoes for livestock feed, a rotary-kiln dehydrator, furnished by the Tennessee Coal, Iron, and Railroad Company, was tested at this Station. Complete records of all factors, such as drying time, fuel oil consumption, power requirements, labor, air velocity, and humidity, were obtained and correlated. It was found that the time required to produce 1 ton of dried material averaged about 15 hours at a cost of approximately $6.50 for fuel and power. Recommendations were made to change the design of the dehydrator, which are expected to result in a 30 per cent reduction in processing cost.

Sorghum and Sugar Cane Harvester. (F. A. Kummer and A. W. Cooper). — A simple horse-drawn cane cutter was constructed and used successfully during the 1942 harvesting season. Cutting sorghum and sugar cane with this simple device required only about 15 to 20 per cent of the time needed to cut the same quantity by hand.

Physical Effects of Tillage in Relation to Plant Growth. (F. A. Kummer and A. W. Cooper). — The work on this project has been carried on for one season only. Since the direct effects of tillage upon plant development are relatively obscure under field conditions, an effort was made to artificially produce soil structures with different degrees of pulverization. A series of 18 experimental plots was filled with screened clod mixtures and separates ranging in size from less than 1/16 inch to 2 inches. Cotton was planted on all plots, and, in order to determine the effects produced by surface mulch, oat straw was applied to one-half of the plots. An analysis of the results obtained during the first year of the experiment showed that good cotton stands were obtained on all plots containing clod mixtures but without surface cover. Poor stands of cotton were observed on most of the mulched plots and very poor stands on both mulched and unmulched plots that contained clod separates of one size only.

Effect of Cropping Practices on Runoff, Soil, and Fertilizer Losses. (J. H. Neal, H. W. Reuszer, and R. J. Jones). — Balks (narrow strips of vegetation between the cultivated row crops) were left on three plots, while on companion plots the winter legume cover crop was completely turned. The water loss from the balk plots was 50 per cent and the soil loss 17 per cent as much as the loss from the companion plots. Notwithstanding the big saving in soil and water, cotton yields from the balk plots were only about one-half of those from the companion plots.

The winter legumes were cut from two plots, the stubble was turned, and the legume hay was spread over the surface as a mulch. On companion plots the winter legume was turned under. The water loss from the mulch plots was 75 per cent and the soil loss 31 per cent of the losses from the companion plots. In one case the cotton yield was higher than the yields from the unmulched plots; in another it was lower.

The determination of soluble plant nutrients removed in the runoff water showed that the maximum loss amounted to 1.3 pounds of nitrate nitrogen, 21 pounds of potassium, and 48 pounds of calcium per acre. The balk plots on the 10 and 20 per cent slopes lost only about 50 per cent as much soluble plant nutrients as the companion plots.

Contour Furrows for Water Conservation on Pasture Land. (J. H. Neal, A. W. Cooper, and E. L. Mayton). — The specific objectives of this project are to study the value of contour furrows in reducing water losses from pasture land, to determine the proper horizontal spacing of contour furrows for pasture land, and to evaluate the practice of contour furrowing in terms of herbage production on pasture land

Three years' results have been obtained on the amount of rainfall, water losses, and herbage yields. The average annual precipitation for the last 3 years has been 48.59 inches. Although the runoff from the check plots was about twice as much as that of the contour furrowed plots, it was of no significance because the amount of water saved was small as compared to total precipitation. The saving of water due to contour furrowing came at the time of the largest rains, when the small amount of water saved was not needed.

There was no significant difference in the herbage yields of the check plot and those of the contour furrowed plots.

The conclusion from 3 years' results is that it does not pay to contour furrow pastures on a Norfolk sandy loam, which has a high infiltration rate and good subsurface drainage.

Agronomy and Soils

High-Analysis Fertilizers. (N. J. Volk). — In a 3-year cooperative study, 9-12-6, 6-8-4, and 3-8-5 (plus sodium nitrate) grades of fertilizer were compared for efficiency in producing cotton. Equal amounts of plant food were used in all cases, except that the 3-8-5 treatment contained 6 extra pounds of potash per acre. The data show that all three grades of fertilizer are equally productive with respect to cotton when rates of application are adjusted to supply equal amounts of plant foods.

Fertilizer	Rate per acre	Yield of seed cotton per acre
	Pounds	*Pounds*
9-12-6	400	1138
6-8-4	600	1163
3-8-5	600	1165
3-0-0 (side-dressing)	600	

If made from the same high-analysis materials as 9-12-6, a ton of 3-8-5 would contain about 1,100 pounds of excess filler or sand. Farmers bought 102,990 tons of 3-8-5 during 1942, or about 56,000 tons of unnecessary filler. At an estimated cost of $11 per ton, this amount of filler cost farmers $616,000. Fertilizers containing less than 18 per cent plant food have been eliminated from the list of approved grades for Alabama for the future.

Phosphorus and Potash for Corn. (N. J. Volk). — For corn production following a crop that was well fertilized with phosphorus and potash, this Station recommends an application of 36 pounds of nitrogen as a side-dressing about 40 days after planting. However, a large acreage of corn in Alabama does not follow a crop that has been well fertilized with phosphorus and potash. Consequently, the application of 36 pounds of nitrogen to corn does not always give the desired results.

Hundreds of cooperative tests conducted in the State show that about 80 per cent of the fields planted to corn are deficient in phosphorus and potash, and that 45 per cent of them respond profitably to an application of these plant food elements. Average yields for all the tests are as follows:

Fertilizer	Rate per acre			Yield of corn per acre
	N	P_2O_5	K_2O	
	Lb.	*Lb.*	*Lb.*	*Bushels*
No fertilizer	0	0	0	22.1
Nitrogen alone	36	0	0	32.9
Nitrogen, phosphorus, and potash	36	28	20	39.3

These tests indicate that 200 pounds of 0-14-10 would supply enough minerals for corn in most cases.

Effect of Inoculation on Hay and Nut Yields of Peanuts (H. R. Albrecht). — The effect of inoculation of Spanish peanuts on land not previously planted in peanuts was studied in 1940, 1941, and 1942. Inoculation of peanut seed planted

on such lands had consistently increased yields of hay and nuts.

The results showed that greater increases from inoculation could be expected when the crop was fertilized. Increases due to inoculation were in some cases neglible on unfertilized plots. Conversely, increases from applications of phosphate and potash were slight if inoculation was withheld. Nodulation of plants on inoculated plots was significantly greater than on those not inoculated.

Cooperative tests conducted in central and northern Alabama in 1942 further proved the value of inoculation of peanuts when grown on lands that previously had not been planted to peanuts. Average increases of 979 pounds of cured hay and 420 pounds of cured nuts were harvested from the inoculated areas.

Incorporation of inoculum with finely ground manure provided a method of inoculating peanut seeds that had been treated with a seed disinfectant. The inoculated manure was placed in the drill at the rate of 400 pounds per acre and the disinfected seed were planted in contact with the manure. Nodulation of plants and yields of hay and nuts from plots treated in this manner were comparable to those that had been planted with inoculated seed. The technique permits a rapid method of inoculating areas where a large number of small lots of legume seed are to be planted.

Use of Certain Plants in the Greenhouse as Indicators of the Magnesium and Minor Element Needs of Cotton and Corn. (A. L. Sommer). — Turnips and crotalaria were used in preliminary work to find crops that, when grown in pots in the greenhouse, would indicate the need of minor elements (boron, copper, zinc, and manganese) and/or magnesium for cotton and corn in the fields. Cotton and corn in the fields were side-dressed with (1) minor elements, (2) minor elements and magnesium, and (3) magnesium. This was in addition to the regular N P K fertilizer applied by the farmer. Similar additions were made to the fertilizer applied to the pots of corresponding soils in the greenhouse. Turnips appeared to have too high a minor element (probably boron) requirement and too low a magnesium requirement to serve as a satisfactory indicator plant for cotton and corn. The green weight of the tops, the dry weight of the seeds, and the appearance

of magnesium-deficiency symptoms for crotalaria were comparable to crop responses to magnesium in the corresponding field plots. The effects of minor elements on the weight of crotalaria seed was in good agreement with that of cotton and corn in the corresponding fields. Since the minor elements were added as a group, the particular elements needed were not determined.

Cotton Variety Tests. (H. B. Tisdale and J. B. Dick). — The average results of cotton variety tests conducted on the Main Station, Substations, and Experimental Fields for 3 years, 1940-1942, show that Stoneville 2-B, Coker 100, White Gold, Carolina Big Boll, and Deltapine 14 are satisfactory varieties of adequate staple length for any section of Alabama that is not infested with the cotton wilt disease. Coker 4-in-1, S and C Big Boll, Cook 144, and the wilt resistant Clevelands are satisfactory wilt-resistant varieties of adequate staple length for sections of Alabama subject to the wilt disease.

Cotton Breeding. (H. B. Tisdale and J. B. Dick). — Work on the improvement in yield, staple quality, percentage of lint, and wilt resistance with Cook 144, Stoneville, Miller 610, and Deltapine varieties of cotton by straight line selection and with the hybridization program involving several varieties was continued in 1942. Two new strains, Deltapine 11A-192 wilt-resistant and Stoneville 2B-870 non wilt-resistant, developed in the breeding work gave good results in the 1942 variety tests. A new strain of Deltapine, designated as No. 189, has been developed in the selfed line work done in cooperation with the USDA Division of Cotton and Other Fiber Crops and Diseases. This strain of the Deltapine variety is high yielding, with medium-size boll, and light foliage, producing 1- to 1-1/16-inch staple.

Animal and Poultry Husbandry

Value of Shelter for Wintering Beef Breeding Cows. (J. C. Grimes). — During a 3-year experiment, a group of cows that had access to shelter lost an average of 46 pounds each in the winter, while a similar group that received the same kind and amount of feed but provided no shelter lost 104 pounds each.

The rate at which the cows lost weight whether in the open or under the shelter was closely related to the severity of the weather.

Study of the Transmission of Factors Related to the Economical Production of Swine. (J. C. Grimes). — After six generations, a strain of hogs has been developed that requires 24 pounds less feed per 100 pounds gain and that reaches a weight of 225 pounds in 20 days less time than a check group descended from the same parent stock. The variation in economy of gain between litters within each strain appears to be growing less each year. This is probably due to the increasing amount of inbreeding in the two strains and to the rigid selection made in past years. The variation in feed requirements per 100 pounds gain between litters in the superior strain this year ranged from 337 to 365 pounds.

Producing, Grazing, and Feeding New Crops in the Piedmont. (J. C. Grimes and D. G. Sturkie). — Of the crops studied last year, kudzu, sericea, manganese strain of bur clover, and hegari (grain sorghum) appeared to be the most promising. These crops were combined into a feeding and grazing program for cattle as follows:

Bur clover grazed December 5 to April 10 and followed by hegari, which was cut and shocked for winter feed.

Sericea grazed April 10 to October 10.

Kudzu cut for hay and the second crop grazed from October 15 to December 12.

Shocked hegari and kudzu hay fed December, January, and February.

The chief advantages of these four crops are:

They are adapted to the soils and climate of the Piedmont.

They can be combined into a program that will furnish grazing and feed for the entire year.

With the exception of hegari, they are either perennials or they reseed themselves.

Except for hegari, they are soil-conserving and soil-building crops.

Kudzu as a Grazing Crop for Hogs. (J. C. Grimes). — In a test conducted during two summers, shoats weighing from 70 to 80 pounds gained an average of .33 pounds daily when grazing kudzu alone, .73 pound when grazing kudzu

and receiving 1 pound of corn per head daily, and 1.48 pounds when grazing kudzu and receiving 5 pounds of corn per head daily.

Sweetpotatoes and Sweetpotato Products for Fattening Steers. (J. C. Grimes). — An experiment using sweetpotatoes and sweetpotato products for fattening steers gave the following results:

One pound of sweetpotato meal was approximately 90 per cent as efficient as one pound of corn meal for fattening steers when fed with cottonseed meal and hay or silage.

When properly combined with cottonseed meal, hay, or silage, raw sweetpotatoes were a satisfactory corn substitute for fattening cattle.

Silage made from sweetpotato vines was approximately equal to that made from sorghum cane.

Effectiveness of Methionine in Preventing Choline-Deficiency Kidney Hemorrhage in the Rat. (R. W. Engel). — A fatal kidney hemorrhage develops in young rats fed a diet deficient in choline. It has been reported that methionine, as well as choline, will prevent this condition. To determine the relative effectiveness of methionine, a series of accurately controlled feeding tests was conducted in which varying dietary levels of methionine were compared to a sub-optimum level of choline. It was found that approximately 5 mg. of crystalline dl-methionine is equivalent to 1 mg. of choline Cl. Preliminary results were also obtained indicating that the naturally occurring methionine in casein is less effective than the crystalline dl-methionine. The results suggest that, except for foodstuffs which are unusually rich in methionine, this compound possesses too little choline-like action to assume any great significance as a substitute for choline in the diet.

Liver Cirrhosis in Choline-Deficient Rats. (R. W. Engel). — Liver cirrhosis occurred consistently in rats fed a choline-deficient diet for 16 to 18 months. The liver cirrhosis was consistently prevented in control rats receiving the same diet plus 20 mg. of choline Cl. daily.

The gross appearance of the livers of the choline-deficient rats indicated varying degrees of fatty infiltration and cirrhosis. In the severe cases, the livers were shrunken and had the typical nodular surface of severe cirrhosis. Microscopically,

the lesions varied from mild periportal fibrous tissue proliferation to an extensive proliferation, with the liver parenchyma being divided into irregular lobules by broad bands of connective tissue.

The diet used in these studies contained 30 per cent of alcohol-extracted peanut meal (45 per cent protein) and 6 per cent of alcohol-extracted casein as sources of protein; apparently the diet was adequate in all respects, since the control animals made normal weight gains and appeared to be in good health. These results assume significance in view of the difficulties encountered by other workers in attempting to produce liver cirrhosis by the use of diets adequate in proteins.

Management of Farm Poultry Flocks. (D. F. King and G. J. Cottier). — The object of this project is to study under farm conditions the relative importance of improved housing, feeding, and breeding of hens, and improved methods of raising chicks.

On farms where all four improvement practices were followed, the hens produced during the year 138.86 eggs each as compared to 48.55 eggs per hen obtained where no improvement practices were used. When only three practices were employed, the egg production was affected the least by the omission of an improved house and the greatest amount by the omission of improved feeding. This indicates that housing is the least important and feeding is the most important of the practices studied. In addition to the management practices studied, other factors such as corn consumption, date of hatching, percentage of pullets, and age of birds were found to materially affect the number of eggs produced by the flock.

Mortality of hens was higher on farms where improvement practices were followed than it was where no improvement practices were employed.

Botany and Plant Pathology

Life History Studies of Bermuda Grass *(Cynodon dactylon* L.) (J. R. Jackson). — Lateral and adventitious buds are formed at the nodes of both rhizomes and stolons of Bermuda grass, and they arise from primodia laid down during the development of terminal buds. Enough Bermuda grass has survived

competition in zoysia and centipede sods during 4 years to constitute a serious infestation if the sods were plowed. The water content of stolons and rhizomes ranged from 47 to 60 per cent in the actively growing condition, and from 37 to 48 per cent in the dormant condition. Bermuda grass in the actively growing condition lost its viability when 65 per cent of the water present was removed.

Horticulture and Forestry

Drying Rates and Capacities of Sweetpotato Drying Areas as Measured in 1942. (L. M. Ware). — For the 4-week period extending from November 2 to November 30, 1941, lots of sweetpotatoes representing different rates of application of material per unit of surface were spread out to dry. Records by 3-hour periods of the rate of drying were obtained. On the basis of these records, it was estimated that during the fall and early winter this material could be dried at the rate of 5 to 6 tons per day per acre of drying surface. To check this estimated rate of drying over a longer period and for a different year, lots of potatoes were put out every day from September 22 to December 22, 1942.

Rates of drying for several rates of application of material on the surface for both hand- and machine-cut sweetpotatoes are given in Table 1.

In determining the rates of drying, the drying surfaces were kept in continuous operation. When rain occurred potatoes on the drying area were left on the area until the return of more favorable drying weather.

It may be seen that the heavier the spread of material on a given area the greater the amount of material dried. The average rate of drying of the hand-cut potatoes at the rate of 2 pounds per square foot for the 90-day period was 6.58 tons per acre per day; at the 1.5-pound rate, 5.76 tons; at the 1.0-pound rate, 5.39 tons; and at the 0.5-pound rate, 4.25 tons per acre per day.

The total amount dried per acre during the 90-day period for the hand-cut shreds were 592 tons for the 2.0-pound rate, 518 tons for the 1.5-pound rate, 485 tons for the 1.0-pound rate, and 383 tons for the 0.5-pound rate. The 1.5-pound rate dried 87.4 per cent, the 1.0-pound rate 81.9 per cent, and the 0.5-pound rate 64.6 per cent as much material as the 2.0-pound rate.

Table 1.—Tons per Acre per Day of Dried Materials by Weekly Periods for Different Rates of Application of Material, 1942

Period	2.0 lb. per sq. ft.		1.5 lb. per sq. ft.		1.0 lb. per sq. ft.		0.5 lb. per sq. ft.	
	Hand	Machine	Hand	Machine	Hand	Machine	Hand	Machine
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Sept. 22-28	10.014	——	——	——	8.932	——	6.456	——
Sept. 29-Oct. 5	8.297	4.354* (3 days)	——	——	6.719	3.536* (4 days)	5.700	3.516* (4 days)
Oct. 6-12	8.352	7.607	3.499* (1 day)	3.224* (1 day)	6.760	6.313	5.612	4.475
Oct. 13-19	7.862	7.920	7.405	6.670	6.964	6.125	5.782	4.890
Oct. 20-26	6.776	6.611	6.251	5.574	6.946	5.186	4.140	3.481
Oct. 27-Nov. 2	6.832	5.847	5.794	5.562	5.037	5.029	4.690	3.889
Nov. 3-9	8.130	6.372	6.981	5.760	6.043	5.507	4.880	4.671
Nov. 10-16	8.689	7.097	7.199	6.392	6.897	5.566	5.286	4.383
Nov. 17-23	4.010	3.579	4.151* (5 days)	3.356	3.832* (6 days)	2.822	2.776* (6 days)	2.422
Nov. 24-30	4.686	4.082* (4 days)	4.902	3.115* (4 days)	4.220	4.130* (2 days)	3.073	1.941* (4 days)
Dec. 1-7	4.406	——	4.547	——	3.526	——	3.035	——
Dec. 8-14	3.639	——	3.265	——	2.326	——	2.362	——
Dec. 15-21	3.969	——	2.724	——	1.691	——	1.309	——
Sept. 22-Oct. 21	8.619	7.308	7.211	6.706	7.451	6.051	5.784	4.632
Oct. 22-Nov. 21	7.087	6.048	6.359	5.327	5.918	4.882	4.665	3.947
Nov. 22-Dec. 22	4.044	——	3.706	——	2.811	——	2.314	——
Sept. 22-Dec. 22	6.580	——	5.760	——	5.390	——	4.250	——

* Figures represent less than a week, as indicated.

Considerable souring of material occurred during warm, damp days or rainy days in September and October at the 2.0-pound and 1.5-pound rates. However, on warm, fair, windy days all of the rates dried satisfactorily. Souring occurred less frequently at low temperatures than at high temperatures. The 1.0- and 0.5-pound rates seldom soured and usually dried in 24 to 30 hours. However, souring did not seem to materially lessen the palatability of the potatoes. There was some loss of material due to flotation during heavy rains.

For comparable periods the rate of drying of the machine-cut material was 88.5 per cent of that of the hand-cut potatoes at the 2.0-pound rate, 89.0 per cent at the 1.5-pound rate, 87.0 per cent at the 1.0-pound rate, and 84.9 per cent at the 0.5-pound rate.

Preservation of Pecan Kernels by Drying in an Oven and Sealing in Fruit Jars. (Hubert Harris). — Pecans harvested in the fall and held in common storage usually become rancid by the following July, but they will often keep considerably longer if stored in a very dry place.

As a result of general observations on the storage of pecans over a period of years at this Station, it appears safe to conclude that unshelled pecans might be expected to keep in a satisfactory condition for periods ranging from 5 to 12 months in common storage, depending on moisture conditions and season.

In 1939 samples were dried in an electric oven at 225° F., to moisture contents ranging from 0.7 per cent to 3.4 per cent. Nuts containing different amounts of moisture were sealed in glass jars in the air and also under vacuum. They were kept in a dark storage room at ordinary temperatures. Those dried to 3 per cent moisture, or less, were still good after 2 years in storage, whereas those of higher moisture content were rancid after 1-year storage. The vacuum seals were only very slightly better than those sealed in air. The tests did not show how long the kernels might have been kept in unsealed containers.

Tests were made again in 1940, but before the storage experiment was added. A preliminary study was made to determine the most satisfactory drying temperature. Greater uniformity with less scorching and darkening of the kernels

was obtained by drying for relatively long periods at comparatively low temperatures than was obtained for shorter periods at higher temperatures. It was found that regular stirring of the kernels during the drying period was necessary.

The results show that pecan kernels can be kept for 2 years or longer by drying them to about 2 per cent moisture and storing them in sealed containers. The best results were obtained by drying them in an oven for about 50 minutes at a temperature of 200° F. The exact length of the drying period varied somewhat with the moisture content of the undried kernels and the quantity of kernels dried at one time.

Several methods of sealing the jars were tried. Probably the most practical is the "hot seal" pack. By this method the hot kernels are transferred directly from the oven pans to clean, dry, hot jars, which are sealed immediately. The contraction of the air as the jars cooled results in a small amount of vacuum.

A practical method was developed for vacuum sealing several different types of clamp-top fruit jars at any desired amount of vacuum. The necessary equipment consists of a common steam pressure cooker, a vacuum siphon attached to the water faucet, and a short piece of vacuum hose. If it is desirable to determine the exact amount of vacuum pulled, the pressure gauge may be removed from the cooker and replaced by a vacuum gauge. The needle valve is removed from the fitting in the top of the cooker, and one end of the hose is slipped over the fitting. The other end of the hose is attached to the siphon. The filled jars with the covers only partially clamped are placed inside the cooker. The sealing surface of the cooker cover is greased with a light film of vaseline, and the lid is screwed down tightly. The water is then turned on and allowed to run until the desired amount of vacuum has been pulled. Air is then allowed to rush back into the cooker and the jars automatically seal themselves as a result of the sudden change in atmospheric pressure. The method proved to be very satisfactory. Failures occurred only with jars having warped covers or where small pieces of trash, grit, or dirt prevented the jar top from making close contact with the rubber gasket.

Use of Zinc Sulphate for Preventing Arsenical Injury and for Overcoming Zinc Deficiency of the Peach. (Hubert Har-

ris). — Peach trees sprayed with a lead arsenate and lime mixture are likely to be injured by water-soluble arsenate which affects the tender leaves, twigs, and fruit, causing defoliation, brown spots, shot holes, cankers, and gum exudations. The damage is usually moderate, but in some cases it has been greater than the damage that might have been expected from pests which the lead arsenate sprays were intended to control.

Since 1939 zinc sulfate has been used with all lead arsenate sprays on 40 trees in a mature orchard, while zinc sulphate was omitted from the spray on 35 other trees. The effect of the zinc sulphate in preventing arsenical injury has been pronounced each year. Trees not sprayed with zinc sulphate have had four times as much leaf drop, five times as many arsenical holes per leaf, and seven times as much dead leaf area as the trees sprayed with zinc sulphate. The leaves in the zinc-sulphate treatments have consistently been darker in color and the trees have been healthier and more vigorous. The average yield for 1941 and 1942 was 210.83 pounds per tree per year on the 40 trees sprayed with zinc sulphate, as compared with 169.63 pounds per tree per year on the 35 trees that were not sprayed with zinc. The zinc sulphate was used at the rate of 1 pound to each 50 gallons of spray. This added about 1 cent per tree per year to the cost of spraying.

In a young orchard set in 1939, many of the young trees developed chlororis of the leaves during the early part of the season. The symptoms occurred again in 1940; a careful check showed that 75 per cent of the trees were definitely affected. The range of injury to individual trees was from slight mottling of some of the leaves to complete mottling of all of the leaves, yellowing of the leaves, premature leaf fall, and stunted growth. Only a few of the trees showed stages beyond mottling of the leaves.

In 1940, several treatments were given. The treatments included manganese, magnesium, iron, potassium, and zinc, which were applied to the leaves and to the soil. All of the treatments gave negative results with the exception of zinc. Trees receiving either soil or leaf treatments with zinc were practically free of the symptoms within 40 days; little change occurred in the conditions of untreated trees and those receiving the various other treatments.

The zinc was applied in the form of zinc sulphate at the

rate of one pound per tree for the soil treatment and one pound per 100 gallons for the spray treatment. Trees receiving zinc soil treatment in 1940 and no zinc in 1941 did not show any of the symptoms during either year. Check trees during 1940 and 1941 continued to show the symptoms during both years, but the symptoms were eliminated in 1942 by treatment with zinc sulphate.

These experiments have shown the value of zinc sulphate for peaches in preventing arsenical injury and in supplying zinc to soils that are deficient in this element. A careful analysis of the data seems to warrant the use of zinc sulphate at the rate of one pound per 50 gallons in all peach sprays containing lead arsenate.

Effects of Heavy, Medium, and Light Pruning Treatments on Yields and Quality of the Champanel Grape. (Hubert Harris). — According to standard practices in pruning bunch grapes, 90 per cent or more of the annual cane growth is cut from the vines each year. It is questionable if such heavy pruning is advisable for all varieties and under all conditions. General observations made at this Station prior to 1935 indicated that such heavy pruning was not best for the Champanel, a vigorous growing variety.

In 1935 a planting was made of this variety for the purpose of determining the effect of degree of pruning on yields and quality of fruit. The planting consisted of 38 vines spaced 15 by 20 feet. The vines were trained on a two-wire vertical trellis running in the direction of the 20-foot spacing. All vines were pruned once each year during the dormant season. Thirteen vines were pruned lightly, 12 were pruned moderately, and 13 were pruned heavily. In the light pruning treatment, only the dead, weak, and unthrifty wood was removed. The moderate pruning consisted of the removal of dead, weak, and unthrifty wood, and, in addition, approximately one-half of the thrifty wood of the previous season's growth. The vines receiving heavy pruning were pruned by the conventional single-trunk, four-cane, renewal Kniffin system, which resulted in the removal of 90 per cent or more of the annual growth.

The vineyard produced its first crop in 1938. A summary of the results obtained during the period from 1938 to 1942 is given in Table 2.

Table 2.—Effects of Degree of Pruning on Yields and Quality of Champanel Grapes, 5-Year Period, 1938-42

Degree of pruning	Vines in test	Prunings per plant per year	Average annual yields						
			Yield per plant per year	Clusters per 100 pounds	Berries per quart	Proportion of stems and culls	Proportion juice from "field run" grapes	Proportion of sugar in juice	pH of juice
	Number	*Pounds*	*Pounds*	*Number*	*Number*	*Pct.*	*Pct.*	*Pct.*	
Light	13	8.19	62.09	698	232	7.9	73.6	12.19	3.20
Medium	12	11.03	45.17	658	223	7.0	73.7	12.16	3.15
Heavy	13	13.15	23.15	542	225	5.7	75.6	12.25	3.10

Table 3.—Height and Diameter Growth of 8-Year-Old Pines Receiving Different Pruning Treatments, 1941-42

Growth	No pruning		¼ pruned		½ pruned		¾ pruned	
	1941	1942	1941	1942	1941	1942	1941	1942
Height growth, feet	2.5	3.1	2.8	3.0	2.6	2.7	2.3	2.7
Diameter (breast height) growth, inches	.70	.75	.64	.82	.59	.63	.60	.68

During the 5-year period, the lightly pruned vines yielded almost three times as many grapes per vine as those heavily pruned. Heavy pruning resulted in slightly larger clusters and fewer cull berries. The degree of pruning had very little, if any, effect on the size of berries, percentage of juice, sugar content, or acidity.

The experiment strongly indicates that the heavy pruning, commonly practiced with most varieties of bunch grapes, will greatly reduce yields of the Champanel variety.

Effects of Pruning on Young Pine Trees. (W. R. Boggess). — The desirability of pruning forest trees is determined by the cost of the operation and the effects of the pruning on the quality and volume of timber produced. Timber volume is affected by tree growth. Pruning could reduce growth by reducing foliage.

The effect of four degrees of pruning on height and diameter growth of an 8-year-old slash pine plantation was studied on land adjoining the Barbour County experimental area. An experiment, using 3 replications of 4 treatments in a randomized block design, was established in February 1941. Pruning treatments were (1) no pruning, (2) trees pruned ¼ the total height, (3) trees pruned ½ the total height, and (4) trees pruned ¾ the total height. Measurements were made on 25 randomly selected trees on each ½-acre plot. Height and diameter growth for the 1941 and 1942 growing seasons are shown in Table 3.

The pruning treatments have not resulted in statistically significant differences in height or diameter growth in either of the 1941 or 1942 growing seasons. Both height and diameter growth were slightly greater in 1942, which probably indicates somewhat better growing conditions.

Establishment of Loblolly Pine Reproduction as Influenced by Condition of Seedbed and Seed Fall. (W. L. Lear). — In the fall of 1941, plots were established within a mixed hardwood-pine stand. The plots were sown at the rate of 24,000, 48,000, and 100,000 seed per acre. They were treated by removing duff, by burning, by raking, and by raking and cultivating. Records were taken of the number of seed germinating and the causes of failure of the seedlings to survive after emergence and during the first growing season. The study

indicated that duff (1½ inches) affects establishment by the reduction of the number of seeds reaching mineral soil and germinating. Light burning did not remove sufficient duff to overcome this condition. Seedbed preparation materially increased germination. A fall of 100,000 seed per acre was not sufficient to assure satisfactory establishment of reproduction under the conditions present (1,000 seedlings per acre). The chief causes of failure were drought (during growing season), failure of seed to germinate, and destruction of seedlings by birds immediately after emergence. Other minor causes were disease and insect injury, mechanical injury by man and animal, and injury by rain (washing out).

Yield and Sugar Content of Selected Thornless Honey Locusts. (O. A. Atkins). — For several years studies have been in progress with superior selections of the thornless honey locust. In the spring of 1938, a few trees of the Calhoun and Millwood varieties were planted at Auburn, but sufficient trees were not obtained to complete the planting until the spring of 1940. Since the experiment was started, individual tree records have been kept on yield of pods, height of tree, and trunk diameter. Observations and data indicate that the two varieties included in this experiment produce few pods until the trees are about 4 years old. The data are given in Table 4.

Table 4.—Average Yield per Tree, Trunk Diameter, and Height of Honey Locust Trees, 1942

Variety	Trees in test	Age of trees	Average yield per tree, dry weight basis	Average trunk diameter	Average height
	Number	*Years*	*Pounds*	*Inches*	*Feet*
Calhoun	31	3	1.01	1.13	5.29
Calhoun	13	4	5.20	2.21	8.95
Calhoun	4	5	26.38	3.50	12.33
Millwood	31	3	1.27	1.25	5.58
Millwood	11	4	4.98	2.07	9.11
Millwood	5	5	58.30	3.56	12.38

Two cultural treatments were used in the experiment: (1) clean cultivation, and (2) lespedeza sericea planted for ground cover and cut twice annually, with the material used as a mulch about the trees. No significant difference in growth due to the different treatments was observed. All trees were

fertilized annually with a 6-8-4 fertilizer at the rate of 1 pound per tree for each year of the tree's age.

The 5-year-old trees of the Calhoun variety in 1942 produced an average of 26.38 pounds of pods per tree (dry weight basis) which is the equivalent of 1,266 pounds per acre (48 trees per acre); the four highest yielding trees in the experiment averaged 10.5 feet in height and 3.1 inches in trunk diameter; these produced an average of 31.69 pounds of pods or the equivalent of 1,521 pounds of pods per acre.

The 5-year-old trees of the Millwood variety in 1942 produced an average of 58.30 pounds of pods per tree (dry weight basis), which at 48 trees per acre would be the equivalent of 2,798 pounds of pods. The four highest yielding trees averaged 12.5 feet in height and 3.6 inches in trunk diameter, and produced an average of 65.62 pounds of pods or 3,150 pounds per acre.

Preliminary feeding tests with dairy cows for 2 years, using ground honey locust pods as a part of the concentrate mixture, were conducted in cooperation with the Dairy Department. These tests show that the ground honey locust pods may be satisfactorily substituted for oats pound for pound in the concentrate mixture, and that the ground material is very palatable in the ration. Samples of the pods of the Millwood and Calhoun varieties collected at Auburn, Alabama in 1940 and 1941 gave the following average analysis (dry weight basis):

Variety	Invert sugar	Sucrose	Total sugar
	Per cent	*Per cent*	*Per cent*
Millwood	7.45	29.20	36.65
Calhoun	6.40	32.55	38.95

A more complete analysis (average of three composite samples) of honey locust pods, collected at random from high-yielding trees in Alabama, as determined by the Alabama State Chemical Laboratory, gave the following results: moisture, 12.47 per cent; ash, 3.14 per cent; crude protein, 8.58 per cent; crude fat, 2.12 per cent; crude fiber, 17.73 per cent; carbohydrates (not including crude fiber), 55.96 per cent.

The estimated yield of 3,150 pounds per acre which came from trees only 5 years of age had a feed value equivalent to 105 bushels of oats or 56 bushels of corn.

ZOOLOGY-ENTOMOLOGY

Insecticide Studies. (F. S. Arant and J. T. Griffiths). — High rotenone-yielding strains of Devil's shoestring *(Tephrosia virginiana)* were planted. Roots were sampled so that the 1943 seed might be saved and graded for rotenone content of the producing plant.

Attempts to control the weevil (*Apion segnipes* Say) on *Tephrosia* seed pods were made. Cryolite was tentatively indicated as a potential control.

Small amounts of rotenone and rotenoids were found in seed of *Amorpha fruticosa.*

In field tests with early and late beans, the diluent pyrax was found to be superior to talc when used with rotenone for Mexican bean beetle infestations. Cryolite (1 part) in talc (3 parts) proved to be as effective as 0.5 per cent rotenone in talc when used against this pest. More experimental work is needed, however.

Cryolite-talc (1-3) proved to be superior to 1.0 per cent and 0.5 per cent rotenone in controlling the cabbage looper in field experiments with collards. One per cent rotenone was definitely superior to 0.5 per cent rotenone and other tested compounds in the field control of the harlequin bug. One per cent rotenone and cryolite-talc (1-3) were efficient in controlling the cabbage webworm on these collard plots. It appeared that 0.5 per cent rotenone could probably replace 1.0 per cent rotenone for control of any of these three insects, and that it would give satisfactory control as compared with the higher concentration. Cryolite can satisfactorily replace rotenone in the control of the cabbage looper and the cabbage webworm.

In laboratory tests, rotenone in pyrax was not superior to rotenone in talc when used against the harlequin bug. Two dinitro-o-cyclohexyl phenols were inferior to 0.25 per cent rotenone. When talc and pyrax were dusted on insects in the absence of rotenone, talc killed 3.75 bugs out of 5 at the end of 2 days time, while pyrax had killed only 0.25 bug out of 5 in this same interval.

In laboratory tests on the green stink bug, rotenone in pyrax was significantly better than rotenone in talc.

Farm Ponds. (H. S. Swingle, E. V. Smith, and J. M. Lawrence). — Selection and breeding of largemouth black bass for efficiency of food utilization were continued for the second year. The efficiency with which the bass utilized small fish as food was measured by determining the ratio of the increase in weight of bass to the weight of food consumed (G:F). In 1941 this ratio for individual bass varied from 1:1.5 to 1:24.2. The progeny from the selected individuals in 1942 had G:F ratios from 1:2.1 to 1:6.03. Individuals having G:F ratios of 1:2.5 or less were segregated for breeding in 1943.

Experiments were conducted in which bluegills, goldfish, golden shiners, and shad were tested as forage minnows for largemouth bass. Bluegills were the most satisfactory of the forage fish tested.

Experiments have shown that the 4-10-4 fertilizer can be substituted for 6-8-4 during the war emergency. A greater number of applications per season of the former are necessary to maintain satisfactory plankton growth. The addition of minor elements (zinc, boron, manganese, iron, iodine, and/or copper) or vitamins B_1 and B_6 did not increase plankton production.

Applications of 1,000 and 2,000 pounds of ground dolomitic limestone per acre did not increase the fish production in fertilized ponds, indicating the fertilizer mixture previously recommended contained a sufficient amount of lime.

Ponds receiving 1 ton of Johnson grass hay per acre, 1 ton Johnson grass hay plus 200 pounds of 6-8-4, and 1 ton of kudzu hay produced respectively 163, 213, and 136 pounds of bluegills per acre. Since these hays sell for $20 to $30 per ton, their use for fish production does not appear promising.

The catch by hook-and-line fishing in a properly fertilized 12-acre pond in 1942 was 273 pounds of fish per acre. The fertilizer costs per pound of fish caught was 7 cents.

Boll Weevil Control with Calcium Arsenate. (J. M. Robinson). — The work on boll weevil control was continued in 1942 on Norfolk sandy loam plots. Poisoning of plots receiving 1,000, 1,500 and 2,000 pounds of fertilizer per acre, resulted in the greatest gains of any year when poisoning was necessary. The cotton came to a stand following a rainfall of 1.66 inches on May 13, 14, and 15. Another rainfall of 2.27 inches May 20, 21, and 22 stimulated growth of the cotton.

The weather thereafter was favorable for the development of the cotton and the boll weevil. The infestation reached 11 per cent by July 13. Three applications of calcium arsenate beginning July 14 kept the infestation below 20 per cent until August 4. The infestation on the unpoisoned plots had advanced to 50 per cent. Applications of poison again were made on August 3, 12, and 17 for the protection of squares and young bolls, and additional applications of poison were made on August 22 and 25. The increased yield from poisoning was 18 pounds of seed cotton per acre on the unfertilized plots. The increased yield on the plot treated with 500 pounds of fertilizer was 482 pounds of seed cotton per acre; with 1,000, 1,500, and 2,000 pounds of fertilizer, the increases from poisoning were 814, 926, and 1,192 pounds of seed cotton per acre, respectively.

The 10-year average increase in yield from dusting was dependent upon the time of planting, the rate of fertilizer, the weather, and the percentage of infestation. Without fertilizer, poisoning increased the yield 42 pounds of seed cotton per acre. With 500 pounds of fertilizer per acre, the increase was 242 pounds of seed cotton with 1,000, 1,500, and 2,000 pounds of fertilizer, the increases from poisoning were 318, 453, and 471 pounds of seed cotton per acre, respectively.

Fumigation of Camellias with Methyl Bromide. (L. L. English). — The fumigation of camellias with methyl bromide for the control of scale insects and other pests was placed on a commercial basis. This measure is being used by nurserymen, not only to meet interstate shipping requirements, but to obtain pest-free plants for transplanting. Recommended fumigation schedules are 3 pounds per 1,000 cubic feet for 3 hours at 60° F., 2 pounds for 3.5 hours at 70° F., 2 pounds for 2.5 hours at 80° F., and 2 pounds for 1.5 hours at 90° F. Proper preheating of the loaded chamber before introducing the gas, and shading of the plants for 24 hours after fumigation are necessary.

Experiments with Camellia Cuttings. (L. L. English and E. W. McElwee). — The response of camellia cuttings to rooting compounds varied with the variety and treatment. Root production on varieties slow to root was improved by Rootone No. 10 and Hormodin No. 3. Talc, used as a control, greatly

retarded root development. Cuttings were made with none, 1, 2, 3, and 4 leaves. All cuttings with no leaves died. Root production decreased as cuttings with 2 leaves were planted 1, 2, and 3 inches deep. However, survival of the 1-inch planting was lower than the 2- and 3-inch plantings. The length of cuttings had no significant effect on root formation. In tests with sand, Florida peat, Canadian peat, sawdust, and mixtures of these with sand, sand appears to be the most practical medium for rooting camellia cuttings.

Studies on the Occurrence, Epidemiology and Inter-Host Relationships of Nematode Parasites of the Chicken *(Gallus gallus)* **in Alabama.** (R. O. Christenson). — During 1942 a total of 178 chickens was autopsied in routine autopsy work, resulting in new records on populations of nematodes and seasonal occurrence. The egg cultures on the longevity of chicken nematode eggs have been maintained and tested for viability at frequent intervals. Eggs of *Ascaridia galli* are viable after 1,100 days of incubation in 2 per cent dichromate solution; eggs of *Heterakis gallinae* are alive after 1,090 days under the same conditions.