
UNIVERSITY SYSTEM OF GEORGIA
H. W. CALDWELL, *Chancellor*

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ANNUAL REPORT

1948-1949

GEORGIA COASTAL PLAIN
EXPERIMENT STATION

GEORGE H. KING, *Director*
Tifton, Georgia



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Agricultural Economics

****L. M. Awtrey, Jr., Economist

Agricultural Engineering

James L. Shepherd, Agricultural
Engineer
***William D. Kenney, Agricultural
Engineer
***James M. Stanley, Agricultural
Engineer

Agronomy

S. A. Parham, Agronomist
J. H. Turner, Agronomist
**J. G. Jenkins, Agronomist
(Cotton Breeding)
*Wayne H. Freeman, Agronomist
(Corn Breeding)
S. B. Parkman, Agronomist
(Seed Stocks)

*Ivan Neas, Agronomist
(Tobacco)
*J. G. Gaines, Pathologist
(Tobacco)
*J. L. Stephens, Agronomist
(Forage Crops and Pastures)
*G. W. Burton, Geneticist
(Grass Breeding)
*Earle H. Devane, Agronomist
(Grass Breeding)
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(Forage Crops and Pastures)
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(Grass Breeding)

Animal Husbandry

*B. L. Southwell, Animal Hus-
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W. C. McCormick, Assistant
Animal Husbandman
Geo. K. Dillard, Assistant
Animal Husbandman
Garrett Jones, Dairy Manager
****J. W. Stevenson, Animal Hus-
bandman
*W. P. Duncan, Assistant
Animal Husbandman
(Range Grazing)
****Paul C. Lemon, Forest Ecologist
(Range Grazing)
*John S. Williams, Range Con-
servationist
(Range Grazing)
*F. E. Knox, Bio-Chemist

* In cooperation with the United States Department of Agriculture.

** In cooperation with the United States Department of Agriculture and the Georgia Experiment Station.

*** In cooperation with the United States Department of Agriculture and the University of Georgia.

**** Resigned.

Animal Diseases

W. L. Sippel, Veterinary
Pathologist

B. L. Gittings, Veterinary
Pathologist

Hughie J. Godwin, Laboratory
Technician

Entomology

*P. M. Gilmer, Entomologist

*D. W. LaHue, Entomologist

L. W. Morgan, Assistant Entomologist

****J. D. Crump, Jr., Entomologist
*Oliver Kendrick, Field Aide

Horticulture

Otis Woodard, Horticulturist

W. T. Brightwell, Associate
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**Naomi C. Woodroof, Botanist
(Peanut Breeding)

*Huey I. Borders, Pathologist
(Vegetable Plants)

*LeRoy Wheeler, Agricultural
Aide

Nematology

*J. H. Machmer, Nematologist

Plant Pathology

Harvey W. Rankin, Pathologist

Parasitology

*John S. Andrews, Swine Parasitologist

*D. J. Jones, Agricultural Aide

Soil Conservation

*G. N. Sparrow, Project Supervisor

Soils

Robert L. Carter, Soil Scientist

Shade Tobacco Branch Station Attapulugus

E. J. Gibson, Pathologist

H. D. Taylor, Assistant Horticulturist

Susie Cox, Secretary

ERRATA

On page 31, under Corn Breeding, 46 different experiments were conducted at eight locations--

On page 41, 4th paragraph from bottom should read "The side application of 188 pounds of soda per acre at first planting, etc...."

On page 43, variety of soybean referred to is Georgian, not Georgia--

On page 69, variety of muscadine referred to is Topsail, not Topsoil--

CONTENTS

Introduction	7
Agricultural Engineering	18
Agronomy	24
Cotton	24
Upland Cotton Breeding	26
Sea Island Cotton Breeding	28
Corn	29
Corn Breeding	31
Peanuts	32
Peanut Breeding	34
Small Grains	35
Flue-Cured Tobacco	36
Flue-Cured Tobacco Diseases	37
Shade Tobacco	40
Shade Tobacco Diseases	42
Forage Crops and Pasture Experiments	43
Grass Breeding	44
Cooperative Pasture Investigations	47
Animal Husbandry	48
Beef Cattle	48
Forest Range Grazing Studies	50
Dairy Cattle	52
Swine Investigations	54
Swine Parasite Investigations	56
Animal Disease Investigations	57
Entomology	59
Cereal and Forage Insect Investigations	62

CONTENTS — (continued)

Horticulture	63
Sweetpotatoes	63
Miscellaneous Vegetables	65
Vegetable Plantbed Investigations.....	66
Fruit Crops	68
Nematology	71
Plant Pathology	74
Crop Improvement	75
Soil Conservation	76
Soils	77

INTRODUCTION

General: The Georgia Coastal Plain Experiment Station conducts research applicable to the Coastal Plain area of Georgia. In this area, slightly over one-half of the farmers of Georgia produce three-fifths of the agricultural income of the State. While producing a large portion of commodities common to the State, tobacco, sugarcane, naval stores, and vegetable plants for shipment are strictly Coastal Plain enterprises. Commercial peanut production is largely confined to this area and here, too, the greater part of the livestock, truck crops, and pecans are produced.

Need for Complete Research Unit: Because of the special importance of certain enterprises in Coastal Plain agriculture and because of the diversity of enterprises, the climate, soil differences, and the prevalence of insects and diseases, this Station should be a complete unit in so far as research is concerned. That is, the Station should have personnel and facilities enough to deal with the problems of the Coastal Plain farmer.

Co-operative Enterprise: The Georgia Coastal Plain Experiment Station has never participated in any of the Federal funds available under the various research acts. Fortunately, due to location and a splendid reputation for co-operation, the Station has many co-operative agreements with Bureaus and Divisions of the U. S. Department of Agriculture. At present, sixteen members of the Staff are state-supported while twenty-three are supported by co-operating agencies, twenty of whom are supported by the U. S. Department of Agriculture. Such agreements have made it possible for many needs of the Coastal Plain farmer to be met which could not be met on the state-supported program.

Departments: The departments of the Station are *Agronomy*, *Animal Husbandry*, including Swine Parasitology and Studies on the Range Grazing Project, *Animal Diseases*, *Agricultural Engineering*, *Entomology*, *Horticulture*, *Plant Pathology*, *Nematology*, and *Soils*. Some of the outstanding new achievements of these departments during the year are as follows:

AGRONOMY

One Variety Cotton Community: The Station has supplied seed of the new upland cotton, Pandora, to a one-variety community in Terrell County. The farmers of this community are organized as the Southwest Georgia Pandora Cotton Seed Producers Association. The Station grows the foundation stock to supply the community, and the corporation produces registered seed.

Dixie 18 Hybrid Seed Corn: Dixie 18 hybrid corn continues to grow in popularity. This year the entire output was sold by January 1 and the acreage in this corn is estimated at 100,000 acres. This corn during three years' tests has consistently outyielded the better varieties and other hybrids of the Coastal Plain. The hybrid corn program has been aided this year by a \$10,000 allotment for research made to the Station by the Greenwood Plantation,

Thomasville, Georgia. Also of assistance is the new greenhouse made possible by an extra allocation from the Board of Regents.

Coastal Bermuda: Coastal Bermudagrass is fast establishing itself as the best pasture grass for the Coastal Plain. Available sprigs for pasture planting from sources were exhausted during the planting season. Almost unbelievable instances of high hay yields and carrying capacity of this grass are being reported. At the Station, with high fertilization, 28 tons of 14% protein hay were produced on four acres. The cost per pound of protein was approximately half of that secured from cottonseed meal.

Pasture Tests: Thirty acres of Coastal Bermuda pasture are being established by the Division of Forage and Pastures for further testing on fertilizing, adaptability of various legumes in mixture with Coastal Bermuda, and other managerial aspects.

Turf Projects: Golf clubs and individuals continue to contribute to the Turf Project. This project is one of the four in the United States carried on in co-operation with the American Golf Green Association and the U. S. Department of Agriculture. Not only is the project visited by those interested in golf greens and fairways, but also by park directors and homeowners interested in better lawns. Clubs and agencies making cash contributions to this project are: Atlanta Athletic Club; Augusta Women's Golf Association; Alabama Golf Association; Atlanta Public Links Golf Association; Athens Country Club; Carolina Golf Association; M. A. Ferst, Atlanta, Georgia; Florida State Golf Association; Georgia State Golf Association; Greenwood Country Club; Gullowheen Chemical Corporation; O. E. Linck Company; Masters Tournament of Augusta; Nashville District Golf Association; Pinehurst, Incorporated; Savannah Golf Club; Sea Island Company; South Carolina Golf Association; Southern Turf Association; Southeastern Section of Professional Golfers Association; and United States Golf Association.

Dwarf Millet: Released for the first time this year is a new strain of Cattail Millet. This millet is later maturing and has a higher percentage of leaf to stalk than the common variety. In addition, it is a dwarf strain which lends itself to combining. Tests this year also indicate a higher yield of beef from this dwarf strain.

Tift Sudan: The Station this year in co-operation with the U. S. Department of Agriculture is increasing seed stocks of Tift Sudan. Tift Sudan developed at this Station is resistant to leaf diseases which attack common Sudan. The main objection has been the small seed crop, but due to its superior qualities, the U. S. Department of Agriculture is assisting in its increase.

Range Revegetation: Much interest is being shown in better grazing under range conditions. This is especially true since many range counties are requiring ranges to be fenced. Preliminary tests show that where the wiregrass is burned off, phosphate added, and

white clover sown, the gain in beef per acre is increased many times and is a profitable practice.

During the year tests are being made on the typical range soils to determine their response to improved grasses under best pasture practices.

AGRICULTURAL ENGINEERING

Peanut Curing: Work with harvesting and curing of peanuts continues to make progress. Already proved is the fact that peanuts can be cured by artificial heat. During the year, our engineers developed a peanut harvesting combine which digs and picks the green nuts in one operation at an acre per hour rate. The machine is attracting belt-wide attention and indications are that several will be on the market by the 1950 harvesting season. This project is being conducted in cooperation with other units of the University System and the U. S. Department of Agriculture. Farmers cooperating with the Station on this project are Mr. H. C. Dodson, Tifton, and Mr. Howard Ponder, Omega, Georgia.

Tobacco Curing: The project on tobacco curing carried on in cooperation with the Division of Agricultural Engineering of the College of Agriculture and the U. S. Department of Agriculture is now in its second year. Preliminary tests indicate that a substantial saving in fuel costs may be made following engineering recommendations in barn construction and heating units. Cooperating on the engineering projects were the following companies:

Turner Manufacturing Company, Statesville, North Carolina
Lilliston Implement Company, Albany, Georgia
International Harvester Company, Atlanta, Georgia
John Deere Company, Atlanta, Georgia
Armco Drainage and Metal Products Company, Inc., Atlanta, Georgia
The Aerovent Fan Company, Piqua, Ohio
Will-Burt Company, Orville, Ohio
Owens-Corning Fiberglas Corporation, Atlanta, Georgia
Reynolds Metals Company, Richmond, Virginia

ANIMAL HUSBANDRY

Crossbred Cattle—Beef: Also in the second year is a project in which calves from Brahma bulls crossed on grade Hereford cows are compared with crosses of purebred Hereford bulls on grade Hereford cows. The Brahma is gaining in popularity and these tests are being conducted to meet demands of the farmers for more information concerning crosses. As a check, Angus bulls crossed on Hereford cows are being compared with Brahma bulls crossed on Hereford cows to see if the Brahma-Hereford cross has any advantages over the Angus-Hereford cross.

Crossbred Cattle—Dairy: This year a halfbred Sindhi-Jersey bull is being crossed on twenty purebred Jerseys. Offspring of this cross will be compared with offspring of pure Jersey breeding to ascertain if the one-quarter Sindhi blood will make the cows more adapted to the summer heat.

Much of the work in the Animal Husbandry Department is carried on in cooperation with the U. S. Department of Agriculture.

ANIMAL DISEASES

"X" Disease of Cattle: This department is probably devoting more time to "X" Disease of cattle than any other project. This disease, as its name indicates, has not been identified with the virus causing it and thus no treatment has proved satisfactory. Dr. Wm. L. Sippel was allowed two months leave to attend a special course on virus diseases, and a friend of the Station assisted in defraying his expenses.

New Personnel: Dr. Ben Gittings, a graduate of the Veterinary College at Auburn, Alabama, was added to the Staff this year in order to meet the demands made upon the Station by the veterinarians of the area for diagnostic work.

ENTOMOLOGY

Green Peach Aphid: In cooperation with the tobacco pathologist, the entomologist worked out control measures for the green peach aphid on tobacco. This pest represents a large potential loss if uncurbed, and the recommendations of this Station seem to hold it in check.

Corn Weevil Research: This work on corn weevil control is now in its second year, and progress is being made in finding insecticides that will more effectively control this damaging pest.

New Personnel: Added during the year to assist in entomological work was Mr. Loy E. Morgan. Mr. Morgan is Georgia reared, has his bachelor's degree from New Mexico and his master's degree from the University of Kansas. This addition was necessary due to the large increase in kinds and numbers of insects over the Coastal Plain.

HORTICULTURE

Bunch Porto Rico Sweetpotato: The Station is doing much to increase pure stock of the Bunch Porto Rico. This sweet potato was a selection made by the late Mr. J. H. M. Cliett of Powersville, Georgia, about 1922. A few years ago our horticulturist started "cleaning up" this stock and now has an excellent strain which we are calling the Cliett Bunch Porto Rico. Five-year tests show an increase in yield over the common "vining" type of 66 bushels of Number 1 potatoes per acre.

Small Fruits and Berries: Work is being continued on blueberries, grapes, blackberries, and dewberries. Our new strain of blueberry, developed as 11-182, is being widely distributed and recently has been named Callaway in honor of Regent Cason Callaway. This year we are propagating an early strain of blackberry which produces fruit a full month earlier than other blackberries.

Okra: During the year, a research project on okra was started on our land at Attapulugus. While okra is the major crop being studied, research will also be conducted with other vegetables of the area. In charge of this project is Mr. Harold Taylor who is a graduate of Clemson and comes highly recommended by that college.

Camellia Trial Garden: During the year this Station was selected by the American Camellia Society as trial grounds for the various camellias. Varieties, fertilizing, methods of propagation, and disease and insect control will be studied in cooperation with the Society. The trial area selected is just north of the original Research Building and within a few years should be a "beauty" spot for camellia enthusiasts.

PLANT PATHOLOGY

Disease Studies: Our department of plant pathology is devoting much time to a study of the various new sprays and dusts to be used against plant diseases. Work is carried on in this connection with the various vegetables and melons. Also receiving the attention of the pathologist is the disease known as "internal cork" of sweetpotatoes. It is hoped to find the means by which this disease is transmitted.

NEMATOLOGY

New Nemacides: Our nematologist is conducting tests to determine the efficiency of the various nemacides that are on the market. He is also studying the various rotations which may be used to control the nematode population.

SOILS

Minor Elements: The soil scientist of the Station is testing crop yields obtained through the use of minor elements. Outstanding in tests at Tifton this year were his findings on corn. Here, the addition of 5 pounds of elemental zinc per acre increased corn yield 8 bushels per acre. This zinc deficiency was formerly thought to be mainly in North Florida and along the Florida line in Georgia. Outlying tests will be run to determine the zinc deficient area.

Radioactive Phosphorus Tests on Peanuts: Also of interest is the test being conducted with radioactive phosphorus on peanuts. By means of this radioactive element as a tracer, it is hoped to determine more closely how, when, and from what material peanuts obtain their plant food.

SOIL CONSERVATION

New Department: During the year, there was established in cooperation with the Soil Conservation Service a research project on soil and water conservation. The Soil Conservation Service appropriated \$10,000 annually for this work and it is the only research project in the Coastal Plain conducted on state experiment station land. Mr. George Sparrow, formerly zone technician from Spartanburg, South Carolina, is in charge of the project. Mr. Sparrow is a graduate of Auburn and has made an enviable record with the Soil Conservation Service.

LIBRARY

The library, sometimes called the heart of a research institution, is used widely both by professional workers and students of Abraham Baldwin College.

OFF-STATION WORK

Outlying Tests: Tests of the different varieties of the major field crops of Georgia are run on soil types different to those found on the Station. These tests are conducted on eight different locations and indicate varieties best suited to specific locations. Farmers and others cooperating in these tests are: A. J. Singletary, Singletary Farms, Blakely, Georgia; Fred Schroer, Valdosta, Georgia; L. L. Patten, Lakeland, Georgia; State Prison Farm, Reidsville, Georgia; Dewey Newton, Millen, Georgia; T. H. Bass, Americus, Georgia; Paul Doke, Baxley, Georgia; Ernest Hayes, Vienna, Georgia; F. R. Frazier, Dawson, Georgia; L. O. Lanier, Metter, Georgia; H. Denham, Cochran, Georgia; Edward Bland, Manager Haley Farms, Albany, Georgia; T. Ross Sharpe, Lyons, Georgia; Mrs. George Gee, Blakely, Georgia; Floyd Tabor, Perry, Georgia; and Greenwood Plantation, Thomasville, Georgia.

SHORT COURSES

The Station cooperates with Abraham Baldwin Agricultural College in conducting short courses. Over 90% of the instruction offered in these courses is given by Station personnel. The College will give a more comprehensive report as to subjects and numbers of people reached.

LOSS OF PERSONNEL

Lost during the year was Mr. L. M. Awtrey who resigned to go into private business. Mr. Awtrey was Agricultural Economist acting as Editor. He was making very valuable contributions to the public relations program of the State and his loss is keenly felt. His position has not been filled due to budget cuts.

OTHER ACKNOWLEDGMENTS

Concerns and individuals other than those already mentioned who have assisted through the contribution of equipment and supplies are:

American Agricultural Chemical Company
American Cyanamid Company
American Potash Institute
Barrett Company
Berrien Products Company
Boyett Sprayer Manufactory
California Spray-Chemical Corporation
Chilean Nitrate Educational Division
Cotton Producers Association
Dow Chemical Company
E. I. DuPont de Nemours and Company
H. D. Hudson Manufacturing Company
International Minerals and Chemical Corporation
Monsanto Chemical Company
Niagara Sprayer and Chemical Company, Incorporated
New Ideal Sprayer Company
Rohm and Haas Company
Shell Chemical Corporation
Sherwin-Williams
Will-Burt Company
Woolfolk Chemical Works, Ltd.
Zonolite Company

DISSEMINATION OF INFORMATION

Visitors: During the year, over 5,000 people in addition to those attending short courses visited the Station. These were farmers, war veterans' classes, and classes in vocational agriculture.

Publications: Thousands of letters have been written in response to direct inquiry. Bulletins, circulars, and mimeographs have been in demand more than any previous year. Shortage of allocation makes it impossible to meet fully the demands made. Published during the year have been:

Bulletin 46 — Twenty-Eighth Annual Report
Circular 10 (Revised) — Coastal Bermudagrass
Circular 11 (Reprint) — Tift Sudan
Circular 12 — Pandora Cotton
Circular 13—Sugarcane, An Economic Winter Roughage

- Circular 14 — Nitrogen Sources for Flue-Cured Tobacco
- Mimeograph 1 (Revised) — Upland Permanent Pastures
- Mimeograph 2 (Revised) — Cotton Insect Control
- Mimeograph 4 (Revised) — Commercial Onion Production
- Mimeograph 7 (Revised) — Blue Mold Control by Spraying Tobacco Beds
- Mimeograph 11 (Revised) — Soybeans
- Mimeograph 16 (Revised) — Fertilizing Flue-Cured Tobacco
- Mimeograph 19 (Revised) — Distribution of Fresh Fruit Supply
- Mimeograph 29 (Revised) — Varieties of Fruits
- Mimeograph 42 (Revised) — Dusting Tobacco Plant Beds for Blue Mold Control
- Mimeograph 46 (Revised) — Sodium Fluoride for the Removal of Large Roundworms from Swine
- Mimeograph 53 (Revised) — Green Peach Aphid Control in Flue-Cured Tobacco
- Mimeograph 56 — The Use of High Protein Meal as a Supplement to Grazing on Native Forest Range
- Mimeograph 57 — Oat Production in South Georgia
- Mimeograph 58 — Lowland Permanent Pastures
- Mimeograph 59 — Saving Blue Lupine Seed
- Mimeograph 60 — Cliett Bunch Porto Rico Sweetpotato
- Mimeograph 61 — Converting Tobacco Barn into Sweetpotato Curing House
- Mimeograph 62 — Improved Cultural Practices for Sweetpotatoes
- Mimeograph 63 — The Production of Watermelons in the Coastal Plain of Georgia

NEEDS

Personnel: The greatest need in the way of personnel is understudies for our departmental heads. Many of our departments consist of one man, and where this condition prevails the loss of a man means the crippling of a department.

Quality of Research: In expressing the philosophy of the administration of this Station, I should like to quote from last year's report to the Board of Regents: "Quality of work is more essential than numbers of men and a budget adequate enough to supply the latest equipment is of the utmost importance. This, combined with highly trained, well paid personnel, will give the best results. A few well conducted projects will contribute more to the welfare of Georgia than many projects poorly supported. The Station has as one of its objectives the building of departments on the basis of good men with adequate facilities."

Building Needs: I also quote last year's report to the Board concerning building needs: "The expanded program of research on the part of the Federal Government means at least more cooperative enterprises. The main buildings at the Station are already crowded to capacity. For the most part, the following buildings were approved by the Legislative Committee of 1945. Others have been added as the need has arisen. Cost estimates have been changed to meet present day conditions":

Science and laboratory building.....	\$200,000
Isolation pens and laboratory for animal diseases	40,000
Greenhouses	30,000
Tenant houses	40,000
Manager's home and laborer's cottage, Attapulgus, Georgia	10,000
Director's home.....	20,000
Manager's cottage, tool shed and barns, Alapaha, Georgia.....	15,500
Faculty and staff homes.....	40,000
	<hr/>
	\$395,500

Of the recommendations originally made, only three have been carried out: the renovation of old buildings, for which \$25,000 was provided, and the sewage disposal system, for which \$12,000 was provided the Station and Abraham Baldwin Agricultural College, and \$10,000 for one unit of a greenhouse.

Conclusion: Agricultural research is expanding, and there is a growing recognition of its value on the part of the people. The Director and Staff of this Station pledge to the farmers of the Coastal Plain their best efforts in meeting the demands of the farmer as they enter what may be termed a new era of agriculture.

TABLE 1
RAINFALL IN INCHES BY MONTHS AND YEARS
FROM 1923 TO 1948 INCLUSIVE

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1923.....	7.04	1.97	5.24	1.38	4.67	8.87	4.51	4.14	1.05	.58	2.01	2.17	43.63
1924.....	5.77	4.43	4.83	5.41	1.52	6.50	5.43	3.21	12.01	1.01	.26	6.63	57.01
1925.....	8.76	2.37	.69	1.28	2.88	6.00	3.34	1.94	2.91	6.63	2.93	4.65	44.38
1926.....	11.02	4.66	8.30	3.53	2.88	2.88	7.56	4.20	2.96	1.13	4.02	2.39	56.02
1927.....	.38	2.93	2.93	2.58	.66	8.40	6.70	9.66	.74	.55	.92	7.70	44.15
1928.....	1.36	7.39	5.55	11.57	3.41	4.27	7.93	18.36	6.72	.40	1.11	2.48	70.55
1929.....	5.11	4.45	6.19	3.69	7.04	7.04	4.87	3.29	6.41	3.31	4.16	4.36	55.22
1930.....	5.41	2.56	5.70	5.95	1.20	7.22	5.62	3.82	3.78	.23	2.84	3.72	48.05
1931.....	2.54	2.75	2.84	2.92	3.24	2.48	7.11	4.77	1.56	1.47	.00	2.73	34.41
1932.....	6.06	2.24	3.50	1.82	3.68	3.63	4.79	7.51	5.47	5.00	2.81	1.83	48.34
1933.....	4.47	6.14	5.20	4.44	2.08	4.33	9.32	2.74	3.98	.14	.78	1.32	44.94
1934.....	2.09	3.38	6.17	1.71	12.42	3.43	3.23	6.21	1.51	2.39	.80	1.92	45.26
1935.....	2.41	5.15	2.61	2.33	2.78	.13	11.58	4.69	6.01	.04	2.36	2.02	42.11
1936.....	5.27	5.18	3.17	7.87	1.40	2.84	2.35	8.93	.80	4.03	.20	4.42	46.46
1937.....	5.55	4.80	4.83	6.52	.65	3.88	7.76	8.41	4.13	2.92	3.26	1.19	53.90
1938.....	2.42	1.24	1.95	2.43	2.39	4.22	2.92	2.17	2.46	1.01	.58	2.41	26.20
1939.....	3.18	10.86	1.73	7.44	2.54	5.94	2.87	10.05	4.22	.00	.81	2.94	52.58
1940.....	2.77	4.26	2.85	4.03	1.37	5.46	11.02	5.25	1.63	.79	3.76	1.83	45.02
1941.....	1.74	2.26	4.92	1.56	1.15	8.01	5.99	2.35	3.24	.99	.58	5.96	38.75
1942.....	5.02	4.15	5.64	2.07	5.06	6.59	3.18	4.75	4.78	.79	.84	4.19	47.06
1943.....	3.98	1.50	3.94	2.81	7.58	6.67	2.93	6.42	2.22	.00	1.36	3.03	42.44
1944.....	4.90	5.19	14.33	8.40	3.01	2.19	6.91	5.46	3.98	2.81	1.96	.98	60.12
1945.....	3.94	3.24	2.33	7.32	1.52	1.99	14.66	4.16	1.65	1.65	.96	7.78	52.73
1946.....	4.84	2.01	5.00	2.64	3.82	6.29	8.94	3.83	1.66	2.05	.81	.36	42.25
1947.....	5.94	.99	8.11	5.14	2.87	4.55	2.95	5.49	6.58	3.16	10.40	8.66	64.84
1948.....	3.50	2.15	9.96	9.26	3.20	2.07	5.64	5.42	2.52	4.03	4.38	6.17	58.30
Average 26 Years.....	4.44	3.79	4.95	4.47	3.10	4.84	6.15	5.66	3.70	1.82	2.11	3.61	48.64

TABLE 2

DATES ON WHICH FIRST AND LAST KILLING FROSTS (32°)
OCCURRED AND THE NUMBER OF GROWING DAYS AT TIF-
TON, GEORGIA, FOR THE YEARS 1923 TO 1948, INCLUSIVE

YEAR	Last killing frost in spring	First killing frost in fall	Number of growing days
1923.....	March 20	November 10	235
1924.....	March 17	November 26	254
1925.....	March 3	November 23	265
1926.....	March 16	November 11	240
1927.....	March 5	November 18	258
1928.....	February 21	November 21	273
1929.....	February 23	November 30	280
1930.....	March 4	November 1	242
1931.....	March 5	*	301
1932.....	March 15	November 13	243
1933.....	March 5	November 9	249
1934.....	March 12	November 13	246
1935.....	March 2	November 25	268
1936.....	February 20	November 26	279
1937.....	March 17	October 24	221
1938.....	February 26	November 25	272
1939.....	February 24	November 28	277
1940.....	April 13	November 15	216
1941.....	March 18	November 26	253
1942.....	February 28	November 12	257
1943.....	April 15	November 10	209
1944.....	March 21	November 22	246
1945.....	February 10	November 5	268
1946.....	February 10	December 3	296
1947.....	March 17	December 2	260
1948.....	February 11	December 26	318
Averages.....	March 8	November 22	259

TABLE 3

TEMPERATURE BY MONTHS FOR THE YEAR 1948

Month	Average	Average maximum	Absolute maximum	Average minimum	Absolute minimum
January.....	44.8	56.5	75	33.0	16
February.....	54.2	64.4	79	43.9	28
March.....	61.3	71.2	84	51.3	35
April.....	69.1	80.3	89	57.9	48
May.....	74.9	87.1	97	62.6	51
June.....	80.3	91.7	100	68.9	59
July.....	81.1	90.9	97	71.4	66
August.....	77.4	87.1	97	67.7	64
September.....	75.7	85.8	94	65.5	53
October.....	64.1	76.6	84	51.7	39
November.....	62.9	74.6	85	51.3	36
December.....	55.4	65.4	79	45.4	29

AGRICULTURAL ENGINEERING

PEANUT MECHANIZATION

Brief observations and studies were made on planting, cultivating, and hay curing; however, concentrated studies were conducted on the harvesting and mechanical curing of Spanish and runner peanuts immediately or soon after digging.

Planting and Cultivating: One test indicated that a tractor-mounted planter operating near the ground produced a more uniform stand of peanuts than a planter mounted high above the ground. The planting season was relatively dry and additional weight on the covering wheel of the low mounted planter apparently was responsible for the difference in results.

Observations indicated that the spring tooth weeder was superior to the rotary hoe in the cultivation of peanuts in a sandy soil.

Harvesting: Harvesting studies involved the use of shakers, stationary pickers, and peanut combines.

Four types of shakers were tested — side delivery rake, Goodrich shaker, International shaker, and Turner shaker. The Turner shaker operated most satisfactorily.

The Turner and Frick stationary pickers satisfactorily picked peanuts from the vine immediately or soon after digging; however, the capacity of each was below a practical limit.

A carding type picker was modified into a semi-combine that was pulled down the windrow and fed by hand forks. This machine did satisfactory picking only after the peanuts had dried in the windrow for at least 48 hours of favorable drying weather.

A John Deere 12-A grain combine was modified for peanut combining as the nuts were taken from the ground. Due to unsuitable design characteristics the machine was discarded as impractical for the purpose.

The performance of a Turner peanut combine was evaluated. The machine did a thorough job of picking and produced a fair sample of peanuts; however, it was limited in capacity and weak in several construction features. This machine appeared to possess good potentialities with improvement in some parts of its construction.

A Lilliston combine produced an excellent sample of peanuts; however, it did not pick a satisfactory percentage of the freshly dug peanuts from the vine. It was extremely limited in capacity and its adaptation to combining freshly dug peanuts appears impractical.

A combine was designed and constructed at the Station incorporating all the desirable features for a practical green harvester. Early tests on both Spanish and runner varieties revealed that under normal conditions the machine was capable of digging, pick-



The peanut harvesting combine developed at this Station in co-operation with the U. S. Department of Agriculture and the College of Agriculture. In one trip this machine digs, picks, and sacks the peanuts after which they are dried in bins by forced warm air.

ing, and sacking peanuts at the rate of one acre per hour. The peanut vine residue is returned to the ground where it may be harvested as hay or left for soil building.

It is contemplated that the new combine will be manufactured commercially for the 1950 harvesting season.

Mechanical Curing: Mechanical curing studies involved the use of a modified all-metal tobacco barn, a special curing house, and a small laboratory unit.

The tobacco barn was equipped with a perforated metal floor and a forced air oil-burning system.

The specially-constructed curing house was equipped with coal stoker heating and a reversible air electric motor-driven fan system. The unit consisted of two curing bins of approximately six tons, dry weight, of peanuts each.

Table No. 4 gives fuel and power costs of tests with the tobacco barn and the special curing house.

TABLE 4
FUEL AND POWER COSTS FOR CURING PEANUTS

Variety	Type Cure	Temp. F°	Per cent moist begin	Per cent moist end	Hrs. curing time	*Total weight dry peanuts	Total fuel used	Fuel per ton	Total KWH used	KWH per ton	Total cost	**Cost per ton
N. C. Runners	Tobacco Barn	100	31.87	7.20	37	3624	30 gal.	16.5	28	15	\$ 5.90	\$3.25
Spanish.....	Special Curing House	90	35.09	9.03	80	7793	675.8 lb.	173	131	53.5	11.62	2.97
Spanish.....	Special Curing House	100	36.00	8.50	38	5621	776.7 lb.	276	68	24	9.20	3.24
N. C. Runner	Special Curing House	100	.....	.....	.....	8030	841 lb.	209	135	33.6	13.05	3.25

* Above total weight of peanuts after foreign material, etc., removed.

** Cost figured on \$15.00 per ton coal and .05 per k. w. h. electricity.

TABLE 5
DAMAGE TO KERNELS BY MECHANICAL SHELLING
AS IT MIGHT BE AFFECTED BY MECHANICAL CURING

Variety	Type curing	Temp. F°	*Air flow	Drying time hrs.	Percent moisture begin curing	Percent moisture end curing	Percent moisture shelling time	**Percent Cracks
Improved Spanish.....	Laboratory Unit.....	118	30	24	47.77	8.23	8.22	8.58
Improved Spanish.....	Laboratory Unit.....	100	30	36	48.35	7.29	8.38	11.54
Improved Spanish.....	Laboratory Unit.....	100	30	48	41.75	7.40	8.45	9.52
Improved Spanish.....	Laboratory Unit.....	90	30	36	21.60	8.67	8.50	4.90
Improved Spanish.....	Laboratory Unit.....	80	30	56	38.17	7.60	8.85	9.83
Improved Spanish.....	Field Stack.....	.....	.....	.....	.....	.....	8.48	6.01
N. C. Runners.....	Laboratory Unit.....	100	60	48	42.00	8.88	9.00	15.50
N. C. Runners.....	Laboratory Unit.....	100	45	48	22.92	6.25	9.00	10.49
N. C. Runners.....	Laboratory Unit.....	100	20	48	27.45	6.68	9.00	11.06
N. C. Runners.....	Tobacco Barn.....	100	.....	37	31.87	7.20	8.85	17.08
N. C. Runners.....	Tobacco Barn.....	100	.....	41	25.41	10.52	9.40	5.65
N. C. Runners.....	Field Stack.....	.....	.....	.....	.....	.....	9.50	10.76

* Cubic feet per square foot per minute.

** % Cracks based on weight of shelled kernels instead of on gross weight.

Results of numerous tests with the small laboratory unit with precision control of temperature and air volume indicate that a correlation exists between the shelling characteristics and the rate of drying air movement, air temperature, and initial and end moisture content of peanuts. Table No. 5 gives results of shelling tests of peanuts cured under various conditions.

Samples of mechanically cured peanuts have been analyzed from a physiological standpoint and no unsatisfactory reports have been received on peanuts subjected to curing temperatures not exceeding 100 degrees F. and not being dried below safe storage moisture content.

Peanut Hay: One lot of 1475 pounds, dry weight, of peanut top hay was cut and mechanically dried. Forced air at 180 degrees F. dried the hay rapidly, thereby preserving a high percentage of the carotene content and leaving a superior quality hay with a high palatability for livestock.

TOBACCO CURING

Tobacco curing studies included bright leaf flue-cured and shade-grown varieties.

Bright-Leaf Flue-Cured Tobacco: Objectives of the bright leaf studies were, (1) To test the effect, with respect to fuel requirements and quality of tobacco, under conditions existing in Georgia, of the following elements of curing equipment and barn design that have been found to have merit in curing studies at Oxford, North Carolina: (a) furnace design, (b) flue design, (c) barn insulation, (d) barn ventilation, (e) barn renovation; and (2) to test under Georgia conditions the effect on quality of tobacco of the curing management schedules that have been developed through experimentation at Oxford, North Carolina.

Procedure: One new curing barn was constructed and one old barn was renovated to provide the following equivalent construction: foundation, 8"x16" concrete footing, two courses 8"x8"x16" concrete blocks with one course 4" x 8" x 16" concrete blocks, side down between for venting; walls, 2" x 4" studding, 1" diagonal sheathing, paper felt and novelty siding; roof, 2" x 4" rafters, 1" sheathing, paper felt and asphalt composition shingles; top ventilators, adjustable double shutters inside below roof ridge; furnace, firebrick of 4" walls with double flue connections; heating unit, automatic feed coal stoker; flues 4" x 18" rectangular sheet iron.

The new barn was insulated on inside side walls with 1" Fiberglass wool. The remodeled barn was insulated on inside side walls with aluminum foil.

Observations were made during curing with respect to: Temperature control throughout barns, effects of ventilation adjustment, fuel consumption, and tobacco end quality.

PRELIMINARY CONCLUSIONS:

1. Both the new and remodeled barns are evidently an improvement over conventional barns and equipment, particularly with respect to fuel requirements, air temperature and distribution control, and safety against fire hazards.

2. The new furnace design appears to possess practical merit in fundamental principle; however, refinements are considered desirable.

3. Rectangular heating flues appear to be more efficient in heat exchanging than round flues of equal radiation area. However, it is not yet known whether the more expensive type of construction would warrant recommendation over the conventional round flues.

4. Additional insulation on the side walls of conventional barns appears to justify the additional cost of installation by reducing fuel consumption and improving air temperature and distribution control.

5. Barn ventilation should be provided with positive control, particularly in barns of very tight construction.

6. It is practical to renovate and modify many existing barns to improve their curing characteristics.

7. Tobacco curing management schedules under Georgia conditions differ appreciably from those which were developed at Oxford, North Carolina.

Shade-Grown Tobacco: Objectives of the shade-grown tobacco studies at Attapulugus were: (1) To test the effect of using a heating system in curing to provide better control and more uniformity of temperatures in barns; (2) to test the effect of using a different system for curing barn ventilation.

Procedures: In an existing curing barn at Attapulugus, Georgia, a section 14' x 12' was partitioned off to provide an isolated area. Insulation board was used for walls which extended to the plate line. The normal side ventilation windows were closed and vents were provided at the bottom of the outside wall instead.

A butane gas burner was installed on the floor in the center of the room, replacing the common provision of open charcoal fires for heat.

Fuel consumption and tobacco quality were evaluated.

PRELIMINARY CONCLUSIONS:

1. It appears that gas may be as economical as charcoal for curing shade-grown tobacco and that appreciable advantage exists in the increase in cleanliness and safety from fire hazard.

2. More intensified and expanded study appears well justified in this category of tobacco curing.

SWEETPOTATO STORAGE

Studies were conducted with existing sweetpotato storage houses at Tifton. The houses were of masonry throughout, except ceilings and roofs. Outside walls were of 8" hollow building tile with no added insulation.

This year's objectives were to study the effect of wall insulation upon heating requirements, heat distribution, temperature and humidity regulation, and weight loss and quality of the stored potatoes.

WALL INSULATION: Storage house walls were insulated with furring and $\frac{1}{2}$ " asphalt impregnated insulation board over which a vapor seal was formed by painting with asphaltic paint.

RESULTS: The wall insulation reduced the heating requirements at least two-thirds and materially improved the temperature and humidity regulation.

Weight loss of potatoes from the insulated room was slightly higher than from uninsulated rooms which were also subjected to a heat curing period.

Weight loss of potatoes from uninsulated rooms where no heat curing was applied was lower than where heat was applied.

Uninsulated rooms without heat produced much less sprouting of potatoes and no more damage from rot.

PRELIMINARY CONCLUSIONS: It appears reasonable to question the advisability of providing highly insulated buildings for sweetpotato storage under South Georgia conditions.

The necessity of subjecting sweetpotatoes to curing heat under South Georgia conditions appears questionable.

There is need for further studies in this respect.

AGRONOMY

COTTON

Cotton Variety Test: On land not heavily infested with wilt, all varieties that are being widely grown in the Coastal Plain area have given satisfactory returns. Table 6 gives data obtained on these varieties since 1944. It should be noted that this test was conducted on land only lightly infested with wilt. In 1948 a number of varieties and breeders' strains were grown on land heavily infested with wilt. Pandora, Coker's 100 Wilt, and Wannamaker's Stonewilt showed high resistance to this disease and gave good yields. Under conditions of this test, Stoneville 2B and Deltapine 15 suffered badly from wilt, and yields were considerably reduced.

Because wilt is common throughout the Coastal Plain area, only varieties having a high degree of resistance are being recommended for general planting. Wannamaker's Stonewilt, Coker's 100

Wilt, Pandora, and Empire should give satisfactory yields on most soils of this area.

TABLE 6
COTTON VARIETY TEST

Variety	Yield in pounds of lint per acre						Per cent lint	Average number bolls per pound	Staple length 32nd inch
	1944	1945	1946	1947	1948	5-Year Aver.			
Wannamaker's Stonewilt.....	609	443	551	404	862	574	38.9	70.4	33.2
Deltapine.....	670	477	403	408	849	561	42.4	74.9	33.5
Empire.....	580	435	525	395	844	556	39.7	59.0	33.5
Coker's 100 Wilt.....	568	421	500	376	876	548	38.2	70.9	33.8
Rhyne's Stoneville.....	623	403	449	391	872	548	37.3	66.0	33.4
Marett's White Gold.....	616	414	488	406	800	545	37.4	66.4	33.7
Stoneville 2B...	611	393	486	367	849	541	37.8	65.5	33.8
Pandora.....	.....	482	574	404	902	.....	38.5	65.9	33.3

Cotton Fertilizer Tests: Nutrition studies with cotton included several tests with major and minor elements. In the past, results of many fertilizer tests have been influenced by effectiveness of insect control. With the use of insecticides that appear more efficient in controlling weevils and other cotton insects, there is a possibility that old fertilizer recommendations may need to be changed. If top bolls are to be protected from insect attack, it will be necessary to apply sufficient fertilizer to mature these top bolls. For the past two years a test has been conducted using varying levels of nitrogen, phosphoric acid, and potash on cotton that was dusted with calcium arsenate as contrasted with Toxaphene. Although this test has not been conducted long enough to give definite conclusions, a few observations may be made. Premature defoliation, due to aphid attack, has been much more severe on plots dusted with calcium arsenate. This premature loss of leaves has had about the same effect on the crop as premature defoliation due to severe potash deficiency. With the early loss of leaves due to either cause, middle and top bolls are small, knotty, and often fail to open, and yields are considerably reduced. With the proper use of good insecticides, it also appears that nitrogen rates may be increased moderately without danger of causing excessive vegetative growth.

The large acreage of harvested peanuts in Southwest Georgia during recent years will also influence cotton fertilization. It should be noted that a good crop of peanuts will remove from the land 50 to 100 pounds of actual potash per acre. On many farms this potash has not been replaced by normal fertilizer practices. When cotton is planted on such land, severe potash deficiency occurs. Tests

begun in 1941 on Tifton sandy loam soil have shown that potash does not leach badly from the soil. On plots that had received 400 pounds of actual potash in 1941, the yield of seed cotton in 1948 was 1849 pounds as compared with 577 pounds of seed cotton on plots that had received no initial application in 1941. Cotton had been grown continuously since the start of this test and no additional potash had been applied at any time. On land where the removal of potash has been in excess of replacement, it appears that heavy rates of application may be desirable, and from the above tests this evidently can be done without danger of severe leaching losses. Potash materials may be broadcast prior to planting or may be applied as side dressing to cotton.

Minor element tests using zinc, boron, and copper have not shown evidence that any of these elements are needed in cotton fertilizers on Tifton sandy loam soils.

Formulas and Rates: On land that is well adapted to cotton and where good insect control measures are to be carried out, an application of 700 to 800 pounds of 4-8-8 per acre is suggested. This should be supplemented with a side dressing of 24 to 32 pounds of nitrogen. Nitrate of soda, calnitro, and ammonium nitrate are considered satisfactory side dressing materials. Where cotton is following harvested peanuts, or when planted on land where cotton plants have a tendency to "rust," additional potash should be supplied.

In order to prevent seedling injury, fertilizer applied at time of planting should either be stirred into the soil, or placed in bands two and one-half inches to the sides of the seed row, and slightly below seed level.

Cotton Defoliation: For the past two seasons, studies have been conducted with cotton defoliation. A dust containing calcium cyanamid when properly applied to mature cotton plants will cause 75 to 100 percent of leaves to shed within five to ten days. There are several advantages in removing leaves after the crop has matured. (1) Boll rot can be reduced by allowing sunlight to reach bottom bolls. (2) Quality of lint and seed are normally improved. (3) Bolls exposed to sunlight fluff better and are easier to pick.

Rules that should be followed in defoliating cotton are: (1) Cyanamid should be applied when about 10 percent of bolls are open. If applied earlier young bolls may not mature or open fully. (2) Cyanamid should be used at the rate of 35 pounds per acre. (3) Dust should be applied only when there is dew or moisture on the leaves.

Satisfactory results have been obtained with both plane and tractor applications.

UPLAND COTTON BREEDING

There were 745 progeny rows in the 1948 breeding plots. With good weather and excellent insect control, the plots averaged 2300



Cotton breeders at the Station call this "The Cotton of Tomorrow". These breeders are working for high yielding varieties of better grade and staple.

pounds of seed cotton per acre. A range in yield from 1050 to 3540 pounds of seed cotton per acre made it possible to select the highest potential yielding lines for further study.

The breeding project included strain tests, pollination test, hybrid studies, and a seed-grade study in addition to the progeny rows and increase fields of Pandora.

The breeding program may be summarized under three headings:

1. **Pandora Cotton:** (For a full account of this cotton write for Circular No. 12.) One-half of the Foundation seed from the 1948 crop was placed with a group of Terrell County farmers who have organized an association known as the Southwest Georgia Pandora Cotton Seed Producers Association. The purpose of this group is to handle the seed in such a manner as to sell Registered Pandora seed to the farmers of South Georgia.

The other half of Foundation seed stocks was sold to various farmers scattered over South Georgia. It is anticipated that some growers in Southeast Georgia, liking the Pandora cotton, will organize an association. It will be desirable to have two locations from which the general farmers of the Coastal Plain may secure Registered seed.

The performance of Pandora cotton may be found in this report under the heading "Cotton Variety Test." Maintenance and improvement work with Pandora is being continued in the breeding program at this Station. The main objectives are to incorporate fiber properties of extra strength into a coarse-fibered Pandora and to secure a boll characteristic which will be less conducive to rot on the lower branches. Improved Pandoras will be increased as rapidly as possible, once they have proved superior.

2. New Strains: Several strains of cotton with plant characteristics different from Pandora have developed in the breeding program at Tifton. These strains are being tested in 12 locations to check their performance with popular varieties.

A number of new types show promise of adaptation to mechanical harvest and a superior fiber to existing varieties. Further selecting and testing will be necessary to determine the insect and nematode resistance. Only the strains which prove adapted to the Coastal Plain area and possess desirable fiber properties will be considered for increasing.

3. Allied Test: There is a constant need for accurate data of yield and quality in connection with a breeding program. Each year a New-Strains Test is conducted where promising lines of cotton are studied, using Pandora as the check variety. Any lines superior to Pandora may be placed in regular variety test the following year. At the same time these lines may be crossed into the regular Pandora for future breeding material.

A hybrid cotton study is also being continued as part of the breeding program. Vigor in plant size and yield is being shown mainly where the two parents used have a very marked difference in plant characters. Such combinations give extremely poor plants and fiber irregularities in the segregating population. Therefore, to produce such hybrids it will necessitate the purchase of new seed each year. More data are needed before the technique for such a seed program can be perfected.

SEA ISLAND COTTON BREEDING¹

Several new strains of Sea Island cotton have been developed at this Station which are much more productive than the variety (Seabrook) which was produced in Georgia from 1936 to 1942. These new strains are now being increased. Crossed lines between

¹ In cooperation with the Division of Cotton and Other Fiber Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture.

Sea Island-Egyptian and Sea Island-Egyptian-Tanguis appear more promising. The latter combinations produce a fluffier boll with good picking quality, higher lint percent, and appear more productive than the old Sea Island variety. Some of these strains now in process of development possess excellent fiber properties as indicated by preliminary spinning tests. Efforts are being made to develop varieties with strong, but coarser fiber than the old Sea Island varieties. The coarser fibered cottons are less "neppy" and produce better appearing yarns.

In Berrien County, Georgia, in 1948, 357 acres of the new long staple cotton known as Sealand produced 197 bales. The price differential was about one-third more than for short cotton for the middling or better grades. Many of the growers failed to get the premium price due to poor harvesting. Much of the cotton was weather damaged partly due to delayed harvesting and being picked with too much foreign matter.

The acreage of Sealand cotton was further expanded in 1949 with about 1200 to 1500 acres planted in four counties. The growers in the four counties are members of the Berrien Staple Cotton Co-operative and are subject to the regulations of this organization. All of the cotton will again be ginned at one gin which will gin no other varieties of cotton. As in the past, the seed will be under strict control of the Co-operative. This is being done to protect the purity of the seed and its production where it will not become mixed with short staple cotton.

CORN

Corn Varieties and Hybrids: For the past three years Dixie 18 has given the highest yields of varieties and hybrids tested at Tifton. This is a yellow hybrid with a very stiff stalk and moderate weevil resistance. Florida W-1 has shown the highest degree of weevil resistance and has given about the same yield as Whatley's Prolific. These three corns have proved satisfactory for most South Georgia conditions. Corn varieties that have been bred farther north do not have sufficient weevil resistance to be considered suitable for crib corns in this area.

Several short season corns that can often be used to advantage for early hogging-off have been yielding well in short-season tests. The most important of these are Tennessee 10, North Carolina 1032, North Carolina 27, Dixie 17, Funk G. 714, and Hastings' Early White Dent. It should be noted that none of these corns are resistant enough to weevil attack to be used as crib corns in the Coastal Plain area.

Table 7 gives results obtained with several long-season corns that have been included in this test since 1946. The percentage of weevil-damaged ears was unusually high in 1948. This figure is much higher than average damage.



A field of Dixie 18 hybrid corn. Close spacing, high fertilization, and better varieties and hybrids have increased Georgia's average acre yield of corn from 12 to 18 bushels in five years. Dixie 18 was developed at this Station. In 1950, 400,000 acres will be planted in this corn.

Corn Fertilizer Test: Nutritional studies include (1) rates of nitrogen and spacing, (2) experiments with nitrogen material, (3) time of application, and (4) minor elements. Adequate fertiliza-

TABLE 7
CORN VARIETY TEST

Variety	Bushels shelled corn per acre				Percent weevil damage ears October 15		Percent erect plants	
	1946	1947	1948	Average	1947	1948	1947	1948
Dixie 18 (Yellow).....	57.5	51.8	54.2	54.5	15.0	32.1	86	98
Florida W-1 (White)...	52.1	45.2	51.1	49.5	10.0	23.0	60	94
Whatley's Prolific (White).....	52.1	44.6	51.6	49.4	17.0	27.2	62	90
Coker's Garrick (White)	51.0	45.0	48.0	48.0	33.0	46.7	67	90
Hastings' Prolific (White).....	46.9	44.6	49.5	47.0	46.0	60.5	47	81
Cood's Golden Prolific (Yellow).....	43.4	41.4	39.6	41.5	15.0	28.3	61	94
Hastings' Yellow Prolific	37.3	40.4	43.4	40.4	49.0	70.6	44	83

tion of corn will not give satisfactory returns unless there is a sufficient number of stalks per acre. Tests indicate that most South Georgia soils, when well fertilized, will support at least 6,000 plants per acre. Soils with better than average water-holding capacity will support 8,000 plants per acre.

Where sufficient plants are present, corn should receive 400 to 500 pounds of 4-8-8 at time of planting and should receive 30 to 60 pounds of nitrogen as a side dressing, the side dressing rates depending upon the number of plants per acre. Nitrate of soda, ammonium nitrate, and calnitro have proved to be good side dressing materials. If nitrogen is derived from Uramon or Cyanamid, it should be noted that these materials are slower and should be applied at the time of planting.

Results of minor element tests with corn are given in the "soils" section of this report.

CORN BREEDING

Corn performance trials of double crosses, single crosses, and test crosses were made in 46 different locations in the Coastal Plain and involved over 6,000 plots. Results of these tests indicate that there is one promising white hybrid and one promising yellow hybrid that will be worthy of expanded testing. The new yellow hybrid, GCP 8004, was tested at three locations and had a better performance than Dixie 18. It does have the disadvantage of being higher eared than Dixie 18. The new white hybrid, GCP 8100, is the first experimental white hybrid tested in several years that was materially higher yielding than Florida W-1.

In performance trials conducted at 7 locations, Dixie 18 had the highest average yield of the 25 entries in the tests. There were thirteen experimental yellow hybrids in the test and all of them yielded more than all but one of the five experimental white hybrids tested. Acre yields of the following hybrids were obtained in these tests: Dixie 18, 36.1 bu.; GCP 8100, 33.7 bu.; Florida W-1, 28.1

TABLE 8
ACREAGE PLANTED FOR THE PRODUCTION OF COASTAL PLAIN
HYBRIDS 1944-1948

Hybrid	Year				
	1944	1945	1946	1947	1948
Florida W-1.....	5	80	185	363	918
Dixie 18.....	0	0	2	105	583
Total.....	5	80	187	468	1501

bu.; and Whatley Prolific, 23.1 bu. These new hybrids will need further testing to determine their value for the Coastal Plain.

Dixie 18 continued to increase in acres grown by farmers and in acres produced for seed. Table 8 shows the acreages of Dixie 18 and Florida W-1 in seed production in Georgia. Enough seed was produced in 1948 to plant 200,000 to 250,000 acres of these two hybrids in 1949. One of the features of Dixie 18 which has caused it to be widely accepted by farmers is its ability to stand erect. In the seven locations mentioned above, Dixie 18 had 89 percent erect plants and Florida W-1 and Whatley had 80 percent and 74 percent, respectively.

Studies of disease resistance were initiated in 1948 and two plantings of 60 inbreds were inoculated with *Helminthosporium maydis* and *Helminthosporium rostratum*. These are leaf-disease producing organisms which under some conditions do considerable damage to corn in the Coastal Plain. Ten lines showed some resistance to *H. maydis* and breeding work is already underway to transfer resistance to this organism into the inbred lines in Dixie 18.

A summary of the study of weevil and earworm resistance which has been carried on for several years indicates a striking reduction in weevil infestation when no earworm damage has occurred. Over 100,000 ears were classified in 13 experiments conducted in the past three years. Earworm damage had occurred in 92 percent of this total and 8 percent were earworm free. Of the ears that had been infested by earworms, 54 percent were weevil damaged, while among the ears that were free of earworms, only 9 percent were weevil infested. It was also found that husk extension had a marked influence on weevil infestation but the effect on earworm was less striking. With one-inch husk extension 84 percent of the ears were weevil damaged and 99 percent were earworm damaged. In crosses with 6 inches of husk extension, 20 percent were weevil infested and 73 percent earworm infested. Husk tightness also had some influence on earworm and weevil damage, but it was not as pronounced as the influence of husk extension.

The corn project has been aided by the construction of a greenhouse 25x100 feet. The corn breeding work is also materially aided by use of facilities of Greenwood Farms, Thomasville, and by their grants-in-aid to the project.

PEANUTS

Peanut Varieties: Two new strains of Spanish type peanuts, designated as numbers 146 and 205, continue to give yields significantly higher than old Spanish lines. These two strains are similar to old type Spanish in most respects but the nuts are slightly larger. Seed stock of number 146 is being increased by the Georgia Crop Improvement Association.



Members of the Georgia Better Farms organization inspect peanut work carried on at this Station in co-operation with the Georgia Experiment Station.

In tests at Tifton, Dixie Runner, bred by the Florida Experiment Station, has been yielding about the same as good strains of North Carolina Runner. Other new runner and bunch strains included in this test are showing promise, but additional testing will be necessary before they can be generally recommended.

Peanut Fertilizers: Although peanuts do not respond to fertilizers as most field crops, a number of tests have shown that profitable returns may be expected from moderate applications of complete fertilizers. For most conditions in the South Georgia area, 400 pounds of 4-8-8 applied at the time of planting should give satisfactory returns. Because a good crop of peanuts will remove 50 to 100 pounds of potash per acre, it should be noted that the above application of fertilizer will not replace all of this element removed by peanuts. Crops that follow harvested peanuts should receive additional potash to make up this deficit.

Where fertilizer is applied to peanuts at the time of planting, seed

should be prevented from coming in direct contact with a concentrated fertilizer band. Fertilizer should either be stirred into the soil or placed in bands two and one-half inches to the sides of the seed row, and slightly below seed level.

The nutritional effect of limestone and gypsum on peanuts is being studied but further data will be needed on these materials before general recommendations can be made.

Breeding and Varieties¹: More than 800 hybrid strains were grown in the breeding field for further selection and study, and approximately 350 of these were found sufficiently uniform to be included in the preliminary yield tests this year. Ninety-two of the best strains and variety selections previously developed were grown in 16 tests scattered throughout the peanut-producing area of Georgia.

Varieties and strains, that during the past seven years have shown up well in the yield tests, are being increased and distributed to growers as rapidly as possible. From seed of North Carolina Runner 56-15, grown under supervision in Bulloch County last year, more than 300 acres have been planted this year. Also, one and one-half tons of seed of this selection were planted in the Dublin area this year. A small-seeded Virginia Bunch, Selection 67, has given consistently high yields throughout the State and is popular wherever tried by growers. More than one and one-half tons of seed were planted under contract for seed increase in Bulloch County, and smaller quantities were planted in Laurens, Worth, Dougherty, and Lee Counties. Seed of a re-selected Spanish 146 is being increased under contract in Lee County, and 600 pounds of re-selected G. F. A. Spanish were distributed to growers in the Southwest Georgia Spanish belt.

Cultural Practices¹: Results from a well designed spacing test using three varieties, five row widths, and six spacings within the row, have confirmed our previous recommendations for close spacing of peanuts and indicated further that row width is an important factor for determining maximum yield. For Spanish in row widths greater than 30 inches, yield dropped sharply in spite of close spacing within the row. For North Carolina Runner and Virginia strains, indicated optimum row width was 30-36 inches, with spacing in the row of three to four seed per foot.

Seed Treatment¹: During the planting season of 1948 and again in 1949, numerous complaints were received of failure to obtain a stand of peanuts. Inquiry brought out the facts that these were seed of the North Carolina Runner variety, and that they had, in every case, been treated with some non-recommended material. Extensive tests were conducted comparing these materials with the three materials recommended for treating peanut seed; namely, 2% Ceresan, Arasan, and Spergon. When the comparisons were

¹ In cooperation with the United States Department of Agriculture and with the Georgia Experiment Station, Experiment, Ga.

made on good seed, the differences in germination were frequently not significant; but when the seed were of low vitality, 2% Ceresan was nearly always significantly superior to any other material used; and the three recommended materials were superior to all non-recommended materials tested.

Leaf-Spot Control¹: During recent years, results obtained at other experiment stations have indicated that certain organic compounds, especially carbamate compounds, were quite effective for controlling certain plant diseases. Two of the carbamates, known under the names "Zerlate" and "Fermate" have been compared with sulphur and copper-sulphur dusts, for the control of peanut leaf-spot, during the past three years, using a 20 percent mixture of the carbamate with sulphur or talc as the diluent. With talc as the diluent, the 20 percent carbamates proved inferior to either sulphur or the copper-sulphur 10-90 mixture. The Fermate-sulphur 20-80 dust and the Zerlate-sulphur 20-80 dust have shown some superiority to sulphur alone, but were not as effective as copper-sulphur 10-90 dust. In 1948, the increases in yield of Spanish peanuts over undusted plots were, on the acre yield basis, as follows: Sulphur, 235 pounds; Fermate-sulphur, 295 pounds; Zerlate-sulphur, 300 pounds; and copper-sulphur, 387 pounds.

SMALL GRAINS

Oat Varieties: The winter of 1948-49 favored the development of rust to such an extent that the more susceptible varieties were completely killed. Rust damage to Red Rustproof strains was more severe than any winter since 1931-32. During the two previous seasons, Victoria blight (*Helminthosporium victoriae*) had caused severe damage to most varieties having Victoria blood. This disease was not severe in 1948-49. Long-time data favors the Red Rustproof strains such as Rustproof 14, Hundred Bushel, Bancroft, and Texas Rustproof for the middle and lower Coastal Plain area. As Victoria blight has been less severe on heavier soils of Upper Coastal Plain, Victorgrain and Fulgrain may also be considered reliable for this area. Stanton continues to give good results in the test at Tifton. Although this variety is not immune to Victoria blight, it has been yielding better than Victorgrain or Fulgrain.

In addition to the use of disease-resistant oat varieties, other measures are necessary to keep disease losses to a minimum. Seed treatment, crop rotation, and proper planting dates are all-important in reducing disease losses. For grain production, oats should be planted between October 15 and November 15. If early grazing is desired, oats may be planted two weeks earlier, but it should be noted that seedling diseases normally cause more damage to oats planted prior to the 15th of October.

Oat Fertilizer Test: Oats planted for grain should receive 300 to 400 pounds of 4-8-8 at planting. A top dressing of 16 to 24

¹ In cooperation with the United States Department of Agriculture and with the Georgia Experiment Station, Experiment, Ga.

pounds of nitrogen from some quickly available material should be applied about the 15th of February. Where oats are to be grazed, it is desirable to apply more nitrogen, but additional nitrogen must be paid for by increased grazing rather than by higher grain yields.

Oat Grazing Test: Results of these tests are given in Bulletin 47 "Winter Grazing in the Georgia Coastal Plain".

Wheat Varieties: Wheat yields have been inconsistent and none of the old varieties have been entirely satisfactory for conditions of the middle Coastal Plain area. Some new selections show promise of being much better adapted, but further testing is necessary before these new strains can be recommended.

FLUE-CURED TOBACCO

The research project for improvement of flue-cured tobacco production in Georgia is in co-operation with the Bureau of Plant Industry, Soils, and Agricultural Engineering, United States Department of Agriculture, and the University of Georgia College of Agriculture.

Fertilizers and Varieties

Fertilizer: With fertilizer rates of 1000, 1400, and 1800 pounds per acre on Norfolk sandy loam, with uniform spacing of plants throughout, the percent of the total yield grading as smoking tobacco dropped from approximately 35 percent at the 1000-pound rate to approximately 21 percent at the 1400-pound rate, and to approximately 16 percent at the 1800-pound rate of fertilizer. Since the smoking grades bring the highest price, the dollars per hundred pounds dropped as the amount of fertilizer was increased. There was an increase in yield of approximately 200 pounds per acre from the 1000 to the 1400-pound rate, and approximately 118 pounds per acre from the 1400 to the 1800-pound fertilizer rate.

Fertilizer mixtures containing no sulphur produce a lower yield, grade, and later-maturing tobacco. Evidence indicates that the sulphur (SO_2) content of tobacco fertilizer should at least be equal to the potash (K_2O) content. Most commercial fertilizer mixtures contain sufficient sulphur, derived from superphosphates, for normal growth of tobacco.

Fertilizer mixtures with a chlorine content above 2 percent did not increase the yield and dollar returns per acre. High chlorine content in fertilizer mixtures does lower the burning quality of tobacco.

Potash applications below 90 pounds (K_2O) and above 180 pounds (K_2O) per acre resulted in a lowering of the yield and grade of tobacco. There was no significant difference in yield and grade from 90 to 180 pounds (K_2O) per acre.

Evidence from preliminary experiments indicates that blue lupine meal compares favorably with other sources of insoluble organic nitrogen.

Varieties: Data for 1948 show that varieties of the 400 group (400, 401, 402, and Yellow Special) produced approximately 200 pounds per acre more than the standard varieties (Gold Dollar, Virginia Bright Leaf, Bonanza, Yellow Mammoth, etc.). Even though the dollars per hundred pounds were lower on the varieties of the 400 group, the total returns per acre were \$50.00 to \$100.00 per acre above the standard varieties. In the varieties of the 400 group, 402 gave slightly higher yield and dollar returns per acre.

During prolonged dry weather that existed during part of the 1948 growing season, the 400 series showed less firing on the higher, drier types of soil. Under the adverse weather conditions in spring of 1949, characterized by temperatures below normal during the early growing season, as high as 20 percent of the plants of standard varieties bloomed prematurely. Less than 2 percent of the plants of the 400 group bloomed prematurely. The standard varieties matured a little earlier and the stalks had a lesser tendency to blow over during heavy windstorms.

Fertilizer and Weed Control in Seedbeds: Good weed control was obtained seven consecutive years where one pound Uramon plus one-half pound Cyanamid per square yard (urea-calcium cyanamide) were broadcast and worked into the top six inches of soil 60 days before seeding. On the same beds there was no difference in the number and size of tobacco plants when fertilizer was applied at the time of Uramon-Cyanamid treatment, and when fertilizer was applied at seeding time.

Beds treated with Uramon 60 days before seeding, and D-D mixture at the rate of 20 gallons per acre, 21 days before seeding, gave good weed control. The plants were slower growing than plants on steamed beds but reached a size suitable for transplanting at the normal transplanting season.

Good plants were produced where (1) a 0-9-3 fertilizer was applied on Uramon-Cyanamid treatments at the rate of one pound per square yard; (2) a 4-9-6 fertilizer was applied on Uramon-D-D treatment at the rate of one-half pound per square yard; and (3) a 4-9-6 fertilizer was applied on steamed beds at the rate of one pound per square yard. The use of nitrates as a top dressing after the plants emerged was not necessary.

For eleven consecutive years, one pound of Cyanamid per square yard has given good weed control but was not effective on nutgrass. Cyanamid used alone has been unsuccessful in preventing root knot. A 4-9-6 plant-bed fertilizer was applied at seeding time at the rate of one-half pound per square yard. Nitrogen deficiency symptoms were present near the end of the plant-bed season. Soil pH taken at approximately 30-day intervals since November 1948 has shown a pH of 8.4 as the highest, with a low of 6.7 in May 1949.

FLUE-CURED TOBACCO DISEASES

Crop Survey: Blue mold (*Peronospora tabacina*) caused an estimated loss of only 3 percent of the Georgia tobacco plants in 1948.

This negligible damage was due in part to unfavorable weather conditions for disease and to general use by growers of ferric dimethyl dithiocarbamate (ferbam) sprays and dusts. Blue mold was reported on hold-over plants in old discarded tobacco beds in late January and was observed in a new Cook County bed February 6. Temperature conditions were favorable for mold activity during February and March, but frequent heavy rains possibly kept the atmosphere washed free of fungous spores and prevented rapid spread and development. The frequent March rains also delayed tobacco plants. Most of the Georgia crop was put in the field between April 8 and April 16. No rain fell at Tifton from April 16 to May 5, making conditions unfavorable for late transplanting. Only 10.91 inches of rain fell at Tifton during May, June, and July, and the tobacco crop suffered from lack of rain in May and June. However, frequent showers and cloudy days in July, with accompanying high relative humidity, were favorable for development of good leaf grades. The resulting crop in the Tifton area was slightly better than average.

No tobacco etch (virus) disease was observed at any time during the season, either in plant bed or field. While no common tobacco mosaic (virus) was observed in any plant bed, occasional symptoms were observed on scattered plants in many fields late in the growing season. Root knot (*Heterodera marioni*) was the most important field disease. It was present to some extent in every field observed and caused an estimated crop damage of 4 percent. Southern root rot (*Sclerotium rolfsii*) developed on scattered plants in nearly all fields during July, causing a loss of approximately one percent. Sore shin (*Rhizoctonia solani*) was observed much less frequently than Southern root rot. Angular leaf spot (*Pseudomonas angulata*) rarely occurred in 1948 and caused no damage. Frogeye leaf spot (*Cercospora nicotianae*) generally developed late in the season in the majority of fields, but infections were light and damage almost negligible.

Blue Mold Control: Sprays and dusts containing ferric dimethyl dithiocarbamate (ferbam) and zinc ethylene bisdithiocarbamate (zineb) proved highly effective and most practical for blue mold control in 1948. Spray concentrations of one pound of ferbam to 25 gallons of water, or $\frac{3}{4}$ pound zineb to 25 gallons are recommended. Where dust is used, 15 percent ferbam, or 10 percent zineb is advised. A spray mixture containing ferric dimethyl dithiocarbamate and salicylic acid (Dimole or Ferm-Sal) also has proved very effective in controlling blue mold under severe epidemic conditions. For blue mold control directions, see Mimeograph Papers No. 7 and No. 42 of the Coastal Plain Experiment Station. Materials that either failed to give adequate blue mold control or injured tobacco plants were disodium ethylene bisdithiocarbamate (nabam), dimetacresyl trichlorethane (RE-358), dinitro capryl phenyl crotonate, and 8-hydroxyquinoline salicylate.

Root-Knot and Weed Control in Tobacco Beds: Heavy rains that fell between time of applying urea (Uramon) and calcium cyana-

mide (Cyanamid) and time of seeding did not reduce effectiveness of this soil treatment for controlling weeds and root knot. A few weed and grass seeds on the soil surface were not as completely eliminated as usual, but the number of weeds resulting from this failure was not significant. Application of an additional half-pound of Uramon or Cyanamid per square yard 40 days before seeding eliminated these surface seeds, although this later treatment was not found to be necessary except in occasional beds. For root-knot and weed control directions, see Mimeograph Paper No. 22 of this Station.

The use of soil fumigants such as dichloropropane-dichloropropene (D-D mixture or Dowfume-N) or 20 percent ethylene dibromide (Dowfume W-40 or Soilfume 60-40) in combination with either Uramon or Cyanamid has given more complete control of root knot in tobacco beds than the combination Uramon-Cyanamid, and at the same time effectively eliminated excessive weed growth. Either one pound of Uramon or Cyanamid per square yard applied as usual, together with two quarts of soil fumigant per 100 square yards, is recommended where the regular treatment fails to control root knot.

Isopropyl-N-phenyl carbamate (IPC) broadcast as a soil treatment in tobacco beds was unsatisfactory. Although the material delayed germination of weed and grass seeds, it did not prevent abundant growth of both weeds and grass before the end of the planted season. Treating tobacco bed soil with methyl bromide gas four days before seeding gave excellent control of weeds and grass, and completely eliminated nutgrass, but failed to give adequate control of root knot.

Root-Knot Control in Tobacco Fields by Soil Fumigation: Fumigation of field soil with the liquid materials, D-D mixture, Dowfume-N, and Dowfume W-40, has given excellent control of root knot in tobacco for five consecutive seasons. Directions for using these fumigants in plant beds and fields are given in Mimeograph Paper No. 66 of this Station. Soil fumigation may be of most value where 3-year crop rotations cannot be practiced regularly, either on farms where good tobacco lands are limited or where irrigation makes rotation less practical. Observations thus far indicate that while soil fumigation may not be an entirely satisfactory substitute for crop rotation for control of root knot, the practice usually can be employed with profit. Field applications of 7 to 10 gallons per acre in the drill two weeks before planting have proved most profitable, the cost approximating \$20.00 per acre. Heavier applications gave more complete disease control but at times caused a slight reduction in leaf grade of flue-cured tobacco. Treatments in the drill applied less than 10 days or two weeks before planting sometimes caused plant stunting, or loss of field stands, especially in sandy soils. Broadcast applications also were successful but more expensive and sometimes reduced leaf grade. This was most apparent where heavy rates of fumigants were applied annually for several

years in the same field. Root knot was not successfully controlled, however, except where the soil was treated each year.

Irrigation plus soil fumigation in 1948 increased flue-cured yields from 1160 pounds per acre on unwatered unfumigated plots to 1780 pounds on irrigated plots that had been fumigated before planting, showing an increase of 620 pounds per acre. These plots were only moderately infested with root-knot nematodes. Irrigation without fumigation in the same field showed an increase of 350 pounds per acre. Approximately 10 inches of water was applied during May, June, and early July, this being in addition to the 10.91 inches of rain which fell during the growing season. Fumigation without watering in this field increased yields from 1160 to 1500 pounds per acre, an increase of 340 pounds. In heavily infested fields, fumigation produced yields as high as 1000 pounds per acre in excess of yields from untreated check plots; while in disease-free soil, no increase due to fumigation was apparent. On soils heavily infested with root-knot nematodes, irrigation without fumigation was not profitable.

SHADE TOBACCO

Results of Fertilizer Experiments

The 1948 season was a successful one for most of the growers in Georgia. The green peach aphid which made its appearance in 1947 was again present during the growing season in large numbers. The insect did not do much damage, as a new insecticide, Parathion (3422), was available in limited quantities. This was used only as needed and was sufficient to keep the insect under control. The rainfall for the year was the highest on record at Attapulugus but most of it came in the spring and late summer. A dry period of eight to nine weeks, starting in April and ending the last of June, necessitated the use of irrigation by those growers who could obtain irrigation equipment. It appeared that this dry period would cause serious damage, but the late rains came in time to improve the crop and permit normal leaf development. There was no serious damage to the crop from diseases.

The following is a brief progress report showing results of nutrition work for the 1948 season.

Nitrogen: Nitrogen (N) applied at the rate of 250 pounds per acre gave the highest yield, grade, and fire-holding capacity. Higher nitrogen rates produced poor-burning tobacco. There is reason to believe that the good response from nitrogen rates above the normally recommended 200 pounds (N) per acre can be partially explained by the less efficient utilization of nitrogen during the extended dry weather.

Phosphorus: Phosphorus (P_2O_5) applied at the rate of 400 pounds per acre produced the highest yield and grade in 1948, and the poorest burn. The best burning tobacco was produced with the 100-pound (P_2O_5) rate. Results from 1948 and previous years indi-

cate that approximately 300 pounds per acre P_2O_5 produces a good yield, grade, and burning tobacco.

Potash: High yields were produced with 100 pounds K_2O per acre. However, better grades and burning tobacco were produced with higher rates of potash. Evidence indicates that approximately 200 pounds (K_2O) per acre is the optimum.

Calcium: Calcium (CaO) made its best showing in 1948 at the rate of 300 pounds per acre.

Magnesium: Magnesium (MgO) at the rate of 150 pounds per acre gave best yield, grade, and burn in 1948.

Sulphur: Sulphur (SO_3) used at the rate of 150 pounds per acre gave highest yield, grade, and burn in 1948. Higher rates should not be used as yield and burn are cut considerably. The use of no-sulphur fertilizer reduced the yield and crop index. Therefore, small amounts of sulphur are desirable.

Boron: Rates of boron (B) up to two pounds per acre improve the grade and fire-holding capacity of tobacco. Higher amounts reduce the grade and fire-holding capacity.

Forms of Nitrogen: Cottonseed meal and stable manure were of approximately equal value when combined with nitrate and urea (Uramon) nitrogen in the fertilizer formula. Cottonseed meal gave slightly higher fire-holding capacity. Tung oil pomace gave highest fire-holding capacity of any materials used, but yield was cut considerably.

Single Organic Nitrogen Sources: Cottonseed meal gave a higher yield and fire-holding capacity than manure as a single source of nitrogen. Tung oil meal gave highest fire-holding capacity and castor pomace gave poorest yield. Manure gave poorest fire-holding capacity of any materials used.

Split Application Series: The side application of 47 pounds Uramon and 50 pounds sulphate of ammonia per acre at first plowing gave an increase in yield and fire-holding capacity. The grade of this tobacco was good. Higher rates of these fertilizers gave poorer fire-holding capacity.

The side application of one-half of the cottonseed meal at first plowing gave considerable increase in yield and did not decrease the fire-holding capacity appreciably.

The side application of ammonium nitrate at first plowing gave an increase in yield but gave a large decrease in fire-holding capacity.

The side application of one-half of the cottonseed meal at first plowing gave an increase in yield and very little decrease in fire-holding capacity.

The use of 146 pounds of Cyanamid as side dressing at first plowing gave a poor yield and decreased the fire-holding capacity.

The use of chlorine in the fertilizers decreased the yield and fire-holding capacity of the tobacco.

SHADE TOBACCO DISEASES

The shade tobacco plant bed season of 1948 was very favorable for the production of plants. Blue mold (*Peronospora tabacina*) caused some damage late in the season on beds not treated with the proper fungicide. This damage caused growers to plant late or obtain plants from beds that were dusted with Fermate. The actual number of plants killed was negligible but the number delayed was considerable.

A number of the beds in the shade tobacco area were infested with the green peach aphid. These beds were dusted with Parathion (3422) at the rate of 25 to 30 pounds of 1 percent dust per acre. Results obtained were satisfactory.

Control of Weeds and Root Knot in Plant Beds: The control of weeds and root knot (*Heterodera marioni*) is one of the most serious problems the shade growers have in the plant bed. A number of different materials were tested in 1948 but a combination of one pound urea (Uramon) plus one-half pound calcium cyanamide (Cyanamid) per square yard was found to give the most desirable results. Other materials used gave control of either weeds or root knot, but did not control both. The materials used in the combination treatment should be broadcast uniformly on well-prepared soil and worked in to a depth of six inches. Results showed that in years of high rainfall a second application of one-half pound Cyanamid 30 or 40 days before seeding is advisable. This second application should be worked into the top two inches of soil in order to kill any weed seed that might be blown on the plant bed after the initial treatment has finished its action. The initial treatment should be applied 60 to 90 days prior to seeding of plant bed. Only well-drained plant beds should be treated.

Root-Knot Control in Shade Fields by Soil Fumigation: The control of root knot in fields by the application of 20 percent ethylene dibromide (Dowfume W-40) and a mixture of dichloropropane-dichloropropene (D-D) was continued in 1948. In the past, Dowfume W-10 was used, which is the same product as Dowfume W-40 except that the latter contains 20 percent ethylene dibromide as against 10 percent in the W-10. The 15 gallons per acre rate of either material gave control of root knot. Higher rates gave slightly better control but not enough to warrant the extra cost of materials. Lower rates applied broadcast did not give the desired control. Tests have shown that broadcast treatments should be applied at least 30 days prior to transplanting. Soil should be treated prior to each crop of tobacco. The two best months for applying materials broadcast are December and January. Applications made earlier may not give desired control, as the weather may be too warm and the materials will not stay in the soil due to evaporation. The soil

should be cool, moist, and in good working condition when treated and some method of packing the soil after treatment should be used to help hold the fumes in the soil.

Methods of Application: Since both of these soil fumigants are liquids, the best way to apply them is by pouring them into furrows at a controlled rate. One method of application being practiced commercially is a broadcast treatment in which the liquid is poured in parallel streams 12 inches apart and 8 inches deep. This method is used in commercial fields. The soil is well pulverized before treatment. A tractor-drawn applicator is used which has several feet that go in the ground 8 inches deep and are spaced 12 inches apart. The applicator is regulated to apply the proper amount of the material through each foot on the machine. In the row application, the rows should be laid off and some means provided for pouring the material in the furrow just ahead of a turnplow. Two plow furrows should cover the material, thus making a list. This list should not be disturbed until planting time and then only enough to freshen for planting.

Burn tests have been made of cured tobacco grown on treated soil and as yet the treatment has not affected the burn or aroma of shade tobacco.

FORAGE CROPS AND PASTURE EXPERIMENTS

The United States Department of Agriculture, Bureau of Plant Industry, Soils and Agricultural Engineering, Division of Forage Crops and Diseases, co-operates with this Station in conducting experiments on pastures, forage crops, and soil-building crops. The pasture and grazing experiments include the co-operation of the Bureau of Animal Industry.

Soybeans: Several of the best adapted southern varieties of soybeans are grown in competitive yield tests of hay and grain. Cooperative tests with the U. S. Regional Soybean Laboratory include the growing of Group 7 and Group 8 planted on two dates. Hybrids and selections are also being grown to study their response to Coastal Plain conditions.

Of the standard varieties, the Palmetto is a good dual-purpose bean, producing high yields of either hay or seed. Some other good varieties include Monetta, Georgia, Hayseed, and Missoy. The Ootootan is a good hay producer, but the seed yield is low. Some recent soybean crosses are showing much promise for high yields and for disease resistance.

Lespedeza: Annual lespedezas grow well on Coastal Plain soils, provided these soils are free from nematodes. Nematode studies indicate that all annual lespedezas are susceptible and should not be planted on infested soils. For this reason the growing of lespedeza is generally limited to new grounds and low moist areas.

Velvet Beans: Several selections and varieties of velvet beans are being tested. Some of the better seed yielding varieties have

been crossed and hybrid behavior is being studied. High seed yield, disease resistance, medium earliness, and smooth hulls are characteristics being sought.

Kudzu: Several selections of kudzu have been collected and studies are being made on vegetative growth, flowering, and seedling characteristics. Plants vary considerably in these characteristics and crosses are being made. Fertilizer tests are being conducted on kudzu and measurements are taken in terms of hay yield. Grazing tests on kudzu have given an average of 224 pounds beef per acre for a 14-year period.

Crotalaria and Other Summer Legumes: Adaptation studies are being made on several summer legumes including crotalaria, meibomia, alysicarpus, lespedeza, wild peanuts, and lotus.

Rotations: A three-year crop rotation including six crops is showing considerable promise. These six crops are corn, oats, *Crotalaria lanceolata*, Dixie Wonder winter peas, peanuts, and lupines. Indications are that many cover crops as well as money crops do best when rotated.

Winter Cover Crops: Yield tests are being made on lupines, winter peas, vetches, serradella, and clovers. Winter cover crops are included in other rotation and grazing studies.

Winter Grazing Crops: Grazing tests have been started on fescue grass and on sweet blue lupines.

Lowland Pastures: Lime studies on lowland pastures of carpet grass, Dallis grass, and white clover have been started. Increased beef gains have been obtained by the use of lime.

Irrigated Pastures: A pasture irrigation project has been started. Dallis, Bahia, and Bermuda grasses are being grown in combination with several clovers to study the value of irrigation on grazing crops.

GRASS BREEDING

The grass breeding project is being conducted cooperatively by the Division of Forage Crops and Diseases of the United States Department of Agriculture, the Georgia Coastal Plain Experiment Station, and the Georgia Experiment Station.

Revegetation Project: In 1946 a new phase of this work was begun in cooperation with the United States Forest Service. Under the title of the Piney Woods Revegetation Project, the objective of this research became the discovery of ways of increasing the productivity of cut-over timber lands through the introduction of better grasses and legumes. A preliminary report of this project appears in the Animal Husbandry section of this report.

Foreign Introductions: Fifty-eight new grass introductions from foreign countries were under observation in 1949. None of

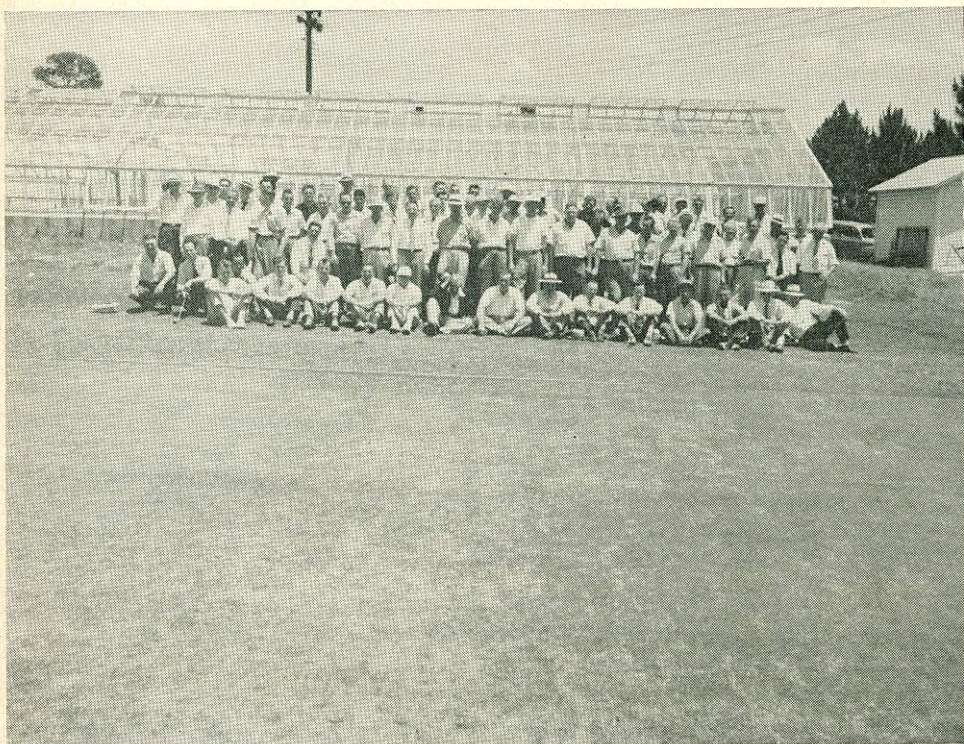


A group of Georgia Flying Farmers inspect machine developed at this Station for planting Coastal Bermuda also a development of this Station.

these introductions was superior to grasses now being developed in the grass breeding projects.

Breeding: Breeding and selection within the following species were continued in 1949: Bermuda grass, Dallis grass, Bahia grass, Sudan grass, and cattail millet. A brief report concerning some of the products of this research follows:

Bermuda: Coastal Bermuda continued to give excellent results in 1949 as evidenced by the greatly increased acreage planted in the State. When grown without legumes and fertilized with 600 pounds of 0-12-6 every third year and 200 pounds of nitrate of soda annually, it has carried eight animals on six acres for a five-year period and has produced from 200 to 350 pounds of beef per acre. This was nearly twice the production obtained from common "cotton patch" Bermuda. When fertilized with 400 pounds of N per acre and 800 pounds of 0-14-10, it has produced from seven to ten tons of hay per acre at a cost below the price of peanut hay. Preliminary grazing studies indicate that it will carry several animals per acre during the entire grazing period when it is heavily fertilized. Repeated tests indicate that legumes will grow as well or better with Coastal Bermuda than with common Bermuda if the lime and fertilizer requirements of the legume are met. Crimson clover has made an excellent combination with Coastal Bermuda on many Coastal Plain farms. There is increasing evidence to indicate that the nitrogen required for good growth of Coastal Ber-



A group of turf specialists from the various Southeastern States visit the Station each spring to study work being carried on with turf. This field of work has practical application on golf courses, lawns, parks, highway shoulders, and air field strips.

muda may be grown with lupines drilled into the undisturbed sod in the fall.

Dallis: The breeding program designed to develop ergot-resistant strains of Dallis grass was carried forward according to plan in 1949.

Bahia: Bahia grass hybrids have been developed that continued to outyield existing commercial varieties in 1949.

Sudan: Progress was made toward the creation of a Sudan grass variety that will combine the desirable characteristics of common, Texas Sweet, and Tift Sudan. Tift Sudan continued to show much greater disease resistance than other varieties and may be expected to give better results than other varieties in the humid southeastern United States.

Cattail Millet: The new leafy cattail millet developed at Tifton continued to show its superiority over common millet in 1949. It will probably be named and released in 1950.

Small-grain Varieties for Winter Grazing: Studies on the use of small grains for winter grazing begun in 1943 were continued. Most varieties produced more forage than usual due to the unusually favorable growing conditions experienced in 1948-49. All past results were summarized and published in bulletin form.

Turf Research: In the spring of 1947 a turf research program was begun in cooperation with the United States Golf Association and a number of southern golf associations. The preliminary results of this work suggest that many southeastern turf problems can be solved. Tifton 57, a hybrid that appears to be outstanding for golf greens and other turfed areas, has been developed as the first product of this research and is being distributed for regional testing.

COOPERATIVE PASTURE INVESTIGATIONS

Coastal Bermuda Better than Narrow Leaf Bahia Grasses as a Permanent Pasture: In a test that ran for four summers (1945-1948), Coastal Bermuda grass gave a liveweight gain of 260 pounds per acre as compared with Pensacola Bahia grass having a liveweight gain of 214 pounds. In the same test Paraguay Bahia grass produced a liveweight gain of 111 pounds. Each of the three pastures consisted of 6 acres. The fertilizer treatment for each pasture was 600 pounds of 6-12-6 in 1943 when the pastures were established and 600 pounds of the same formula again in 1946. Two hundred pounds of nitrate of soda was applied each year in split applications, one-half in the spring and the other half in the summer. During the years when the 6-12-6 was applied, only enough nitrate of soda was applied to bring the total up to 200 pounds per acre. The liveweight gains per acre varied on the Coastal Bermuda pasture from 148 pounds to 351 pounds in 1948. The liveweight gain per acre on the Pensacola Bahia varied from 88 pounds in 1946 to 319 pounds in 1945, while the gains varied

TABLE 9

COMPARISON OF COASTAL BERMUDA AND NARROW LEAF BAHIA GRASSES AS A PERMANENT PASTURE

4-YEAR SUMMARY 1945-1948

	<i>Coastal Bermuda</i>	<i>Pensacola Bahia</i>	<i>Paraguay Bahia</i>
Number of days on test.....	203.00	217.00	217.00
Number of acres in plots.....	6.00	6.00	6.00
Average number steers on plots.....	8.75	8.75	8.25
Average initial weight..... (lbs.)	508.29	498.64	486.85
Average final weight..... (lbs.)	686.54	654.55	567.91
Average daily gain..... (lbs.)	.98	.74	.38
Average grazing days per acre.....	265.42	289.92	289.92
Average liveweight gain per acre..... (lbs.)	259.96	214.38	111.46

NOTE: Animals were added to and removed from plots as considered necessary.

on the Paraguay Bahia pasture from 42 to 179 pounds per acre. The average daily gains made by the steers on the three pastures were 0.98, 0.74, and 0.38 pound, respectively. The steers on Coastal Bermuda grass did better during the latter part of the grazing season (September, October, and November) than the steers on the Bahia grasses.

Cattail Millet Grazing Test: A dwarf variety of cattail millet developed at this Station, when planted in rows, supplied 124 grazing days per acre and produced 275 pounds of liveweight gain per acre during the 1948 grazing season. Commercial cattail millet on a comparable area, also in rows, furnished 128 grazing days per acre and produced 223 pounds of liveweight gain per acre. The dwarf variety was somewhat later maturing but furnished ample grazing two weeks later during the summer than the commercial type.

When dwarf cattail millet was sown broadcast it produced only 86 grazing days and 112 pounds of liveweight gain per acre. Commercial cattail millet planted broadcast furnished only 88 grazing days and 128 pounds of liveweight gain per acre.

Based on this one year's test, cattail millet produced almost twice as many pounds of liveweight gain per acre when planted in rows and cultivated as when sown broadcast. The one or two cultivations given the millet seemed to stimulate growth as well as destroy competition of native grasses and weeds. The animals trampled a considerable portion of the cattail millet sown broadcast.

ANIMAL HUSBANDRY

The soil and climatic conditions in the Coastal Plain area of the State are conducive to maximum forage production both in summer and winter. For this reason special emphasis is being placed on forage production, forage utilization, and winter feed production. A year-round grazing system for dairy cattle will enable the dairyman to get maximum and economical production. Studies are being conducted to determine the best crops for this year-round grazing system. Breeding studies are being carried on with swine, dairy cattle, and beef cattle in an effort to develop superior animals for pork, milk, and beef production. The beef cattle and swine investigations are in cooperation with the Bureau of Animal Industry. The range grazing studies are in cooperation with the Forest Service, the Bureau of Plant Industry, and the Bureau of Animal Industry, all of the United States Department of Agriculture.

BEEF CATTLE

Temporary Winter Grazing Valuable for Fattening Steers: To study the value of winter grazing in the fattening process, three treatments in replicate were considered, namely, dry-lot feeding, feeding grain on winter pasture, and winter pasture alone. The



The Station's Angus herd on a pasture of Dallis grass, carpet grass, and White Dutch clover.

winter grazing crop used in the test was a mixture of Rustproof oats, vetch, and crimson clover. Sufficient growth had accumulated by December 9 to carry approximately a 650-pound steer per acre for 140 days. Two groups of steers in dry lot on full grain and peanut hay feeding made average daily gains of 2.48 and 2.72 pounds, respectively, while two groups on full grazing and one-half the amount of grain consumed by steers in dry lot made average daily gains of 2.56 and 2.47 pounds. Two lots of steers on grazing without grain made average daily gains of 2.10 and 1.79 pounds. The liveweight gain per acre made by steers without grain was approximately 245 pounds. The liveweight gain per acre made by the steers receiving both pasture and limited grain feeding was 326 pounds per acre. A portion of this liveweight gain was due, of course, to the grain consumed by the steers but at the same time the pastures on which these two groups of steers fed were not grazed near capacity. In fact, each of these two 10.8-acre areas would have carried two or three additional steers for most of the 140-day grazing period.

Coastal Bermuda Grass Good Winter Feed for Beef Cattle: With liberal fertilization, from four to eight tons per acre of Coastal Bermuda grass hay can be produced yearly. It is necessary to make four or five cuttings during the year. Liberal applications of high nitrate fertilizers materially increase the protein content of the grass.

Bermuda grass and peanut hays were fed to groups of beef cattle at the Tifton Station during the winter of 1948-49. Fifteen pounds of Coastal Bermuda hay maintained the weight of 650-pound grade Hereford heifers while comparable cattle eating 16 pounds of peanut hay per head daily lost some weight. Adding one pound of peanut meal to the Bermuda hay ration caused cows to gain 0.3 pound per head daily, while a similar amount of peanut meal added to the peanut hay ration caused cows to gain only one-half as much. Coastal Bermuda grass promises to be one of the cheap sources of good quality hay in the southeast. Under favorable weather conditions, the hay can be baled the second day after cutting.

Corn Equal to Grain Sorghum as a Winter Grazing Crop for Beef Cattle: Thickly planted corn when grazed during mid-winter of 1948-49 produced 110 cow grazing days per acre. Grain sorghum grazed during the same period produced only 54 grazing days per acre. During former years sorghum had produced from 70 to 90 grazing days per acre. The cows consumed the corn stover better than the sorghum stover. Considerable corn grains were lost by shattering during the grazing process. A few grains of corn passed through the cattle undigested and it was estimated that from 30 to 40 percent of the sorghum grains were undigested.

Based on this one year's test, thickly planted corn is apparently as good source of winter feed as grain sorghum when the two are left in the field to be grazed off during the winter. The thickly planted corn produced many small ears. An advantage of grain sorghum over corn is that sorghum can be planted after small grain has been harvested, at which time it is too late for planting corn.

FOREST RANGE GRAZING STUDIES

Range grazing studies are being conducted primarily on the area at Alapaha, Georgia. Some are being carried on at other points in the Coastal Plain area. The studies are in cooperation with the United States Forest Service, the Bureau of Plant Industry, and the Bureau of Animal Industry, of the United States Department of Agriculture. Problems in cattle management, forest range management, and reseeding practices on forest range are being studied. There is a vast acreage in the lower Coastal Plain area that is adapted primarily to tree growth. This forest area is well adapted to range cattle production. The two can perhaps be carried along together with more profit to the landowner than when either is carried on alone. The forest range studies are set up with this in view.

Revegetation on Forested Lands: Common Bahia, Pensacola Bahia, Dallis grass, and carpet grass continue to show good growth on the poorly drained Plummer and Leon soils of the Georgia flatwoods. The Bahia grasses were superior to Dallis grass on the better drained upland sandy soils. Fertilizer and lime favored establishment of all grasses and were essential for successful establishment and growth of legumes such as white clover and big trefoil.

Common lespedeza, white clover, and big trefoil were successfully established by simple seeding on burned-over range without tillage where adequate limestone, phosphorus, and potassium were broadcast. This method of seeding on untilled forest ranges will be more apt to succeed in the flatwoods area than on the deep sand of the upper Coastal Plain. There were indications that strips of improved pasture under these conditions could be used successfully as fire breaks on forest lands by introducing palatable grasses and legumes, adequately fertilizing and liming, and closely grazing the improved areas. In areas where palmetto and gallberry are abundant, it will probably pay to chop or disk these shrubs before introducing the improved species.

Several experiments on the Alapaha experimental range near Alapaha and on the Walton Forest near Cordele have given the following information:

1. On the Alapaha range approximately 90 percent of the tops and rootstocks of gallberry and palmetto were killed by a solution of one gallon of 2,4,5-T (a hormone-type weed and brush killer) in 100 gallons of water, applied at a volume of 200 gallons of solution per acre. Seedling slash, pond, and longleaf pines were killed or damaged by this spray. Present costs of the chemical for killing the undesirable shrubs in these experiments were impractical for use on low-value range lands. Future studies will be with the use of high pressure-low volume spraying which should materially cut down costs.

2. Successful growth of white clover and big trefoil was obtained on untilled flatwoods from plantings in 1948 between October 1 and December 15. Moisture conditions were favorable for good fall growth, and the winter was mild, so that time of planting made little difference.

3. Definite information has not been obtained on the desirability of using minor elements in addition to the usual fertilizer applications for improving forages on virgin forest soils.

4. Best growth of big trefoil was obtained from thoroughly prepared flatwoods soil that had received 3,600 pounds of dolomitic limestone and 500 pounds of 0-24-24 fertilizer per acre at planting time. This promising legume has given 2 tons of oven-dry forage per acre by August 1 from plantings made the previous December. Between June 7 and August 1, 2,900 pounds of actual legume, less weeds, were produced per acre. The late spring and summer

growth and perennial characteristics make this legume very promising for piney woods reseeding purposes in the flatwoods area. Disease may be a problem at times and the species is under further experimentation.

5. Excellent first-year stands and growth of white clover have been obtained under open, medium, and dense pine canopy conditions from October plantings on burned and untilled forest ranges. An application of 2 tons of limestone, 400 pounds of 0-12-12 at seeding time, and an additional 400 pounds of 0-12-12 in February just prior to maximum season growth, furnished an exceptionally good growth of white clover. It is not known how detrimental the needle cast in the dense pine canopy condition or the gallberry regrowth after burning will be on subsequent clover growth after the first year.

Many of the experiments with liming, fertilization, and improved forages on forest lands indicate methods of improving near-idle cutover lands. Also possible procedures for making improved pasture fire breaks in a coordinated grazing-timber program have been suggested.

DAIRY CATTLE

Studies with dairy cattle have to do primarily with breeding and the development of a year-round grazing system. For a number of years all cattle in the Station dairy have been on test and, with few exceptions, at least one lactation record has been obtained on all females produced in the herd. These production records have been used in the evaluation of herd bulls and in carrying on a constructive breeding program.

One of the greatest needs of dairymen in Georgia is for information on a year-round grazing program. An abundant supply of high quality grazing will not only furnish most of the nutrients needed for high and economical milk production but acts as a stimulant and will generally cause cows to produce higher than they would ordinarily on dry feed or green forage of low quality. During the past year further studies have been conducted in an effort to develop a good year-round grazing system for dairy cattle. The studies during the past years have had to do primarily with the comparison of various summer and winter crops and with the management of these crops as to time of planting, dates of grazing, fertilization, and general management.

Summer Grazing: During the summer of 1948, commercial and dwarf varieties (a variety developed by this Station) of cattail millet were studied to determine their value in the year-round program. In general it was found that there was little difference in the carrying capacity of the two varieties. The regular cattail millet is faster growing and will furnish earlier grazing than the dwarf variety but in turn the dwarf variety will last longer and furnish grazing over a longer period than the commercial variety. The

regular or commercial millet proved to be somewhat more palatable than the dwarf variety but the latter was palatable enough to give excellent milk production. Additional pasture management observations made during the 1948 summer grazing period are:

(1) Millet crops should be planted on two or three different dates, such as early spring, early summer, and late summer, if excellent cattail millet grazing is desired. With liberal fertilization, one-third acre per cow per planting is sufficient.

(2) Each planting of cattail millet should be divided into at least two, and preferably three, areas so that rotation grazing might be practiced. An electric fence has been used very successfully for such temporary divisions.

(3) It is well to have an additional acreage of shaded permanent pasture for the cows during the hot summer months. This additional permanent pasture furnishes considerable grazing as well as ample shade.

Winter Grazing: For fall and winter grazing (1948-49) a mixture of Rustproof oats, Italian ryegrass, and crimson clover was compared with Abruzzi rye. When planted on the same date (October 14) the Abruzzi rye furnished grazing from one to two weeks earlier than a mixture of Rustproof oats, crimson clover, and ryegrass. Abruzzi rye furnished 492 grazing hours per acre from November 6 through January as compared to 245 grazing hours for the oat-ryegrass-crimson clover mixture from November 15 through January. In fact, the mixture gave practically no grazing during January. In February and March, Abruzzi rye gave 235 grazing hours per acre as compared with 493 hours for the oats-ryegrass-crimson clover mixture. The Abruzzi rye produced no grazing during April while the mixture furnished 312 grazing hours per acre. It will be seen from the results of this one test that Abruzzi rye produced much more grazing during the late fall and early winter than the mixture, but the mixture of oats, ryegrass, and crimson clover produced much more grazing during late winter and early spring. Since early grazing is important for the dairyman, the results of this one year's test would suggest that part of the grazing area be planted to Abruzzi rye and part to a mixture of cereals and crimson clover. As with the summer grazing crops, it was found beneficial to practice rotation grazing with winter crops to get maximum use of the pasture.

In general it was found during the 1948-49 winter grazing season that one acre of winter grazing per cow furnished one-half the roughage requirements during November, December, and January, and three-fourths the roughage requirements during February, March, and April. When the cows were placed on winter grazing in November, milk production was increased by approximately 15 percent.

SWINE INVESTIGATIONS

Ground Snapped Corn Too Bulky for Hogs: Three individual feeding trials comparing a mixture of cracked corn and protein supplement with a mixture of ground snapped corn (whole ear corn finely ground) and protein supplement showed the cracked corn mixture made 40 percent faster gains than the pigs fed the ground snapped corn mixture. On the average, the pigs fed cracked corn required a total of 450 pounds of feed per 100 pounds of gain as compared with 686 pounds for the pigs fed the ground snapped corn mixture.

These tests were conducted with pigs that weighed approximately 120 pounds at the beginning of the feeding test. Had younger and smaller pigs been used, it is thought the difference would have been even greater. The young pigs could not have utilized the fibrous material (ground cob and shuck) in the ground snapped corn mixture as well as older hogs.

North Carolina Bunch Peanuts Good for Hogging-Off: During the winter of 1948-49, North Carolina bunch peanuts and North Carolina runner peanuts were hogged-off to determine the comparative value of the two varieties. There was little difference in the average daily gains of the two lots.

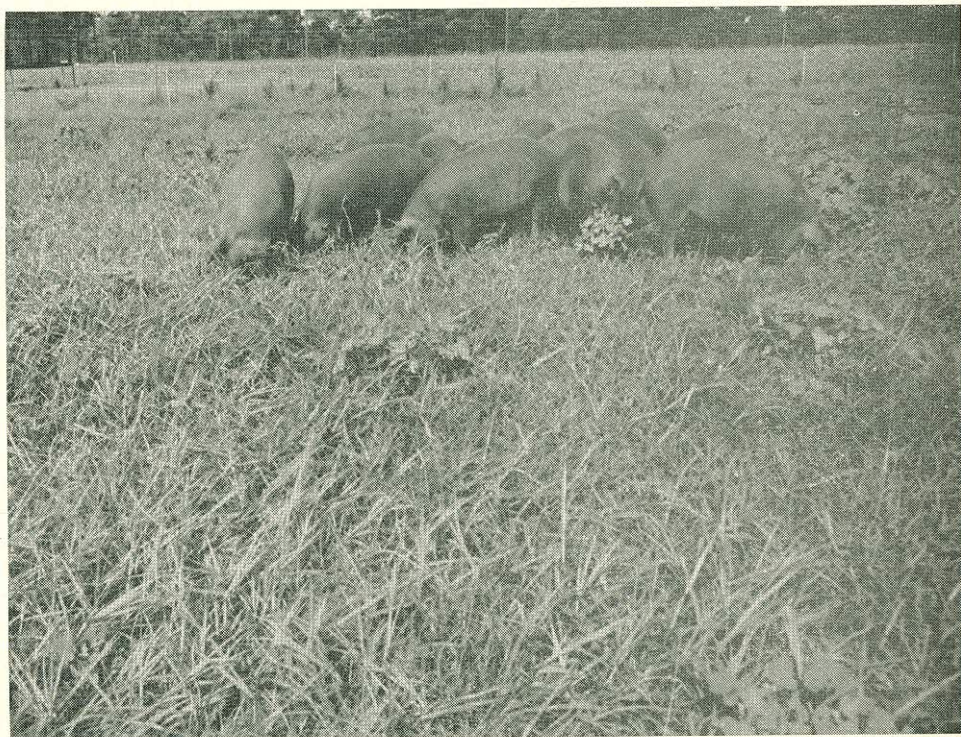
Based on this one year's test, it cannot be safely said that one variety is superior to the other.

Management of Brood Sows—Spring 1948 to Spring 1949:

1. *Spring Litters 1948.* Twenty-two litters of pigs were farrowed from February 12 to February 26, 1948. The sows were placed in the farrowing lots approximately four days before farrowing and remained there until April 23 when the pigs were weaned. Oats pasture provided an ample amount of succulent grazing for the sows and pigs. The sows were fed a grain mixture consisting of 85 parts of cracked corn and 15 parts of protein supplement. The grain feeding was limited just before and after farrowing. Thereafter the sows were fed liberally. The pigs were creep-fed the above grain mixture.

2. *Gestation Period—Spring and Summer 1948.* Spring breeding began April 16 with the breeding of replacement gilts. Breeding of the sows was begun immediately following weaning. Immediately following breeding, the sows and gilts were transferred to a field of mature oats. They were fed one-half pound of protein supplement per animal daily during the gestation period. On August 1, the oats were practically hogged-off. At that time, feeding of two pounds of shelled corn per animal daily was begun with the gilts. Both the sows and gilts were transferred to the farrowing lots by August 14.

In hogging-off oats during the gestation period, animals gain the desired amount of weight without becoming excessively fat. Vol-



Brood sows in gestation period hogging off oats plus one-half pound of protein supplement per sow daily. Vegetation showing is primarily crab grass.

unteer native vegetation furnishes a sufficient amount of palatable grazing. The sows acquire plenty of exercise in hogging-off the grain and at the same time save labor.

3. *Fall Litters 1948.* The fall litters were farrowed from August 8 to August 21. Cattail millet which was planted three to four weeks prior to farrowing furnished grazing for the sows and litters. The sows and litters were managed similar to the spring litters. The fall litters were weaned on October 19.

4. *Gestation Period—Fall and Winter 1948-49.* Following weaning, fall breeding was started. Breeding of the sows was completed by October 26 whereas the breeding of the gilts was completed on November 8. After breeding, the sows and gilts were used to glean corn fields and sweetpotato fields. They were placed on oats pasture as quickly as possible (December 16). While on oats pasture they were fed one-half pound of protein supplement and three to four pounds of shelled corn per animal daily. Both the sows and gilts were transferred to the farrowing lots by February 8.

SWINE PARASITE INVESTIGATIONS

The Swine Parasite Laboratory in cooperation with the Animal Husbandry Department completed experimental work on two projects and began work on another during the period covered by this report.

Effect of Internal Parasites on the Growth of Growing Pigs and Their Utilization of Feed: Although spring pigs farrowed and maintained after farrowing on an unsanitary lot for the fifth consecutive year had an average weight of about 10 pounds less during the greater part of the experiment, and required 23.6 pounds more protein supplement and mineral per 100 pounds of liveweight gained than similar pigs occupying a clean area from which manure was removed daily, they harbored a relatively light infection at post mortem and attained a market weight of approximately 206 pounds in the same length of time as the clean pigs. The reduction in the growth rate of the pigs on the unsanitary lot, as has been shown in previous experiments, was limited to the period before an average weight of 50 pounds was attained, but was small enough in this instance for the pigs in question to regain the loss later. The parasites causing this reduction in growth rate in the unsanitary pigs were the intestinal threadworm, the whipworm, the lungworms, and the large roundworm. The average number of parasites recovered post mortem from the unsanitary pigs was 2,362 as compared to 9,536 the previous year and was less than the number recovered from the pigs occupying the lot for the first year of the experiment. The average number of parasites harbored by the clean pigs was 588.

Excessive Precipitation Cause of Reduction in Number of Swine Parasites: The reduction in the number of parasites harbored by the pigs in the unsanitary lot was totally unexpected since there had been no decrease in the number of parasites recovered from these pigs during the previous four years of the experiment and conditions had not appeared unfavorable for the survival of swine parasites in the soil since the pigs had been removed from this lot the previous summer. All species of parasites were reduced in the pigs on this lot in 1948 with the exception of the kidney worm. The fact that this was the first group of pigs showing a decrease in parasite infection since the beginning of the experiment and that this decrease occurred within six months of a period of excessive precipitation strongly indicated that the presence of large quantities of water in the soil for an extended period of time was unfavorable to the survival of swine parasites.

The Accumulation of Swine Parasites on Previously Clean Soil Now Occupied by Swine for the Seventh Consecutive Summer: The pigs occupying a previously clean area for the seventh consecutive summer were found to harbor an average number of 3,570 internal parasites when they were slaughtered at a market weight of approximately 215 pounds. This number was 679 parasites less than

the number recovered from the pigs occupying this area in 1947. It was also the first time a decrease in the number of parasites recovered from pigs occupying this area had been recorded. This result is significant in that it corroborates that of the previous experiment.

Experimental Work on the Short-Tailed Nodular Worm: The short-tailed nodular worm, *Oesophagostomum brevicaudum*, has been found in almost pure infections in swine from two localities in Georgia and Florida, respectively. Experimental work is now being carried on to ascertain the pathogenic importance of this parasite as compared with the two more common species of nodular worms, *O. dentatum* and *O. longicaudum*.

ANIMAL DISEASE INVESTIGATIONS

Diagnostic Service: The free diagnostic service made available by this department was used by farmers through their veterinarians 364 times during the past year. The service is used for obtaining a diagnosis in disease outbreaks with indefinite symptoms or in routine tests in disease control programs. In many cases, this assistance enabled veterinarians to make a diagnosis in outbreaks of diseases where the symptoms were indefinite and thus save animals that otherwise would have been lost.

X-Disease: X-disease of cattle has been given major attention during the past year. This is a chronic disease affecting cattle under one year of age more often than older animals. There is no breed or sex predisposition. The course of the disease is usually about two to three months, although some young animals may die in a week or two from the time they are first noticed to be sick. About 80 percent of the affected calves and about 60 percent of older cattle die from the disease.

The following symptoms usually appear in this order: First, the calf loses weight, its hair coat becomes dull, and it begins to shed tears so that the sides of its face stay moist. The skin on the side of the calf's neck, face, or ears, or back become thickened, roughened or thrown up in wart-like elevations. Often an intermittent diarrhea is present. The calf often develops wart-like elevations on the tongue or roof of the mouth. It frequently shows symptoms of a sore throat, has difficulty in swallowing and often develops pneumonia. It usually gets progressively worse and dies.

Research at this Station during the past year has been directed toward learning the cause of the disease. Attempts to transmit the condition by treating various tissues in different ways and inoculating calves have been unsuccessful thus far. Although it appears from the history of some outbreaks that the condition is infectious, no one has been able to successfully reproduce a case either by inoculation procedures or by exposure of a healthy calf to a diseased one in new surroundings.

Investigation of this condition is being continued.



Calf affected with X-disease. Hair has been clipped to show thick skin.

“Summer Itch” of Mules: Two mules with this condition were treated with Caracide (Lederle) in January 1949 during the quiescent stage of the disease. These mules had previously been treated with the same drug during the summer as reported in the 28th Annual Report. The summer treatment was only partially effective as the clearing of the skin that resulted was only temporary. The winter treatment was without effect.

This year a new drug, Carpaside sodium (Abbott), was tried without apparent benefit. These animals are being retained until next spring before final judgment is passed on this drug, as it is effective against the adults but not the larvae of other members of the family of parasites that cause “summer itch.”

Tests were made of the possible sensitivity of “summer itch”-affected mules to the parasites found in their skins. An antigen was prepared from the dog heart worm, a member of the same family as the parasite causing “summer itch,” and “skin tests” made on several mules and horses. All tested animals showed a marked

reaction to the antigen. Further tests with more specific antigen are planned.

Mastitis Testing Service: This department has continued the testing of milk samples, free of charge, for dairymen and veterinarians. During the year 64 groups totaling 672 samples were received.

The mastitis control program in the Experiment Station herd has continued. *Streptococcus agalactia* mastitis has been satisfactorily controlled by the sanitary milking procedures outlined in Mimeograph Paper No. 41 which is available from this Station.

Clinical mastitis resulting from hemolytic staphylococci and the colon group of organisms is appearing more frequently in samples sent by dairymen. Staphylococci are more resistant to penicillin treatment than are streptococci (the most common cause of mastitis.) Coloform organisms do not yield to penicillin but do to streptomycin. Veterinarians are now using a combination of the two drugs suspended in a vehicle that spreads them throughout the udder. It should be emphasized that the treatment of cows as they come down with clinical mastitis will not control the disease in a herd. A full-scale eradication program must be adopted with emphasis on sanitation and prevention of the spread of the disease. Affected cows should be treated only by experienced veterinarians or those familiar with aseptic techniques or the disease will be spread rather than cured.

Dystrophic Rhinitis (Sneezing Disease) of Swine: Workers in Canada have shown that this is a virus disease spread by direct contact. The condition is appearing more frequently in Georgia. Affected animals should be sold for slaughter. If a high percentage of the drove is affected, the farm should be depopulated of swine, feed and water troughs disinfected with *hot* lye solution (1 pound in 5½ gallons hot water—keep from painted or varnished surfaces) before more hogs are brought on the farm.

ENTOMOLOGY

Cotton Insect Investigations: Work on cotton insects in 1949 was confined to plat tests of the relative efficiency of spraying and dusting techniques for the control of such cotton insects as boll weevils and bollworms.

The materials used were low gallonage concentrate of "Kiltone," a proprietary material consisting of toxaphene and DDT, applied at rates of approximately 1½ to 2 quarts per acre per application and equivalent to approximately 3 to 4 pounds of technical material, equivalent amounts of the usual 20% toxaphene dust in 40% sulphur, and unpoisoned checks.

Results of the tests showed excellent gains over unpoisoned cotton, with no significant differences in total yields between the poisoned plats. Actual differences were so small as to amount to

less than 20 lbs. of seed cotton per acre, and might easily be accounted for in slight differences in moisture content at picking.

An interesting factor appeared in the fact that gains in the case of sprayed cotton appeared in a very heavy first picking. The second picking showed excellent gains of both poisoned plats over check, and slightly larger gains for the dusted as compared with the sprayed. The third picking showed markedly larger gains for the dusted over the sprayed cotton, the difference fully compensating for the earlier gains of the sprayed cotton.

It would appear from this that the spraying technique probably is more effective early in the season on small cotton than later when cotton weed is larger. This would seem to be reasonable and to correlate with difficulty of getting really adequate coverage at the low pressure, low gallonage rate used, on cotton which was large enough to meet easily in the rows. Pressure was apparently insufficient to get penetration and a somewhat larger percentage of boll injury seems to have occurred on the sprayed areas. Actual boll set, while no actual counts were made, appeared to be slightly higher in the sprayed areas.

It would appear from this season's results that either method of application will give satisfactory yields and there seems to be no particular choice between the two as to effectiveness.

Control of bollworm in both poisoned plats appeared about equal.

Cotton Insect Survey: A very considerable proportion of the time during the summer was again spent in conducting the State Survey of Cotton Insects. This activity appears to be one that is paying high dividends in increased yields to growers. The information this season was collected with the co-operation of approximately 1,000 growers, mostly veterans' trainee program students, scattered over all of the cotton producing counties of the State. In all, 2,770 reports from 988 observers were received, and some 21,000 or more reports of cotton insect condition within the State were sent out, there being twelve weekly issues averaging about 1,800 individual copies per week.

The unexpectedly good yields considering the very heavy boll weevil and boll worm populations which occurred throughout the whole State were in no small degree owing to the information of both State and local conditions received weekly contained in this report. While insecticide shortages appeared within the State, we suffered, on the whole, much less from this stringency than did most of the other cotton producing states. Insecticide dealers, manufacturers and processors have expressed the opinion that this better distribution within the State was to a very considerable degree owing to the information received in this report weekly of potentially "hot" areas and the assistance given by it in determining where and when to ship limited supplies of materials available within the State.

Pickleworm: Little progress was made in the pickleworm project because of an unfortunate loss of stand from disease on the early planted cucumbers and failure of the late planting to produce pistillate flowers. Such progress as was made was in the field of plant injury from the use of the chlorinated hydrocarbon insecticides. Results here for the previous three seasons have not substantiated the reports of serious damage from the use of these insecticides elsewhere. Therefore, this season a few special tests were made to endeavor to find why these discordant results were obtained locally.

Plants sprayed with DDT, toxaphene, gamma benzene hexachloride, and parathion all showed some injury, the damage being very slight with parathion, but severe with the other materials. Both DDT and toxaphene sprayed plants suffered a severe loss in stand and severe damage to all plants. The BHC plants showed less stand loss and less damage, but injury was too severe for commercial use.

Spray applications included both materials of the "emulsion" type and wettable powders.

Where dusted less injury was sustained in all cases. Dusting on wet plants, wet either from dew or rain showed damage in all cases, and sufficient to constitute rather serious commercial injury in the case of toxaphene. With parathion, damage was so small as to be negligible; with DDT and BHC, sufficient to indicate that it might be serious enough to affect growth and early fruiting.

Dry dusted plants in general showed little injury. What did show up was generally, if not always, due to light rains immediately following dusting late in the afternoon. Injury here was not considered "commercial" except possibly in the case of toxaphene where considerable "bronzing" and some yellowing and drop of foliage occurred.

Temperature appeared to be a definite factor in injury, the degree of "burn" being noticeably higher in all cases where temperatures were low than when temperatures were well above 75° F. level. This would seem to correlate with the effectiveness of the chlorinated hydrocarbon insecticides which is greater at low than at high temperatures.

Sudan Grass: Work was continued upon the plat scale in the control of sorghum midge on Sudan grass seeding. DDT was not used this season but plats sprayed with toxaphene, chlordane and gamma BHC emulsions at low gallonage and high concentrate technique were compared with checks in the same field.

Results were rather disappointing. The rather higher than usual check yield pointed to the fact that checks included in treated blocks received a very considerable benefit from this juxtaposition, probably due to movement of adults into poisoned areas and the resulting reduction of check infestation. Again after loss of poison effectiveness from rains or exposure the check areas offered excellent

sources of infestation for fruiting plants with a resulting tendency to level off late fruiting somewhat. Lastly, since the season was very favorable to grass growth it was noted that although the poisoned plats set a heavy early crop not set by the check areas, these recovered and set a reasonably good crop on additional shoots late in the season. The numbers of shoots per stool in the check were definitely higher than in the poisoned areas and late fruiting much more marked.

Actual yields showed no marked gains from the poisoning. On the whole the comparable check and poisoned plats showed consistent and small gains for the treated areas but none that were statistically significant. There was little question but that the check seed was lighter and bulkier than that from the poisoned plats but early germination records to date have shown no significant differences in percentage of germination. All germination percentages were quite low and it seems probable that further drying and seasoning of the seed will be necessary before any reliable data from germination tests can be made.

It would appear, however, that the tendency of Sudan grass to continue to set fruit until it has set a crop such as to utilize the maturing ability of the plant, is a definite factor that must be considered in this particular problem.

CEREAL AND FORAGE INSECT INVESTIGATIONS

The investigation of "Methods of Protecting Stored Corn and Corn Products in the Southeastern States" is a co-operative project of the Division of the Cereal and Forage Insects, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture and the Georgia Coastal Plain Experiment Station. Experimental studies, inaugurated last year, are being pursued along the lines of both practical and exploratory research.

Resistance of Field Corn to Rice Weevil Infestation: Preliminary studies concerning the resistance of corn to rice weevil infestation in the field indicates differences among the lines tested. Special emphasis is being placed on isolating lines from among the in-breds which are used in producing hybrids grown in the Coastal Plain region.

Insecticides Applied to Seed Corn: Preliminary laboratory tests have indicated definitely that it is possible to protect shelled seed corn from insect injury for a period of eighteen months. Large-scale tests are now under way in a study of methods of practical application of the laboratory findings.

Tests with Fumigants: Studies of several fumigating materials, applied at different rates to husked and unhusked corn, are being continued. New fumigants are being incorporated in the tests.

HORTICULTURE

In addition to the projects listed below, the Department of Horticulture is co-operating with the Pathology Department in disease control studies in tomatoes, watermelons, cantaloupes, and roses; with the Entomology Department in pickleworm control on cucumbers; with the Soils Department in a study of minor plant food elements in corn, tomatoes, sweetpotatoes, okra, and snapbeans; and, with the Department of Nematology in a study of preplanting soil fumigation, followed by annual planting of nematode-resistant cover crops with both peaches and figs.

SWEETPOTATOES

Sweetpotato Variety Test: The Cliett Bunch Porto Rico continues to be the most desirable sweetpotato to grow in the Coastal Plain area of Georgia for table use. This variety led in yield of marketable potatoes in a test of 16 varieties in 1948.

Other varieties, recently named or introduced, have been tested at this Station with the following results:

Australian Canner yields very poorly in the Coastal Plain and cannot be recommended for this area. This variety was released solely for its use in certain sections of the South where canneries desired its special qualities in preparation of a vacuum-packed product.

Ranger has qualities intermediate between the Porto Rico type sweetpotato and the drier-fleshed Jersey types. Although the total yield is fair in the Coastal Plain, the shape and size tend to reduce the number of marketable potatoes. It, also, is highly susceptible to stem rot and is not adapted for production in this area.

Queen Mary has never given satisfactory yields under local conditions and is also highly wilt susceptible.

A variety known locally as 100-to-the-Hill appears to be almost identical with Unit I Porto Rico.

Texas 51, a Porto Rico mutation discovered in Texas, has an extremely short top growth. The vines are not of sufficient length to permit practical use of vine cuttings for seed production. This would be a great disadvantage to Georgia farmers, as the use of vine cuttings for seed potato production is a valuable means of keeping seed stocks free of disease. Insufficient yield data of this variety do not permit a comparison with the Cliett Bunch Porto Rico at this time.

Whitestar and Pelican Processor are varieties developed primarily for industrial use and for livestock feed where carotene is not needed. Both are white-fleshed and high in dry matter. Of the two, Whitestar is better adapted to the Coastal Plain area but is not recommended for use here.

Sweetpotato Cooperative Seedling and Variety Tests: This Station is conducting co-operatively with the United States Department of Agriculture and the state experiment stations in the sweetpotato belt a preliminary study of all new varieties and recently introduced seedlings. These studies are for the purpose of determining the varieties and/ or seedlings best suited for use (1) in Georgia and (2) in the other areas represented by the various co-operators. Greater emphasis is placed on table potatoes, the primary object being to find varieties with both local and regional adaptation that are superior to the kinds now in commercial use in such characters as increased productivity, higher quality, higher nutritive value, better appearance, and disease resistance. As a result of this work, three table varieties (previously discussed) already have been introduced under the names Queen Mary, Ranger, and Australian Canner.

A seedling developed in Louisiana through this co-operative program, and which has considerable promise, is known in that state as Heart-O-Gold.

Three introductions from Japan and one from the Tinian Islands have been placed in the variety trials. Results in 1948 indicate that they are inferior to the varieties commonly grown but may be of value in the breeding program.

Sweetpotato Spacing and Rates of Applying Fertilizer Test: This test has been concluded. Row spacing was 3½ feet wide and drill spacings were 6, 12, 18, and 24 inches. Rates of application of fertilizer were 400, 800, 1200, 1600 and 2000 pounds per acre for each drill spacing.

The highest total yield of Number 1 potatoes was obtained from the 6-inch spacing with 2000 pounds of fertilizer per acre. The lowest yield was from the 6-inch spacing with 400 pounds of fertilizer.

As a result of this study it appears that marketable yields are directly influenced by combinations of spacing of plants and rates of applying fertilizer. For the average grower it appears that 800 to 1200 pounds per acre applied to plants spaced 12 inches in the drill and in rows 3½ feet wide will give the most profitable returns. Closer spacing requires higher fertilization.

Sweetpotato Foundation Seed Stock Production: The production of Bunch Porto Rico foundation seed potatoes is being continued. Approximately 200 bushels were released to plant growers in nine different counties for the 1949 crop. The help of the Georgia Crop Improvement Association and the Georgia State Department of Entomology is making it possible for these superior seed to be distributed to many farmers.

Sweetpotato Breeding: To date the sweetpotato breeding program has resulted in the production of some very high yielding seedlings of the type used in starch production. Also several selections high in carotene and with fair yielding ability have been

made. Some of these will be sent to other states to be tested for regional adaptation.

Sweetpotato Minor Plant Nutrient Test: A test to study the effects of minor plant nutrients on yield of sweetpotatoes was started in 1948. Zinc, copper, boron, magnesium, and iodine are being used. The results from the first season's data are too inconclusive for publication.

MISCELLANEOUS VEGETABLES

Watermelon—Variety Trials: Black Diamond (Certified seed) continues to lead in yield of marketable melons. Missouri Queen ranks second in yield in the 1949 test. Dixie Queen Wilt Resistant is third and several selections from the United States Department of Agriculture, Vegetable Laboratory at Charleston, South Carolina, are among the leaders.

In a preliminary test of recently selected seedlings, two from the Vegetable Breeding Laboratory showed considerable resistance to wilt and Anthracnose.

Tomato—Variety and Strain Tests: Rutgers is the best tomato variety for the Coastal Plain area. Southland, a recently released variety, ranked fifth in yield of marketable fruit in a test where Rutgers ranked second and Stokesdale fourth.

Twenty-nine unnamed selections from the Vegetable Breeding Laboratory at Charleston, South Carolina, were tested in observation trials. None showed exceptional promise in this preliminary study.

Tomato—Minor Plant Nutrient Study: No significant increase in yield has resulted from the use of zinc, copper, magnesium, boron, or iodine when used in addition to a standard fertilizer.

Lima Bean—Variety Test: Oklahoma 8-2, Triumph, Peerless, and Henderson Bush are the leading varieties of lima beans tested at this Station. Of these four varieties Oklahoma 8-2 retained its foliage longer and was more productive over a longer period. Triumph was the most severely defoliated variety at the peak of the harvest season.

English Pea—Variety Test: The average yield in a four-year test shows that Wando has produced more peas than any other variety. It is approximately 10 days later than Thomas Laxton. This variety is very hardy with considerable cold resistance. The pods are small, straight, and well filled.

This season's results indicate that Delwiche Commando, Dark Skin Perfection, Wyola, and Victory Freezer (new varieties not adequately tested in this area yet) may out-yield Wando and Thomas Laxton.

Sweet Corn—Variety Test: The work in evaluating sweet corn selections described in the twenty-eighth annual report of this Station is being continued.

Tri-state, Golden Security, Golden Hybrid, Victogold, Oto, and Gulf Coast are leading newer varieties.

Tri-state and Aristogold Bantam Evergreen rank with Golden Cross Bantam in appearance. Golden Security and Victogold have the best shuck protection. However, there was no appreciable difference in the amount of ear worm damage in 1948.

Cucumber—Variety Test: Producer and Model are pickling varieties and are the most productive cucumbers in test. Of the slicing varieties, Cubit, Marketer, Colorado, and A. & C. are the most desirable but are shy bearers. Stays Green and Earliest of All are prolific varieties that are popular in the pickling areas, as they can be sold on the early market as slicers and are acceptable for pickling in late season.

In fall cucumber variety tests Puerto Rico Number 39 and Palmetto were outstanding varieties. These varieties are mildew resistant and give high yields of marketable fruit.

Cowpea—Variety Test: Sugar Crowder, Brown Crowder, Purple Hull, Alacrowder, and Conch are the leading varieties of table peas tested to date.

Cowpea—Weevil Control: Under the conditions of this test insecticides did not give sufficient control to reduce worm infestation to the requirements of the pure food laws under which peas must be packed. A more effective method of reducing worm infestation consists either of extremely early or of late planting.

Okra—Variety Test: The okra variety test indicates that recently introduced dwarf stalk, round pod selections are preferable to the standard commercial varieties now in general use.

Okra—Top Dressing Test: A test to study the effects of top dressing okra during the bearing period was started in 1947. To date this test shows that the application of 100 pounds of nitrate of soda per acre at 30-day intervals will increase yields so long as other factors affecting growth are normal. On late plantings two applications should be adequate.

Okra—Minor Plant Nutrient Study: No significant difference in yield was found to result from the use of copper, zinc, magnesium, boron, or iodine when used in addition to a standard fertilizer mixture.

VEGETABLE PLANTBED INVESTIGATIONS

The vegetable plantbed investigations this year included work on problems connected with both cabbage plant production and tomato plant production.

One of the more important diseases affecting cabbage plant production is downy mildew, caused by the fungus *Peronospora parasitica* (Pers.) Fries. Tests for the control of downy mildew in cabbage seedbeds were run during the fall of 1948 and included fungi-

cides applied both in the form of dusts and sprays. Adequate commercial control was found to be obtained under Georgia conditions by the use of either Fermate or Spergon applied either as a dust or spray. Due to the difficulty of getting sprays to stick to the cabbage leaves under commercial operational conditions it was found that generally a better control could be obtained by the use of dusts on the small cabbage seedlings.

In the tomato seedbed investigations the work was divided into field and greenhouse investigations and these were further divided into tests of various fungicides for control of *Alternaria* disease and other fungous diseases of tomato plants, tests of the effect on tomato plants of various materials added to the seedbed soil for the control of insects, soil treatments for the control of soil-borne fungi and bacteria which cause diseases of tomato seedlings, and shipping tests to determine the efficacy of various materials applied to the plants or packing material at time of shipping for the prevention of disease and damage to the plants in transit.

The fungicide tests this year were quite successful, enough disease appearing in the test plots to give high statistical significance to the materials that afforded control. The results of these tests are shown in Table 10.

Several shipping tests were made to determine the efficacy of materials in preventing wilting of tomato plants in shipment and to determine the value of some nutrient solutions when added to the water used to moisten the packing material for shipping plants. It was found that one of the new synthetic latex materials has a definite value in prevention of wilting of the plants in transit, but the results of several seasons tests will be necessary before it can be determined whether or not such materials are worth the extra cost and labor as compared with normal good packing technique under normal shipping conditions.

One of the most important soil-borne diseases in the tomato plant growing industry is Southern Blight caused by the fungus *Sclerotium rolfsii* Sacc. Southern Blight together with another soil-borne disease, Bacterial wilt, (caused by *Bacterium solanacearum* EFS) causes great losses to the plant growers each year.

Efforts to find a control of these two important soil-borne diseases are divided into two classes: One is the testing of tomato varieties in order to try to find some that have an inherent resistance to the organisms that cause the disease, and the other is the testing of many chemical materials in an effort to find a material that will fit the requirements of a fungicide to eradicate the organism from the soil. We have tested a number of tomato crosses and selections to determine if they possess the necessary disease resistance. We have also tested a number of both organic and inorganic chemical compounds in the search for a soil fungicide. Although some of our results have been encouraging, we have not yet completed this phase of the investigations.

TABLE 10
SPRAY TEST FOR CONTROL OF TOMATO PLANT DISEASES

<i>Treatment No.</i>	<i>No. leaflets infected</i>		<i>Percent of leaflets infected</i>	<i>No. stem and petiole lesion</i>	
	Total	Means	Means	Total	Means
Dithane D-14, ZnSO ₄ Lime @ 2 Qt—1-1½:100	143	36	6.04	6	2
Zerlate @ 2:100	152	38	6.52	17	4
*CuSO ₄ @ 4:100	1662	416	62.20	128	32
Phygon XL @ 1:100	1886	472	58.92	203	51
Check, CaAs ₂ only	3534	884	97.87	1124	281
L.S.D. @ .05 level		131.62	11.93		60.02
L.S.D. @ .01 level		184.54	16.73		84.16

* Calcium arsenate was used as the insecticide at 4:100 in all sprays and the check.
Rate of application was at 125-150 gallons of spray per acre.

FRUIT CROPS

Peach—Nematode Control Study: This project, involving pre-planting chemical soil treatment and also the growing of nematode resistant cover crops in the orchard, is being continued.

Peach—Variety Test: This planting was made in the spring of 1949 and embraces a combination of commercial and recently introduced varieties. The purpose of this study is to find peaches adapted for home use and local markets in areas south of the commercial peach belt.

Pecan—Variety Test: This test, embracing 32 varieties, has been in progress 27 years. Because of the constantly increasing disease menace, many of the one-time commercially important varieties are entirely unprofitable unless protected by spray materials applied in a regular spray schedule. Among the leading varieties that require spray protection in the Tifton area are Schley, Success, Mobile, Van Deman, Pabst, Alley, Moneymaker, and Mahan. Varieties that are showing to best advantage in the Station trial grounds and that possess high scab resistance are Farley, Bradley, Stuart, and Curtis. Other varieties with high scab resistance that are just coming into bearing are Desirable and Brooks. Suggested cultural practices are contained in Station Circular 15 entitled "Pecan Culture and Grove Management".

Pears: A collection of fourteen varieties and selections, which was set in 1947, is being observed. A comparison of growth in early season indicates that Baldwin requires less cold to break the rest period than any of the varieties in test. In an older variety collection Baldwin is the best variety for this area. It is of excellent quality and also possesses considerable blight resistance.

Citrus: Several of the citrus fruits may be grown in the lower Coastal Plain of Georgia. Satsuma trees have been growing in the Station trial grounds for 26 years and are well adapted for home orchard use. Owari is the best variety. Myers lemon, Duncan grapefruit, and Eustice limequat are other citrus fruits which may be grown in the tier of counties bordering the Florida line.

Tung: Tung trees in the Station trial grounds show a tendency to produce annual crops as they attain age, and the fruit buds seem to be less susceptible to cold injury. However, there was a crop failure in 1948 and the trees appear less vigorous than in previous years. The present annual production is slightly more than one ton per acre.

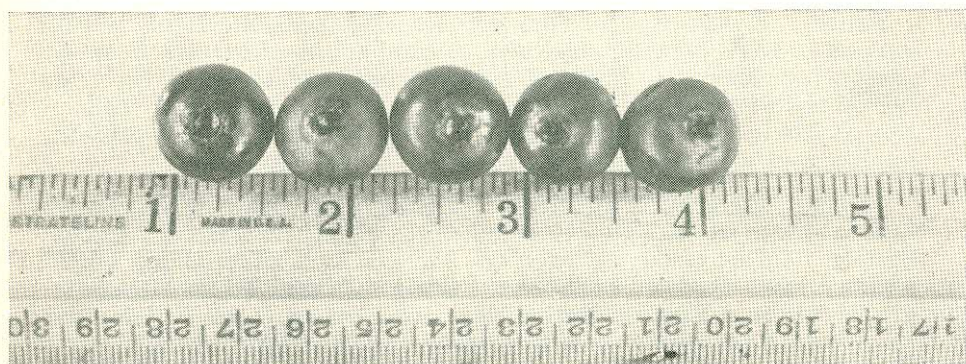
Chestnuts: Blight-resistant chestnuts are productive and well adapted to this area. The nuts, however, generally are of only fair quality and cannot be held over long periods except when placed on cold storage or processed to prevent spoilage.

Muscadine Grape Spacing and Trellising Tests: One acre each of the Hunt and Yuga varieties was set in February of 1945 for the purpose of studying the effect of row and drill spacing. The third crop of the Hunt variety which was produced the fourth summer after planting varied from three and one-fourth tons per acre from plants spaced 22 feet by 14 feet to five and one-fourth tons per acre from plants spaced 20 feet by 10 feet. The yield of the Yuga variety varied from one and three-fourths tons per acre from the widely spaced plants to four and three-fourths tons per acre from closely spaced plants.

To determine the effect of trellis on yield, two-wire and three-wire vertical trellises are being compared. The two-wire trellis consists of posts five feet above the ground with one wire on top of the posts and another wire two and one-half feet below the top wire. The three-wire trellis consists of posts six feet high with the bottom wire two feet above ground, the second wire four feet, and the third six feet or on top of the posts. With both varieties, the three-wire trellis has yielded slightly more than the two-wire. These data are from young vines, however, and cannot be considered conclusive.

Muscadine—Variety Trials: A study of muscadine varieties indicates that Hunt is the best variety for commercial planting and that for home use Dulcet, Yuga, and Topsoil are preferable. They are less productive than Hunt but are of superior quality.

Figs: A planting has been made of three plants each of 125 varieties. Previous to planting, the soil was fumigated to reduce



The Callaway blueberry recently developed at this Station as a part of its work with blueberries.

the nematode population in the soil. Cultural practices designed to hold nematode in check consist of oats as a winter cover and either peanuts or crotalaria as a summer cover.

Blueberry Propagation Studies: Softwood cuttings of several blueberry varieties were made in late September and early October. A very high percentage of these rooted and after one growing season will be transplanted to the nursery.

Limited tests of vermiculite and various ratios of vermiculite with peat, sand, and sawdust were made. Neither vermiculite nor the vermiculite mixtures were conducive to rooting of cuttings in open beds.

Blueberry Breeding: Seedlings of crosses of northern highbush and Florida evergreen blueberries produced their first fruit this year. The object of this cross is to obtain varieties possessing the adaptability of the Florida evergreen blueberry and the fruit characteristics of the northern highbush. Some plants looked promising, producing large berries of high quality.

Two outstanding seedlings have been selected from crosses of rabbiteye varieties. These seedlings previously designated as 11-182 and 9-109 have been introduced as new varieties under the names Callaway and Coastal, respectively.

Approximately five thousand new seedlings are being grown for field planting next year. Many older seedlings which are not superior to present selections will be eliminated.

Dewberries: In 1945, fifteen varieties and selections of dewberries were planted. Most of these have grown well with the exception of the varieties Thornless Loganberry, Pacific, and Cascade. Boysenberry, Youngberry, and Austin are among the most productive varieties.

Blackberries: Twelve varieties of blackberries were planted in 1945. Two very early trailing types which look promising are

Earli-Ness and Regal-Ness. Of the bush types Early Wonder, Healthberry, and Macatawa have been among the most productive.

Vegetable Tests at Attapulcus

Experimental work on vegetables with special emphasis on okra was begun at Attapulcus in Decatur County on July 1, 1948.

Okra: Tests on okra deal with nearly every phase of production, including fertilizer formulas, rates of fertilizing, side application of fertilizer, minor nutrient studies, spacing, planting dates, variety tests, and fusarium wilt studies.

Cabbage: Already some results have been obtained from tests on cabbage:

a. Variety—Seven varieties were tested. All Season was highest in total production but poorest in quality. Charleston Wakefield, Copenhagen Market, Marion Market, and Golden Acre were all high yielding varieties of good quality. Golden Acre and Copenhagen Market were the earliest varieties.

b. Fertilizer—Considerable increase in yield was evident from each additional increment of fertilizer applied up to and including 2,000 pounds per acre which was the heaviest application used.

c. Spacing—The 15-inch spacing in 3½ foot rows gave best results where 1600 pounds of 8-8-8 per acre were used.

Cucumber: Among the slicer types tested, South Carolina Number Five and Palmetto were highest both in the production of fancy cukes and in total production.

Seven varieties of the pickle type were also tested with Producer showing the best yield and quality. Model and Mincu also made good yields of high quality.

NEMATOLOGY

The root-knot nematode presents a serious problem to the farmers of the Coastal Plain. Very few of the crops grown in this area escape damage caused by this pest. The United States Department of Agriculture, Bureau of Plant Industry, Soils, and Agricultural Engineering, Division of Nematology, co-operates with the Station departments and specialists on the various crops in an effort to find efficient, economical means for root-knot control. These control measures consist primarily of soil fumigation, rotation practices, and parasite-host relationship studies.

Among the more important experiments in progress for a number of years or conducted during the past year, are:

1. Various experiments with perennial plantings, notably peach, fig, and grape. These employ cover-crop rotations during the life of the orchard and preplanting soil fumigation, or combinations of

these methods, for control of the root-knot nematode. Soil fumigation methods originating and tested at this Station are now widely practiced, even nation-wide.

For example, with bunch grapes, yields of 3 tons per acre were secured from fumigated planting sites as compared to 1½ tons per acre from non-fumigated sites. Peach trees attained trunk diameters of approximately 4½ inches by preplanting site fumigation as compared to only 3-inch diameters on sites not fumigated. These same trees, on sites fumigated, made 2 1/3 times larger heads, or limb spread, than trees grown without benefit of preplanting soil fumigation.

Where root-knot nematode-resisting cover crops were employed along with preplanting site fumigation, 46 pounds of peach fruit were obtained to every 9 pounds of fruit from non-fumed sites on which also, root-knot nematode-susceptible cover crops were permitted.

2. Considerable work is being done on the evaluation of agricultural chemicals, screened elsewhere and having shown some promise as possible nemacides. On determining their efficacy under Tifton conditions this laboratory further endeavors to determine their utilization with annual and perennial crops of the region.

Crops of high acre value, such as melon, okra, tomato, beans, and other truck crops, shade tobacco, and in many cases flue-cured tobacco, plants produced for shipping, and flower production lend themselves readily to nemacide treatment. Increased yields through soil fumigation can be assured to more than justify its cost on land infested with the root-knot nematode. In many cases two and three-fold returns have been obtained by soil fumigation and five or more fold returns are not uncommon with highly susceptible crops on land heavily infested with the root-knot nematode.

3. Soil fumigation costs for material and application service per acre range from approximately \$40 or less, where the solid area is to be treated, to approximately \$15 or less where a strip or the predetermined planting row only is to be treated.

There are many borderline crops so far as soil fumigation cost-return is concerned and further studies are expected in the near future to lessen the per acre treatment costs for market crops.

Home gardeners will find soil fumigation extremely profitable and satisfying for their effort when properly done. Commercial outlets of materials and equipment suitable to the home garden are still, however, not too well developed in this region.

4. In co-operation with various other departments, especially pathology, studies are being made on the effects of nemacides and soil fumigation methods on other factors of plant growth.

Such studies have revealed benefits resulting from the control of other soil-borne pests and certain weeds. Experiments pertaining

to nematodes in combination with or as separate from certain root and stem rot disease-causing organisms are in process. These experiments have for their objectives the questions of whether the root-knot and other plant parasitic nematodes, as well as soil-inhabiting nematodes, act as aids or precursors to the plant rot diseases. Such studies also pertain to inverse effects from soil fumigation even though good control of the root-knot nematode may have been obtained. For example, yields have been held in check or maturity retarded as a result of stimulated vegetative growth and other factors following soil fumigation.

5. A co-operative experiment is under way to determine how successfully annual lespedeza (quite susceptible to root-knot) may be grown in root-knot resistant Coastal Bermuda sod. On common Bermuda sod (susceptible to root-knot) annual lespedeza has not done well in infested sod. Coastal Bermuda, it is hoped, might so effectively control the root-knot nematode as to prove this desirable annual legume, common lespedeza, practical in a resistant Coastal Bermuda sod.

6. Co-operative effort is being maintained with State and Federal plant breeders in the selection of root-knot resistant varieties of peach, cotton, corn, legumes, okra, lima bean, and other crops. Extensive resistance screening tests have been conducted and are in process.

7. During the past two years nematological investigations at this Station have been concerned with the appearance of what is evidently a race, if not a species, of the root-knot nematode attacking peanuts in Southwest Georgia. Long regarded as highly resistant and greatly benefitting root-knot control on a million or more acres annually in Georgia alone, peanut has suffered very severe losses in a number of counties. This presents a serious problem to the peanut industry should this race of the root-knot nematode become widespread. The acre value from peanuts on the present yield average is not sufficient to recommend fumigation at present cost of treatment. While fumigation control studies are under way, rotation control of the peanut root-knot nematode seems the most promising hope.

A two-year retirement of peanut from peanut root-knot-infested land is recommended along with an effective control of coffee weed, apparently the native host to this specialized pest. The substitution of crotalaria, cotton, and corn with winter grains is recommended for what will likely prove the most effective rotation control. This rotation must not be interrupted with legumes such as lupines, vetches, clovers, winter or summer peas either alone or interplanted, and to be effective, the so-called "root-knot resistant" cowpeas, etc., should be avoided until it can be determined whether they are effective rotation control crops against this peanut root-knot nematode.

8. A rather similar race specialization problem with the root-

knot nematode presents itself with cotton. This problem is being studied with view of improving rotation recommendations for root-knot infested cotton land.

The Department of Nematology is testing various crops to determine their relative resistance to the peanut and cotton races of the root-knot nematode in the hopes of finding suitable crop rotations by which these specialized pests might be more effectively controlled.

9. This laboratory in co-operation with and led by Nematological colleagues believes there is sufficient morphological evidence to establish at least three species of the root-knot nematodes as occurring in this region. For the time being, their specialized host relationship is recognized as the most practical means of working with them toward a recommendable rotation control. Reports or observations of the future on resistance to the root-knot nematode for any crop or ornamental plant will probably be valueless and deceiving in rotation recommendations unless studied from this specialized host-parasite race relationship.

These are only a few of the many experiments being conducted by this Department in an effort to bring relief to the farmer as he combats this inconspicuous but important and universal pest of the Coastal Plain, the root-knot nematode, in its several forms.

PLANT PATHOLOGY

The Plant Pathology Department may be termed a service department in that it works in close cooperation with other departments in an effort to solve the various plant-disease problems. The Department also acts as "trouble shooter" in identifying diseases for farmers of the area.

Assisting in agronomy, the Department is making disease investigations on the following field crops: corn, cotton, oats, and blue lupine.

Corn: In cooperation with the corn breeding program, cultures of *Helminthosporium* fungus are prepared in order to test the resistance of inbreds, hybrids, and various selections to this disease. Seed treatment tests are also being conducted.

Cotton: In cooperation with agronomists and cotton breeders, cultures of *Fusarium* wilt and wilt fungus are prepared to test the resistance of the different varieties of cotton to the wilts. Also, in cooperation with the Division of Nematology, the effect of nematodes on soil fungi is being studied.

Oats: Various seed treatment tests are being conducted on oats.

Blue Lupine: In cooperation with the Georgia Experiment Station and with the Florida Experiment Station, tests are being conducted on the treatment of blue lupine seed. No conclusive results have been obtained.

Commercial seed have been contrasted with selected seed, and there are indications that disease-free and properly cured seed of high germination will go far in solving the lupine growers' problems.

In cooperation with the Horticulture Department, research on disease is conducted on sweetpotatoes, tomatoes, watermelons, cantaloupes, okra, turnips, and roses.

Sweetpotato: While incomplete at the present time, conclusive tests are being made in an effort to determine how internal cork is transmitted. Also, stem rot fungus cultures are produced to test the susceptibility of various strains of potatoes.

Tomato: Certain fungicides are being tested for disease control in the field. Most of the fungicides used gave good control of early blight. Sprayed tomatoes remained green and produced fruit three weeks longer than unsprayed tomatoes. Fixed coppers have given the best results. The use of certain fungicides in fertilizer for control of southern root rot gave no significant results.

Watermelons: Fungicidal dusts for disease control on watermelons have been compared for two years, and in both tests Dithane and Parzate have given good results. Copper dusts have also been satisfactory.

Cantaloupe: Comparison of certain fungicides for disease control has been made with not enough information as yet to make recommendations.

Okra: Production of okra wilt fungus for testing okra varieties and selections for wilt resistance has been made with the Horticulture Department at the Attapulugus project.

Turnips: Fungicides for the control of turnip leaf spot were tested. Spray tests on turnips were made on two crops at this Station last winter and spring. Several fungicides gave commercial control of this disease, but satisfactory insecticides for the control of the vegetable weevil have not been found. Further work is in progress.

Roses: Fungicidal dusts for the control of black spot and mildew on roses were compared. Very encouraging results were obtained in these tests, and it is hoped that recommendations may be made in the near future.

CROP IMPROVEMENT

Cooperative Testing: A total of fourteen cooperative tests were conducted in 12 counties of the Coastal Plain area. This number includes two small grain tests with seven varieties, two cotton tests with eight varieties, six corn tests with nine varieties, and four peanut tests with five varieties. Three pasture grass variety tests were begun which are not included in the total. All tests were conducted

under farm conditions, on the farm itself. A total of seven soil types found in the Coastal Plain are represented in the project.

These tests are to assemble information as to: (1) Which of the available varieties or hybrids are most satisfactory for use in different sections of the Coastal Plain area; (2) which recent developments of plant breeders may satisfactorily replace varieties or hybrids now in production and become eligible for certification by the Georgia Crop Improvement Association.

These cooperative tests are used as farm demonstrations in co-operation with county agents and other county agricultural leaders.

As yet no conclusions can be made on data collected on this project. Three or more years' data are generally considered in evaluating the performance of a field crop variety. The testing is being continued with additional crops and locations.

Seed Certification: Assistance was given the Georgia Crop Improvement Association in its program of maintaining and increasing high quality planting seed of superior adapted varieties. This is done through seed certification. To be eligible for certification, seed must be inspected by the Association in field, storage, and laboratory, and satisfactorily pass certain standards.

A total of 96 growers produced 5,100 acres of certified seed in the Coastal Plain area. This acreage included 565 of cotton, 1,465 of hybrid corn, 1,030 of small grains, 555 of Dixie Crimson clover, and 832 of peanuts. The Association certified 30,100 acres of seeds of all varieties in the State. This is an increase of over 200 percent over the previous year.

Assistance was given in training inspectors for field and storage inspections.

SOIL CONSERVATION

A project for research in soil and water conservation began on October 11, 1948, as a co-operative project with the Soil Conservation Service of the United States Department of Agriculture. Planned studies include the measure of soil and water losses from sloping land under different systems of cropping and the development of cropping systems and cultural practices which will minimize such losses. Physical and chemical studies of soils will be an integral part of the research as a means of determining the effects of various soil characteristics on soil and water losses. As the project progresses, it is hoped that the research can be extended to include other fields of study of soil and water conservation.

Progress for the year includes the laying out of experimental plots, the planting of plots to Spanish peanuts for the determination of plot uniformity, the making of preliminary soil studies, the construction and equipping of a field laboratory-shop building, and the beginning of construction of devices for measuring soil and water losses.



A group of Soil Conservation supervisors inspect the newly instituted work on Soil and Water Conservation carried on in co-operation with the Soil Conservation Service.

SOILS

Soil Testing: Soil samples are collected and tested from various plots and experimental areas on Experiment Station property as requested by the different departments of the Station. These samples are tested usually by means of rapid soil tests for available nitrogen, potash, phosphoric acid, calcium, magnesium, and soil reaction (pH). Lime requirement and exchange capacity determinations are made when needed. This service is confined exclusively to the Experiment Station and co-operative projects on outlying farms.

Soil Studies:

A. Lime Rotation Test. (Tifton sandy loam, Norfolk sandy loam, Plummer loamy sand.)

Soil samples are collected periodically, usually at the end of a rotation cycle. Determinations of the available nitrogen (N), phosphoric acid (P_2O_5) and potash (K_2O) content, the soil reaction (pH), organic matter and base exchange capacity are made on

these samples. Physical soil studies involving the measure of moisture equivalent, volume weights, and permeability are also conducted in conjunction with this study. No definite conclusions can be made at this time.

B. Soil Conservation Research: In cooperation with the Soil Conservation Service Research Project, detailed chemical and physical soil studies will be made:

1. **Physical Soil Studies:** Physical determinations will be made of the soil in all experimental plots used in research in soil and water conservation to assist in determining the effect on the soil of cropping systems and cultural practices. The determinations will include measurements of pore volume, volume weight, soil permeability, moisture equivalent, and mechanical analyses of the soils. Soil samples on all plots were collected in March, 1949, before any treatments were applied to the plots.

2. **Chemical Soils Studies:** In order to evaluate accurately the effects of soil losses on experimental plots in soil and water conservation research, chemical determinations will be made as a means of checking the value of conservation practices on the chemical properties of the soil. Such studies will include determinations of organic matter content, total nitrogen, soil reaction, available nutrients, etc. Soil samples on all plots were collected in March, 1949, before any treatments were applied to the plots.

TABLE 11
CORN MINOR ELEMENTS TEST THOMAS COUNTY

<i>Treatment</i>	<i>Yield Bu/Ac. 1947</i>	<i>Yield Bu/Ac. 1948</i>
No Zn.....	34.45	14.18
Normal Zn. 2.5 lb. Zn/Ac.....	35.23	(1)18.30
Double Zn. 5.0 lb. Zn/Ac.....	36.95	(2)17.07
No Mg.....	33.36	17.41
Normal Mg. 12 lbs. Mg/Ac.....	35.23	18.30
Double Mg. 24 lbs. Mg/Ac.....	36.09	15.07
No Cu.....	34.37	17.86
Normal Cu. 2.5 lbs. Cu/Ac.....	35.23	18.30
Double Cu. 5.0 lbs. Cu/Ac.....	32.96	15.07
No B.....	35.47	16.75
Normal B. .5 lb. B/Ac.....	35.23	18.30
Double B. 1.0 lbs. B/Ac.....	35.31	16.63
Check—No minor elements.....	31.87	11.71
Complete—Zn, Mg, Cu, B.....	35.23	(3)18.30
Double—Zn, Mg, Cu, B.....	36.01	(4)15.63

(1) 5.0 lbs. Zn/Ac.

(2) 7.5 lbs. Zn/Ac.

(3) 5.0 lbs. Zn/Ac.

(4) 7.5 lbs. Zn/Ac.

Minor Elements:

A. Corn:

1. (Ruston Sandy Loam). This test is located on Greenwood Plantation in Thomas County. Four elements—magnesium, zinc, copper, and boron—are being used as soil amendments to determine the nutritional effect on corn.

No definite conclusions can be made from the data in Table No. 11, but the indications are that applications of zinc are beneficial to crop yields sufficient to warrant the small cost involved. The complete application of all four elements indicates a favorable response.

TABLE 12
EFFECT OF DIFFERENT LEVELS OF ZINC ON
DIFFERENT CORN HYBRIDS
TIFTON, GEORGIA—1948
(Soil—Tifton Sandy Loam)

Treatment	Varieties					Mean All Varieties Bu. Per Acre
	Fla. W-1 Bu/Ac.	F3xF2 Bu/Ac.	F3xF4 Bu/Ac.	Dixie 18 Bu/Ac.	GCP 7073 Bu/Ac.	
Check—No Zn.....	61.2	62.4	54.9	72.9	64.8	63.2
5 lbs. Zn/Ac.....	62.7	74.6*	63.2	75.4	65.2	68.2
10 lbs. Zn/Ac.....	60.8	64.0	53.5	71.2	67.5	63.4
10 lbs. Zn/Ac, 48 lbs. Mg/Ac.....	61.9					

* L. S. D. 5% Level—9.73 bu.

TABLE 13
EFFECT OF DIFFERENT LEVELS OF ZINC ON FIVE DIFFERENT
CORN HYBRIDS
BOSTON, GEORGIA—1948
(Soil—Ruston Sandy Loam)

Treatment	Varieties					Mean All Varieties Bu. Per Acre
	Fla. W-1 Bu/Ac.	F3xF2 Bu/Ac.	F3xF4 Bu/Ac.	Dixie 18 Bu/Ac.	GCP 7073 Bu/Ac.	
Check—No Zn.....	24.6	33.1	25.0	39.4	43.9	33.2
5 lbs. Zn/Ac.....	25.8	37.9	24.6	49.7*	38.2	35.2
10 lbs. Zn/Ac.....	26.4	36.0	22.5	44.1	42.8	34.4
10 lbs. Zn/Ac, 48 lbs. Mg/Ac.....	26.8					

* L. S. D. 5% Level—6.02 bu.

2. (Tifton Sandy Loam). This test is the same as number 1, but located on the Experiment Station property at Tifton. It has run only one year and no definite conclusions can be made at this time.

3. (Ruston Sandy Loam and Tifton Sandy Loam). A test was run one year (1948) in Thomas County and at Tifton in which zinc sulphate was used at rates of 5.0 and 10.0 pounds per acre of elemental zinc on five hybrid corns. The five-pound rate gave slight increase in nearly all cases, but the 10-pound rate was detrimental in nearly all cases. The results are indicated in Table No. 12 and Table No. 13.

B. **Cotton.** (Tifton Sandy Loam) This test is the same as the corn test (A-1) in rates and elements used. No conclusions have been reached on this test to date.

C. **Peanuts.** (Tifton Sandy Loam) A test was carried out for two years, 1947 and 1948, in which copper sulphate at rates of 2.5 and 5.0 pounds of elemental copper and zinc sulphate at rates of 2.5 and 5.0 pounds of elemental zinc were used. In 1948 elemental zinc was used at the rate of 5.0 and 7.5 pounds. One set of replications was dusted with sulphur and the other set was left undusted. Two years' results indicated no significant results and the test was concluded.

Corn-Zinc Demonstration Test: In cooperation with local farmers in eleven counties of South Georgia and the county agents in the respective counties, a test was set up to determine the extent of zinc deficiency on corn in South Georgia. Fertilizer (4-8-8) containing zinc and fertilizer without zinc was furnished to each farmer to be applied at the rate of 400-500 pounds per acre. The results of this test are incomplete and no conclusions can be made.

Radioactive Phosphorus Experiment on Peanuts: In cooperation with the Bureau of Plant Industry, Soils, and Agricultural Engineering, an experiment was set up during the 1949 growing season using radioactive phosphorus on Spanish peanuts as a tracer to determine uptake of phosphorus by the plants.

Two rates of radioactive superphosphate were used on peanuts: 20 lbs. per acre and 40 lbs. per acre of P_2O_5 respectively. Samples of the plants were collected at 20-day intervals and analyzed at Beltsville for percentage of phosphorus derived from the fertilizer applied and total phosphorus content. Data were incomplete on June 30, and no conclusions can be made.