

GEORGIA EXPERIMENT STATION
DEPT. OF AGRICULTURAL ECONOMICS
EXPERIMENT, GEORGIA

May 9, 1952

Draft

ACCOMPLISHMENTS

of

The Georgia Experiment Station

Experiment, Georgia

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Accomplishments of the Georgia Experiment Station

Preface

To give you a better idea of the value of this Station to the people of Georgia, we have assembled this statement of accomplishments. They are arranged according to departments. Most of the studies referred to are completed, as opposed to those in the Synopsis of Research, where current studies are reported. Please feel free to question us concerning anything mentioned here.

The results of research are hard to evaluate in dollars and cents. Often we are not able to do so. All of the accomplishments listed here have been of direct benefit to the farmers of this State, and of indirect value to all the citizens of the State. We feel we may be justly proud of them.

William G. Mitchell
Editor

ACCOMPLISHMENTS OF THE AGRICULTURAL ECONOMICS DEPARTMENT

The research program of the Department of Agricultural Economics has been directed toward the economic problems of farmers. Together with other states and the United States Department of Agriculture, several broad overall analyses of agriculture have been made since 1934. These studies indicated ~~probable changes in agriculture under~~ certain conditions. During the war and later, production capacity reports were used by the government in setting production goals, in the rationing of farm materials, and other program-planning activities.

Farm management studies have been made in a number of counties in different parts of the State. These show the organization, and operation of, and income from, various sizes and types of farms. Related problems include conservation, farm tenure and rental arrangements, the opportunities for farm adjustments, and farm operation to meet the needs of war. Dairy-farm operation has been analyzed for both fluid milk and manufacturing milk production. Some economic aspects of beef production have been studied.

Mechanization of farming has been investigated from many angles. The cost and utilization of tractor power and equipment has been studied in both the Piedmont and Coastal Plain areas. The efficiency of harvesting small grains and seed crops with various sizes and types of combines is being studied; this is being done because self-propelled machines equipped with tanks for the bulk of handling of grain have become available. ~~The use of electricity on farms in north Georgia has been studied.~~

Farm prices in Georgia since 1910 have been compiled and published. This publication is of great value for reference, since it contains monthly prices of all the important farm products, index numbers, and seasonal price variation charts.

Practices used in the production of crops and livestock are now being studied in a comprehensive way. Information is now available on important crops. This information presents the sequence of operations and the hours of labor and machinery used for each operation, and the quantities of seed, fertilizer, and other materials used per acre. Similar information for beef cattle, dairy cattle, and hogs refers to the volume of production and the inputs of grazing, hand-fed feeds, and other expenses. These data will be used, along with other information, in testing the economic possibilities of adjusting the sizes and types of farms to various economic and physical conditions.

The financial requirements and credit needs of farmers in the development of new systems of farming have received special attention also. The accumulation of capital through savings from the returns of dairy farms and the effectiveness of supervised commercial bank credit have been studied.

The marketing of farm products is another broad field of economic research. Vegetable marketing at the local level has been investigated in several parts of the State and at regional concentration markets in cooperation with neighboring states. Cotton marketing has been a major interest.

The passage of the Research and Marketing Act of 1946 made available additional funds for marketing research on both the State and regional levels. Since then, projects have been completed or are now in progress on the marketing of various kinds of fruits and vegetables, sweet potatoes, peaches, cotton, peanuts, cornmeal, eggs, milk, broilers, livestock, and forest products. Of special value in connection with peanut research has been the design and development of equipment for sampling peanuts and separating foreign matter. This work was done in cooperation with the Georgia School of Technology.

Research in the economics of marketing shows that farmers' incomes may be increased by improvements in the marketing system. (Suggestions in the past for improving the marketing system may be grouped as follows: (1) farmers should perform more of the marketing services and functions, (2) farmers should perform less of them, (3) the monopoly power of farmers should be increased, (4) the near monopoly power of buyers should be broken, and (5) the efficiency of the marketing system should be increased. This conclusion seems indicated by history and logic: Farmers, in a commercialized and specialized economy, will provide less and less of the necessary marketing services and functions and become increasingly dependent upon an efficient marketing system for moving their products to consumers in a systematic, orderly, and low-cost manner.

The commercialization of farming is making farms larger, for this reason, farmers are becoming larger purchasers of supplies and industrial products and larger sellers of food and fiber. Both production and marketing is becoming more dependent upon the application of scientific knowledge. The failure to develop methods of marketing that are in tune with our modern economy has resulted in large surpluses of some farm products. Prices have been too low at times to cover even the marketing costs, and so the products have been left unharvested.

ACCOMPLISHMENTS OF THE AGRONOMY DEPARTMENT

The production and distribution of foundation seed is the final product of plant breeding. The plant breeding program is a very important part of the work in the Agronomy Department. Seventy-five percent of the budget goes for developing high yielding varieties with superior qualities. The plant breeders have given a good account of themselves; for since 1936, eighteen new varieties of crops have been released by the Agronomy Department. The following is a list of the latest varieties or hybrids available to farmers.

Production and Distribution of Foundation Seed and Farmers' Increased Annual Income

Variety or hybrid	Year	:released		Farmers' Inc. Income
		1950-51	1951-52	
Chancellor wheat	1948	1,000 bu.	3,200 bu.	\$500,000
Terruf oats	1936	600 "		
Arlington oats	1948	1,000 "	1,600 "	\$500,000
Atlantic oats	1948	80 "		
Dixie crimson clover	1944	4,000 lbs.	20,000 lbs.	\$6,000,000
Hybrid corn Ga. 101	1948	7,500 "	4,000 "	
Hybrid corn Ga. 103	1950	1,000 "	1,000 "	\$500,000
Cherokee sweet corn	1936	600 "	1,000	
Empire cotton*	1944	1,500 tons	2,200 tons	\$3,000,000 Ga. \$16,000,000 Nation
Gatan soybeans	1940	50 bu.	100 bu.	
Climax lespedeza**	1948			

* Last multiplication of Empire cotton seed is done by Empire Seed Producers Assn., Haralson, Ga. under supervision of Georgia Experiment Station.

** Climax lespedeza was released by this Station in cooperation with USDA.

NOTE: New varieties of wheat, fescue, Sericea lespedeza, corn hybrids, and peanuts to be released. Volume at present about one-fourth the demand.

Plant breeding programs here have developed and are developing varieties adapted to Georgia. Crops bred by this department are cotton, corn, small grain and forage crops.

Some of the farm equipment developed to further mechanization: high-speed peanut planter, cotton picker, cover crop planter, etc.

Chemical weed control has been proved practical in this area, especially with cotton.

This department began soil testing in Georgia in 1938. Previous to the establishment of this service, farmers and growers in the State had to rely on guesswork to determine how much lime and fertilizer were needed on their soil. This service has grown from one laboratory at Experiment to four which are located at various points in the State. In addition to the laboratory at Experiment, there are soil testing laboratories at Athens, Tifton, and Blairsville. The number of samples tested annually has increased from a few hundred during the first year of operation to approximately 50,000.

Dr. L. C. Olson of this department inaugurated mobile soil testing. This Station was the first in the country to use this type of soil testing. At the present time, there is a mobile unit operating out of each of the central laboratories listed above. The units located at Experiment have made over 200 county trips and tested nearly 20,000 samples on the spot.

Investigations on the use of radioactive fertilizer as a research tool in Georgia were begun at this Station. At the present time a regional assay laboratory for radioactive phosphate is located at the soils laboratory.

Fertilizer tests with rates of nitrogen on corn planted in heavy stands have resulted in an increase in corn yield in the State.

The first investigations with various types of liming materials were begun at this Station.

Fertilizer experiments with alfalfa have resulted in an increased acreage and larger yields of this valuable hay crop.

ACCOMPLISHMENTS OF THE DEPARTMENT OF ANIMAL INDUSTRY

The possibilities of green grazing in winter gives Georgia's livestock producers a distinct advantage over livestock producers in the North and West. Tests show temporary winter pasture mixtures are most productive. Research was concentrated on this type of pasture. Various practices important to obtaining abundant and early winter grazing were determined. Some of the practices proved necessary are: early seedbed preparation and seeding; adequate fertilization at seeding time, and nitrogen topdressing later; proper method and rate of seeding, most productive seeding mixtures and crop varieties; and sod production to hold up cattle under wet soil conditions.

Tests here have determined the value of winter pastures for:

1. Milk production. The net value of milk produced, above feed and pasture costs, was \$100 per acre on fertilized and only \$30 on unfertilized temporary winter pastures.
2. Beef production. Winter pastures have produced beef gains of \$30 to \$75 per acre net value above pasture costs. Temporary pastures (oats, rye grass, and crimson clover) have given the greatest gains, Dixie crimson clover the second best, and fescue grass the lowest gains. Beef gains are produced at less cost on winter pastures than in dry lot. Beef gains on fescue grass are entirely satisfactory when the steers are fed a small corn ration to supplement the pasture; corn feeding is not economical on the other two types of winter pasture under study.
3. Dairy heifers. Dairy heifers developed better on winter pastures than in dry lot; they gained at a rate of 1.3 pounds daily on pasture and 0.8 pounds daily in dry lot. Gains cost half as much on pasture as in dry lot. Supplemental feeding of grain to heifers grazing on fescue grass is desirable, but such feeding is not economical on temporary winter pasture.

Increased beef production has been shown possible with pasture improvement.

Over an 11-year period, limed and fertilized permanent pasture produced 317 pounds while unimproved pasture produced 124 pounds beef gains per acre.

Supplementary irrigation of Bermuda-white clover pasture increased forage protein production 60 percent. Irrigation of winter pastures in September and October make it possible to graze these pastures a month earlier than would be possible otherwise, and helps insure the successful establishment of new fall seedings of pastures.

Over an 8-year test period, three tons of pasture forage were produced per acre with heavy fertilization while only 1,160 pounds forage were produced per acre without fertilizer or lime. The nutritive value of the forage also was increased by fertilization.

It was found that good quality lambs weighing 80 pounds could be produced for the high-price early spring market with good management practices. Good winter grazing is essential for this program. Sheep production offers another opportunity to increase Georgia farmers' incomes from livestock.

Compared in test here with dry lot feeding, the use of green grazing crops to pigs on a fattening ration has shortened the time required to get them to market weight, and has reduced the amount of concentrate feeds needed per 100 pounds of gain made.

Our research indicates it is more economical to feed brood sows on green grazing than in dry lot, and their pigs are stronger at birth.

An increase in the level of internal parasites of spring-dropped calves was found to occur in September and October - coincident with a lower quantity and quality of pasturage available and a decrease or cessation of milk production by the calves' dams. Special feeding, pasture management, or control measures are desirable at this period if maximum continued gains of the calves are desired.

Yearlings on fescue pasture have shown a much heavier internal parasite infection than yearlings on other winter pastures. Supplemental corn feeding greatly reduced the severity of internal parasitism of yearlings on fescue grass.

It has been found that cows can, or will, consume nearly one-third more of some forages than of others. Pasture herbage has varied from 55 to 80 in percent digestibility. The highest level of livestock production is obtained with those pasture forages that enable the animal to consume the most herbage daily and digest it most completely.

Supplemental feeding to better balance the feed nutrients of specific pasture grasses and legumes has increased livestock production and the efficiency of utilization of several forages studied.

Many species and varieties of grasses and legumes have been tested here and at several places over the State for their adaptability and productiveness. According to these tests, some of the best forage species and varieties are common and Coastal Bermuda grass, Dallis grass, southern strains of white clover, Ladino clover, the Starr variety of Pearl millet, the Tifton variety of Sudan grass, Kenland red clover, Atlantic alfalfa, annual lespedezas, Lespedeza sericea, Dixie crimson clover, and tall fescue grass.

Some harvested and stored feed should be on hand for periods of pasture shortage. Silage is one form of stored feed that can be preserved without interference from weather hazards. Trench silos have been used successfully at the Georgia Experiment Station for over 15 years for storing corn, sorghum, sweet potatoes and vines, and grass silage. Trench silos are cheaper to construct than upright silos.

ACCOMPLISHMENTS OF THE BOTANY DEPARTMENT

During the early years of the present century, pepper diseases became so destructive that the industry appeared doomed to failure. No systematic study of pepper diseases and their control had been made anywhere in the world.

A study of the diseases and possible control methods was begun in 1919. It was found that the fungi and bacteria responsible for the most serious diseases were carried on the seed and that this source of infection could be eliminated by careful selection of seedstock and disinfectant treatment of the seed. Some of the disease producing organisms were found to live over in the fields and in the seedbeds.

Canners understood the importance of disease control and gladly helped to educate the growers in following our recommendations as to careful selection of disease-free seedstock; seedbed sanitation; and proper rotation for pepper growing.

A study of various methods of treating cotton seed to destroy seed-borne parasites and improve germination of the seed was started in 1924 and finished in 1936. At the start, no dust fungicides were available, except copper carbonate, which was found worthless on cotton seed. We made up our own dusts during the first few years. As soon as we had demonstrated the possibility of using dust fungicides, DuPont and Bayer began cooperating in an effort to develop a satisfactory fungicidal dust. Altogether, nearly 100 chemicals were tested. In 1928, the E. I. DuPont Company submitted a material later known as 2% Ceresan, then New Improved Ceresan in 1930. Both of these were found very effective. These two were recommended and are still in use.

After we published our results, experiment stations in all cotton-growing states entered the field. Today, dust treatment of cotton seed is standard practice all over the South. It is worth several million dollars annually in improved stand, freedom from diseases, and in consequent increased yield.

After working four years on control methods for disease of tomato plant seedlings, Frank Van Haltern of this department recommended: 1. that seed be saved only from fields free from diseases; 2. that all seed be treated before planting; 3. that tomatoes should not be grown on the same field oftener than one year in three; 4. that the plant fields be sprayed at least three times before plants were shipped; and 5. that sanitary precautions be observed in pulling and handling the plants.

These recommendations were eagerly followed by the better plant growers. The recommendations were later adopted by the State Board of Entomology as a basis for certifying plants.

Principal results to date of our peanut breeding and disease control work may be summarized as:

a. The complete life histories of the two common leaf-spot-producing fungi have been recorded and control methods worked out. These control methods are now being practiced by about 30 per cent of growers. The average increase in yield from leaf-spot control appears to be about 20 per cent.

b. The cause and means of controlling both "concealed damage" of runner peanuts and "blue-black" discoloration of Spanish have been worked out. These two diseases are estimated to cause a 5 per cent damage to the crop.

c. Our experiments indicate poor stand is the most important factor in the low average yield of peanuts in Georgia. Poor stand is related to type of seed planted, failure of seed to germinate, and spacing of the seed. In 1940 estimates indicated that 25 per cent of the peanut acreage was planted with "peg" seed (small, immature, shriveled seed); about 5 per cent planted in the shell; and the remainder with No. 1 machine-shelled seed. We found that peg seed produced small, weak seedlings which developed slowly and never equaled in productivity the plants from No. 1 seed. Seed planted in the shell never gave a good stand except at an excessively high rate of seeding. Machine-shelled seed have the seed-coats scratched and broken and, unless protected by a disinfectant, germinate poorly, but when treated with an effective dust disinfectant, germinate as well as or better than hand-shelled seed.

Optimum yields can not be obtained, with the Spanish variety, with less than four plants per linear foot of row, with rows 24 to 30 inches apart. Southeastern Runner and Virginia types should have at least two plants per foot in rows 30 to 36 inches apart.

Under certain weather conditions, occurring about one year in four, diseases destroy the foliage of the cantaloupes and the cantaloupes are of poor quality. Attempts to develop sprays that would economically control diseases have resulted in failure. The disease most difficult to control is "downy mildew", which overwinters on cucurbits in Florida. During cool, humid weather of spring, spores are produced in abundance and spread up the coast by winds, frequently reaching the New England States by August.

A few years ago some wild cantaloupes introduced from foreign countries were found to be almost immune to downy mildew, but the fruits were bitter and inedible. However, these were crossed with high quality commercial cantaloupes and selections obtained that combined disease resistance of the wild parent with excellent quality of flesh. One of these selections has just been released as Georgia 47. Further work is in progress, attempting to improve the market qualities of the fruits.

ACCOMPLISHMENTS OF THE CHEMISTRY DEPARTMENT

In recent years the Chemistry Department at the Georgia Experiment Station has found that boron is necessary for the development of squares on cotton plants. It was also shown that minute amounts of zinc are necessary for the life and growth of cotton.

The Department showed that peanut proteins are soluble in water and so are easily separated for any potential use; that peanut oil may be sulfonated and used as a satisfactory substitute for olive oil in the textile industry; and that an unstable, plastic form of peanut oil is useful in the prevention of oil separation in peanut butter.

Pigs showed little susceptibility to benzoic acid toxicity and it was found that peanut meal may be fed to these animals at any level suggested by current feed prices. Peanut skins, a by-product of peanut processing, were found to be worthless in pig rations, but the hearts, another by-product, were shown to have about the same feeding value as whole peanuts. It was also shown that kudzu leaf meal is a satisfactory substitute for alfalfa meal in pig and poultry rations.

Newer varieties of sorghum were found to produce much higher yields of syrup, and because of the relatively lower cane sugar content of the juice these varieties are readily adaptable to ordinary farm processing equipment.

The amount of the indispensable amino acid, tryptophane, was found to be much less in peanut and other proteins than the previously accepted values, and many standard rations have been revised on this newer basis.

Spanish peanuts were found to be more susceptible to peroxide rancidity development than Runner or Virginia types, and are thus under a competitive handicap in end-user markets.

Gossypol, a toxic substance in cottonseed meal, was found to induce delayed clotting of the blood when given by mouth to rabbits and pigs. This physiological action, much like that of the drug Dicumarol, accounts in part for the hemorrhages caused by toxic cottonseed meal.

Such additives to cottonseed meal rations as green grass, vitamin K, rancid vegetable oil, barley, and antibiotics have been found to afford some protection against toxicity to pigs, but none overcomes the toxicity altogether.

ACCOMPLISHMENTS OF THE ENTOMOLOGY DEPARTMENT

The purpose of the Entomology Department is to conduct research on the life history, habits, and control of injurious insects of Georgia crops. Control may be cultural, biological, mechanical, or chemical. Chemical control, the use of insecticides, receives the most active attention at the present time. All insects are not injurious; therefore, in devising control measures, it is important to recognize the beneficial insects.

The Entomology Department serves as a clearing house for the identification and control of various pests. Numerous inquiries are referred to the department from farmers, gardeners, and housewives throughout the State. Control information is furnished on insect pests of cotton, corn, peanuts, fruits, vegetables and field crops, ornamental shrubs, stored products, household, and livestock. Information is also furnished on such pests as rats, mice, moles, and slugs.

The Experiment Station works closely with insecticide manufacturers in testing new materials. Before an insecticide can be recommended for general use, it is important to establish the effectiveness of the insecticides against the insect, dosage levels, toxicity to plants, residue tolerance, and especially if it is practical and economical.

It is impossible for entomologists at the Station to test all new insecticides, consequently it is necessary to cooperate with other state and federal workers in order to keep abreast of recent developments and progress. Further, it is not possible, due to limitations of funds and personnel, to study all of the major insect pests of economic importance in the State. Only a few problems can be investigated each year.

At the present time, the Entomology Department is actively conducting five projects and cooperating with the Horticultural Department on another. The latter involves a study of the control of insects affecting peaches.

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During 1949 and 1950, increased yields of 1,398 and 1,360 pounds of seed cotton per acre were obtained, in tests where regular applications of insecticides were made for control of cotton insects.

Results of tests have shown that water emulsion sprays are equally as effective as dusting for control of cotton insects.

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In the search for an effective control of the cowpea curculio, consistently good results have been obtained with several new organic insecticides. Further study is needed to determine if a residue remains on the crop following the use of the insecticide. The insecticides have reduced the percent of infested pods by this insect to less than one percent.

ACCOMPLISHMENTS OF THE HORTICULTURE DEPARTMENT

Five years work with new organic spray materials for use against peach insects has forced the abandonment of the arsenate of lead spray program. Parathion has proved much superior as a peach insecticide. Parathion will control nearly all insects which attack the peach tree or fruit. Since it does not injure the trees, longer lived, more productive orchards may be expected. It is established that this new spray program has saved the peach growers of Georgia over \$750,000 annually by the reduction of fruit and tree losses.

In 1944, the Truhart Perfection variety was released to growers by the Experiment Station. It is estimated that this variety has added at least \$250,000 per year to the Georgia pimiento industry. In an attempt to further improve the present variety and increase its disease resistance, the Horticulture Department has expanded its pimiento breeding program.

Muscadine grapes were the particular interest of the late Dr. H. P. Stuckey who carried on active work with this type grape for over 45 years. Among many good varieties of this grape, he bred and introduced the well-known Hunt variety, which is now grown in all the southern states. The breeding program is still going forward with the goal of developing a self-fertile variety which is superior to our present varieties.

Fence posts are becoming increasingly important to Georgia farmers as they shift their farms into cattle production. The Georgia Experiment Station, in cooperation with the Tennessee Valley Authority and other State Experiment Stations, has developed the cold-soak method of preservatively treating fence posts. This cold-soak method is simply the soaking of dry posts in either copper naphthenate, pentachlorophenol, or creosote for a predetermined length of time. Such treatment produces posts which last five to six times as long as untreated posts.

The Georgia Experiment Station pioneered the use of sawdust as a mulch for such horticultural crops as blueberries and strawberries with work started in 1939. This work has been widely copied and given much publicity by other states as a new finding even though the work was first done here and results published in 1942.

Evaluation of new fruit, vegetable, and flower varieties with consideration of their possibilities for the Piedmont area of Georgia is carried on by the Horticulture Department of the Georgia Experiment Station. The number of requests for this type of information during the course of a year is very high.

Work over an eight-year period shows that under Georgia conditions the moderately small-sized nursery stock will reach bearing size as quickly as larger nursery trees, are cheaper and more easily trained, and frequently are much more productive. Peach growers planting orchards will find this quite a saving in initial as well as later costs.

