

TWENTY-SIXTH ANNUAL REPORT

OF THE

Agricultural Experiment Station

OF THE

ALABAMA POLYTECHNIC INSTITUTE

AUBURN, ALABAMA

JANUARY 31, 1914

OPELIKA, ALA:
THE POST PUBLISHING COMPANY

1914

ALABAMA POLYTECHNIC INSTITUTE

Auburn, Ala., January 31, 1914.

GOVERNOR EMMET O'NEAL,

Executive Department,

Montgomery, Ala.

Sir:—I have the honor herewith to transmit to you the Twenty-sixth Annual Report of the Agricultural Experiment Station of this College.

The report of the Treasurer, herewith included, is for the fiscal year ending June 30, 1913.

This report is made in accordance with the provisions of the act of congress (approved March 2, 1887), establishing Agricultural Experiment Stations in the several States and Territories.

It contains the report of the Director, the Chemists, the Veterinarian, the Agriculturist, the Botanist, the Horticulturist, the Entomologist, the Plant Pathologist, and the Animal Husbandman, for the year ending December 31, 1913.

Respectfully,

CHAS. C. THACH,

President.

AGRICULTURAL EXPERIMENT STATION.

TRUSTEES.

His Excellency, Emmet O'Neal, President	Ex-Officio
W. F. Feagin, Superintendent of Education	Ex-Officio
A. W. Bell	Anniston, Ala.
Harry Herzfeld	Alexander City, Ala.
Oliver R. Hood	Gadsden, Ala.
H. L. Martin	Ozark, Ala.
W. K. Terry	Birmingham, Ala.
J. S. Frazer	Mobile, Ala.
R. B. Barnes	Opelika, Ala.
R. F. Kolb	Montgomery, Ala.
J. A. Rogers	Gainesville, Ala.
C. M. Sherrod	Courtland, Ala.

STATION COUNCIL.

C. C. Thach	President
J. F. Duggar	Director and Agriculturist
B. B. Ross	Chemist and State Chemist
C. A. Cary	Veterinarian and Director of Farmers' Institutes
J. T. Anderson	Chemist, Soil and Crop Investigations
C. L. Hare	Physiological Chemist
W. E. Hinds	Entomologist
L. N. Duncan (a)	Agricultural Extension Work
F. A. Wolf	Plant Pathologist
J. S. Caldwell	Botanist
J. B. Hobdy (a)	Agricultural Extension Work
George S. Templeton	Animal Husbandman
Ernest Walker	Horticulturist

ASSISTANTS.

T. Bragg	Assistant Chemist
J. B. Jackson	Analyst
E. F. Cauthen	Associate Agriculturist and Recorder
I. S. McAdory	Assistant Veterinarian
J. E. Buck	Assistant in Entomology
M. J. Funchess	Assistant Agriculturist
A. B. Massey	Assistant in Botany
J. C. C. Price	Assistant in Horticulture
J. T. Williamson	Field Agent in Agriculture
G. V. Stelzenmuller	Field Agent in Horticulture
E. S. Girton	Assistant in Animal Industry
S. S. Jerdan	Assistant in Beef Industry
Mrs. B. I. Robinson (a)	Assistant in Girls' Demonstration Work
L. J. Hawley	Field Agent in Agriculture
S. Adler	Assistant in Chemistry
G. W. Ells	Field Agent in Entomology
I. B. Kerlin (a)	Assistant in Agricultural Extension Work
H. B. Tisdale	Assistant in Agriculture
A. R. Gissendanner	Assistant in Animal Industry
J. A. McLeod	Assistant in Swine Husbandry
A. H. Kierce	Secretary to Director

(a) In co-operation with U. S. Department of Agriculture.

REPORT OF HATCH AND ADAMS FUNDS FOR 1912-1913

Receipts

	Hatch	Adams
To amount from U. S. Treasury	\$ 15,000.00	\$ 15,000.00

Disbursements

By Salaries	\$ 8,092.94	\$ 10,133.80
By Labor	1,337.26	1,840.39
By Publications	1,279.45	
By Postage and Stationery	427.15	74.19
By Freight and Express	135.33	68.27
By Heat, Light, Water and Power	692.61	296.34
By Chemicals and Laboratory Supplies	599.25	633.57
By Seeds, Plants and Sundry Supplies	390.46	256.12
By Fertilizers	333.33	220.44
By Feeding Stuffs	361.17	382.05
By Library	516.31	
By Tools, Machinery and Appliances	241.18	53.08
By Furniture and Fixtures	31.15	125.75
By Scientific Apparatus and Specimens	111.67	168.37
By Live Stock	200.00	220.76
By Traveling Expenses	51.48	354.87
By Contingent Expenses	37.75	
By Buildings and Land	161.51	172.00
Total	\$ 15,000.00	\$ 15,000.00

State of Alabama:

Lee County.

Personally appeared before me, Welborn Jones, a Notary Public in and for said county, M. A. Glenn, known to me as Treasurer of the Alabama Polytechnic Institute, who, being duly sworn, deposes and says the above foregoing account is true and correct. Witness my hand this 28th day of January, 1914.

WELBORN JONES,

Notary Public, Lee County.

This is to certify that I have compared the account with the ledger account of the Treasurer, and this is a correct transcript of the same.

C. C. THACH,

President Alabama Polytechnic Institute.

REPORT OF DIRECTOR AND AGRICULTURIST.

J. F. DUGGAR

Dr. C. C. Thach,

President Alabama Polytechnic Institute.

Sir:

I respectfully submit the following report for the past year of the work under my charge as Director and Agriculturist of the Alabama Experiment Station:

PUBLICATIONS.

During the calendar year 1913 the publications of the Alabama Experiment Station consisted of the annual report, seven bulletins, six circulars, and nine press bulletins. The titles and authors are given below:

Bulletin No. 168.—**Fattening Hogs in Alabama**; by the Animal Husbandman and Assistants. (From Local Experiment Fund).

Bulletin No. 169.—**Local Fertilizer Experiments with Cotton in South Alabama in 1912**; by the Director and Assistants. (From Local Experiment Fund).

Bulletin No. 170.—**Local Fertilizer Experiments with Cotton in North Alabama in 1912**; by the Director and Assistants. (From Local Experiment Fund).

Bulletin No. 171.—**The Biology of Life History of the Cattle Tick as Determined at Auburn, Alabama**; from the Veterinary Department; **Dipping Vats and Dips**; by the Veterinarian.

Bulletin No. 172.—**Black Spot of Roses**; by the Pathologist.

Bulletin No. 173.—**Oats; Experiments on Culture, Varieties and Fertilizers**; by the Director and Associate Agriculturist.

Bulletin No. 174.—**Fertilizer Experiments With Cotton in South Alabama in 1913**; by the Director and Assistants. (From Local Experiment Fund).

Circular 19.—**Annual Report of the Director of the Ex-**

periment Station on Work Done Under the Local Experiment Law in 1911. (From Local Experiment Fund).

Circular 20.—**Annual Report of the Director of the Experiment Station on Work Done Under the Local Experiment Law in 1912.** (From Local Experiment Fund).

Circular 21.—**Boys' Pig Clubs;** from the Extension Department. (From Local Experiment Fund).

Circular 22.—**Alabama Boys' Corn Club Day;** from the Extension Department. (From Local Experiment Fund).

Circular 23.—**How to Organize and Conduct a Girls' Canning Club;** from the Extension Department. (From Local Experiment Fund).

Circular 24.—**Information on Corn Growing For Corn Club Boys;** from Extension Department. (From Local Experiment Fund).

Press Bulletin No. 60.—**Cotton Boll Weevil Infested Area in United States and Quarantine Line in Alabama 1912-1913;** by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 61.—**Tests of Varieties of Corn in 1912;** by the Director and Associate Agriculturist.

Press Bulletin No. 62.—**Tests of Varieties of Cotton in 1912;** by the Director and Associate Agriculturist.

Press Bulletin No. 63.—**Control of White Fly and Scale Insects on Citrus Fruits;** by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 64.—**Boll Weevil Control in Early Summer;** by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 65.—**Fall Campaign Against the Boll Weevil;** by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 66.—**Oats;** Conclusions from Seventeen Years' Experiments at Auburn; by the Director and Associate Agriculturist.

Press Bulletin No. 67.—**Oat Smut;** Directions for Preventing it by Treating Seed Oats with Formalin; by the Director.

Press Bulletin No. 68.—**Tests of Varieties of Corn in 1913**; by the Director and Associate Agriculturist.

Mention should also be made of Circulars Nos. 17 and 18, published in 1912 and accidentally omitted from previous list, and of a reprint of Bulletin No. 159, made in 1913.

Bulletin No. 159.—**Heading Off the Boll Weevil Panic**; by the Entomologist.

Circular 17.—**A Field Method For Distinguishing Certain Orange Stock**; by the Pathologist.

Circular 18.—**Feeding and Managing Dairy Cattle, etc.**; from Animal Industry Department.

STAFF.

Record was made in my previous report of the resignation of Professor D. T. Gray, formerly Animal Husbandman of the Station. His successor, Professor Jesse M. Jones, was promoted to a position in the U. S. Department of Agriculture, and was succeeded, in September, 1913, as head of the Department of Animal Industry by Professor G. S. Templeton.

Dr. E. P. Sandsten resigned as Horticulturist in July, 1913, to accept a more lucrative position in another institution. His successor is Professor Ernest Walker, formerly of the Arkansas University and Experiment Station. Professor Walker's appointment took effect in October, 1913.

Vacancies in the position of assistants in the several departments have been filled by the following appointments:

In Botany, A. B. Massey; in Horticulture, G. V. Stelzenmuller; in Animal Industry, E. S. Girton, A. R. Gissendanner and J. A. McLeod; in Agriculture, H. B. Tisdale; in Entomology, G. W. Ells.

AGRICULTURAL DEPARTMENT (Work Under Hatch and Adams Funds.)

In accordance with a principle well recognized by experimenters with field crops, namely the necessity for long-continued repetition of field experiments in order to arrive at averages that are reliable, much of the work in this de-

partment is a continuation of the lines of experimentation heretofore reported. Among the new lines of work may be mentioned liming experiments with alfalfa and tests of different phosphate with this crop, and the rate at which nitrification proceeds in the soil when variously cropped and tilled.

As usual, plant breeding with cotton, corn, and oats has employed more of the time of the staff in this department than any other single line of investigation. Very satisfactory progress has been made in this line of endeavor, where, from the nature of the case, results are slow in maturing. For example, a more extensive test by farmers in many parts of the State of the variety of corn, Experiment Station Yellow, which has been bred up on the Station farm for resistance to weevil and for increased productiveness, has brought forth many expressions of approval of this variety and has resulted in the growing of a sufficient area by farmers to supply the probable demand for seed in 1914.

One strain of Henry Grady corn, resulting from the breeding work on this station, led all varieties in productiveness in the variety test on the Station farm in 1912, and also ranked first in yield in the variety test made at the Alabama Canebreak Station in 1913. Likewise, two strains, bred up on the Station farm from the Cook variety of cotton, ranked first and third in productiveness among the large number of varieties tested here in 1913.

Several of the cotton hybrids made on this station within the past few years and tested out by farmers in 1913 have given increased evidence of promise and have been grown by the co-operating farmers in sufficient amounts to furnish seed for a considerable acreage of these improved kinds in 1914.

The following is an incomplete list of field experiments conducted on the Station farm in 1913:

- (Cotton, effects of planting light and heavy seed.
- (Cotton, variety tests.
- (Cotton, tests of long staple varieties.

- Cotton, best time for applying nitrate of soda.
- Cotton, calcium cyanamid versus other forms of nitrogen.
- Cotton, subsoiling, both with plow and dynamite.
- Corn, variety tests.
- Corn, Williamson versus other methods of culture.
- Corn, subsoiling with dynamite.
- Corn, best rotation for.
- Corn, best time of applying nitrate of soda.
- Cowpeas, variety tests.
- Cowpeas, for soil improvement.
- Clovers, tests of species and varieties.
- Clovers, effects of liming.
- Clovers, best plants for sowing with these legumes.
- Forage crops, tests of a large number of species and varieties.
- Grasses, tests of species and varieties.
- Hog crops, (chufas, peanuts, soybeans, etc.).
- Nitrogen, best sources of, for cotton, oats, and corn.
- Oats, variety tests.
- Oats, time of sowing.
- Oats, fall versus spring strains.
- Oats, breeding experiments.
- Oats, tests of Auburn-made hybrids.
- Phosphates, best form of, for soybeans and cowpeas.
- Rotation experiments.
- Soybean and cowpea mixtures for hay.
- Soybeans, effects of different phosphates.
- Soybeans, varieties.
- Soybeans, best dates for planting.
- Sorghum, tests of varieties.
- Sorghum, drilled versus broadcast sowing.
- Subsoiling.
- Sugar cane, Japanese, as a forage crop.
- Velvet beans, varieties.
- Vetches, varieties and best mixtures.
- Wheat, varieties.
- Yokohoma beans, varieties.
- The most notable among the new crops are Kudzu,

Rhodes grass and Sudan grass. The latter has made an extremely luxuriant growth from seed and seems to combine most of the advantages of Johnson grass with the added quality of being easily exterminated, since it dies completely each winter and is propagated only by seed.

LOCAL EXPERIMENT WORK THROUGHOUT THE STATE.

Nineteen thirteen was the third year during which the Experiment Station had the opportunity, under a state appropriation, to conduct experimental work in all parts of the State. This work has been continued along the same general line as heretofore reported, each department of this local work being under the charge of the corresponding head of the department in college and station.

This local work has embraced work in crops and fertilizers (mentioned in more detail in a later paragraph of this report) in horticulture; in animal industry, including feeding experiments with cattle, hogs, mules and poultry; in entomology, including the enforcement of boll weevil quarantine regulations and the giving of information on the boll weevil and other insect pests; in plant diseases; in extension work, including boys' corn and pig clubs, and girls' canning clubs; and in drainage and farm machinery. Detailed information on all these lines of work is contained in a separate report which will soon be submitted as provided by law.

LOCAL EXPERIMENT WORK IN AGRICULTURAL DEPARTMENT.

In plant breeding the principal work has consisted in testing in a number of localities those varieties and strains of cotton, corn, oats, and other plants, which have been selected and bred at Auburn in previous years.

Drainage investigations have been continued in co-operation with the Drainage Division of the Office of Experiment Stations, U. S. Department of Agriculture, and field results have been collected on the drainage plots put in

during previous years. Some of these results show a remarkable increase due to drainage.

Tests of and notes on farm machinery have been continued.

The following is a list of the local experiments (that is, experiments conducted elsewhere than at Auburn), undertaken by the agricultural department during the calendar year 1913:

- Cotton, fertilizer experiments.
- Cotton, complete nitrate experiment.
- Cotton, time of applying nitrate of soda.
- Cotton, variety tests, extensive.
- Cotton, variety tests, short.
- Cotton, extensive tests of wilt-resistant varieties.
- Cotton, short tests of wilt-resistant varieties.
- Cotton breeding, tests of Auburn hybrids and pedigreed strains.
- Corn, fertilizer experiments.
- Corn, time of applying nitrate of soda and amount.
- Corn, complete nitrate experiment.
- Corn, variety tests, extensive.
- Corn, variety tests, short.
- Corn breeding, tests of Auburn pedigreed strains.
- Forage crop tests, extensive.
- Alfalfa, fertilizer experiments.
- Alfalfa, lime experiments.
- Cowpeas, tests of wilt-resistant varieties.
- Clover, bur, California versus Southern variety.
- Clover, crimson, best methods of inoculation.
- Clover, Alsike, for acid soils.
- Clover, Ladino versus white clover.
- Grasses, varieties.
- Machinery, notes on tractors, ditching machines, etc.
- Kudzu, as a forage crop.
- Oats, breeding experiments (Local tests of Auburn strains).
- Oat smut, prevention of, by treatment with formalin.
- Oats, variety tests.

Oats, methods of seeding.

Peanuts, fertilizer experiments.

Peanuts, variety tests.

Rotation experiments.

Soybean tests.

Sugar cane, Japanese, in North Alabama and as a forage crop.

Sweet potatoes, fertilizer experiments.

Tile drainage, results of.

Vetch, tests of varieties.

Wheat, tests of varieties.

Velvet beans, versus Lyon and Yokohoma beans.

Respectfully submitted,

J. F. DUGGAR,

Director and Agriculturist.

REPORT OF CHEMIST

B. B. Ross

Dr. C. C. Thach,
President Alabama Polytechnic Institute.

Sir:

I beg to submit the following report as to the work of the Chemical Department of the Experiment Station for the year just ended:

The work carried out in the laboratories of this department embraces experimental and investigation work conducted under the provisions of the original Hatch Act and under the Adams Act of 1906, together with inspection work performed under the requirements of State laws. A large amount of analytical work on miscellaneous samples is also done in this laboratory, many samples of possible agricultural value or interest being sent in by citizens in various portions of the State, the results being reported direct to the senders. Many analyses of this character have been made during the past year, and the samples examined included natural phosphates, marls, soils, limestones, insecticides, waters, etc.

The reports of Dr. J. T. Anderson and Prof. C. L. Hare present detailed information with regard to the nature and scope of the investigations conducted by them in the special lines of work which they have in hand, the investigations carried out by the former being under the provisions of the Adams Act, while the latter is giving attention to work that is being done under the authorization of both the Hatch and Adams Acts.

In addition to the above work, analytical work has been performed in connection with experiments and investigations conducted by other departments of the Experiment Station, whenever the co-operation of this department has been requested.

The laboratory has also continued investigations as to the availability of certain classes of organic nitrogenous

materials employed for fertilizing purposes, this work being done under the direction of Prof. Hare.

This department has conducted some experimental work each season for a number of years with a view to introducing improved and more economic methods in the manufacture of syrup from the sugar cane, and during the past season has co-operated with cane growers in an investigation of the composition and quality of sugar cane grown in the southern portion of the State.

The fertilizer work of the past season was quite heavy and a large number of samples of feed stuffs was analyzed under the provisions of the feeding stuff law, while many samples of foods and drugs were likewise analyzed. Three bulletins, giving the results of the work of this laboratory along the above lines, have been prepared for publication in this office.

Very respectfully,

B. B. ROSS,
Chemist.

REPORT OF VETERINARIAN

C. A. CARY

Dr. C. C. Thach,

President Alabama Polytechnic Institute.

Sir:

The following is a report of the Veterinarian for the year 1913:

A study of animal parasites of the hog, cat, dog, horse, chickens and rat is being continued.

The pathology of the cow's udder and the bacterial flora of the cow's udder are under investigation.

Testing the effect of cotton seed meal on hogs and mules and horses is also continued.

The effect of moldy corn on mules and horses has been studied and tested, some new and interesting data having been secured.

We have also tested *modiola caroliniana*. It has been repeatedly reported to me by farmers that the plant (commonly and erroneously called ground ivy) is poisonous to cattle. I thoroughly tested this plant and find it is not toxic or poisonous when fed in large quantities to calves or cows.

I have also tested *hydrocotyle Umbellata*, a plant that has been repeatedly reported to me by farmers of Alabama as being toxic for cattle. Some authors report it as being an emetic. Thorough test upon the dog fails to produce any emetic action. Our tests on cows and calves have discovered it to be a deuretic, increasing the quantity of urine, increasing the water without an increase in the salts or solids of the urine.

I have also continued the study of the action of china-berry seed and leaves on hogs and horses and mules. So far the tests show that they produce under certain conditions intoxication, salivation and fatty degeneration of the liver and kidneys. Some tests indicated that the seed have vermifugal effects on intestinal parasites.

During the year 1913 Farmers' Institutes were held in seventeen counties of Alabama.

Total number in attendance, 5,254.

Number of sessions, 45.

Average attendance per session, 117.

The Summer School or Round-up Farmers' Institute was held at Auburn, August 1 to 9, 1913. Nearly all of the counties of the State were represented and seven other States. The interest taken by the men, women, boys and girls was all that could be desired. This work has been most successful and the growing demand is such that it is most difficult to meet the requirements with the funds at our disposal.

C. A. CARY,
Veterinarian.

REPORT OF CHEMIST OF SOILS AND CROP INVESTIGATIONS

J. T. ANDERSON

Dr. C. C. Thach,
President Alabama Polytechnic Institute.

Dear Sir:

I herewith beg to submit our report for the year 1913.

The project which has claimed our attention for several years, the study of the fertilizer requirements of soils by the chemical analysis of the plants grown in them, was continued. The data accumulated during this year but confirm the conclusions announced in previous reports.

This does not mean that there were no exceptions to the rule. The frequent, and often inexplicable, departures from the usual trend would seem to justify, indeed to make advisable, a continuation of the investigations.

As announced in a previous report, the results thus far obtained clearly warrant, we think, the conclusion that the chemical composition of a plant is affected by the amount of available plant food in the soil. There is a marked difference, for instance, in the potash content of a cotton plant grown in a soil known to be poor and in another soil known to be rich. It is, also, well established that a cotton plant grown in a poor soil which has been fertilized with potash, has a higher potash content than one grown in the same soil without potash fertilization. In other words, the addition of available plant food to a soil needing fertilization means an increased percentage of the fertilizer constituents in the plant. If these facts are related to each other as cause and effect, and are not merely accidental coincidents, the higher percentages of the fertilizer constituents in the plant should indicate higher productivity of the soil. The solution to this problem is to be had only by repeated and painstaking comparisons of the analytical method with the direct method of determining soil requirements by field tests.

In its co-operation fertilizer experiments with cotton, the Agricultural Department of the Station is applying the direct method of determining the fertilizer requirements of soil. We propose to parallel their work with our analytical method. The soils that they test in their plots we use in earthenware pots for growing our sample plants, using the same system of fertilization as they and the same test plant, cotton. A beginning in this co-operative work was made during the 1913 season, but only a beginning, as relatively few samples of soil for investigation purposes were obtainable. Better arrangements for procuring the soils have been made for the coming season.

In addition to growing and analyzing the plants, the soils themselves are carefully studied, each being subjected to a complete chemical analysis, and, besides, the available plant food is determined by approved methods.

As usual, the fertilizer inspection work claimed our attention from about the first of March to about the first of August. During this period no analytical work connected with the research investigations is attempted, but sufficient time for the cultivation, curing and preparing the sample plants for subsequent analysis is devoted thereto.

Respectfully submitted,

JAMES T. ANDERSON,
Chemist of Soils and Crop Investigations.

REPORT OF PHYSIOLOGICAL CHEMIST

C. L. HARE

Dr. C. C. Thach,

President Alabama Polytechnic Institute.

Sir:

During the year just closing, this Department has pursued the investigations which it has had under way for the past several years.

The effort to breed a strain of cotton seed with high oil content has as yet met with little success so far as concerns a permanent increase in the amount of oil carried by the seed.

It may be noted, however, that the strains in the breeding experiment have, during no year of the four years of the experiment, shown a lower oil content than did the initial parent plants.

The analytical results secured indicate that seed high in oil may be expected to contain somewhat below the average amount of protein.

This decrease in protein is relatively small and the consequent lower valuation of meal from such seed is much more than compensated by the increased yield of oil.

The investigations also show that an increase of oil or protein in the seed does not affect the quantity of the fibre, there seeming to be no relation between these three quantities.

The breeding experiments have, during the year, been extended to include efforts to breed seed high in protein. They have been further extended so as to determine if possible the effects of differing amounts of certain fertilizing ingredients upon the oil and protein; and it is planned during the coming year to run parallel experiments upon three or four different types of soil in a search for some definite information as to the effect of soil types upon oil, protein, and lint.

There is at present in progress the analysis of a large

number of lots of cotton seed with a view to determining if any well defined relations exist between amounts of oil, protein or lint and amounts of some of the more important inorganic plant constituents.

During the Atlanta meeting of the A. A. A. S. a paper summarizing the above investigations was read before the chemical section of that body.

Investigations upon the effects of feeds upon the properties of lards has been interrupted for two years, due to changes in the Department of Animal Industry, but the cooperative work with this department will be resumed during the coming year.

Study of the old samples of lards is being continued. During the year there was published in the Journal of Industrial and Engineering Chemistry a paper setting forth some of the information secured during the course of this investigation.

Respectfully,

C. L. HARE,
Physiological Chemist.

REPORT OF ENTOMOLOGIST

W. E. HINDS

Dr. C. C. Thach,

President Alabama Polytechnic Institute.

Sir:

I submit herewith the annual report for the Department of Entomology in the Alabama Experiment Station for the year ending Dec. 31, 1913:

STAFF.

Mr. W. F. Turner resigned on January 15, 1913, to accept an appointment in the U. S. Bureau of Entomology. The position of Assistant Entomologist was filled, beginning March 1, 1913, by the appointment of Mr. J. E. Buck, a graduate of the Virginia Polytechnic Institute. A large part of Mr. Buck's work has been devoted to our Adams Fund projects. Mr. J. A. Dew, Field Assistant, resigned October 31, 1913, and this position was filled by the appointment of Mr. G. W. Ells, a graduate of the Massachusetts Agricultural College, who began work November 1, 1913. Considerable additional labor in the conduct of our rice weevil investigation has been necessary and this has been employed by the day or hour as occasion required.

CORRESPONDENCE.

The unusually light insect occurrence for the past year has been reflected in the decreased correspondence. About 2,500 dictated letters have been called for and between 2,500 and 3,000 circular letters have been sent out.

PUBLICATIONS.

During the year we have issued the following: Press Bulletins Nos. 63, 64 and 65. The restriction in our number of publications has been due to the limitation of our printing fund as we have considerable matter ready for publication that could not be printed by the Station. The manuscript for a bulletin on the life history and control of the

grass worm (*Laphygma frugiperda*) has been prepared by Mr. J. A. Dew and should be issued as soon as possible. Priority in a portion of this work has been lost to us through the delay in publication which has already occurred. It is a subject of importance and has been worked out here more thoroughly than at any other place so far as we yet know. An article on this species by Mr. Dew has been published in the Journal of Economic Entomology. A circular on the oak Lecanium (*Lecanium quercifex*) was prepared by Mr. W. F. Turner before he left this department. This shade free pest is of widespread occurrence and the publication of this circular seems advisable. Numerous articles growing out of our work of the past year have been published in scientific journals and agricultural and daily papers.

LECTURES.

Numerous lectures have been given as in former years on the subject of the boll weevil and other important insect pests. The traveling expenses for these have in most cases been met by the local parties requesting the meetings. The opportunity for this type of work is much greater than it is possible for us to fulfill.

EXHIBITIONS.

This Department co-operated with the Agricultural Department principally in supplying the exhibit made by this Station at the Fifth National Corn Exposition held at Columbia, S. C., January 27th to February 15th, 1913. The exhibit presented especially our work with the rice weevil in corn and the control of insects infesting stored grains. No exhibit was made at fairs within the state this season.

INSECT PROBLEMS.

The Mexican cotton boll weevil (*Anthonomus grandis*) continued its advance during the past fall, but was checked by extremely early killing frosts which occurred October 20th and 21st, so that the average advance this season was a little less than 25 miles. In the southern part of the State the weevil line for 1913 came within about 6 miles

of the Alabama-Georgia State line. The line now extends diagonally across the State and includes somewhat more than one-half of the cotton producing area of Alabama. Insect pests of all descriptions were rather less abundant than usual. The extremely hot, dry weather of the early summer was a very important factor in checking the development of the boll weevil so that it did less damage than would normally have been expected. The cotton worm (*Alabama argillacea*) appeared during the latter part of July in small numbers in several localities in Central Alabama, but did not multiply so as to become a very important pest this past season. The grass worm or fall army worm (*Laphygma frugiperda*) which was extremely abundant in 1912, attracted attention in only one locality and that near Mobile. Advantage was taken of this occurrence to supplement our observations of the previous season upon the fall life history of this species. Work with the boll weevil and other pests referred to in this paragraph has been conducted under Local Experiment Funds.

ADAMS FUND INVESTIGATIONS.

Work with our project on the life history and control of the rice weevil (*Calandra oryza*) has constituted our principal line of investigation. Important results were obtained from the corn storage experiment instituted at Prattville, Ala., in the fall of 1912. Numerous control methods have been tested and it has been shown that several of the common practices in corn storage contribute directly to increasing rather than decreasing insect injury to the stored corn.

Fumigation work has been continued with the rice weevil as its principal subject.

A new project, No. 5 for this Department, entitled, "An investigation of the factors affecting the distribution, adhesion, economy of application and insecticidal efficiency of arsenical insecticides with particular reference to Arsenate of Lead in its various forms," has been approved by the Office of Experiment Stations and work under it continued

during the past season at Franklin, Ala. Important results in this project have already been obtained and some entirely new questions relative to the effect of the use of arsenical sprays have been brought out. A paper dealing with the control of insects in stored grain was presented by the writer and one dealing with the Arsenate of Lead project was presented by Mr. J. A. Dew before the American Association of Economic Entomologists at their last meeting and these papers will appear in the Journal of Economic Entomology at an early date.

Respectfully submitted,

W. E. HINDS,
Entomologist.

REPORT OF THE PLANT PATHOLOGIST

F. A. WOLF

Dr. C. C. Thach,

President Alabama Polytechnic Institute.

Sir:

I herewith respectfully submit a report of the work of the Department of Plant Pathology of the Alabama Experiment Station for the year 1913.

Some progress has been made in the investigation of peanut diseases conducted under the subvention of the Adams Fund. With the installation of the gas machine and gas apparatus it is to be expected that the work which has previously been seriously handicapped may be carried to completion.

Under the Local Experiment Fund work, both in the nature of demonstration and experimentation, has been conducted. Successful control of apple black rot has been demonstrated in a commercial orchard. No exact data on the control of this form of the disease are available in previously published accounts. A preliminary report of this work has been prepared, however, and it is hoped that the results of the present summer's work may make possible the publication of a complete report. The work on egg plant rots and a leaf blight of Persian walnuts, reported in 1912 as being in progress, has been finished and will soon come from the press. One of the egg plant rots had not previously been investigated and the walnut leaf disease was found to be due to a new species of fungus. The study of a physiological disorder of figs has been completed and published. The work on aster stem rot is being continued. In addition, co-operative work with planters in growing cotton seed free from boll rot by the selection of disease-free seed has been begun. Some work on a leaf disease of bur clover is also being undertaken.

Besides the scientific notes and reviews which have been

prepared for several of the current botanical journals the following papers have appeared:

1. Black Spot of Roses, Ala. Agr. Exp. Sta. Bul. 172:113-118, figs. 3 and pls. 2, 1913.
2. Abnormal Roots of Figs. *Phytopathology* 3:115-118, pl. 11, 1913.
3. Notes on Diseases of Potatoes and Cabbage in Alabama. *Proc. Ala. State Hort. Society* 10:27-31, 1913.
4. The Control of Apple Black Rot. *Phytopathology*. 3:288-289, 1913.
5. Another Host for *Rhodochytrium*. *Phytopathology* 3:311, 1913.
6. Internal Aecia. *Mycologia* 5:303-304, pl. 111, 1913.
7. Melanose. *Phytopathology*. 3:190-191, 1913.
8. The Satsuma Orange, Its Insect Pests and Diseases (with J. A. Dew). Insecticide Department Van Antwerp's Seed Store. Bul. 1:1-14, 1913.
9. A Leaf Disease of Walnuts. *Mycologisches Centralblatt* (in press).
10. Egg Plant Rots. *Mycologisches Centralblatt* (in press).

Respectfully submitted,

FREDERICK A. WOLF,

Plant Pathologist.

REPORT OF THE BOTANIST

JOSEPH S. CALDWELL

Dr. C. C. Thach,

President Alabama Polytechnic Institute.

Sir:

The last annual report of this department outlined rather fully four lines of work then actually in progress or temporarily interrupted. The past year has been spent mainly in continuing investigation in two of these lines.

The study of the effect of variation in environmental conditions upon the wilting coefficient for plants growing in several soils having widely differing physical properties has been continued. The results of earlier studies have already appeared. (The relation of environmental conditions to the phenomenon of permanent wilting in plants. *Physiological Researches* 1:1-56, 1913.) The work done during the year has had as its primary purpose to ascertain the range of variation in environmental conditions within which the water content of the soil at permanent wilting of plants rooted therein is a constant. The data in hand indicate that the "wilting coefficient" for the six or seven species used is subject to considerable modification under comparatively small variations in intensity of evaporation, and also bear out the previously published conclusion that the moisture content of foliage at permanent wilting is in very high degree constant, irrespective of environmental conditions prevailing at or preceding the time of wilting. Some attention has been given to the condition of the root hairs at the time when permanent wilting has become fully established, and considerable difference in the capacity of root hairs of different species to withstand reduction of the water content to the wilting coefficient without injury have been observed. Further study will be given this point in the coming spring and summer.

Continuation of the work on the antagonistic relations

of certain salts along the lines indicated in last year's report has yielded interesting results. Antagonisms between fourteen pairs of salts have previously been reported by investigators working with solution cultures or with lower marine forms, and of these fourteen, twelve pairs have, in the course of the present investigation, been rather exhaustively studied as regards their effects upon maize and cotton plants grown in an artificial soil. The results obtained show clearly that no conclusion as to the probable effect of a given salt mixture upon plants rooted in the soil can be drawn from observations upon solution cultures, the results being profoundly different not only by reason of selective absorption by the soil, but also by reason of the lessened susceptibility of the plant to the specific effects of individual salts when grown in its normal habitat. A portion of the results of this investigation was presented in summary form before the Botanical Society of America at its December meeting. A paper giving in detail the results and conclusions from the earlier studies is in press, and a second is at present in an advanced stage of preparation.

With the increased facilities for investigation in lines demanding accurately controlled temperatures which have become available during the year, it has become possible to resume lines of work interrupted eighteen months since. It is hoped that the problem of the chemical nature of the organic acid nucleus of the cactus mucilage may be worked out within the next year, and that certain problems suggesting themselves in the course of the study may be taken up.

Respectfully submitted,

JOSEPH S. CALDWELL,

Botanist.

REPORT OF ANIMAL HUSBANDMAN

G. S. TEMPLETON

Dr. C. C. Thach,
President Alabama Polytechnic Institute.

Sir:

I respectfully submit the following report of the experimental work in the Animal Industry Department for the past year:

The writer did not enter on his duties until September 1st, 1913, and the changes in the staff, both at that time and earlier in the year, interfered somewhat with the continuity of the experimental work.

Those experiments mentioned below as being conducted at Auburn are supported by the Hatch and Adams Funds appropriated by Congress, while the work in Marion, Chambers, Bullock, Henry, Sumter and Mobile Counties is supported by the State appropriation contained in the Local Experiment Law.

BEEF CATTLE.

The beef cattle work in co-operation with the Bureau of Animal Industry at Washington is being conducted on the Cobb-Norvill farm in Sumter County. The questions under consideration are:

First, the comparative value of cotton seed cake versus corn and cob meal as supplements to summer pasture for fattening steers.

Second, to determine the relative values of the following feeds for fattening beef cattle: (1) Cotton seed meal and hulls; (2) cotton seed meal and corn silage, and (3) cotton seed meal and hulls supplemented by half ration of corn silage.

DAIRY CATTLE.

The problems being studied with the dairy herd, chiefly on farm of Hall & Son, in Bullock Co., are as follows:

First, to determine the relative value of various concentrates for milk production.

Second, to determine the cost of rearing dairy heifers to a producing age.

SWINE.

First, the work at Auburn in co-operation with the Department of Chemistry to ascertain the influence of the various concentrates and forage crops on the hardening of the flesh and the lard of hogs, is still in progress.

Second, the work in Sumter and Henry counties is being continued to determine the cost of raising and fattening hogs under farm conditions.

POULTRY.

The poultry work at the Sixth District Agricultural School at Hamilton is still in progress. The value of rye and oat pasture is being tested as influencing the cost of egg production.

The work at Citronelle is a study of the various feeds to determine the cost of egg production.

MULES.

A feeding test was started in Chambers County during the year to determine the comparative efficiency of different rations for farm work mules.

Respectfully submitted,

GEO. S. TEMPLETON,
Animal Husbandman.

REPORT OF HORTICULTURIST

ERNEST WALKER

Dr. C. C. Thach,
President Alabama Polytechnic Institute.

Sir:

The following is a brief report of work in the Horticultural Department of this Experiment Station for the past year:

The writer entered upon his duties as Horticulturist in October. The continuity of the work was interrupted to a considerable extent by several changes in the staff, all of which occurred in a period of but little more than a year. Most of the time of Prof. J. C. C. Price, Associate Horticulturist, was taken up, during the summer, by nursery inspection work, also that of Mr. G. V. Stelzenmuller, Field Agent, and of Mr. B. E. Evans, Graduate Assistant in Horticulture. I desire to acknowledge the valuable assistance which Prof. Price has rendered in the preparation of this report.

WORK UNDER ADAMS FUND.

Under Adams work, that mentioned in the report for last year relating to Irish potatoes, was continued and received all the attention possible. During the summer a small cellar of special design was constructed and has been in use during this fall and winter in this work. A number of notes and valuable data have been obtained.

The Adams project relating to Peach Breeding for resistance against Brown Rot received attention for several seasons. A large number of crosses was made and recorded, but great difficulty, it seems, was encountered in obtaining viable seeds from the crosses and only a few grew.

WORK UNDER HATCH FUND.

Under the Hatch Fund several lines of work were continued, relating to citranges, vegetables in the field and under glass, including varieties, fertilizers, the canning of

sweet potatoes, as well as various other vegetables and fruits. The greenhouses afforded opportunity for studies in the forcing and management of vegetables under glass, as well as certain floral crops.

Further data were gathered along the line of orchard fruits and management and the control of certain diseases and insect pests.

A body of notes derived from some three seasons' work with fertilizers and other tests with truck or vegetable crops, has been gathered and awaits publication.

New work under the Adams and Hatch funds along two or three lines is being carefully considered and plans made.

STATE NURSERY INSPECTION.

Attention to a large correspondence in connection with nursery inspection, local experiment work, and other subjects consumes much time. The same statement applies also to nursery inspection, which must be done during the summer. A full report on this work, as State Horticulturist, has been prepared separately and filed with the records of the State Board of Horticulture.

Since the creation of the Federal Board of Horticulture, the Department has been called upon to inspect shipments of nursery stock received from foreign countries by firms and individuals in various parts of the State. This inspection of foreign nursery stock is done almost wholly during the fall and winter. This added work has greatly increased expenses for traveling and makes further inroads upon the time of the staff. In this place a summary regarding nursery inspection work may be of interest, and the same is submitted. Certificates of inspection or licenses issued in 1913 were as follows:

Alabama nurserymen	47
Alabama dealers	7
Nurseries in other States.....	92
Total amount of nursery stock inspected in the State the past year, including fruit, nut trees, various ornamental trees and shrubs.....	24,896,473
Bulbous plants	250,000

This represents a large increase over the preceding year. The increase is due to increased numbers of ornamental shrubs, chiefly privet. Foreign stock inspected the past fall has amounted to several hundred cases, and upwards of three-quarters of a million plants.

LOCAL EXPERIMENT WORK.

A report relating to work carried on under the provisions of the fund for local experiment work in various parts of the State, outside of Auburn, has been prepared and filed with Prof. J. F. Duggar, Director of the Experiment Station. Mr. H. M. Conolly was in charge of this work until June. The lines of work named in the last report received attention and useful data were gathered relating to varieties of vegetables and fruits adapted to various localities. Sweet potato storage, a very important subject, was included in those studies and data gathered at four points in the State, representing different conditions of climate. This work is being continued and expanded.

Respectfully submitted,

ERNEST WALKER,

Horticulturist.

