TWENTY-FOURTH ANNUAL REPORT

1910 — 1911

OF THE

Agricultural Experiment Station

OF THE

ALABAMA POLYTECHNIC INSTITUTE

AUBURN, ALABAMA

JANUARY 31, 1912

1910 — 1911

OPELIKA, ALA:
THE POST PUBLISHING COMPANY
1912

ALABAMA POLYTECHNIC INSTITUTE.

Auburn, Ala., Jan. 31, 1912.

GOVERNOR EMMET O'NEAL,

Executive Department,

Montgomery, Ala.

SIR:—I have the honor herewith to transmit to you the Twenty Fourth 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, 1911.

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 Biologist, the Horticulturist, the Entomologist, and the Professor of Animal Industry, for the year ending December 31, 1911.

Respectfully,

CHAS. C. THACH,

President.

AGRICULTURAL EXPERIMENT STATION.

TRUSTEES.

His Excellency Emmet O'Neal, President .....Ex-Officio
H. J. Willingham, Superintendent of Education .....Ex-Officio
A. W. Bell.....Anniston, Ala.
N. B. Denson .....LaFayette, Ala.
W. F. Feagin .....Montgomery, Ala.
H. L. Martin .....Ozark, Ala.
W. K. Terry.....Birmingham, Ala.
J. S. Frazer.....Evergreen, 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 .....Chemist
Dan T. Gray .....Animal Industry
W. E. Hinds .....Entomologist
F. E. Lloyd .....Botanist
L. N. Duncan* .....Agricultural Extension Work
P. F. Williams .....Horticulturist
F. A. Wolf .....Plant Pathologist

ASSISTANTS

T. Bragg .....Assistant Chemist
C. S. Williamson .....Assistant Chemist
J. B. Hobdy* .....Agricultural Extension Work
E. F. Cauthen .....Associate Agriculturist and Recorder
W. F. Ward* .....Junior Animal Husbandman
I. S. McAdory .....Assistant Veterinarian
W. F. Turner .....Assistant in Entomology
M. J. Funchess .....Assistant Agriculturist
C. S. Ridgway .....Assistant in Botany
J. C. C. Price .....Assistant in Horticulture
L. W. Shook .....Assistant in Animal Industry
E. R. Eudaly* .....Assistant in Beef and Swine Husbandry
J. T. Williamson .....Field Agent in Agriculture
L. L. Glover .....Field Agent in Agriculture
H. M. Conolly .....Field Agent in Horticulture
Della Stroud* .....Assistant in Girls' Demonstration Work
O. H. Sellers .....Secretary to Director
†E. Hodson .....Assistant in Agriculture
J. Cohen .....Assistant in Chemistry
I. W. Carpenter .....Field Agent in Entomology
L. W. Summers.....Assistant in Animal Industry
S. S. Jerdan* .....Assistant in Beef Industry
A. R. Gissendanner .....Assistant in Swine Husbandry
C. D. Allis .....Assistant in Poultry

*In Co-operation with U. S. Department of Agriculture.
†Resigned.

REPORT OF HATCH AND ADAMS FUND FOR 1910-1911.

Receipts.

	Hatch	Adams
To amount from U. S. Treasury.....	$ 15000.00	$ 15000.00

Disbursements.

By Salaries	$ 8358.26	$ 8209.36
By Labor	1545.35	1315.24
By Publications	808.72	
By Postage and Stationery	390.96	177.86
By Freight and Express	345.09	281.29
By Heat, Light, Water and Power.....	71.02	198.02
By Chemical Supplies	462.26	691.15
By Seeds, Plants and Sundry Supplies..	425.88	414.34
By Fertilizers	318.80	153.63
By Feeding Stuffs	326.65	496.10
By Library	470.76	4.43
By Tools, Implements and Machinery..	143.30	88.91
By Furniture and Fixtures	29.50	245.08
By Scientific Apparatus	96.18	1901.84
By Live Stock	800.00	376.35
By Traveling Expenses	130.61	170.98
By Contingent Expenses	25.00	20.00
By Buildings and Repairs	251.66	255.42
Total	$ 15000.00	$ 15000.00

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 that the above and foregoing account is true and correct.

Witness my hand this 31st day of January, 1912.

WELBORN JONES,
Notary Public.

[Seal]

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 THE 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 1911 the publications of the Alabama Experiment Station consisted of the annual report, ten bulletins, six circulars, and eleven press bulletins. The titles and authors are given below:

Bulletin No. 152.—*Self Boiled Lime Sulfur and Its Use;* by the Horticulturist and the Assistant Horticulturist. (From Local Experiment Fund).

Bulletin No. 153.—*Experiments With Cotton.* Varieties, Boll Rot, Wilt, Phosphates; by the Director and the Associate Agriculturist.

Bulletin No. 154.—*Corn, Soybean Pasture, Tankage, Cotton Seed Meal for Fattening Hogs;* by the Chief and Assistants in Animal Industry.

Bulletin No. 155.—*The Pecan In Alabama;* by the Horticulturist. (From Local Experiment Fund).

Bulletin No. 156.—*Peach Growing In Alabama;* by the Horticulturist and the Assistant Horticulturist.

Bulletin No. 157.—*The Satsuma Orange;* by the Horticulturist.

Bulletin No. 158.—*Feeding Calves in Alabama;* by the Animal Husbandman and the Assistant.

Bulletin No. 159.—*Heading Off the Boll Weevil Panic;* by the Entomologist. (From Local Experiment Fund).

Bulletin No. 160.—*Local Fertilizer Experiments With Cotton in South Alabama In 1911;* by the Director and Assistants. (From Local Experiment Fund).

Bulletin No. 161.—*Lime for Alabama Soils;* by the Director and Assistant Agriculturist. (From Local Experiment Fund).

Circular No. 8.—*Bud Worms in Corn;* by the Assistant Entomologist.

Circular No. 9.—*The Relation of the County Superintendent of Education to the Boy's Corn Club Work. How to Organize a Club;* by the Superintendent of Extension Work. (From Local Experiment Fund).

Circular No. 10.—*Fighting the Cotton Worm;* by the Entomologist. (From Local Experiment Fund).

Circular No. 11.—*The Relation of the Teacher to the Boy's Corn Club Work;* by the Superintendent and Assistant in Extension Work. (From Local Experiment Fund).

Circular No. 12.—*How to Organize and Conduct a Girl's Canning Club;* by the Assistant in Extension Work. (From Local Experiment Fund).

Circular No. 13.—*School Gardening;* by the Botanist and the Superintendent of Extension Work. (From Local Experiment Fund.)

Press Bulletin No. 43.—*Tests of Varieties of Cotton in 1910;* by the Director and the Associate Agriculturist.

Press Bulletin No. 44.—*Protect Your Peaches from Plum Curculio and Brown Rot;* by the Entomologist. (From Local Experiment Fund.)

Press Bulletin No. 45.—*Look Out for the Cotton Worm;* by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 46.—*Cotton Worms Increasing;* by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 47.—*Cotton Worms of Second Crop Soon Due;* by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 48.—*Cotton Worm Damage in Alabama;* by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 49.—*The Boll Weevil Is Spreading Fast. Look Out for It;* by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 50.—*Announcement of Boll Weevil Line and Quarantine Rules Applying to Alabama;* by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 51.—*Notice Relative to Shipments of Articles Quarantined Against on Account of the Boll Weevil;* by the Entomologist. (From Local Experiment Fund).

Press Bulletin No. 52.—*Tests of Varieties of Cotton in 1911;* by the Director and the Associate Agriculturist. (From Local Experiment Fund).

Press Bulletin No. 53.—*Tests of Varieties of Corn in 1911;* by the Director and the Associate Agriculturist.

The reason for the larger number of publications in 1911 than in any former year lies in the fact that a part of the appropriation for local experiments, made for the first time in 1911, was available for meeting expenses of publication.

STAFF.

Early in November, 1911, Dr. F. A. Wolf entered upon his duties as Plant Pathologist of the Experiment Station, dividing his time between Adams fund work and work on plant diseases under the Local Experiment Law. Extensive additions to the staff of assistants were made as the result of the Local Experiment Law.

LOCAL EXPERIMENT WORK THROUGHOUT THE STATE.

This Station entered in 1911 on the most important era of expansion in its history as the result of the passage by the Legislature of Alabama in February 1911 of a bill appropriating funds for the purpose of conducting popular experiments throughout the State. Under this law the following annual appropriations are made for the purposes named:

For local fertilizer experiments in the several counties and for the investigation and introduction of new or improved field crops and forage plants .....$7,000.

For combatting the cotton boll weevil and other injurious insects .....$2,300.

For plant breeding of field and forage crops ....$1,200.

For work in drainage, irrigation and farm machinery .....$1,500.

For publication and administrative expenses, etc., $2,500.

For horticultural investigations .....$2,000.

For live stock investigations .....$3,500.

For investigations of diseases of cotton and other plants $1,000

For promoting the poultry industry .....$1,000.

For agricultural extension work .....$5,000.

Under the provisions of this Act the work in field crops was organized and begun in March 1911 and during the summer a beginning was made in the local experiment work in entomology, horticulture, extension, animal industry, poultry industry, and drainage. As soon as the position of Plant Pathologist could be filled, which was later in the year, preliminary work was begun along this line.

Under this law it became possible for a number of assistants to be added to the staff, namely,—three in agriculture, drainage, and plant breeding; five in animal industry; two in extension; one in horticulture, and one in entomology. By the employment of these new assistants it became possible for several departments of the Experiment Station to conduct their experiments on farms throughout the State and to carry their lessons to the farmers of every part of Alabama.

By this means the Animal Industry Department has been able to inaugurate experimental work in Animal Industry or Poultry Industry in eight localities; the Department of Horticulture and Entomology to operate in about half the counties of the State; the Extension Department to extend its activities into all parts of Alabama; and the Agricultural Department to conduct fertilizer experiments, variety tests, and other special investigations in every county in the State.

More detailed information relative to the Local Experiment Work is contained in the reports of the heads of departments mentioned.

Agricultural Department.

The work on the Experiment Station farm has been continued in much the same lines as in previous years. Plant breeding with cotton, oats, and corn, has required more time than any other single line of effort. In addition, the following may be named as the most important lines of investigations still in progress on the farm at Auburn:

Cotton, relative fertilizing values of ground phosphate rock and acid phosphate.
Cotton, effects of planting heavy and light seed.
Cotton, a continuation of the study of varieties.
Cotton, best time for applying nitrate of soda.
Corn, variety and culture experiments.
Oats, variety and culture experiments.
Crimson clover, variety and culture experiments.
Cowpeas, variety tests.
Sorghum, variety tests.
Relative amounts of food produced by various crops suitable for hogs.
Soybeans, variety and culture experiments.
A study of numerous forage plants, including alfalfa, vetches, clovers, kudzu, and grasses.
Experiments in the manufacture on the farm of drain tile from cement and sand.
Rotation of crops.
Wheat, tests of varieties and mixtures.

Local Experiment Work In The Agricultural Department.

Local drainage investigations were begun in the summer of 1911 in co-operation with the Drainage Division of the Office of Experiment Stations, U. S. Department of Agriculture. The main points investigated are the numerous problems arising in connection with the application of tile drainage to the stiff lime or so-called prairie soils of central Alabama. Provision has been made for the experimental drainage of five small fields and the work

on most of these was nearly completed before the end of the calendar year. The experiments are so arranged as to determine the best depth and distance for tiles on this character of land and to throw light on other drainage problems. The work thus inaugurated should continue to give instructive results for a number of years. It is planned that the next experiments in tile drainage shall be on a different type of land, so that as results on the several types of soils become available we shall be able to answer the questions that arise in connection with tile drainage on different characters of land.

In farm machinery a beginning was made in testing machines for the sowing of oats by the open-furrow method.

In plant breeding the principal work done consisted in testing out, in numerous localities, varieties and strains which had been selected or bred at Auburn in previous years.

The following is a list of the local experiments (that is, experiments made elsewhere than at Auburn) undertaken in the agricultural department during the ten months between March 1 and December 31, 1911,

Regular fertilizer experiment with cotton.
Complete nitrate experiment with cotton.
Special phosphate experiment with cotton.
Special nitrate experiment with cotton.
Cotton variety test, extensive.
Cotton variety test, extensive, wilt-resistant kinds.
Cotton variety test, short.
Cotton variety test, short, wilt-resistant kinds.
Cotton isolation test (plant breeding).
Regular fertilizer experiment with corn.
Complete nitrate experiment with corn.
Corn variety test, extensive.
Corn variety test, short, hard varieties.
Corn variety test, short, soft varieties.
Corn breeding, ear-to-row test.
Corn, isolation test (plant breeding).
Special nitrate experiment with oats.

Cowpea variety test, extensive.
Cowpea variety test, short.
Regular fertilizer experiment with peanuts.
Peanut variety test, extensive.
Regular fertilizer experiment with sugar cane.
Special fertilizer experiment with sugar cane.
Nitrate of soda experiment with sugar cane.
Regular fertilizer experiment with sweet potatoes.
Sweet potato variety test.
Sweet potato isolation test.
Soy bean test.
Lime experiments (various crops).
Wheat experiments.
Lyon bean and velvet bean experiment.
Johnson grass fertilizer experiment.
Winter forage crop test, extensive.
Bur clover test.
Crimson clover test.
Vetches.
Forage crops, miscellaneous, (clovers, etc.).

Respectfully submitted,

J. F. DUGGAR,

Director and Agriculturist.

REPORT OF THE CHEMIST

B. B. Ross.

DR. C. C. THACH,

President Alabama Polytechnic Institute.

SIR:—I beg to submit the following report with regard to the work of the Chemical Department of the Experiment Station for the year just ended.

The work performed in this department includes investigations carried out under the provisions of the original Hatch Experiment Station Act, work conducted under authority of the later Adams Act, and inspection work under the police requirements of State laws providing for the analysis of fertilizers, feed stuffs, foods and drugs, illuminating oils, etc. In addition to the work just outlined, a large number of miscellaneous samples sent in by citizens of the State have been analyzed, reports of analyses being made direct to the parties sending in samples. Among the miscellaneous materials analyzed were samples of soils, marls, natural phosphates, ores, waters, insecticides, etc.

The report presented by Dr. J. T. Anderson gives a *resume* of the work carried out by him in connection with the investigation of the effects of certain elements of plant food upon the composition and productiveness of the plant, attention having been directed especially to the influence of potash when applied in varying amounts.

Prof. C. L. Hare also gives in his report a statement with regard to the work performed by him, under both the Hatch and Adams Acts, in connection with investigations he is conducting with a view to noting the effect of breeding upon the oil and protein content of cotton seed, and also in studying the effects of different feeds for hogs upon the composition and quality of lard produced.

Some very interesting data has already been secured and the investigations above outlined are being continued.

Analytical work has also been performed in connection with experiments and investigations conducted by other departments of the Experiment Station, quite a number of analyses being made in connection with tests of insecticides carried out by the Department of Entomology.

The fertilizer work of the past season exceeded in volume that of any preceding year, the total number of official and unofficial sample analyses being about 1750. As all of these samples are analyzed in duplicate, this is equivalent to about 3500 analyses, requiring more than 15,000 separate determinations.

The new feed stuff law enacted by the legislature of 1911 also became effective during the past year, more than 300 duplicate analyses of commercial feeding stuffs having been made up to this date. About 200 samples of foods have also been analyzed under the provisions of the Food and Drug Law of the State, while between 300 and 400 samples of illuminating oils have been examined, other tests being still in progress.

The results of the above analyses and tests are embodied in four different bulletins, two of which have already been published, while still another is in the hands of the printer.

Very respectfully,

B. B. ROSS,

Chemist.

REPORT OF VETERINARIAN

C. A. CARY.

DR. C. C. THACH,

President Alabama Polytechnic Institute.

DEAR SIR:—I respectfully submit a synopsis of the work of the Veterinary Department for 1911.

A study of the effects of china berries when fed to hogs and mules has been started. Farmers have used these berries to produce supposed therapeutic actions in horses, cattle and hogs. Traditional reports have been heard concerning the actions of these berries on birds. We have found that the berries do have some physiological actions on pigs. Further tests will be made on mules, horses and chickens.

A series of tests on the effects of cocklebur have been started. Numerous reports from farmers assert that the young cocklebur plants are poisonous to pigs. It is our aim to thoroughly test the plant by feeding it to animals in its various stages of growth.

We are also continuing the study of the effects of cotton seed meal on hogs, horses and mules.

The infectious and pathological changes in cows udders are being continued.

The effects of peanuts as a single ration for pigs is being studied. Also an effort is being made to determine the cause of paraplegia in hogs.

When cases are presented, observations are made on cases of osteo-porosis with a view of discovering the cause and a means of prevention.

The problems of farm santitation are considered and many suggestions are offered to live stock and dairy farmers. Meat and milk inspection, the location of slaughter houses and dairy barns in cities of Alabama.

Observations and records on the animal parasites of domestic animals are being made with the view of learn-

ing more about their pathological effects on the hosts and to find better methods of preventing the infestation of the hosts and the eradication of the pests.

The Farmer's Institutes of 1911 were greater in number and in attendance than usual.

During 1911,

The number of Farmer's Institutes held was	33
The number of counties visited	24
The number of sessions held	54
The average attendance per session	95
The total attendance	5115

The Round-up Farmers' Institute and Summer School for Farmers were held at Auburn from July 29th to August 5th, 1911. The lectures began at 8 A. M. and continued until 10 P. M. every day, with short intermissions for dinner and supper. From 60 to 70 lectures and demonstrations were given. The lectures on cooking and home economics and home sanitation were especially for women. A large number of women and girls from the farms were in attendance and were greatly benefitted by these lectures delivered by women who were experts in their respective lines of work. The total enrollment for the Summer School for Farmers was 1100.

C. A. CARY,
Veterinarian.

REPORT OF CHEMIST OF SOILS AND CROP INVESTIGATION

JAS. T. ANDERSON.

DR. C. C. THACH,
President Alabama Polytechnic Institute.

DEAR SIR:—I beg herewith to submit the following report of work done in this subdivision of the Department of Chemistry of the Agricultural Experiment Station during the year 1911.

The investigations along the line of the Adams Project, Soil Requirements by Plan Analysis were continued. As previously, the Cotton Plant was grown in open plots in the fields, in clay cylinders imbedded in the ground, in sand cultures, in imbedded clay cylinders, in wire baskets and during the last season, in ordinary earthen pots; and at the four-leaf stage, were drawn and analyzed. It has been deemed advisable to withhold from publication the analytical data obtained until the series is complete, when all can be published and studied together. Suffice it for the present to say, that it seems established that by fertilization with potash, for instance, the potash content of the plant is materially, and with more or less uniformity, increased. Whether this increased fertilizer content in the plant bears any fixed and definite relation to increased fruitage and consequent crop production, is the task set specially for the incoming season. To determine the effect of fertilization on crop production, the soil will be tested in the usual way in open plots in the field. The difficulty of getting proper samples of plants for analysis from the plots away from Auburn, proves insurmountable. Hence for getting these samples the soil will be transported to Auburn to be used in earthen pots, these pots to be numbered and fertilized correspondingly with the plots in the field. Our experience with these earthen pots for this purpose during the summer of 1911

was altogether satisfactory. By resorting to the method of sub-irrigation, the chief trouble with the wire baskets, with stiff clay soils, black root in the plants, was eliminated. The greater ease of manipulation is also, an item of importance in their favor.

As is customary, the attention of this sub-division, along with the rest of the Chemical Staff, was given to fertilizer analysis for the State Department of Agriculture. In the present instance this work began the first of March and ran well into the month of July. The number of official samples analyzed was 1475, thus breaking the record of previous years by several hundred.

Respectfully submitted,

JAS. T. ANDERSON,

Chemist of Soils and Crop Investigations.

REPORT OF PHYSIOLOGICAL CHEMIST

C. L. HARE.

DR. C. C. THACH,

President Alabama Polytechnic Institute.

SIR:—In this department the problems which have been the subject of study for the past two or there years were continued in the investigations during 1911.

Continued effort has been made to breed Cotton seed with high oil content without sacrificing the quantity and quality of the fibre.

In this investigation there is being observed the relation of oil to weight and size of seed, of lint to weight and size of seed and amount of oil, the ratio of hulls to meats and of oil to proteids and other like practical inquiries.

The study of the properties of lards as affected by feeds has progressed so far that a mass of analytical data has been secured.

The information sought, it is hoped, will possess a certain scientific value and throw light upon practical problems such as the effect of feeds upon the keeping qualities of lards, and other factors which make them more or less merchantable.

Respectfully,

C. L. HARE,

Physiological Chemist.

REPORT OF ENTOMOLOGIST

W. E. HINDS.

DR. C. C. THACH,

President Alabama Polytechnic Institute.

SIR:—The entomological work in the Experiment Station has increased rapidly during the past year. In addition to the writer and Mr. W. F. Turner, Assistant Entomologist, Mr. I. W. Carpenter, of Louisiana, took up the work of Field Assistant the middle of August continuing through the balance of the year, and Mr. N. C. Powell became Secretary to the Entomologist the middle of July. This additional assistance has enabled us to extend very materially the correspondence and publication work of the department.

CORRESPONDENCE.

During the year 1911, the correspondence increased to more than 3,000 dictated letters giving advice and information in regard to insect control principally. Be side this, form letters of inquiry and of information were sent out numbering between 4,000 and 5,000 copies.

PUBLICATIONS.

During the year, we have issued quite a number of Press Bulletins giving information of immediate importance and requiring rapid and widespread distribution. These included Press Bulletins Nos. 44, 45, 46, 47, 48, 49, 50 and 51, Circulars Nos. 8 and 10 and Bulletin No. 159, copies of which are attached hereto. Aside from the Station publications, many articles have been issued through the daily and weekly press which have been most cordial in their support of our work.

Aside from these publications of a popular nature, two articles in connection with Adams Fund investigations have been published in the Journal of Economic Ento-

mology. In one the life history of the rice weevil in corn was given and in the other were recorded some facts in regard to fumigation for the control of this insect giving warning particularly against the danger involved in the carbon disulphide treatment applied to corn that was in process of heating. The publications in the Experiment Station series cover about 50 pages with editions of from 5,000 to 50,000 copies.

Public Addresses.

The number of these increased materially during the past year and the subjects considered became more varied than formerly. Stereoptican illustrated lectures on the boll weevil have been given a number of times and other special boll weevil lectures without illustrations. In connection with the campaign against the cotton worm during August and September, 1911, a large number of addresses were given ranging from one to four per day much of the time during a period of six weeks. If the funds needed for meeting traveling expenses, etc., were available, many invitations for lectures which now have to be declined, could be accepted with, we believe, advantage to the public and to the work which we are seeking to do.

Fair Exhibit.

In connection with the station exhibit at the State Fair at Montgomery, the Department of Entomology again showed a large number of enlarged photographs, charts, insect specimens, spraying apparatus, insecticide materials, etc., which attracted considerable attention and opened the way for the spread of much information regarding insect control.

A similar exhibit was made by the department of entomology at the Gulf Coast Tropical Fair held later in Mobile.

The Cotton Worm.

During the latter part of July reports were received of the occurrence of the cotton worm at widely separated

points through the South and at a few points in Alabama. These reports when considered with the season of their occurrence and the condition of the cotton crop together with the prevailing climatic conditions, indicated to the writer that a widespread and serious outbreak of this cotton pest was almost certain to occur. Warnings of the danger were spread broadcast throughout the State and planters were thus led to watch their cotton closely. The worms soon appeared with surprising rapidity and in enormous quantities stripping within a few days fields where they had not been suspected of being present. We had notified the manufacturers of insecticides of the threatened danger and received most hearty co-operation from them in securing the movement into the State of practically all of the Paris green and powdered arsenate of lead available in the eastern United States. The newspapers were full of reports of the occurrence of the cotton worm and willingly gave space to the publications of the department advising as to the best methods of control. It was shown that the pest could be readily controlled by properly dusting the cotton plants with powdered arsenical poison as soon as the works of the worms began to show. Powdered arsenate of lead gave especially satisfactorily results in this work and will henceforth be much more generally used in this State for other leaf-eating pests as well as for the cotton worm when it appears again. In spite of our utmost efforts we were unable to forestall the necessity of express shipments of poison being made over long distances, scores of tons being moved in this way for hundreds of miles so great was the demand for poison that developed.

From careful examinations in the field we are convinced that the cotton worm actually decreased the Alabama crop of 1911 by approximately 10 per cent. In spite of this an unusually good crop was secured. The counties on the eastern border of the State were less severely affected than most of the counties as the worms did not appear therein until late in the season. No one can foretell whether the cotton worm will appear in num-

bers in 1912, but the severity of the present winter gives some indication that it will not.

Mexican Cotton Boll Weevil.

The advance of the boll weevil began during the latter part of August, 1911, and continued until about the middle of November when frost killed the cotton. The infested area then included all or part of twelve counties in Alabama, the weevil line extending in a general southeasterly direction from near the northeast of Pickens county to the middle of Escambia county. This line is shown in our bulletin No. 159 entitled "*Heading Off Boll Weevil Panic*. The quarantine zone includes also a "safety zone" 20 miles in width immediately adjoining this weevil infested area in Alabama or in other states. The area now infested by the weevil should porduce about 10 per cent of the normal Alabama crop. The damage done by the weevil increases generally during the first three years of its occurrence and then decreases as planters become accustomed to it and adopt those methods of fighting the weevil which have given best results in other infested sections.

The work of determining the line of weevil infestation increases steadily as the weevil advances in the State. This is of fundamental importance in the administration of quarantine regulations. Alabama is now on the firing line in this work. The entomologists of the cotton growing states at a meeting held in Atlanta early in December 1911, agreed upon a uniform set of regulations and upon practically a uniform system of certification, etc., in connection with shipments to be made from infested to uninfested territory. These recommendations conformed in nearly all respects to what has been previously adopted and put in practice in Alabama by the Alabama State Board of Horticulture which has placed the Entomologist of the Experiment Station in charge of the administration of its boll weevil quarantine regulations. These regulations with amendments thereto are shown in publications which are available for general distribution.

Adams Fund Investigations.

The two projects previously started have been continued throughout the past year with steady advance. The life history of the rice weevil has been quite thoroughly determined. Much data of a fundamental nature has been gathered in regard to fumigation. Difficulty was experienced in the early part of this work through unavoidable leakage in the apparatus constructed for carrying on fumigation experiments and the necessity for a metal, gas-tight apparatus became apparent. Consequently, a fumigation tank was designed and has been made to order. With this apparatus more satisfactory results are being obtained.

Some of the results obtained call for co-operative experimental work with the department of Agronomy and this will be continued during the coming year.

Respectfully submitted,

W. E. HINDS,
Entomologist.

REPORT OF PLANT PHYSIOLOGIST.

FRANCIS E. LLOYD.

DR. C. C. THACH,
President Alabama Polytechnic Institute.

DEAR SIR:—I beg to hand you my report for the work of the Department of Plant Physiology of the Alabama Agricultural Experiment Station for the year just ending. All the investigations in this department have been carried on under the subvention of the Adams fund. The general results, so far obtained, may be stated in broad outlines as follows.

TRANSPIRATION IN COTTON, GOSSYPIUM HERBACEUM.

(A portion of this project, namely, that relating to boll shedding, is being carried on under co-operation with the Bureau of Plant Industry, United States Department of Agriculture). This project involves a study of physiological methods for the investigation of transpiration and associated phenomena, including stomatal behavior, rates of diffusion of water vapor relative to the size of the stomatal pore, and boll shedding. The material for study was grown from seed supplied by the Bureau of Plant Industry through Dr. W. A. Orton. Material advance has been made in this investigation, for the pursuit of which it was found necessary to rent a small piece of ground, apart from the Experiment Station domain. Efficient assistance, during the summer of 1911, was afforded by Mr. Charles S. Ridgway and Mr. Edgar A. Hodson. Part of my own time was spent in studying the same variety of cotton in Arizona for the sake of obtaining comparative results. I wish to acknowledge the co-operation of the Desert Botanical Laboratory of the Carnegie Institution of Washington and the courtesy of Dr. D. T. MacDougal, Director of the Department of Botanical Research, for causing a number of cotton

plants to be grown for my use and for the privilege of the laboratory. The following results have accrued. A new method for the direct observation of stomata on the living leaf, this remaining attached to the plant the while, has been worked out. It has been found possible to determine miscroscopically the dimensions of the stomatal pores, even of very thick leaves, by the use either of very strong artificial illumination or by means of direct sunlight. A substage cooling cell is necessary to protect the leaf from damage by heat. A new type of microscope for field work has been designed by me and is in course of building. The method thus briefly stated makes it possible for an observer to follow the behavior of one or more stomata during an extended period of time and makes a distinct advance in the study of these organs. A full series of observations of the evaporation rate per hour, together with other meteorological data for the whole of the growing season of the cotton plant, has been obtained. For the evaporation studies black and white Livingston porous cup atmometers were used. The march of transpiration for the cotton plant for several 24 hour periods was obtained in full triplicate series, both in terms of weight and volume. These data enable us to compare the transpiration of the plant with the purely physical evaporation from the porous cup and will doubtless afford ground for some important conclusions in regard to the value of evaporation studies of plant physiology. Determinations of leaf water permit the extension of my previous studies of the ocotillo *(Fouquieria splendens)* to the cotton and show that the amount of leaf water is increasingly reduced after sunrise until some time in the afternoon.

Full data in regard to the rate of boll shedding per day for the whole season have been obtained and have been studied in the light of the meteorological data above mentioned. The indications are pretty definite that, under the soil water conditions in this place, boll shedding is a response to the evaporating power of the air. In the light of the work of Mr. W. Lawrence Balls, of the Khe-

divial Agricultural Society, Cairo, Egypt, this conclusion is of considerable interest. Under the climatic conditions of Egypt, the position of the water table is of very considerable, apparently major, importance. The apparent difference in results, however, I believe, may be harmonized, as will be shown in a publication of the work done here. In passing I wish to emphasize the importance of work done under the semi-arid conditions found in the Southwest (and similarly in Egypt) which permit a more definite determination of the water relations of plants.

Evidence has been obtained that boll shedding results directly from peculiar anatomical relations in the internode below the insertion of the boll, due to the concrescence of a stem of determinate growth with one of indeterminate growth. These anatomical peculiarities affect the relative water carrying capacity of these organs. The conclusion that the shedding of bolls is quite definitely related to the transpiration stream is thus rather clearly indicated, from the physiological-anatomical point of view. The absence of an abciss layer when the separation of the boll proceeds decurrently, together with the role played by the cambium, is to be noted.

Fumigation. This project starts with the assumption that the diffusion of gases into the plant is related to the condition of the stomatal openings. For this reason a study of the stomatal behavior of a number of economic plants during the whole day period is under way.

Ripening of Persimmons. As may be seen from an examination of the publications from this department on this subject, this work has taken two directions, continuous with my previous work done on the date, *Phoenix dactylifera.* On the one hand, an explanation of the peculiar behavior of the tannin during that period of ripening in which the fruit becomes nonastringent has been sought for, and it is maintained that the becoming nonastringent is due to the adsorption of the tannin by an associated colloid (a hydrogel) upon its coagulation. In support of this contention a considerable body of evidence has been published in the papers listed below.

This study has been extended to the acorn (in particular the fruit of the water oak, *Quercus laurifolia*) and conditions have been found also in this form analogous to those described for the persimmon tannin cells. The more immediately practical aspect of the problem, namely, that of processing the Japanese persimmon so as to render it nonastringent in advance of the remaining processes of ripening, has resulted in confirming the work of Mr. H. C. Gore, of the Bureau of Chemistry, U. S. Department of Agriculture, showing the availability of carbon dioxide for the purpose. In addition, my results indicate that the churn barrel may serve well the practical demands as a container during treatment. Experiments with carbon dioxide under 15 pounds pressure carried on in an autoclave appear to justify the conclusion that the reagent has a coagulating effect on the associated colloid, and that a quantitative relation between the amount of carbon dioxide and the rate of coagulation exists. If on further investigation this conclusion turns out to be correct, the period required to render a particular variety of the persimmon nonastringent may be considerably shortened, as appears actually to be the case for two varieties (recognized at this Station as Hyakume, the astringent variety, and Taber 129) and for the native species, *Diospyros virginiana.* It is hoped that the work of the coming season will permit a definite determination of the correctness of these views and of the results so far obtained.

Aside from the above work done under the Adams Fund, a study of the guayule rubber plant *(Parthenium argentatum)* is being continued. It is of interest to note in this connection that a considerable number of inquiries have come in from various quarters of the globe, together with several requests for seed. The publication of my memoir on the subject, cited below, has brought to light a wide spread interest in the plant. Of the several extended reviews of this volume may be mentioned especially that under the title "The Story of Guayule," published in the Bulletin of the Pan American Union.

Publications dealing with the results above briefly indicated are in process of preparation. During the past year the following papers have appeared.

(1) *The Artificial Ripening of Persimmons.* Proc. 8th Ann. Meeting Ala. State Hort. Soc., Bull. Ala. Dept. Agri. No. 42, pp. 42-49. January 19-20, 1911.

(2) *Cedar Apples and Apples.* Bull. Ala. Dept. Agri. No. 39, p. 19. March 1, 1911. (With C. S. Ridgway).

(3) *Manufacture of Rubber from the Guayule Plant.* Jour. N. Y. Bot. Gard. 12: 96-97. May, 1911.

(4) *An Unusual Pine.* Jour. N. Y. Bot. Gard. 12: 98-102. May, 1911.

(5) *Guayule: A Rubber Plant of the Chihuahuan Desert.* VI and 213 pages, 46 plates, 20 text figures. Carn. Inst. Wash. Publ. 139, 1911.

(6) *Ueber den Zusammenhang zwischen Gerbstoff und einem andern Kolloid in Reifenden Fruchten, insbesondere von Phoenix, Achras und Diospyros.*

Zeitschr. f. Chemie u. Industrie d. Kolloide. 9: 65-73. 1911.

(7) *The Tannin-Colloid Complexes in the Fruit of the Persimmon, Diospyros.* Biochemical Bulletin I: 7-41. pl. 1-3. September 1911.

(8) *Carbon Dioxide at High Pressure and the Artificial Ripening of Persimmons.* Science N. S. 34; 924-928. Dec. 29, 1911.

(9) *Certain Phases of the Behavior of the Stigma Lips in Diplacus glutinosus Nutt.* Plant World 14: 257-267. fig. 1. Nov. 1911.

(10) *The Propagation of Guayule.* A Criticism. India Rubber World 45: No. 4. 164-5. Jan. 1, 1912.

(11) *The Relation of Transpiration and Stomatal Movements to the Water Content of the Leaves in Fouquieria splendens.* Plant World 15: 1-14. Jan. 1912.

(12) *The Behavior of the Nectar Gland in the Cacti, With a Note on the Development of the Trichomes and*

Areolar Cork. (With C. S. Ridgway). Plant World. In press.

(13) *School Gardening.* Ala. Agri. Expt. St. Circular No. 13. Dec. 1911, 27 pp. 4 fig. (With L. N. Duncan).

Respectfully submitted,

FRANCIS E. LLOYD,
Plant Physiologist.

REPORT OF ANIMAL HUSBANDMAN

DAN T. GRAY.

DR. C. C. THACH,

President Alabama Polytechnic Institute.

DEAR SIR:—Three bulletins have been issued from the Animal Industry Department the past year. Bulletin 154 has to do with the problems of feeding "Corn, Soy Bean Pasture, Tankage and Cotton Seed Meal to Fattening Hogs." In bulletin 158 is found a summary of the calf feeding experiments which have been carried on in Sumter County in co-operation with the Bureau of Animal Industry at Washington. In bulletin 163 is found the partial summary of the steer feeding work which has also been done in Sumter County in co-operation with the Bureau of Animal Industry. A large demand has been created for these bulletins, especially the one dealing with the problem of feeding hogs.

As a result of the increased appropriations made by the last State Legislature, the work of the Department has been considerably enlarged during the year. Some new problems have been undertaken as a result of the increased funds, but a large portion of the new appropriation has been devoted to enlarging the work already under way. In a general way, the experimental work continues as reported in the last annual report . The present activities of the Department may be summarized as follows:

WITH SWINE.

First, to study the economic results of finishing swine by dry lot methods as compared to the methods of using green pasture crops. This feature of the swine work has been considerably enlarged during the past year. At the present time, co-operatice work is being done with four of the District Agricultural Schools. Sufficient funds were not available to undertake this co-operative work with all of the District Schools, so the four schools loca-

ted in the corners of the State were selected as the ones with which to work. The schools at Jackson, Abbeville, Hamilton and Albertville are co-operating in swine feeding work; arrangements have been completed to undertake poultry experiments with the Albertville school. Approximately 100 hogs have been fed upon the Station grounds of these various schools the past year.

Second, to study the subject of hardening flesh and lard after they have been rendered soft as a result of the animals having grazed certain green crops. This work is done in co-operation with the Department of Chemistry. The peanut crop has been under investigation the past year, as has also rape, rye, velvet beans and cowpeas. This feature of the work has also been considerably enlarged during the year as a result of the extension of the first part of the swine work.

Third, to learn the effect of some of the southern swine feeds upon the frame work of the body. As in the past, samples of the bones have been taken from each hog slaughtered on the Station farm. This division of the swine work is also being done in co-operation with the Department of Chemistry.

Fourth, to determine the most profitable kinds of concentrates, and the amount of each, to feed with such green pastures as peanuts, rye and rape. During the year a test was made to determine whether it was profitable to use tankage as a supplementary feed to peanut pastures.

Fifth, to study the question of the home curing of meats. Several questions of scientific interest are associated with this work, as the effect of feeds upon the keeping qualities, and the effect of feeds upon the shrinkage of meats.

Sixth, two experimental hog farms are now established in the State. The object of this work is to determine the cost and the best methods of producing pork under average farm conditions. One of the farms is located in Sumter County; this farm is managed in co-operation with the Bureau of Animal Industry at Washington. The second farm is located in Houston County; the es-

tablishment of this second center of swine experimentation was made possible by the recent appropriation of the State Legislature. Both of these farms are carried on in co-operation with farmers who furnish everything except a trained man to superintend the work.

With Beef Cattle.

The co-operative beef work with the Bureau of Animal Industry at Washington is still going forward in an exceedingly satisfactory manner. On account of the fact that it is impossible to get good pastures and good cattle near the Station farm at Auburn, this part of the work is located in Sumter County, one of the farms being located in the northern part of the County and the second one in the southern part. The questions under consideration at the present time are:

First, to study the cost of carrying beef cows through the year, or to determine the cost of raising a beef calf under average southern conditions. A breeding herd of about 60 cows is being used. Their calves are kept until about one year of age, and then finished for the market.

Second, to determine the profit, if any, in supplementing the summer pastures with certain cotton seed by-products in finishing cattle for the summer and fall markets. 75 steers were fattened last summer. Hereafter, corn is to be introduced into the summer rations.

Third, to study the question of fattening calves during the winter months on dry feeds and silage. At the present time, 120 calves are being fattened. They will be sold in March and April.

Fourth, to determine the profit, if any, in using certain hays along with cotton seed meal and hulls in fattening steers. Johnson Grass hay has, so far, been tested and the results seem to indicate that it is not profitable to add it to a ration of cotton seed meal and hulls.

With Dairy Cattle.

Heretofore, the work with dairy cattle has been largely devoted to breeding the herd up to a sufficient number

of animals so that experimental work could be undertaken. The herd now consists of about twenty reasonably good milking animals; it is expected that lines of experimental work will be undertaken this summer. When the Animal Industry Department was established, there were only four milking dairy cows in the herd.

WITH POULTRY.

The last Legislature made an appropriation of $1000 to be used in poultry experimental and educational work. The law states that this work must be done away from Auburn, so the experimental phases of the work were undertaken with Mr. C. D. Allis, of Pinson, who is a graduate of both Auburn and Cornell. The work was inaugurated June 1, 1911, and is divided into two parts.

First, a complete flock record of the detailed expenses and receipts is kept. As a result of keeping this complete record for a series of years, it will be possible to determine accurately the profit, if any, to be derived from the poultry business in Alabama.

Second, tests are under way to determine the value of certain pasture crops for laying hens. It is expected that many different crops will be tested before this line of work is finished. During the present year, dry feeds have been compared to crimson clover, rye pastures and mangels.

Very respectfully submitted,

DAN T. GRAY,
Animal Husbandman.

REPORT OF THE HORTICULTURIST

P. F. WILLIAMS.

DR. C. C. THACH,

President Alabama Polytechnic Institute.

SIR:—I respectfully submit the following report for the year ending December 31st, 1911.

ADAMS INVESTIGATION.

Several trees were obtained from the crosses made in 1910 and these are in vigorous condition at present. About 4000 crosses were made in the orchard in the spring of 1911 and over 500 in the greenhouse. A large number of perfect pits were obtained from the crosses in the greenhouse while the number obtained from those in the orchard was comparatively small. Severe frost at blooming time resulted in a heavy loss of crossed fruits.

An additional Adams project was started the past year. The object of this experiment was to determine the factors essential to the successful germination of this crop in producing a fall crop. A storage room under the Agricultural building is being used for the experiment and a self recording temperature and humidity machine has been placed in it.

CITRANGE INVESTIGATIONS.

Owing to a heavy freeze in the spring it was impossible to make any progress with this work.

GREENHOUSE.

Excellent results have been obtained in forcing tomatoes under glass. The low, solid bed is essential in this work. The work along this line has been enlarged and the data accumulated during the last three years will be published this coming year.

For the past four years tests have been made to deter-

mine the most desirable Chrysanthemum varieties for forcing in the greenhouse. "Commercial" and "Exhibit" varieties have been selected. Among the most desirable "Commercial" varieties are, Colonel Appleton, Dr. Enquehard, Mrs. H. Robinson, Intensity, Yellow Eaton, Golden Glow, Roi de Italia, Mrs. Clay Fricke, M. Simon Gauthier and Crocus. For "Exhibit" purposes the following varieties are recommended; Beatrice May, Monrovia, M. Louis Tousseau and Alice Byron.

Variety tests have been conducted in the field with cabbage, sweet corn, peppers, tomatoes, English peas, Irish potatoes, turnips, beans, cucumbers, and beets. Fertilizer tests have been continued with cabbage, potatoes and tomatoes. This work will be enlarged for the season of 1912.

In the orchard good results have been obtained in controlling pear blight by careful pruning; using Muriate of Potash about the trees in the spring and in maintaining sod culture.

A considerable increase in the fruit planting will be made this winter. Spraying for the control of the San Jose scale, Brown Rot and the Plum Curculio has been continued with the same degree of success as in preceding years. Peach tree borers have also been controlled by the method of banking.

Japanese persimmons responded readily to the action of well balanced fruit fertilizers.

A large number of apple trees were top worked with the more promising varieties for this section and the courtesies extended by the Virginia Station in supplying cions aided materially in this work. Many promising seedling apples have been reported the past year in diffdifferent sections of the State and these will be propogated at the Station for trial purposes.

Cions from a seedling pear supposed to be entirely resistant to blight have been successfully grafted into many of the old trees in the orchard and the showing of these will be watched with much interest.

Canning the surplus fruit and vegetables has been continued.

A collection of standard pecans and also promising seedling pecans has been made which represents some 50 standards and 30 seedlings.

Practically every promising peach variety is represented in the collection of preserved fruits which was prepared for exhibit purposes. The preservation of fruits and vegetables for exhibit purposes involves considerable study and the relation of soils and the mineral content of each fruit and vegetable must be taken into consideration.

Variety tests with carnations were started this last fall and splendid blooms were obtained from such varieties as Magora, Winona and Mrs. Chas. Knapp.

A new barn has been erected the past year for the Department which contains ample space for fertilizer mixing, tools, storage, etc.

Publications.

The following bulletins have appeared the past year:

152.—*Self Boiled Lime-Sulphur and Its Use.*

155.—*The Pecan in Alabama.*

156.—*Peach Growing in Alabama.*

157.—*The Satsuma Orange.*

Numbers 153 and 156 were joint publications; Mr. J. C. C. Price assisting me materially with their preparation.

Mr. H. M. Conolly, a graduate of the Michigan Agricultural College, was appointed July 1st, 1911 to take up the field work of the Department which was made possible by an appropriation known as the Local Experiment Fund. Much valuable data has been obtained from his travels over the State and co-operative experiments have been instituted in many counties, both with relation to truck and fruit growing.

Nursery Inspection.

Mr. J. C. C. Price and Mr. H. M. Conolly have both assisted me in carrying on the inspection of nurseries the past season.

The lists of State nurserymen, out of the State Nurserymen and Dealers, follow:

CERTIFICATES ISSUED 1911-12.

Alabama Nurserymen.

1. Oak Lawn Nursery, A. W. Newson, Prop., Huntsville.
2. W. W. Gravlee, Newtonville.
3. The Suggs Nursery Co., Gladstone.
4. J. O. Kelly & Sons, Jeff.
5. Rolfe Nursery Co., Huntsville.
6. Huntsville Wholesale Nurseries, Huntsville.
7. Fraser Nursery Co., Huntsville.
8. Chase Nursery Co., Huntsville and Chase.
9. A. E. Welch, Madison.
10. C. S. Biggers, Cullman.
11. John Rehberg, Vinemont.
12. Colmant Nurseries, Birmingham.
13. Birmingham Landscape and Nursery Co., Elyton.
14. Arlington Nursery, W. D. Summerfield, Birmingham.
15. Carlos Reese, Birmingham.
16. G. E. Luffman, Glen Iris, Birmingham.
17. Rosemont Gardens, Montgomery.
18. Fernhill Greenhouse, Montgomery.
19. E. H. Williams, Montgomery.
20. Eagle Pecan Co., Willis Thompson, Prop., Pittsview.
21. Eufaula Pecan Co., Cliffe A. Locke, Prop., Eufaula.
22. Sneed Bros., Pronto.
23. Whetstone Nursery, L. M. H. Whetstone, Autaugaville.
24. Frank Holman, York.
25. Wakefield Nursery, Wm. Wake, Flomaton.
26. John P. Brown, Carney.
27. J. S. Gaylord, Barnwell.
28. Figdale Nurseries, Magnolia Springs.
29. Fairhope Nursery. A. M. Troyer. Fair Hope.
30. J. M. Crutchfield. Vinemont.
31. Industrial School Gardens. Mobile.
32. Ravier & Sons. Mobile.
33. Little Gem Floral Gardens. Mobile.
34. Shad Stevenson. Russell.
35. R. H. Dickie. Citronelle.
36. Dixie Co-operative Nurseries, Deer Park.
37. Citronelle Nursery & Orchard Co. Citronelle.
38. Roseview Nurseries. F. E. Welch. Chunchula.
39. J. P. Jones. Fabius.
40. Citrus Fruit Co. Deer Park.
41. G. W. Lipp. Roanoke.

42. J. B. Earnest. Roanoke.
43. W. L. Owen. Ashland.
44. Irvington Nursery, A. H. Daves, Irvington.
45. E. A. Smith. Theodore.
46. W. P. Brock. Fruitdale.
47. W. L. Morris. Cusseta.
48. E. Downing, Jr., Castleberry.
49. C. S. Harris. Citronelle.
50. Paul Hoffman. Waverly.

II. Alabama Dealers.

1. C. S. Biggers. Cullman.
2. G. E. Luffman. Birmingham.
3. A. E. Welch. Madison.
4. D. G. Calkins. Foley.
5. J. J. Holmes. Montgomery.
6. A. M. Preston. Blountsville.
7. Loveman, Joseph & Loeb. Birmingham.
8. M. M. Dawson. Montgomery.
9. Horticultural Sales Co., J. L. Hoffman, Mgr. Birminghgam.
10. Homer N. Sneed. Pronto.
11. Judson Strock. Verbena.
12. F. J. Ulbricht. Anniston.
13. A. M. Troyer. Fairhope.
14. W. D. Whetstone. Grandview.
15. T. Swift. Fairhope.

III. Nurserymen Outside The State.

1. A. C. Oelchig and Sons. Savannah, Ga.
2. Oakland Nurseries, W. Y. C. Grant, Columbia, Tenn.
3. Commercial Nursery Co., Winchester, Tenn.
4. Southern Nursery Co., Winchester, Tenn.
5. The United States Nursery Co., Roseacres, Mississippi.
6. Mount Arbor Nurseries. E. S. Welch, Shenandoah, Iowa.
7. Wild Bros. Nursery Co., Sarcoxie, Mo.
8. Stark Bros. Nurseries and Orchards Co., Louisana, Mo.
9. Hoopes Bros. & Thomas, West Chester, Pennsylvania.
10. Wm. Warner Harper, Chestnut Hill, Pennsylvania.
11. Centre Grove Nursery Co., Smithville, Tennessee.
12. Excelsior Nurseries, Rome, Georgia.
13. The Morris Nursery Co., Westchester, Pennsylvania.
14. Jackson & Perkins Co., Newark, New York.
15. T. V. Munson & Son, Denison, Texas.
16. Dreer Nurseries, Henry A. Dreer, Inc., Riverton, New Jersey
17. The Shenandoah Nurseries. D. S. Lake, Prop. Shenandoah, Iowa.

18. Biltmore Nurseries, Biltmore, N. C.
19. A. D. Williams. Yatesville, Georgia.
20. Knoxville Nursery Co., Knoxville, Tennessee.
21. P. J. Berckmans Co., Augusta, Georgia.
22. J. G. Harrison & Sons. Berlin, Maryland.
23. The Anderson Nursery. Wm. Anderson, Prop. Temple, Ga.
24. Easterly Nursery Co., Cleveland, Tennessee.
25. Geo. S. Josselyn. Fredonia, New York.
26. Perter Henderson & Co., Jersey City, New Jersey.
27. Bobbink & Atkins. Rutherford, New Jersey.
28. Ellwanger & Barry. Rochester, New York.
29. T. S. Hubbard. Fredonia, New York.
30. Thomas Meehan & Sons, Germantown, Pennsylvania.
31. Continental Plant Co., Kittrell, North Caoolina.
32. W. N. Scarff, New Carlisle, Ohio.
33. J. C. Hale Nursery Co., Winchester, Tennessee.
34. The Schmidt & Botley Co., Springfield, Ohio.
35. Thomas Meehan & Sons. Dresher, Pennsylvania.
36. J. Van Lindley Nursery Co., Pomona and Kernersville, N. C.
37. Richland Nurseries. Rochester, New York.
38. Brown Bros. Co., Rochester, New York.
39. Greensboro Nurseries. Greensboro, North Carolina.
40. Wagner Park Conservatories. Sidney, Ohio.
41. Franklin Davis Nursery Co., Mullikin, Mr.
42. Lewis Roesch & Son. Fredonia, New York.
43. James Brodie, Biloxi, Mississippi.
44. Georgia Seed Co., Jno. Wilkinson, Prop., Hogansville, Ga.
45. Bluhm Nursery Co., Smithville Tennessee.
46. Smithville Nursery Co., Smithville, Tennessee.
47. Will F. Halliday. Decherd, Tennessee.
48. Simpson Nursery Co., Monticello, Florida.
49. Concord Nurseries. Smith Bros., Proprs., Concord, Ga.
50. J. Steckler Seed Co., Ltd., New Orleans, Louisiana.
51. G. M. Bacon Pecan Co., Dewitt, Georgia.
52. Prosperity Nursery. Smithville, Tennessee
53. Forest Nursery & Seed Co., McMinnville, Tennessee.
54. Blanche Nursery Co., Blanche, Tennessee.
55. Bell & Conger Nursery Co., Smithville, Tennessee.
56. Lone Oak Nursery. Smithville, Tennessee.
57. California Rose Co., Pomona, Calif.
58. J. M. Cantrell, Smithville, Tennessee.
59. The Florida Nursery & Trading Co., Walton Co., Florida.
60. Pike County Nurseries, A. A. McElveen, Prop. Concord, Ga.
61. Big Four Nursery Co., Smithville, Tennessee.
62. Lynnville Nurseries, Lynnville, Tennessee.
63. Cedar Hill Nursery Co., Winchester, Tennessee.
64. Mount Hope Nursery, Smithville, Tennessee.

65. Jas. Cureton, Austell, Georgia.
66. The Royal Palm Nurseries, Reasoner Bros., Prop., Oneco, Florida.
67. Miller & Gossard, Summit Nurseries, Monticello, Florida.
68. Union Nursery Co., Smithville, Tennessee
70. The Fresno Nursery Co., Inc., Fresno, California.
71. Chase Bros. Co., Rochester, New York.
72. Vinehill Nursery, M. G. Black, Mt. Pleasant, Texas.
73. Frank H. Wild Floral Co., Sarcoxie, Missouri.
74. The Griffing Bros. Co., Griffing's Nurseries, Macclenny, Fla.
75. Keltonsburg Nursery, Smithville, Tennessee.
76. The Turkey Creek Nurseries, Macclenny, Florida.
77. Greens Nursery Co., Rochester, N. Y.
78. American Rose & Plant Co., Apha Jackson, Mgr., Springfield, Ohio.
79. Tullahoma Nursery, Tullahoma, Tennessee.
80. Woodlawn Nursery, Prospect Station, Tenn.
81. The Glenn St. Mary Nurseries Co., Glen St. Mary and Winter Haven, Florida.
82. Pecan Grove Nursery, J. B. Wight, Prop., Cairo, Georgia.
83. Old Dominion Nurseries. W. T. Hood & Co., Richmond, Va.
84. Sneed's Nursery. Jno. F. Sneed, Tyler, Texas.
85. The Donaldson Co., Sparta and Warsaw, Ky.
86. Mountain Spring Nursery, Smithville, Tenn.
87. Jno. D. Stroud, Pass Christian, Miss.
88. Pure Fountain Nurseries, Smithville, Tenn.
89. Alvin Japanese Nursery, Houston and Alvin, Texas.
90. Storrs and Harrison, Painesville, Ohio.
91. The Old Denny Orchard and Nursery Co., Lucedale, Miss.
92. Southern Nut Tree Nursery, Thomasville, Ga.
93. The Wm. H. Moon Co., Morrisville, Pa.
94. The Chattanooga Nurseries, Chattanooga and Soddy, Tenn.
95. The Ramsey Pecan Nursery Co., Ocean Springs, Miss.
96. The Newton Nurseries, Newton, Miss.
97. The Eastern Nurseries, Holliston, Mass.
98. G. H. Mellen Co., Springfield, Ohio.
99. The Fairview Floral Co., Springfield, Ohio.
100. The Bechtel Pecan Nurseries, Ocean Springs, Miss.
101. The Jefferson Nursery Company, Monticello, Fla.
102. C. Forkert, Ocean Springs, Miss.
103. The Tennessee Nursery Co., Cleveland, Tenn.
104. S. Saibara, Webster, Texas.
105. J. W. Adams Co., Springfield, Mass.
106. Rood Pecan Groves, Albany, Ga.
107. H. S. Taylor & Co., Rochester, N. Y.
108. The Peachwood Nurseries, State Line, Miss.
109. F. H. Lewis, Scranton, Miss.

110. F. W. Meneray Crescent Nursery Co., Council Bluffs, **Iowa.**
111. American Pecan Co., Jas. A. Bair, Pres., Palatka, **Fla.**
112. Barnesville Nursery, W. C. Stafford, Prop., Barnesville, **Ga.**
113. J. R. H. Hilton, Knoxville, Tenn.
114. D. Hill Nursery Company, Dundee, Ill.
115. German Nurseries, Carl Sonderegger, Prop., Beatrice, **Neb.**

Respectfully submitted,

P. F. WILLIAMS,

Horticulturist.