

TWENTY-SECOND ANNUAL REPORT

OF THE

Agricultural Experiment Station

OF THE

ALABAMA POLYTECHNIC INSTITUTE

AUBURN, ALABAMA

JANUARY 31, 1910

Opelika, Ala.

Post Publishing Company

1910

ALABAMA POLYTECHNIC INSTITUTE.

Auburn, Ala., Jan. 31, 1910.

GOVERNOR B. B. COMER,

Executive Department,

Montgomery, Ala.

SIR:—I have the honor herewith to transmit to you the Twenty-Second 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, 1909.

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, 1909.

Respectfully,

CHAS. C. THACH,
President.

AGRICULTURAL EXPERIMENT STATION.

TRUSTEES.

His Excellency, B. B. Comer, President.....	Ex-Officio
H. C. Gunnels, Superintendent of Education.....	Ex-Officio
R. F. Ligon, Jr.	Montgomery, Ala.
Tancred Betts	Huntsville, Ala.
Wm. C. Davis	Jasper, Ala.
A. W. Bell	Anniston, Ala.
N. D. 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.

STATION COUNCIL.

Chas. C. Thach, M. A., LL. D.....	President
J. F. Duggar, M. S.....	Director and Agriculturist
B. B. Ross, M. S.....	Chemist
C. A. Cary, D. V. M., B. S.....	
.....	Veterinarian and Director Farmers' Institutes
J. T. Anderson, Ph. D.....	
.....	Chemist in Charge of Soil and Crop Investigation
W. E. Hinds, Ph. D.....	Entomologist
F. E. Lloyd, A. M.....	Plant Physiologist and Pathologist
C. L. Hare, M. S., M. A.....	Physiological Chemist
D. T. Gray, M. S.....	Animal Industry
P. F. Williams, B. S.....	Acting Horticulturist

ASSISTANTS.

Thos. Bragg, M. S.....	Assistant Chemist
C. S. Williamson, M. S.....	Assistant Chemist
E. F. Cauthen, B. S.....	Superintendent of Farm and Recorder
N. E. Bell, B. S.....	Assistant in Chemistry
I. S. McAdory, B. S., D. V. M....	Assistant in Veterinary Science
W. F. Turner, B. S.....	Assistant in Entomology
C. S. Ridgway, B. S.....	Assistant in Botany
M. J. Funchess, B. S.....	Assistant Agriculturist
J. C. C. Price, B. S.....	Assistant Horticulturist

REPORT OF HATCH AND ADAMS FUND FOR 1908 - 1909.

RECEIPTS.

	<i>Hatch.</i>	<i>Adams.</i>
To amount from U. S. Treasury.....	\$15000.00	\$11000.00

DISBURSEMENTS.

By Salaries	\$ 8732.86	\$ 7459.88
By labor	1361.71	542.58
By publications	1229.48	
By postage and stationery	438.66	30.24
By freight and express	435.09	98.38
By heat, light, water, and power.....	493.97	99.34
By chemical supplies	150.34	201.20
By seeds, plants, and sundry supplies....	546.53	435.54
By fertilizers	356.20	38.40
By feeding stuffs.....		296.21
By library	523.05	15.02
By tools, implements, and machinery....	39.24	6.35
By furniture and fixtures	169.30	225.50
By scientific apparatus	212.34	1132.18
By live stock		60.33
By traveling expenses	89.85	89.75
By contingent expenses	21.00	
By buildings and repairs	200.38	269.10
	<hr/>	<hr/>
Total	\$15000.00	\$11000.00

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 10th day of February, 1910.

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 A. P. Institute.

REPORT OF DIRECTOR AND AGRICULTURIST.

J. F. DUGGAR.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

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 1909 the publications of the Alabama Experiment Station consisted of the annual report, five bulletins and one press bulletin. The titles and authors are given below:

Bulletin No. 144.—The San Jose Scale and Lime-Sulphur Wash; by the Entomologist.

Bulletin No. 145.—Local Fertilizer Experiments With Cotton in 1905, 1906, 1907 and 1908; by the Director.

Bulletin No. 146.—Facing the Boll Weevil Problem in Alabama; by the Entomologist.

Bulletin No. 147.—Crimson Clover; by the Director.

Bulletin No. 148.—Raising Lambs in Alabama, Maintenance, Rations for Ewes, Feeding Cotton Seed Meal to Pregnant Ewes; by the Chief and Assistant in Animal Industry.

Press Bulletin No. 34.—Tests of Varieties of Cotton in 1908; by the Director and Farm Superintendent.

Press Bulletin No. 35.—Tests of Varieties of Corn in 1909; by the Director and Farm Superintendent.

As stated in each of my reports for the last two years, a large percentage of the bulletins of the Alabama Experiment Station are now out of print. There is urgent need that a number of the bulletins now out of print be reprinted. However, this cannot be done unless a special fund be appropriated for this purpose.

An increase in the printing fund is also needed in order that the mailing list of the Station be permitted to grow

in proportion to the increased need for information shown by the farmers of Alabama. With an ample printing fund, much wider publicity could be given to the fact that these bulletins are intended for every farmer in Alabama; and bulletins could be published on a wider range of subjects than at present. In many states a state appropriation supplements the printing fund of the Experiment Station, so as to provide for the widest possible dissemination of agricultural information.

STAFF.

The following changes in the staff have occurred during the past year:

During the latter half of the year the Assistant in Horticulture, P. F. Williams, has discharged the duties of Acting Horticulturist, in the absence of Prof. R. S. Mackintosh, who was granted a year's leave of absence. To supply the position of Acting Assistant in Horticulture, J. C. Price, a graduate of the Virginia Polytechnic Institute, was appointed.

L. N. Duncan, formerly Assistant in Agriculture, was promoted to the position of Professor of School Agriculture and Agent of the U. S. Department of Agriculture. His place in Station work was taken by M. J. Funchess, a graduate of Clemson College, S. C., and a post-graduate student of the University of Wisconsin.

C. S. Ridgway, a graduate of the Maryland Agricultural College, and a post-graduate student of Johns Hopkins University, was appointed Assistant in Botany.

AGRICULTURAL DEPARTMENT.

Because of the need of frequent repetition of field experiments, the work of this department has been chiefly a continuation of work previously reported as in progress. The most extensive single lines of investigation are plant breeding experiments with cotton, corn, and oats. These are supported by the Adams Fund from the Federal Government. A requirement of all investigations under this fund is that they look to the establishment of fundamental

principles, rather than to the attainment of immediate results. With this end in view, the detailed work in the field and in the office has been more elaborate than is necessary in plant breeding work intended merely for the improvement of a given variety of cotton, corn, or oats.

However, encouraging progress has been made in the improvement of the varieties of cotton, corn, and oats, that were chosen for this investigation. In the Cook cotton progress has been made in improving the form and uniformity of the plant, in increasing the percentage of lint, and in productiveness. Two of the strains thus bred up took the first and second rank in productiveness among the thirty varieties of cotton tested at this Station in 1909. This was done in spite of considerable loss from anthracnose, to which all strains of this variety are especially susceptible, and toward the reduction of which by selection attention will be directed in the future.

Gratifying progress has been made in improving the Experiment Station yellow variety of corn in the matter of productiveness and number of ears per plant; and significant data have been accumulated in a study of the correlation of qualities of corn, which latter investigation promises to establish principles that will serve as direct and practical guides in plant breeding with corn.

In addition to the large number of experiments in improving the Cook cotton, the past year has brought to maturity several thousand hybrid cotton plants of the second generation since the cross was made. A careful examination of the qualities of these hybrids is now in progress, and results up to this date are very encouraging for the prospect of uniting in one variety many of the various qualities required in a cotton suitable for boll weevil conditions. However, this line of work must proceed for several years longer before we can properly expect to demonstrate any marked superiority of any one hybrid or strain. Many hundreds of separate samples of cotton, including the offspring of single promising plants, have been separately ginned and recorded.

In addition to plant breeding, some of the most important lines of experiments in progress during the year 1909 in the agricultural department are the following:

Cotton, local fertilizer experiments.

Cotton, relative fertilizing values of ground phosphate rock and acid phosphate.

Cotton, continuation of the study of varieties.

Cotton and corn, relative fertilizer requirements.

Corn, variety, culture, and fertilizer experiments.

Oats, variety and culture experiments.

Crimson clover, variety and culture tests, and fertilizing value.

Cowpeas, variety tests.

Sorghum, variety tests.

Relative amounts of food produced by various crops suitable for hogs.

A study of numerous forage plants, including alfalfa, vetches, clovers, soybeans, kudzu, and grasses.

Experiments in the manufacture on the farm of drain tile.

Rotation of crops.

Effects of lime on acid soils, using a number of crops.

The season of 1909 was a most unfavorable one for cotton. Excessive rains during the first half of the year, a period of acute drought in the late summer, and the most severe injury from anthracnose, commonly called boll rot, ever known during the fourteen years of the writer's connection with this Station, all combined to cut short the yield of cotton. Yet, in spite of these obstacles, the Station farm averaged more than one and one-fourth bales of cotton per acre. This result is believed to be chiefly due to the use of crimson clover as a soil-improving crop preceding cotton and to the improvement of cotton by careful plant breeding.

Respectfully submitted,

J. F. DUGGAR,

Director and Agriculturist.

REPORT OF THE CHEMIST.

B. B. ROSS.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—I beg to submit the following statement with regard to the nature and scope of the work of the Chemical Department of the Experiment Station for the year just ended:

This work, as heretofore, has embraced investigations conducted under the provisions of the original Hatch act, work carried out under authority of the Adams act, and inspection work performed under the police requirements of State laws, while, in addition, a considerable amount of miscellaneous analytical work has been accomplished.

The reports submitted by Dr. J. T. Anderson and Prof. C. L. Hare give the essential features of the work carried out by them under the provisions of the Hatch and Adams acts and a large amount of valuable data has been accumulated in connection with their investigations during the past year. In carrying out these investigations, as well as in connection with the usual routine work of the laboratory, a large number of specimens of agricultural products has been analyzed since the date of the last annual report.

In addition to the lines of investigation mentioned in the reports of Messrs. Anderson and Hare, some work has been and is being done in connection with the study of the relative availability of the phosphoric acid of the basic slag or cinder obtained as a by-product from the manufacture of steel by the basic open-hearth process.

For a number of years the basic slag obtained as a by-product of the Thomas-Gilchrist steel process has been successfully employed as a fertilizer both in Europe and in this country, but the slag obtained as a by-product of the

basic open-hearth process has not yet found any general application for fertilizing purposes.

This slag is produced in large quantities both at Birmingham and Gadsden, and should constitute an important economic source of supply of phosphoric acid, if the final results of investigations as to its availability should prove satisfactory.

The Tennessee Coal, Iron and Railroad Company has placed a considerable quantity of this material at the disposal of this department, and already considerable work has been done in connection with laboratory tests of its availability, while further practical field tests as to availability will also be carried out during the coming season.

During the fall some experimental and demonstration work was performed, as heretofore, in the manufacture of syrup from sugar cane, and this office has answered many inquiries which have been received with reference to improved methods in the manufacture of this important agricultural product.

The fertilizer work of the past season showed a considerable increase over that of the preceding year, the number of analyses, including duplicates, being well in excess of 2,000. The results of these analyses were reported as usual in the annual fertilizer bulletin issued by the State Department of Agriculture, and, in addition, a considerable amount of descriptive matter relating to the composition, sources and properties of the fertilizing materials marketed in the State was included in the same bulletin.

Besides the fertilizer work alluded to, this department has made analyses of a large number of specimens of miscellaneous materials sent in from different portions of the State, including marls, phosphates, ores, waters, feed stuffs, etc.

Very respectfully,

B. B. Ross,
Chemist.

REPORT OF VETERINARIAN.

C. A. CARY.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—I herewith submit a synopsis of work of the Veterinary Department for the year 1909.

The work on the life history of the cattle tick in co-operation with the Bureau of Animal Industry has been completed. The material is now being prepared for publication by the Bureau.

The study of the effects of cotton seed meal on the health and various organs of pigs is being continued. We have collected quite a quantity of data, have repeated feeding tests and have made a large number of blood examinations and also examinations of sections of various organs, such as the liver, spleen, kidneys, heart, and lungs. We have also made some observations on the effects of cotton seed meal on the health and condition of horses and mules. An experiment is now planned for carrying out a feeding test in which cotton seed meal will be used as the chief or only ingredient of the ration. It has been observed for some time that hogs and pigs which are fed on peanuts become affected. This has been investigated and experimental tests will be made.

The sanitary conditions of farms in their relation to the health of the people and animals on the farm have commanded our attention. It has been especially noted that careless methods in the disposal of carcasses of dead animals on the farm are responsible for the extension and spread of a number of animal diseases. It should be especially noted that buzzards are carriers of infectious materials from farm to farm, and are consequently great factors in the transmission of infectious diseases.

The study of bacteria in cows' udders and morbid changes

in the udder has been continued. The various pathologic changes, the causes of these changes, and resulting effects on milk secretion and the milk are problems to be solved.

Farmers' Institutes for 1909 were greater in number than any year since the institutes began. The average, and the total attendance are below those of previous years. The necessity for live stock farming, diversification of crops, eradication of cattle ticks and the production of more cotton on less acreage have been the chief lines of instruction given in the institutes.

DURING 1909.

Farmers' Institutes held in Alabama	35
Counties in which they were held	28
Number of sessions at these institutes	57
Average attendance at each session	67
Total attendance	3,790

The Round-up Farmers' Institute was held at Auburn, July 23d to July 31st, 1909. At this institute there were 60 lectures and demonstrations given. Every day lectures and demonstrations were commenced at 8 a. m. and continued with brief intermissions for dinner and supper until 10 p. m.

The enrollment for the entire institute was 730. The new feature of having women to lecture on household economics and sanitation was very well received.

The Farmers' Institutes and the Round-up or Short Summer School for Farmers have about reached the limits of growth, unless more money can be secured. It is now almost impossible with present funds to secure the help in the way of lecturers to meet the demand of the farmers.

C. A. CARY,

Veterinarian and Director of Farmers' Institutes.

REPORT OF CHEMIST OF SOILS AND CROP
INVESTIGATION.

J. T. ANDERSON.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—The following report of the work done in the division of the Chemistry of Soils during the year 1909 is respectfully submitted:

For reasons to be given later, the research work has been confined in the main to the Adams' project. As stated in previous reports, this project seeks to determine the fertilizer requirements of the soil by the chemical analysis of the plant grown in it. Cotton has been selected as the plant and was grown last season under the following conditions:

1. In plots in the open field.
2. In clean sand in clay cylinders imbedded in the ground.
3. In wire baskets.

1. To secure samples of analysis from field plots, use was made again of Prof. Duggar's series of Co-operative Fertilizer Experiments with Cotton. Thus were obtained samples from some twenty odd sets of ten plots each, located in widely separated sections of the state, and in all varieties of soil. Several of these sets were located in the vicinity of Auburn, and were under the scrutiny of this writer. Most of these samples have already been analyzed, some two or three sets, however, remain to be worked up.

2. An attempt was made to grow cotton in clean sand in clay cylinders which were imbedded in the ground, using the same system of fertilization as is employed in the field plots. The attempt met with indifferent success, failing entirely, or practically so, on those cylinders where no fertilizer was used. A number of samples, however, were secured from cylinders which were completely or partially fertilized. With the experience of last season to guide us,

it is hoped that the attempt to be made next season will meet with better success.

3. Samples of the unfertilized soils from the plots located near Auburn were brought to the laboratory, and after proper preparation were used in series of small wire baskets. One of the soils used was a stiff clay, another a medium sandy loam and the other a sandy soil. Each of these soils was tested independently in a series of baskets, using the same system of fertilization as in the field plots. As samples for analysis from the field plots were drawn while the plants were small in the leaf stage, it was assumed that they could be grown normally to that stage in the small wire baskets. The assumption was found to be correct, and the analytical results obtained from the wire basket samples accord reasonably well with those obtained from the same soil in the open plots. The facilities for wire basket work are limited at present, and hence only a few comparisons of this with the open plot method have been made. Special attention to these comparisons in a larger number and variety of soils is to be given during the coming season.

With the purpose of securing whatever good that might be derived from it, samples of soil from each of ten plots from two of the locations near Auburn were obtained and analyzed for moisture and available potash. The data obtained will be published with the other.

The Hatch project, whose purpose was the study of the effect of the humification of certain nitrogenous substances in rendering insoluble phosphoric acid available to the plant, met with no advance during the last season. The ravages of the cut worm, which baffled all attempts to check, made it necessary to abandon rye and sorghum as the growing crops. An attempt was made to substitute turnips with no success, the young plants being destroyed in some way almost before appearing above ground.

The usual amount of time was given to the official fertilizer work for the State Department of Agriculture.

Respectfully submitted,

JAS. T. ANDERSON.

REPORT OF PHYSIOLOGICAL CHEMIST.

C. L. HARE.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—The work in this department during the past year has been continued according to the plans set forth in the last annual report.

The work on breeding cotton for high oil content in the seed has made some progress and the results secured encourage a continuation of the experiments.

The determination of the properties of lard as affected by the ration fed to the hog has proceeded to such a point that there is possible a fairly accurate knowledge of the effects of such feeds as soybeans, peanuts, corn, cotton seed meal, and tankage, as far as regards certain of the properties of lards.

It has also given an index to some correctives for soft lards and the extent to which the corrective effect may extend.

Respectfully submitted,

C. L. HARE.

REPORT OF ENTOMOLOGIST.

W. E. HINDS.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—The following report relates to the work of the Department of Entomology in the Experiment Station for the fiscal year 1909:

Work during the past year has continued mainly along the lines inaugurated during 1908. There has been no change in the working forces. Mr. W. F. Turner, as Assistant, has given nearly all of his time to the routine station work, and especially to the Adams Fund investigation projects.

Correspondence.—Inquiries regarding the control of insect pests have increased during the past year, indicating that there is a general advance in agricultural and horticultural information along these lines. The entomologist has received and answered somewhat more than 1,200 letters during the year.

Publications.—During the year 1909, the Department of Entomology has issued two bulletins and one circular. Bulletin No. 144, entitled "The San Jose Scale and Lime Sulphur Wash," has been quite largely in demand. Bulletin No. 146, entitled "Facing the Boll Weevil Problem in Alabama," was designed to prepare cotton planters for the advent of the boll weevil, and this publication will be increasingly useful as the boll weevil enters the state. Circular No. 3 gives a list of "Manufacturers and Dealers in Insecticide Materials and Spraying Apparatus," for distribution in correspondence.

Besides these regular Station publications, the Entomologist has published articles in the reports of the State Department of Agriculture at Montgomery, two articles in the *Journal of Economic Entomology*, besides brief notes in the *Southern Farm Gazette*.

Farmers' Institutes.—The demand for addresses at institute meetings conducted by this college and by the State Department of Agriculture has been much greater than I have felt at liberty to take the time to supply. Meetings of the State Horticultural Society and Farmers' Institutes have been addressed by me. There is now considerable demand for illustrated lectures on the cotton boll weevil problem, and these should be given so far as may be possible.

The Cotton Boll Weevil.—The cotton boll weevil has continued its eastward advance during the past season and has been found within six or eight miles of the Alabama line, but so far as we know, it does not yet occur in Alabama. It is very probable that this important insect pest will invade the State during 1910, and every possible step should be taken to minimize the damage which it will certainly cause if present practices in cotton culture are continued unchanged.

Adams Fund Investigations.—During the past year project No. 4, entitled "Investigation of Life History, Economic Relationships and Injury of the 'Rice Weevil,' (*Calandra oryza*, L.), Attacking Corn in Alabama, with a Study of Methods for Its Control," has been approved by the Office of Experiment Stations for this department and substituted for project No. 2, relating to the study of the fire ant (*Solenopsis geminata*), which was found to occur but rarely in this locality. The new project deals with a problem of great value to the planters of Alabama, and in many respects can be carried on simultaneously with project No. 3, relating to fumigation investigations. In the fight against the boll weevil, more corn must be grown, and this means that some method of preserving it against injury from corn infesting pests must be worked out for the South.

Material progress has been made in the fumigation project, upon which our efforts have been largely concentrated. The magnitude, as well as the importance, of this investigation becomes more evident as the work proceeds. The results thus far obtained, while only preliminary, are still

of much importance, and are so considered by entomologists in other states. Our advice in regard to work with carbon di-sulfid is quite frequently requested by workers in other sections.

There is urgent need of a station bulletin dealing with the rice weevil and its control to be available for distribution by August, 1910. We contemplate the publication of this bulletin.

New Quarters for the Department.—The new quarters provided in Comer Hall for the experiment station work in entomology consist of two laboratory rooms and a large office, library and collection room on the first floor in the western end of the main building, with a work room and insectary in the green house range immediately south of Comer Hall. The completion of these rooms has enabled us to do many necessary things which were impossible previously for lack of space.

Equipment.—Most of the equipment added for the Department of Entomology during the past year has been for the station investigation work. This has been increased by the value of fully \$500 during the past year. The largest single item has been the construction of fumigation boxes for use in the project investigations. The items secured have been only those most essential to the continuance of the investigations. Many additional items would greatly facilitate the work.

Respectfully submitted,

W. E. HINDS,
Entomologist.

REPORT OF BOTANIST.

FRANCIS E. LLOYD.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—In response to your request of recent date, I beg herewith to make my annual report as Botanist of the Agricultural Experiment Station for the year ending.

The importance of studying the plant diseases caused by plant parasites has become increasingly evident. Special attention has been given to the Grape Rot (*Guinardia bid-welii*) and to the Fire Blight of Pome fruits (*Bacillus amylovorus*), and two circulars on these diseases have been prepared and are about to be sent to press, and the best known methods of their control. Both of these maladies are the cause of great losses, and this is especially true of the Grape Rot, which is known to destroy the entire crop.

The Orange Rust of Apples has been studied with reference to the history of the alternate form, *Gymnosporangium*, on the cedar, which is known popularly as Cedar Apple. The biennial character of the cedar apple has been established, confirming, independently, the work of Heald in Nebraska.

The problem of meeting the pecan situation is becoming increasingly important. This tree has been assumed by many to be free from the attacks of fungous parasites, and this view has been used as an argument to plant the tree. It now develops that some varieties at least, if not all, are attacked by the same organism which produces the scab of apples, *Fusicladium effusum*. Whether the treatment given to apples may prove effective remains to be determined. The extent of loss has been so great in some quarters that it is of the highest importance that a careful study should be made of methods of control.

The two projects under the Adams Fund have been begun. Several attempts have been made to carry out certain

preliminary experimentation, but the severe weather and the difficulty of controlling the temperature in the green house during the winter have been a constant hindrance.

The routine correspondence of the Department contains a considerable number of botanical inquiries of a general nature. These frequently require a great deal of time and study for satisfactory reply. The chief material factor in this phase of our work is the Herbarium, and for this reason it is important that it should be put into shape for use. The Herbarium must not be thought of as extraneous to the work of the Station, as it includes, aside from general material, the working collection of plant parasites. Our greatest need at the moment is proper housing in the form of tightly constructed cases, since without these we cannot control the insect pests which are peculiarly bothersome here.

A paper embodying in brief form my studies of the desert rubber plant above mentioned was presented before the Botanical Society of America, at the recent meeting in Boston, under the title, "The Response of the Guayule, *Parthenium Argentatum* Gray to Irrigation." An article, "The Guayula Rubber Situation," was contributed, by request of the editor of the *India Rubber World*, to the twentieth anniversary number of that periodical.

Yours truly,

FRANCIS E. LLOYD,
Botanist.

ANIMAL INDUSTRY DEPARTMENT.

DANIEL T. GRAY.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—One bulletin has been issued from the Animal Industry Department the past year. This is bulletin No. 148, and deals with the subjects of spring lamb production and feeding cotton seed meal to pregnant ewes.

In the main, the experimental work continues as was reported in the last annual report. The present work of the Department may be summarized as follows:

WITH SWINE.

1. To study the results of finishing swine by dry lot method as compared to the method of using green pasture crops.
2. To study the subject of hardening flesh and lard after they have been rendered soft as a result of the animals having grazed green crops.
3. To note further the toxic effect of feeding cotton seed meal to hogs.
4. To study the effects of some of the Southern swine feeds upon the frame work of the body.
5. To determine the most profitable amount of grain to feed along with such green pasture crops as soybeans and peanuts.

WITH BEEF CATTLE.

The co-operative beef work with the Animal Husbandry Department at Washington is going forward in an exceedingly satisfactory manner. The work has been enlarged to include the subject of finishing beef cattle in the winter time. The main questions involved now are:

1. To study methods of carrying mature beef animals through the winter months, when the object is to fatten them on pasture the following summer.

2. To determine the profit, if any, in supplementing the summer pastures with certain cotton seed by-products in finishing cattle for the summer market.

3. To study methods of carrying calves through the winter months when the object is to finish them for the market the following summer or fall.

4. To determine the most profitable amount of cotton seed cake to feed steers while they are being finished on pasture for the market.

5. To compare silage, cotton seed hulls, and Johnson grass hay as feeds for finishing cattle for the market in the winter time.

Last winter and summer 175 head of cattle were used in the feeding work. The cattle were sold in September. The experiment terminated in a very satisfactory manner. The data are now being prepared for publication.

WITH SHEEP.

The work with sheep continues about as reported in the last annual report. The most important points under consideration are:

1. Early lamb production.
2. Effect upon the pregnant ewe of feeding cotton seed meal to her.
3. A comparison of Alabama feeds for carrying the ewe through the winter months.

The Dairy Extension work, which is being carried on as a co-operative work between the Dairy Department at Washington and this Department, continues the same as last year. Many dairy farmers are being reached and helped. Interest in the work is increasing rapidly.

Very respectfully submitted,

DANIEL T. GRAY.

REPORT OF ACTING HORTICULTURIST.

P. F. WILLIAMS.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—I respectfully submit the following report for the year ending December 31st, 1909:

Adams Investigation.—The work of the Department has been along lines similar to those of the previous year. The meteorological records have been taken to assist in the work in Peach Breeding under the Adams Fund and complete records in the blooming periods and fruiting of the various trees in the orchards.

Personnel.—Prof. R. S. Mackintosh was granted a year's leave of absence to take up study at Ames, Iowa, and left August 15th, 1909. The writer has been in charge of the work of the Department since that time. On October 1st Mr. J. C. C. Price took up his duties as Assistant Horticulturist. In this capacity he has done very efficient work. He has been particularly concerned with the green house operations.

Nursery Inspection.—With the approval of the State Board of Horticulture I have carried on the inspection of nursery stock, and have been ably assisted in this work by Mr. E. E. Binford, Dr. W. E. Hinds, and Mr. J. C. C. Price. A list of the individual nurseries receiving Alabama certificates will be found in the report to the State Board of Horticulture at the close of the present nursery year. This includes the granting of 116 certificates to nurserymen outside of the State; 40 certificates in the State, and 17 dealers' certificates.

Greenhouse Work.—The new greenhouse was occupied in February. With the constant demand for cut flowers, both locally and in Opelika, an addition to the present house

would be more than self-supporting. About one-half of the material for this addition is on hand. A number of students are anxious to take up the study of growing vegetables and flowers under glass, and I respectfully request that provision be made for this imperative need.

Experiments.—An experiment was started in October to test out several varieties of tomatoes for forcing under glass. We have the promise of some valuable results from this. Mr. Blake is making the experiment the basis of his thesis work. Another project started in December was an experiment testing cabbage varieties and cabbage fertilizers and work along this same line with tomatoes.

Citrange Investigations.—A number of Citranges have been received from the U. S. Department of Agriculture, and they will be set out in the citrus orchard next spring. Mr. Walter Swingle, who is in charge of this work at Washington, D. C., has requested the Department to take up this work of breeding new citrus fruits on a much larger basis than has heretofore been attempted. It is desirable that this work should be undertaken. A portion of this work will call for space under glass. An efficient worker is needed to conduct these investigations.

Publications.—The material for a bulletin of information on pecans has been prepared for publication and this will appear in a few months. Pecans have become a very important crop in Alabama, and a test orchard should be planted on the Station grounds. Co-operation along this line should be encouraged in every county, as there is such a diversity of soils, and the best variety for each county have not been determined as yet. Valuable statistics have been received concerning the pecan industry in Alabama through the co-operation of the U. S. Department of Agriculture with this Department. Statistics concerning the peach growers of the State have also been received from the same source.

There is a pressing demand for a truck survey of Alabama, especially in Mobile and Baldwin Counties. A station

man should spend considerable time in the above sections to make a close study of the conditions there and learn the methods now employed with the view of undertaking co-operative experiments to further advance this important industry.

A bulletin on School Improvement has been published and appears to have filled a much needed want. At present the work along this line is crowding the time and facilities of the Department. Provision should be made for this work and this emphasizes the fact that funds for extension work in connection with the Experiment Station are very much needed.

CERTIFICATES ISSUED 1909 - 10.

ALABAMA NURSERYMEN.

1. Chase Nursery Co., Huntsville.
2. Rolfe Nursery Co., Huntsville.
3. Oak Lawn Nursery, Huntsville.
4. Huntsville Wholesale Nurseries, Huntsville, Ala.
5. J. O Kelly & Sons, Jeff.
6. Frazer Nursery Co., Huntsville.
7. Welch Nursery Co., Madison.
8. Chas. A. Hughes, Getup.
9. Blount County Nursery, Blountsville.
10. Arley Nursery, Arley.
11. Owen Nursery, Ashland.
12. Ashland Nursery, Ashland.
13. Earnest Nursery, Roanoke.
14. Slay Nursery, Buffalo.
15. Cusseta Nursery, LaFayette.
16. Lipp Nursery, Roanoke.
17. Joiner Nursery, Wedowee.
18. Rosemont Gardens, Montgomery.
19. Eagle Pecan Co., Pittsview.
20. Park Floral Co., Selma.
21. Wakefield Nursery, Flomaton.
22. Gravlee Nursery Co., Newtonville.
23. Joppa Nursery, Joppa.
24. C. Ravier & Sons, Mobile.
25. Industrial School Gardens, Mobile.
26. Little Gem Gardens, Mobile.

27. J. S. Gaylord, Barnwell.
28. J. M. Colmant, Birmingham.
29. C. R. Long, Montgomery.
30. G. E. Luffman, Birmingham.
31. J. P. Jones, Fabius.
32. Vinemont Nursery, Vinemont.
33. F. E. Welch, Roseview Nursery, Chunchula.
34. Arlington Nursery, Birmingham.
35. Waverly Nurseries, Waverly.
36. Alabama Nursery Co., Huntsville.
37. Birmingham Landscape and Nursery Co., Birmingham.
38. J. C. White, Fort Payne.
39. Orchard Hill Nursery, J. M. Crutchfield, Cullman.
40. Gwendolin Nursery, Carlos Reese, Birmingham.

ALABAMA DEALERS.

1. W. F. Probst, Oakman.
2. J. M. Colmant, Birmingham.
3. C. R. Long, Montgomery.
4. G. E. Luffman, Birmingham.
5. H. A. Sparkman, Mobile.
6. A. M. Preston & Son, Blountsville.
7. M. M. Dawson, Montgomery.
8. J. H. Parker & Son, Vinemont.
9. J. J. Holmes, Montgomery.
10. E. Day, Birmingham.
11. W. D. Summerfield, Birmingham.
12. A. B. Webb, Scottsboro.
13. Homer N. Sneed, Pronto.
14. Judson Strock, Clanton.
15. G. W. DeVaughan, Prichard.
16. A. Swift, Fairhope.
17. John B. Stroud, Pass Christian, Miss.

NURSERYMEN OUTSIDE THE STATE.

1. H. C. White & Co., DeWitt, Ga.
2. H. M. Simpson & Sons, Vincennes, Ind.
3. A. D. Williams, Yatesville, Ga.
4. Frank H. Wild Floral Co., Sarcoxie, Mo.
5. Southern Nursery Co., Winchester, Tenn.
6. Wild Brothers Nursery Co., Sarcoxie, Mo.
7. P. J. Berckmans Co., Fruitland Nurseries, Augusta, Ga.
8. Stark Brothers Nursery and Orchard Co., Louisiana, Mo.

9. Tennessee Wholesale Nurseries, Winchester, Tenn.
10. Biltmore Nurseries, Biltmore, N. C.
11. M. L. Spivey, Lynnville, Tenn.
12. T. S. Hubberd Co., Fredonia, N. Y.
13. Geo. S. Josselyn, Fredonia, N. Y.
14. Griffing Bros. Nursery Co., Pomona Nurseries, MacClenny, Fla.
15. The Nut Nursery Co., Simpson Bros., Monticello, Fla.
16. Hoopes, Bro. & Thomas Co., West Chester, Pa.
17. Andorra Nurseries, Chestnut Hill, Pa.
18. Ellwanger & Barry, Rochester N. Y.
19. Lewis Roesch & Son, Fredonia, N. Y.
20. Dreer Nurseries, Henry A. Dreer, Riverton, N. J.
21. Bluhm Nursery Co., Smithville, Tenn.
22. Morris Nursery Co., West Chester, Pa.
23. Jackson & Perkins Co., Newark, N. J.
24. Smith Bros., Concord, Ga.
25. Pike County Nurseries, Concord, Ga.
26. Excelsior Nurseries, G. H. Miller & Son, Rome, Ga.
27. T. V. Munson & Co., Denison, Texas.
28. The Barber-Frink Co., MacClenny, Fla.
29. Summit Nurseries, Miller & Gossard, Monticello, Fla.
30. Cedar Hill Nursery, Winchester, Tenn.
31. Thos. Meehan & Sons, Inc., Germantown, Pa.
32. Lamar Nursery Co., Pulaski, Tenn.
33. Bobbink & Atkins Nurseries, Rutherford, N. J.
34. Center Grove Nursery Co., Smithville, Tenn.
35. John Lightfoot, East Chattanooga, Tenn.
36. Chase Bros. Co., Rochester, N. Y.
37. A. C. Oelschig & Sons, Savannah, Ga.
38. Thos. Meehan & Sons, Inc., Dresher, Pa.
39. The Knoxville Nursery Co., Lowell Station, Tenn.
40. J. Van Lindley Nursery Co., Kernersville and Pomona, N. C.
41. Arcadia Nurseries, J. H. Girardeau, Monticello, Fla.
42. Glen St. Mary Nursery Co., Glen St. Mary, Fla.
43. Glenn Cliff Nursery, Winchester, Tenn.
44. Easterly Nursery Co., Cleveland, Tenn.
45. United States Nursery Co., Rich, Miss.
46. Forest Nursery and Seed Co., McMinnville, Tenn.
47. Prosperity Nursery, Smithville, Tenn.
48. New Hope Nursery, Daylight, Tenn.
49. J. L. Westbrook, Temple, Ga.
50. J. Steckler Seed Co., New Orleans, La.
51. Franklin Davis Nursery Co., Mullikin, Md.
52. Will F. Halliday Decherd, Tenn.

53. Pecan Grove Farm Nursery, Cairo, Ga.
54. Storrs & Harrison Co., Painesville, Ohio.
55. W. N. Scarff, New Carlisle, Ohio.
56. The Donaldson Co., Warsaw and Sparta, Ky.
57. Wagner Park Conservatories, Sidney, Ohio.
58. The G. M. Bacon Pecan Co., DeWitt, Ga.
59. The Wm. H. Moon Co., Morrisville, Pa.
60. James Cureton, Cureton Nurseries, Austell, Ga.
61. Tullahoma Nursery, Tullahoma, Tenn.
62. W. W. Thomas, Anna, Ill.
63. Peter Henderson & Co., Jersey City, N. J.
64. Joe Shadow Nursery Co., Winchester, Tenn.
65. Chattanooga Nursery Co., Chattanooga, Tenn.
66. Continental Plant Co., Kittrell, N. C.
67. Jackson County Nursery, J. G. Justice, Jefferson, Ga.
68. L. H. Garretson, Fall River, Tenn.
69. Alexander Seed Co., Kittrell, N. C. (Augusta, Ga.)
70. Greensboro Nurseries, Greensboro, N. C.
71. Morey & Son, Danville, N. Y.
72. R. A. Eubank, Prospect Station, Tenn.
73. Old Dominion Nurseries, W. T. Hood, Richmond, Va.
74. H. C. Hastings, Kittrell, N. C. (Atlanta, Ga.)
75. Wick Hathaway, Madison, Ohio.
76. Moss & Allen, Smithville, Tenn.
77. Union Nursery Co., Smithville, Tenn.
78. Commercial Nursery Co., Winchester, Tenn.
79. Mt. Olive Nursery Co., Smithville, Tenn.
80. Carroll County Nursery, C. P. Turner, Carrollton, Ga.
81. Oakland Nurseries, W. Y. C. Grant, Columbia, Tenn.
82. F. R. Pierson Co., Tarrytown, N. Y.
83. Geo. A. Sweet, Danville, N. Y.
84. Bremen Nursery, T. J. Anderson, Bremen, Ga.
85. Hartwell Nurseries, S. W. Peck, Hartwell, Ga.
86. Keltonburg Nursery, Smithville, Tenn.
87. Cumberland Nurseries, Winchester, Tenn.
88. Fruit Farm Nursery, J. E. Gregory, Cabot, Ark.
89. Cumberland Mountain Nursery Co., Smithville, Tenn.
90. White Elm Nurseries, Oconomowoc, Wis.
91. Monticello Nurseries, Standard Pecan Co., Monticello, Fla.
92. Sneed's Wholesale Nursery, John F. Sneed, Tyler, Texas.
93. Bechtel Pecan Nurseries, Ocean Springs, Miss.
94. Mt. Arbor Nurseries, E. S. Welch, Shenandoah, Iowa.
95. Shenandoah Nurseries, Shenandoah, Iowa.
96. B. W. Stone, Thomasville, Ga.
97. The Jefferson Nursery Co., Monticello, Fla.
98. J. W. Adams & Co., Springfield, Mass.

99. C. Forkert, Ocean Springs, Miss.
100. Southern Floral Nursery Co., Bucatunna, Miss.
101. Peachwood Nurseries, A. C. Coles State Line, Miss.
102. Ramsey Pecan Co., Ocean Springs, Miss.
103. Columbia Nurseries, P. B. Simmons, Gainesville, Ga.
104. Toomsba Nurseries, Toomsba, Miss.
105. Rood Pecan Groves, C. M. Rood, Albany, Ga.
106. Southern Nut Tree Nursery, C. A. Rouzer, Thomasville, Ga.
107. Stafford & Howard, Barnesville, Ga.
108. J. Henry Walker Griffin, Ga.
109. Alvin Japanese Nursery, S. Ari, Alvin, Texas.
110. F. W. Meneray, Crescent Nursery Co., Council Bluffs, Ia.
111. Winter Haven Nurseries, A. M. Klemm, Winter Haven, Fla.
112. Gainesville Nurseries, H. S. Graves, Gainesville, Fla.
113. The Kilian Nurseries, Newton, N. C.
114. Vadesian Nurseries, Bostic, N. C.
115. James A. Bear, Palatka, Fla.
116. Texas Nursery Co., Sherman, Texas.
117. The Livingston Seed Co., Columbus, Ohio.

Respectfully submitted,

P. F. WILLIAMS,
Acting Horticulturist.

