FIFTEENTH ANNUAL REPORT

OF THE

Agricultural Experiment Station

OF THE

ALABAMA POLYTECHNIC INSTITUTE

AUBURN, ALABAMA

JANUARY 25, 1903

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ALABAMA POLYTECHNIC INSTITUTE.

Auburn, Ala., Jan. 25th, 1903.

GOVERNOR WILLIAM D. JELKS,

Executive Department,

Montgomery, Ala.—

SIR:—I have the honor herewith, to transmit to you the Fifteenth Annual Report of the Agricultural Experiment Station of this College.

The report of the Treasurer, herewith included, is for the fiscal year ending June 30th, 1902.

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

It contains the report of the Acting Director, the Chemist, the Veterinarian, the Agriculturist, and the Biologist and Horticulturist, for the year ending December 31st, 1902. Respectfully,

CHAS. C. THACH,
President.

TRUSTEES.

His Excellency, WILLIAM D. JELKS, 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.

JONATHAN HARALSON .....Selma, Ala.

THOMAS WILLIAMS .....Wetumpka, Ala.

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W. K. TERRY.....Birmingham, Ala.

T. H. FRAZER.....Mobile, Ala.

T. D. SAMFORD.....Opelika, Ala.

AGRICULTURAL EXPERIMENT STATION.

COMMITTEE OF TRUSTEES OF EXPERIMENT STATION.

THOMAS WILLIAMS ..... Wetumpka, Ala.
JONATHAN HARALSON ..... Selma, Ala.

STATION COUNCIL.

CHAS. C. THACH, A. M. ..... President and Acting Director.
S. B. ROSS, M. S. ..... Chemist.
C. A. CARY, D. V. M., B. S. ..... Veterinarian.
I. F. DUGGAR, M. S. ..... Agriculturist.
E. M. WILCOX, Ph. D. ..... Biologist and Botanist.
J. T. ANDERSON, Ph. D. ..... Associate Chemist.
R. S. MACKINTOSH, B. Agr. ..... Horticulturist.

ASSISTANTS.

*C. L. HARE, M. S. ..... First Assistant Chemist.
A. M. RANSOM, M. S. ..... Acting First Assistant Chemist.
THOS. BRAGG, M. S. ..... Second Assistant Chemist.
J. C. PHELPS, M. S. ..... Third Assistant Chemist.
T. U. CULVER ..... Superintendent of Farm.
**R. W. CLARK ..... Assistant Agriculturist.

*On leave. **Resigned Jan. 1st, 1903.

REPORT OF TREASURER.

Treasurer of Alabama Polytechnic Institute, in account with United States Appropriation Hatch Fund, for the year 1901-1902:

RECEIPTS.

To United States Treasury	$15,000 00

DISBURSEMENTS.

By amount paid—		
Salaries	$8,640 00	
Labor	1,445 37	
Publications	1,146 90	
Freight and express	317 11	
Heat, light and water	329 61	
Chemical supplies	451 88	
Seeds, paints and supplies	830 17	
Fertilizers	267 14	
Feeding stuff	322 41	
Library	506 74	
Tools, implements and machinery	392 14	
Scientific apparatus	302 76	
Live stock	15 05	
Furniture and fixtures	17 72	
Contingent	15 00	
		$15,000 00

STATE OF ALABAMA,
Lee County.

Personally appeared before me, Welborn Jones, a Notary Public in and for said county, E. T. Glenn, known to me as Treasurer of the A. P. Institute of Alabama, who being duly sworn, deposes and says that the above and foregoing account is true and correct.

Witness my hand, this 15th day of January, 1903.

[Seal.] WELBORN JONES, N. P.

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.

CHAS. C. THACH,
President A. P. Institute.

REPORT OF THE PRESIDENT AND ACTING DIRECTOR.

GOVERNOR WILLIAM D. JELKS,

Executive Department,

Montgomery, Ala.—

SIR:—According to the act of Congress of 1887 establishing Agricultural Experiment Stations, it is the duty of the Station to submit to you a full and detailed report of its operations, including a statement of receipts and expenditures.

On September 10th Dr. P. H. Mell, the Director of the Station, resigned his position in this institution to accept a call to the Presidency of the Agricultural and Mechanical College of South Carolina, and at a subsequent date at a meeting of the Executive Committee of the Institute, I was elected as Acting Director of the Station, and in this capacity it devolves upon me to make a brief review of the organization and work.

The functions of the Director of this Station are briefly set forth in section 5, of the original articles of organization of the Station adopted by the Board of Trustees in 1888.

"A member of the Board of Direction shall be appointed by the trustees officer in charge; who, in addition to the special duties of the Station to which he may be assigned, shall conduct the general correspondence incidental to the work of the Station."

The lines of work undertaken by the Station are discussed and agreed upon in full meeting of the Council, and their proper execution, and the publication of their final conclusions are left largely in the hands of the men who are experts in their various departments. I beg to say that I have found all members of the Staff energetic and enthusiastic in their investigations of ag-

ricultural problems, and the result of their labors seem in every way commendable.

Correspondence.

Since entering upon the duties of the position I take pleasure in stating that the work of correspondence has been discharged with ease and promptness by referring all letters of inquiry to the different officers in charge of the several Departments that are concerned with the especial field of work in regard to which the inquiries are made. The proper assignment of these letters has been facilitated by the aid of the Assistant to the Director.

It is encouraging to note the vast mass of questions that are directed to this Station from farmers of all sections of the State, indicative of a growing spirit of intelligent investigation. The most detailed inquiries are made daily in regard to soils, crops, methods of culture, diseases of plants, insects injurious to vegetation, dairying and all the phases of work connected with making a livelihood from the soil. It is also agreeable to note the large correspondence from the states of the North and West in regard to the possibilities and profits of fruit growing, truck-raising, cattle raising, etc., in Alabama. Many farmers of that section are turning their faces in this direction, and many are becoming permanent residents of our State. Not a little influence can be, indeed, is executed by this Station in turning the attention of this desirable population to the great agricultural resources of Alabama.

The Station.

The Station as it is now constituted was organized under the provisions of the "Hatch Act" February 24, 1888. The Staff of the Station is now composed of the following officers:—Chemist, veterinarian, agriculturist, biologist and botanist, horticulturist, associate chemist, three assistant chemists, farm superintendent, and assistant argriculturist.

The farm embraces 303 acres and serves the double purpose of experimentation and student instruction. Here are conducted the investigations of the varied problems that confront the farmers of Alabama, and to the solution of these problems are directed the energy and skill of men who have been selected for their proficiency and expert knowledge of the sciences relating to agriculture.

The high order of work done by this valuable and important department has been of vast service to the farmers in Alabama, and has given the Institution a high rank in scientific circles.

INSPECTION OF FERTILIZERS.

The inspection of commercial fertilizers is conducted with the same care and skill that have hitherto characterized the work of the Department of Chemistry. The college has erected for this work a separate brick building, fitted with desks and supplied with gas and water. This inspection work continues throughout the entire year. By means of the guaranteed analysis done by this department, the farmers of Alabama are protected against adulterated and fraudulent fertilizers.

Honest manufacturers are likewise protected from the competition of unscruplous rivals.

On the application of an extensive manufacturer of cotton seed meal in Alabama, a law was passed last year requiring this department to analyze that substance, and within a short while the law was called into use for excluding a spurious brand manufactured in a neighboring state.

No tax is collected on the analysis of cotton seed meal. According to law any mineral, soil, etc., of general value, whose analysis might contribute to the general good, must, at the direction of the Commissioner of Agriculture, be analysed by the State Chemist.

A large amount of work is done in this line for the citizens of the state.

For the work done in this department, the College receives one-sixth of the tax accruing from tax on ferti-

lizers. The other five-sixths are appropriated by the State for other purposes.

The revenue accruing from this source to the College is slightly in excess of the cost of inspection to the College. This surplus is devoted almost exclusively to the College Department of Agriculture, Dairying, Horticulture, Farmers' Institutes, etc.

The Hatch Fund, according to the original Federal law, can not be used to pay for (1) the analysis of fertilizer; (2) for farmers' institutes, nor for any educational work whatsoever. No teaching, even of agriculture, is permitted. The entire fund must be applied to experimentation.

These facts are stated in order that it may be understood that the Department of Agriculture in the College is largely dependent upon the revenue from the tag tax.

BULLETINS.

The Station bulletins, issued since the organization, number 121 and amount to over 4,000 pages of printed matter. They are highly esteemed by both the practical farmer and the scientific expert. The mailing list to which the bulletins are distributed embraces over 10,000 names. Four bulletins of 234 pages have been issued this year. They give the practical results reached by the Station upon such important questions as "The Cowpea," "Dairy Herd Records and Creamery Notes," etc.

It is difficult for the ordinary reader to realize the immense amount of patience, accurate care, and scientific knowledge that is employed in conducting these experiments from day to day and from year to year, in noting and recording the facts, and drawing therefrom broad, trustworthy, practical conclusions for the guidance of the man on the farm.

Special attention may be directed to the reports and recommendations contained in this report from the Agriculturist, Prof. J. F. Duggar, the Veterinarian, Dr. C. A. Cary, and the Chemist, Prof. B. B. Ross.

AGRICULTURE AND CO-OPERATIVE SOIL TESTS.

The lines of investigation conducted by Prof. Duggar in regard to agriculture are manifold and of the highest practical importance. Of especial interest are the following : (1) Testing the relatice value of home raised products, such as cowpeas, corn, meal, and of high priced commercial feed stuffs for dairy and beef-raising purposes. (2) The value of pasturage for cattle at differet stages of development. (3) The amount and nature of different food-stuffs for the greatest yield and the least cost of milk. (4) The renovation of worn out soils. (5) The cost of beef production and the adaptation of different breeds of cattle. (6) The cost of pork production (a bulletin on the subject is now ready). 7) The best forage for Alabama farmers. (8) Testing the fertilizers for cotton and corn culture. These are all questions of vital concern to the farmer, and the proper answers to them will prove of incalculable benefit to the 90 per cent. of our population in this industrial pursuit.

Your attention is directed to the recommendation of Prof. Duggar and Dr. Anderson for more extensive experiments in testing the soils in the different sections of the State thereby determining the fertilizers and methods of culture best adapted to different localities. The plan suggested is entirely possible, and if carried into execution will awaken much interest and stimulate much inquiry among the farmers.

ANIMAL HUSBANDRY OR SROCK RAISING.

In view of the low price of cotton and the high price of meat the farmers of Alabama must necessarily look to other than cotton for a legitimate return for their labors. Today it takes about two pounds of cotton to buy one pound of meat. No country has ever been prosperous that relied upon only one staple crop. This is an axiom of political economy. Our people cannot afford in their farming operations to be producers of only the lowest and crudest forms of agricultural products.

This is not the place to argue this point, but it can never be out of place to assert it, and to emphasize it. The Agriculturist and the Veterinarian both join in applying for an increased appropriation for developing in Alabama the great industries of dairying and cattle raising.

Careful investigation has been made in regard to the value of a Department of Animal Husbandry and your attention is invited to the following statements received from the leading authorities in the United States:

Director W. A. Henry, of Wisconsin, says: "Animal husbandry and dairying are the easy leaders in both our college and Station efforts. This is because our State could not prosper if we were to attempt to sell the raw products of our farms. To sell corn, wheat, oats, barley, hay, etc., and keep little or no live stock would soon ruin Wisconsin farmers and Wisconsin soil. Instead of selling food products (cotton seed, hay, corn, etc.) grown on the farm, the farmers should feed them to live stock (cows, steers, pigs, sheep) and the animals sold,—leaving practically all the fertility on the farms. As a result of feeding all the home raised feed and all we can buy, Wisconsin farms are actually growing richer year by year."

Prof. C. S. Plumb of Ohio University, says, "The live stock interests of Alabama amount to about eight million dollars. A department of Animal Industry at the A. & M. College and Station should be able to teach such lessons as would very greatly add to the valuation of the live stock of the State. Students brought in touch with breeding and feeding experiments and practical stock work should be able to go back to their homes and improve the methods of breeding and feeding animals in their respective localities."

Vice Director Hays of Minnesota University and Station, says, "Animal Industry is of great importance to an agricultural college and experiment station. It should not be omitted in any State. It is the best means for keeping and improving the fertility of the soil."

Vice Director Soule of University of Tennessee says, "I consider a department of Animal Industry more es-

sential to the welfare of an agricultural and mechanical college than any other department. It prepares students for successful breeding and feeding of live stock. It enables the station to conduct investigations along lines that are vitally related to the welfare of the State."

Prof. Lloyd of Mississippi A. & M. College and Station says, "Animal Industry work has attracted more students to the agricultural department than any other feature of the department. Alabama needs such a department and I hope the State will enable you to get it."

SUMMARY.

An Animal Industry Department at Auburn is necessary:

1. Because (a) it will prepare young men for the stock business on the farms; (b) it will test the relative value of home grown feeds in producing meat products and as fertilizers; (c) it will test new feeds and new food plants.
2. It will induce Alabama farmers to raise more and better live stock and thus get a double use of all the feeds produced on the farm and all that are bought.
3. It will more quickly and permanently improve the poorer lands than in any other way. Animal manures add to the soil humus nitrogen, phosphoric acid, and potash, and increase the water holding and water retaining capacity of the soil; they also improve the mechanical condition of the soil.
4. By stimulating the stock industry of the State it will bring about diversity of crops in farming without cutting down cotton production; it will reduce the requirements of the land for commercial fertilizers; it will give the farmer all the meat he needs and some to sell; it will make the farmer more successful and more independent.

THE COST.

Wisconsin spends $30,000 in the work. Illinois spends $21,000 in the work. Prof. Soule says he ought to have

$10,000 annually, but a start might be made with $5,000 a year.

It will require $1,500 or $2,000 to get a good man to head the department.

HORTICULTURE.

On September 10th Mr. C. F. Austin resigned his position as Assistant Horticulturist of the Station to accept a more renumerative position in the A. and M. College of Maryland. At a meeting of the Executive Committee in Montgomery Dec. 9, Prof. R. S. Mackintosh B. Agr. of the University of Minnesota, was elected as Professor of Horticulture and Horticulturist to the Station. Mr. Mackintosh comes highly remommended, and has already made an excellent record. He was raised on the farm, and is acquainted practically with all phases of farm work. He engaged for years in truck gardening. He took an extended course in Agriculture in the University of Minnesota and for ten years has been Assistant Horticulturist of the Station. He has been inspector of nursery stock in Minnesota, has been prominently identified with the State Horticultural Society, lectures in farmers' institutes, and is a successful teacher in college work.

It seems that the field of Horticulture offers excellent opportunities for development and for affording substantial aid to the farming interest of the State in improving the methods of vegetable and fruit raising. These industries have received, in recent years, marked attention in many sections of our State, notably in Calhoun, Shelby, Montgomery, Baldwin and Mobile counties, etc. Numerous inquiries in regard to the problems concerning these industries are received by our experiment Station. This work, I am confident, will be most acceptable to the Agricultural leaders of the State.

Recently the horticulturists of the State have made loud complaint of the importation into Alabama of diseases and insects destructive of orchards and gardens. These men have absolutely no protection against the

importation of the San Jose scale, and all forms of plant pests. Tennessee and Georgia have inspection of nursery stock, and all inferior and diseased stock is dumped into this State, and many farmers are thereby victimized, and many orchards ruined by contagion.

For a small amount paid for travelling expenses, and supplemantary to his salary the College Horticulturist could render valuable aid for the protection of this industry.

FARMERS' INSTITUTES.

The report on this point is encouraging. Necessarily a small number of men can attend the college courses, but on the other hand, the knowledge and experience of the Station can be broad cast through bulletins and farmers' institutes among the great masses of our agricultural people. We need a revival of interest in the farmers themselves concerning experiments and the progress made in this profession, concerning better methods, new lines of work, new labor saving machines, more economical processes, etc., etc. To this end "for diffusing among the people of the State" the latest and best information. No agency is superior to these farmers' institutes. The Director of Farmers's Institutes reports that last year the College held institutes in twenty counties with an average attendance of one hundred and nine farmers, and a total of 2,613.

This work has received liberal aid in Mississippi and a tremendous impetus has been imparted to all agricultural interests.

The College sets aside a fund for this work and it seems that the State should willingly add to its support.

The regrets of the Station are hereby expresed at the loss of Dr. P. H. Mell who for over twenty years was a Professor in this institution, who from its organization was a member of the Station Staff, and since 1898 was Director. Their best wishes follow him in his new field of labor as President and Director of the A. and M. College of South Carolina.

We also regret to record the resignation on January 1st of Mr. A. M. Clark, Assistant Agriculturist.

LIST OF BULLETINS WITH CONTENTS ISSUED BY THE STATION IN 1902. COMPRISING VOL. X.

Four bulletins have been issued by the Station during 1902 as follows:

Bulletin No. 118—*Cowpea Culture.*

Contents.—Summary; time for planting cowpeas; preparation and planting; subsoiling; drilling versus sowing broadcast; varieties; size of seed; yield of seed; yield of hay, and proportion of seed and hulls with different varieties; fertilizer experiment; nitrogen in a fertilizer for cowpeas; forms of phosphate for cowpeas; nutritive value of cowpeas and cowpea vines; cowpeas versus velvet beans, soja beans, and beggar weed as forage; cowpeas in various mixtures for hay; most profitable method of utilizing cowpeas as stock food; methods of harvesting the seed; curing cowpea hay; and composition of the different parts of the cowpea plant.

Bulletin 119.—*Flora of the Metamorphic Region of Alabama.*

Contents.—Basis of list of plants collected by Professors Mell, Underwood, Earle, and Baker; plants identified by Drs. Mohr, Small, Nash, Green and Earle; plants in the herbarium of the Alabama Polytechnic Institute and the herbarium of the University of Alabama; topography of Metamorphic Region; Carolina Life Zone; Gulf region, ecological relations of the flora of this region; hydrophytes; plants living in streams, ponds, marshes, timbered swamp lands, clay swamp lands, damp sandy lands; plants of mesophyte associations, creek and river bottoms, moist northern slopes, sandy uplands; plants of zerophytic associations, dry hard wood forest, plants of mixed woods including long and short leaf pines and hard woods; weeds of 1st cultivated fields, 2nd pastures and road sides, 3rd "turned out" fields, 4th second growth woods and aban-

doned fields; list of the plants of the Metamorphic Region arranged in orders.

Bulletin No. 120.—*The Cowpea and the Velvet Bean as Fertilizers.*

Contents.—Summary; time to plow in cowpea vines; relative fertilizing value of varieties of cowpeas; fertilizing effects as shown by following crops of cotton, sorghum, oats, wheat, rye and corn; fertilizing materials in leaves, stems, and roots of the cowpea; immediate fertilizing effect of stubble versus vines; relative fertilizing values of the cowpea and velvelt bean; what crops are most benefitted by fertilizing with legumes; rotation of crops the first step in soil improvement; duration of the fertilizing effects of stubble or vines of cowpeas and velvet beans; and a rational system of fertilization.

Bulletin No. 121.—*Dairy Herd Records and Creamery Notes.*

Contents.—Yield and cost of butter from each cow in the herd; cost of raising Jersey heifer calves; removing bitter weed taste from cream; flavor of wild onions; separation versus setting of milk; effect of food on quality of butter; preservatives for samples of milk; churning experiments, and summary.

CHAS. C. THACH,
President and Acting Director.

REPORT OF CHEMIST.

PROF. C. C. THACH,

President Alabama Polytechnic Institute.

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

During the first half of the year, as has heretofore been the case, the time of the Chemical Staff of the Station was chiefly occupied with the analysis of official samples of fertilizers, and although the number of brands received for analysis was not so large as during the preceding year, the amount of analytical work performed was quite as large owing to the great number of duplicate analyses made during the past season. The results of these analyses were published in the annual fertilizer bulletin of the State Department of Agriculture, the chemical portion of this bulletin being prepared as usual in this office.

The work of this labortary, in addition to the fertilizer work referred to, has included analysis of soils, marls, phosphate rocks, cave earths, sugar cane, sorghum, forage plants, dairy products, waters, and a number of miscellaneous materials of minor importance.

Work has been continued during the past season along certain lines alluded to in preceding reports, the importance and value of the work being enhanced by reason of the fact that the results of the work of several successive seasons can be utilized in formulating the final report upon the subjects under investigation.

As will be noted by reference to the report of Dr. Anderson, Associate Chemist of the Station, the investigation with regard to the sources of supply of the nitrogen of leguminous plants, which he has been conducting in co-operation with Prof. Duggar, is still in progress and the results will be ready for publication in

bulletin form as soon as the analysis of certain samples already in the laboratory is completed.

A number of years ago this department inaugurated some experiments looking toward the improvement of existing methods of manufacture of syrup from sugar cane, an effort being made at the same time to encourage the development of an industry which, in this State, is capable of expansion to much larger proportions.

Experiments along the same line have been continued during the past season, improved methods being applied to the manufacture of syrup both from sorghum and sugar cane. Owing to the extremely unfavorable conditions which prevailed during the past summer the quality of the material used in these experiments was quite inferior, but the results secured, nevertheless, confirmed the conclusions of several preceding seasons, with regard to the possibility and practicability of producing a commercial article of syrup of purer quality and of greater uniformity in composition and character without any greatly increased expenditure.

Mr. Thomas Bragg, the Second Assistant Chemist, was given leave of absence during the past few months to carry on special work for the United States Department of Agriculture in the investigation of the conditions of the sugar cane and syrup industry in the State of Alabama. He has visited a number of localities, made numerous analyses, inquired into local conditions of cultivation and manufacture, and has secured data and information which will be of great value in conducting further investigations along these lines.

A number of analyses of forage plants grown upon the Experiment Station have been made during the past season, and some work of this character is still in progress in connection with the investigation as to the composition of legumes, before referred to. Work has also been continued this winter in investigating the character and quality of lands produced from hogs fed upon various feeds employed separately and in mixtures.

As has been before noted by Prof. Duggar, the peanut is one of the cheapest and most satisfactory foods for

fattening hogs, but owing to the low melting point of the lard obtained from peanut-fed animals, it is necessary that the peanuts be substituted by some other food during the last period of the fattening process in order that the lard may have the proper consistency and firmness. Laboratory tests have accordingly been carried out with a view to determining or aiding in the determination of, the condition under which these foods can be best utilized for fattening purposes.

The experiments for determining the leaching effects of winter rains upon the nitrogenous constitutents of the soil, to which reference was made in the last annual report, were continued through the remainder of the winter and through the early spring, but the excessive rainfall which characterized this portion of the past year militated strongly against securing results which would obtain under normal conditions, and it is hoped that more satisfactory experiments can be carried out later under more favorable circumstances.

Analyses of marls, phosphate rock, cave earths, etc., made during the past year confirm the conclusions given in previous reports with regard to the occurrence of native deposits of manurial materials in this State. In many cases these deposits can be used to good advantage locally, but the quantity of high grade materials of this character appears, so far as our observations and investigations have extended, too limited to warrant at this time development upon a large scale.

In addition to the work of analysis of the large number of brands of fertilizers sold in this State, this laboratory during the past year has performed the work of in spection of samples of cotton seed meal sold in this State in conformity with the provisions of an Act adopted by the General Assembly of 1900-01

The wisdom of the provision for the analytical inspection of goods of this character is shown in the results of analyses made during the past season, a number of samples being analyzed which were well below the desirable limit as regards certain fertilizing cinstituents, while one sample contained only a little more than one-

half of the nitrogen which should be found in a first-class article. As the commercial value of such a low grade of goods is between $9 and $10 below that of a high grade meal, the importance of selling such goods upon their true merit will at once be seen.

Prof. C. L. Hare, First Assistant Chemist, having secured a leave of absence for a year for the purpose of pursuing a course of advanced study at one of the Universities, it became necessary to make temporary provision for the work of this position, and Mr. A. McB. Ransom, of the class of '98 of this institution, was appointed by the Board to fill the vacancy during the period of Prof. Hare's absence.

Very respectfully,
B. B. ROSS.

REPORT OF ASSOCIATE CHEMIST.

PROF. C. C. THACH,

Alabama Polytechnic Institute.

DEAR SIR:—In compliance with established regulations I have the honor to submit herewith the annual report of the Associate Chemist of the Agricultural Experiment Station for the period ending December 31, 1902.

ANALYSIS OF FERTILIZERS.

The Trustees have made it the duty of the Associate Chemist to assist in the fertilizer analysis, in order that this important work may be done as expeditiously as possible. In the division of this work all determinations of nitrogen fall to the writer.

In 1902, owing to a more systematic and thorough manner of collecting samples adopted by the Commissioner to prevent an unnecessary multiplication of samples and at the same time to establish a more thorough system of inspection, the number of sample received fell somewhat short of the average of previous years. During the later season, however, it was deemed advisable to analyze all samples in duplicate, and in this way the actual number of determinations made was considerably in excess of those of previous years. Considering the improved method of collecting samples, the redoubling of effort to secure thoroughness in the analysis, and the decided improvement in the manner of publishing the results in the bulletin, it is believed that better service has been rendered the public this year than on any previous year.

MISCELLANEOUS ANALYSES.

It is also the duty of the Associate Chemist to assist

in the analysis of miscellaneous samples for the other departments of the Station. In pursuance of this requirement he has made a number of analyses of feeding stuffs, such as pea vines, pea roots, pea leaves, sorghum, etc., and stable manures for the Agriculturist of the Station.

GREEN HOUSE EXPERIMENTS.

For two seasons past the writer, with the co-operation of the Agriculturist, has been conducting a series of experiments in the Station green house with the view of determining practically to what extent the legumes (peas, beans, clover, vetches, etc.,) depend on the soil for their nitrogen and what part of that valuable and costly constituent they may derive from the atmosphere. The plan involves the cultivation of the plants in metal pots in the green house, and at maturity, their collection, weighing and analysis. The analysis of each sample of soil at the beginning and at the end of each season and of samples from each lot of water used for irrigating the plants during the season, will furnish the additional data needed for computing the results. In a few days the results of the two years' experiments will be ready for publication.

SOIL AND FERTILIZER EXPERIMENTS.

A series of experiments in cylinders imbedded in the open ground have been undertaken for the purpose of studying in the one case the Availability of the Plant Food in the Soil and in the other the Availability of the Phosphoric Acid in the Materials used in the manufacture of Commercial Fertilizers. These experiments are still in their preliminary stage, and no analytical work has been done yet.

A RECOMMENDATION.

In this connection the writer would offer a recommendation, if such is admissible in this report. This

department is constantly in receipt of requests from many sections of the State for data in regard to the chemical composition of their soils and to their fertility of these soils as shown by chemical analysis. We can make no satisfactory replies to many of these requests by reason of the inadequacy of the data at hand. To meet this urgent demand this writer has for some time desired to undertake a systematic study of the soils of the State with a view of determining by chemical means their inherent fertility. The immense amount of chemical work involved in this undertaking, together with the inadequacy of the funds at our disposal to meet the necessary expenses, has been hitherto an insuperable barrier in the way. It now occurs to me that, as it is a matter of such universal and direct interest to the farmers of the State, the honorable Legislature might be induced to make the necessary appropriation of funds to defray the expense of the investigations. The work as contemplated by the writer could and should be done in cooperation with Prof. Duggar in his "Co-operative Soil Test Experiments." The following points are deemed worthy of consideration:

(1.) The places selected for the experiments should be judiciously distributed over the State, so as to include, as far as possible, in the study, all the typical soils of the State.

(2.) The plots of ground on which the experiments are conducted should be under the complete temporary control of the Station officers interested, and to this end, the owner of the land should receive a small monetary consideration for the use of his land and for his services in caring for the plots as directed.

(3.) Provision should be made for three or four visits to each locality during the season by one of the Station officers for the purpose of inspecting and of collecting samples of soils and plants for analysis.

(4.) It is advisable that a record of climatic conditions, especially of rainfall, be kept at each place. It is suggested, therefore, that a rain guage (which is inexpensive) be provided for each place. The other climatic conditions could be obtained with reasonable accu-

racy from the nearest Weather Bureau Station. A comparison of the weather conditions under which the several experiments are conducted, is necessary for the proper interpretating of the results. f

(5.) The amount of analytical work entailed by this investigation could not be compassed by the regular laboratory force, without serious detriment to the regular work of the Department. It is recommended, therefore, that provision be made far the employment of a special laboratory assistant at a salary of $1,000 per annum. A cheaper man would hardly meet the demands, as the work required is out of the ordinary.

(6.) The amount necessary to meet the expenses of the above investigations is difficult to estimate but it is believed that $2,000 is the least amount with which they could properly be undertaken.

J. T. ANDERSON,
Associate Chemist.

REPORT OF VETERINARIAN

C. C. THACH,

President Alabama Polytechnic Institute.

DEAR SIR:—The following is a brief statement of the work of the Veterinary Department for the year 1902:

I have issued one press bulletin on "Infectious Cerebritis," and one on "How to Check an Outbreak of Texas Fever."

The study of infectious cerebritis (commonly called blind staggers) has been continued. Observing individual cases, watching and noting clinical symptoms, searching for the cause in the feed, water and the microscopical study of the brain and spinal cord, are the lines along which work has been done. So far we can only suggest means of prevention.

Texas or Tick Fever is the most common disease of cattle in this State. According to known facts, the cause of tick-fever can be transmitted naturally from the infected cattle to the non-immune cattle, only by and through the cattle tick. Eradication of the cattle tick means the disappearance of the fever. The time is coming when Alabama must begin the battle of tick-extermination.

Protective blood and tick inoculators have been advocated and practiced as a means of producing immunity. I have inoculated several herds of cattle (mostly young stock) charging only my travelling expenses to the owners of the cattle. No doubt, immunization, by blood or tick inoculations, must be practiced until the ticks have been completely exterminated.

The disease known as "bighead" (osteo jorasis) in horses and mules has been investigated. The cause and cure have been sought. Neither has yet been found. Yet we have gathered many new facts and shall continue our search for the cause as opportunities present themselves.

Another very common disease of poultry has been studied; it is commonly called "Sore-Head." We have

found a cure for this troublesome disease of poultry and hope to have material to publish covering its cause as well as its cure.

Just now we are pushing some pig feeding tests with cotton seed meal in order to discover a means of avoiding or eliminating toxic effects of the meal, and if possible obtain the toxic principle. We consider this problem one of the most important because of its relation to the production of pork in the South. This work will be continued until we get definite results.

Farmers Institute work for 1902 has been more extensive than in any previous year.

Number of Institutes held	24
Total attendance	2,613
Average attendance	109
No. of counties in which Institutes were held	21

This record shows four more than in 1901. The average attendance for 1902 is more than double that of 1901.

The interest in this work is growing. Face to face talks with farmers are effective; farmers thus take in more of the real practicable part of scientific facts in their bearing upon agriculture than in any other way. It has been our aim to visit every county in Alabama in the course of two years; but at the present rate and with present funds it will require three years.

F. G. Matthews, C. F. Austin, C. L. Hare, B. B. Ross, J. F. Duggar and E. M. Wilcox have all assisted in the Farmers' Institute work.

This department has furnished tuberculin to Montgomery and Birmingham and veterinarians of Alabama upon condition that reports of tuberculin tests be sent to the head of the department.

I have aided both Montgomery and Birmingham in improving their systems of meat and milk inspection. I have also visited various localities of the State to investigate diseases of live stock; this work was done upon request of owners of live stock, the commissioner of Agriculture and in the interest of investigation.

C. A. CARY,
Veterinarian.

REPORT OF THE AGRICULTURIST.

PROF. C. C. THACH,

President Alabama Polytechnic Institute.

I respectfully submit the following report of the past year's work of the Agricultural Department of the Alabama Experiment Station:

The promotion of Mr. R. W. Clark, formerly assistant in Animal Husbandry, to a much more lucrative position in a similar institution in the West, is a decided loss to the agricultural work here, both in the College and in the Experiment Stateion.

During the year ending Jan. 1, 1903, the Agricultural Department published the following bulletins:

No. 118.—Cowpea Culture.

No. 120.—The Cowpea and the Velvet Bean as Fertilizers.

No. 121.—Dairy Herd Records and Creamery Notes.

Three press bulletins have also been published and extensively copied by newspapers throughout the South.

There is also on hand practically ready for the printer a bulletin giving the results of feeding and grazing experiments with hogs. There is on hand a large accumulation of data on a variety of subjects, especially relative to the value of stable manure, corn, wheat, varieties of cotton, sorghum, and a number of forage plants.

An experiment made last winter indicated that vetch hay could be substituted with great profit for an equal weight of wheat bran in the ration of dairy cows. A similar experiment comparing cowpen hay with wheat bran is now in progress.

An experiment comparing corn meal with rice meal was made last winter with grade calves of the beef breeds. A continuation of the experiment with the same animals is now in progress with the object of ascertaining the cost of beef production and comparing shredded corn stover with sorghum hay for beef cattle.

Records have been kept of the growth made by differ-

ent classes of animals during the pasturage season with a view to ascertaining the value of pasturage and the relative profits from grazing cattle of different ages. Records have been kept showing approximately the amount of food consumed by most of the cattle in the herd, showing also the yield of milk and the composition of the milk of each cow.

By the sale of the aged or inferior cows and the substitution of superior cows raised on the station farm, the value of the dairy herd has been considerably increased. A small flock of native sheep has recently been purchased for the purpose of experimenting in the raising of early lambs.

Extensive repairs have been made, as urgently needed, on fences, office building, both residences, dairy, and all of the barns.

The writer has conducted a large correspondence, answering inquiries from farmers on a great variety of agricultural subjects. The Agriculturist and the Assistant in Animal Husbandry have attended and participated in as many Farmers' Institutes as practicable.

In the dairy a satisfactory method has been tested for removing the taste of bitter weed from cream intended for butter making.

In pork production numerous experiments have been made and the results have been most satisfactory in demonstrating that we can produce pork at a low price by substituting for a part of the corn usually fed, peanuts, chufas, the rape plant, vetch pasturage, cowpeas, rice, polish, etc.

The principal experiments conducted during the past year by the Agricultural Department have been as follows:

(1) Renovation of worn soils by the use of leguminous plants. (a) Relative fertilizing values of different legumes, cowpeas, velvet beans, beggar weed, peanuts, vetch, crimson clover, burr clover, and red clover. (b) Relative fertilizing value of stubble of soil-improving crops and of the entire plant.

(2) Forage plants. A study of their relative yields,

food value, adaptability, fertilizer requirements and cultivation. Principal attention to be given to:

Sorghum—(variety, fertilizer and culture tests.)

Vetches—(variety, best mixtures, feeding and culture tests.)

Alfalfa—(fertilizer and culture tests.)

Cowpeas—(variety, fertilizer, feeding, and culture tests.)

Soybeans—(variety tests.)

Small grains—(oats, wheat, rye and barley; relative yields of forage.)

Also smaller number of experiments with crimson and other clovers, rescue grass, cheat, Johnson grass and some other of the best known grasses, velvet beans and beggar weed.

(3) Beef production, including: (a) Cost of feed of all beef animals in the herd; (b) Feeding experiments with yearling steers comparing farm-grown with purchased ration. (c) Growth of native cattle of different ages on pasture (in co-operation with J. P. Slaton, Loachapoka, Alabama.)

(4) Dairy cattle, including feeding experiments: (a) Comparing farm-grown with purchased ration. (b) Substitution of hay of the legumes for wheat bran. (c) Best succession and relative values of rye, vetch, and wheat. (d) Record of food consumed by each cow.

(5) Pork production, including continuation of: (a) Feeding experiments with by-produts of rice, with cowpeas and with usual grain. (b) Effects of food on quality of pork and lard and means of hardening soft pork and lard due to feeding of peanuts. (c) A study of a practicable method of mixing cotton seed meal with the usual foods of the pig. (d) Grazing experiments with peanuts, cowpeas, sorghum, rape and vetch. (e) Relative acre-yields of food made by following hog crops: corn, cowpeas, peanuts, soy beans, sweet potatoes, chufas, and sorghum.

(6) Sheep raising has been recently begun so as to obtain lambs for use in future feeding, shearing and marketing tests.

(7) Dairying, continuation of the work on: (a)

Effect of food on quality of milk and butter. (b) Removal of weedy flavors from cream.

(8) Cotton. (a) Classification, description, and synonomy of varieties (continued since 1899), one aim being to determine what new and high-priced varieties are identical with old varieties, of which the seed is much cheaper. (b) Fertilizer requirements of cotton on a number of soils in different parts of the State, looking to mapping the State with reference to the best fertilizers for the different soil belts. (c) Best system of rotation for cotton.

(9) Wheat and oats, a continuation of fertilizer, variety and culture tests.

(10) Corn, variety, fertilizer and culture tests.

(11) Barnyard manure: (a) Immediate and residual, or remote, fertilizing effects as tested on sorghum, wheat, oats and corn. (b) Amounts produced per animal. (c) Quality as affected by food.

(12) Methods of destroying weeds, especially Johnson grass and bitter weed.

(13) Plant breeding with cotton and cowpeas.

(14) Soils, local experiments in liming and simple tests for acidity with a view to mapping the large areas of acid soils which occur in Alabama.

(15) Rotation experiments (in progress since 1896.)

(16) Proportions of its nitrogen derived by the cowpea from the soil and from the air (in co-operation with the Associate Chemist, Dr. J. T. Anderson, the practical end being to determine whether the cowpea is most useful as a renovator for very poor, poor, or medium soils.

Increased revenue is needed to properly extend that part of our experimental work in agriculture, that is concerned with ascertaining the fertilizer requirements of the different soils of the State, the forage plants best adapted to each, the kind of preparation most profitable for each soil. Increased financial support is equally needed to enable us to properly encourage stock raising in this State. To this end we need funds for the purpose of making our feeding experiments at Auburn on a larger and more convincing scale, to make local feeding and pasturage experiments in several other locali-

ties in the State, using the pasture and hay plants now grown and such new forage plants as our local experiments may show to be best adapted to each region, and to make demonstrations of the profit on live stock by making shipments (in car load lots) in co-operation with individual stock raisers—to the best markets and publishing the financial results.

The United States Department of Agriculture is now making soil surveys in a number of localities in Alabama. To make that work of the maximum practical value to our farmers the Experiment Station should follow it up by local experiments to ascertain the best fertilizers, the best staple crops, and the best forage crops for each type of soil in each area thus surveyed.

The two methods of solving local problems of (1) the making of experiments throughout the State such as this department now conducts on a small scale, or (2) the establishment of permanent sub-stations. For the investigation of local agricultural problems in any locality the States of Illinois and New York place at the disposal of their experiment stations large annual appropriations from the State treasury.

The following states have each established one or more sub-stations under the direction of the Hatch Experiment Station for the study of local agricultural problems: Arkansas, one; California, six; Colorado, one; Kansas, one, Louisiana, two; Michigan, one; Mississippi, one; Minnesota, two; North Dakota, one; Ohio, two; Texas, two; Washington, one.

Respectfully submitted,

J. F. DUGGAR,

Agriculturist.

REPORT OF THE BIOLOGIST AND HORTICULTURIST.

PROF. C. C. THACH,
Auburn, Alabama.

MY DEAR SIR:—I have the honor to submit herewith a report covering the operations of the Departments under my charge during the year 1902-3.

In the Horticultural Department the same lines of investigation have been followed as in previous years. The work on asparagus culture was completed and will soon be ready for publication as one of the bulletins of the Station. Much of the time of Mr. C. F. Austin who acted as my Assistant in charge of Horticulture until October 10, 1902, was of necessity devoted to Farmers' Institute work during the summer and this greatly interfered with the work of the Department. The Institution is to be congratulated on the erection of this work into a new chair and the appointment thereto of a competent person to conduct the work along this line. My thanks are due Mr. Austin for his faithfulness and skill in the management of the work entrusted to him.

The greater portion of my time has been devoted to the investigation of plant diseases and other strictly botanical subjects. Among these the following are worthy of special mention at this time. The study of the oil producing properties of the various sorts of the genus Ricinus, castor oil bean, has been continued and many valuable data have been secured. Over one hundred and fifty sorts were under observation during the past season and seeds from all of these are now on hand for the next year's planting. It remains only to determine by analysis the oil content of the various samples of seeds to have a basis for the work of selection and breeding of more valuable sorts than are now commonly cultivated.

Among the plant diseases that have been under ob-

servation those of various species of legumes have occupied most of my attention on account of the great importance of this class of most plants to the agriculture of the State. It is hoped that sufficient data will be accumulated within a year to enable me to publish a Bulletin on this subject. The related question of the life history of the organisms causing the tubercles, and enabling this class of plants to employ the free nitrogen of the atmosphere, has been taken up and much progress made in determining some of the doubtful pomis regarding their behavior and their culture in artificial culture media.

Data are now being collected for the publication in the near future of a Bulletin upon the common fungous diseases of our fruit trees for the purpose of calling special attention to the available means of preventing and combatting these pests. I am of the opinion that a considerable portion of our proper work is in part educational and on that account the Bulletin just mentioned is being prepared. Our fruit growers must be taught to recognize the common disease and to regard spraying as much of a necessity as any other ordinary operation incident to the cultivation of their crops.

A preliminary study has been made of a heretofore unknown disease of rice and during the coming season the matter will be taken up under field conditions in the hope of securing some means of combatting the trouble on a large scale.

I have given some attention to the forestry interests of our State, and have taken preliminary steps to secure funds to prepare for exhibition at St. Louis in 1904 of a first-class exhibit of our forest resources and as well of our native flora. The last census reports that nearly $2,500,000.00 of forest products were produced by this State during the year 1899 and it is evident that this department must take steps to make an exhaustive study of the forest resources of the State.

In the interests of fruit growing in this State I have taken an active part in the steps now being taken to secure a nursery inspection law for this State. Alabama is now the only Southern State that does not pro-

tect its fruit growers from the importation and widespread distribution in the State of the San Jose Scale and various other insect and fungus pests. The interest of fruit growers and nurserymen has been enlisted in this movement. I shall shortly issue a call to all those interested to meet in Montgomery to organize a State Horticultural Society whose objects shall be the increase and diffusion of knowledge of this subject among the people of the State and for the exchange of personal experience.

Work on the Herbarium has been devoted largely to the care of the large collections now in the Department. I again call attention to the pressing need of better accommodations for this most important portion of the equipment of this Department. A start has been made toward the formation of a logically arranged museum of botanical specimens to serve as illustrations of matters brought out in the various courses in this subject in the College. A mere collection of material arranged in a hit and miss fashion as in a junk shop is of no value, but the value of a properly arranged museum designed to illustrate important facts cannot be overestimated. The Department must needs have more room for the proper display of this collection in the course of time. A prominent feature of such a collection will be the collection of typical specimens illustrating the various diseases of plants cultivated within this State.

The recent removal from my charge of the Department of Horticulture has made possible in the future more extensive and valuable work in the various lines along which botanical science supports and assists general agriculture and horticulture in this State. There is now no reason that this Department should not render important services to the people of the State and to that end your assistance is desired. I desire to offer you my best thanks for contiuous support and for numerous courtesies extended me in the past.

Cordially yours,

E. MEAD WILCOX,

Botanist.