1917

Twenty-Ninth annual report of the agricultural experiment stations of the Louisiana State University and Agricultural and Mechanical College.

W R. Dodson

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TWENTY-NINTH ANNUAL REPORT

OF THE

Agricultural Experiment Stations

OF THE

Louisiana State University and Agricultural
and Mechanical College

FOR 1916

TO THE GOVERNOR

By W. R. DODSON, Director

The Ortlieb Printing House, Inc.,
Baton Rouge, La.
1917
Louisiana State University and A. & M. College

Louisiana State Board of Agriculture and Immigration

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HARRY D. WILSON, Commissioner of Agriculture and Immigration.
THOS. D. BOYD, President State University.
W. R. DODSON, Director Experiment Station.

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A. P. KERR, M. S., Assistant Director, Baton Rouge.
C. E. HESTER, B. S., Assistant Director, Calhoun.
F. C. QUEREAU, M. S., Assistant Director, Crowley.
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H. MORRIS, D. V. M., Bacteriologist and Assistant Veterinarian, Baton Rouge.
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C. C. MORELAND, B. S., Assistant Plant Pathologist, Baton Rouge.
W. R. GRIFFING, B. S., Assistant Plant Pathologist, Baton Rouge.
F. V. EMERSON, Ph. D., in charge of Soil Survey Work, Baton Rouge.
G. L. TIEBOUT, B. S., Horticulturist, Baton Rouge.
J. B. GARRETT, B. S., Entomologist Baton Rouge.
W. L. OWEN, B. S., Bacteriologist, Audubon Park, New Orleans.
M. A. SCHNELLER, Ph. D., Chemist, Audubon Park, New Orleans.
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J. H. JOLLY, B. S., Assistant Chemist, Baton Rouge.
ROBT. G. SCOTT, B. S., Assistant Chemist, Baton Rouge.
I. SELECTER, M. S., Soil Chemist, Baton Rouge.
MISS MAYME DWORAK, M. A., Scientific Assistant in charge of Seed Laboratory, detailed by United States Department of Agriculture, Baton Rouge.

MRS. EDITH STRONG, Secretary to the Director, Baton Rouge.
J. K. McHUGH, Clerk and Stenographer, Audubon Park, New Orleans.
R. P. SWIRE, A. B., Treasurer, Baton Rouge.
C. B. ANDERS, B. S., Assistant Animal Husbandman, Baton Rouge.
R. C. CALLOWAY, R. S., in charge of Dairy, Baton Rouge.
C. J. BARRILLEAUX, Farm Manager, Audubon Park, New Orleans.
J. A. WEDGEWORTH, Mailing Secretary, Baton Rouge.
To His Excellency, Ruffin G. Pleasant,
Governor of Louisiana:

Sir—I am pleased to submit herewith the annual report of the Experiment Stations of the Louisiana State University and Agricultural and Mechanical College for the year 1916. As required by act of the National Congress of March 2, 1887, providing federal aid for experiment stations of the several states, and in accordance with act of March 2, 1906, providing additional federal funds for research work at the experiment stations of the several states, a financial statement is submitted for the year beginning July 1, 1915, and ending June 30, 1916.
FINANCIAL STATEMENT.

The state appropriation for the experiment stations is kept in a separate account from that of the federal funds, as will be shown by the complete financial statement submitted herewith.

HATCH AND ADAMS FUNDS.

Dr.

To receipt from the Treasurer of the United States as per appropriation for fiscal year ending June 30, 1916, under Acts of Congress approved March 2, 1887 (Hatch Fund), and of March 16, 1906 (Adams Fund) $15,000.00

<table>
<thead>
<tr>
<th>Hatch Fund</th>
<th>Adams Fund</th>
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<tr>
<td>By salaries</td>
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<tr>
<td>Building and repairs</td>
<td>511.35</td>
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</table>

$15,000.00 $15,000.00

STATE FUND.
(Dec. 1, 1915, to November 30, 1916.)

Receipts:
Received from State Treasurer $23,458.34
Miscellaneous sales 4,016.97
Refunds 1,290.96
Interest on daily balance 46.74
Deficit, Nov. 30, 1916 3,310.96

$32,123.97
Expenditures:

<table>
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<tbody>
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$32,123.97

FERTILIZER AND FEEDSTUFFS FUND.

Receipts:

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<td>Miscellaneous sales</td>
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<td>Refunds</td>
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<td>Commissioner of Agriculture</td>
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$13,685.24

Expenditures:

<table>
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<td>Livestock</td>
<td>1,234.80</td>
</tr>
<tr>
<td>Building and repairs</td>
<td>1,234.80</td>
</tr>
</tbody>
</table>

$13,685.24
ADMINISTRATION.

There have been no important changes in the personnel of the staff during the past year. For three months during the summer the Assistant Director of the Rice Station was on leave of absence, having been called to service with the National Guards.

I have continued to act as Dean of the College of Agriculture and Director of Agricultural Extension Work, as well as Director of the Stations, and have also served as a member of the committee of three directing officials for the Live Stock Extension Service conducted by the United States Department of Agriculture in co-operation with Louisiana State University.

SHORT COURSES AND AGRICULTURAL FAIRS.

As a result of increased funds for extension work, the extension staff has been increased to an extent that renders it unnecessary for the members of the Station staff to attend short courses and to act as judges for agricultural fairs. This greatly facilitates the work of the stations.

FERTILIZER AND FEEDSTUFFS LABORATORY.

The laboratory has continued to analyze samples of fertilizer and feedstuffs for the State Board of Agriculture and Immigration. The General Assembly of 1916 passed a law to replace previous laws enacted for the control of the sale of feed stuffs and fertilizers. The law states that the Director of Experiment Stations shall be State Chemist, instead of Official Chemist as heretofore. The inspection department was modified so as give greater efficiency in both departments of this work.

In connection with the fertilizer and feed stuffs laboratory, a soil and miscellaneous laboratory has been established and is making good progress in systematizing analytical work on the soil types of the State, as a part of general soil survey.
FIELD WORK.

The field work at the Sugar Experiment Station during the year was largely a continuation of the work carried on during the previous year.

FERTILIZER EXPERIMENTS.

Results from potash in the form of sulphate, when applied to first-year stubble, were in line with those obtained last year from plant cane, and average increase from triplicate experiments being 3.03 tons of cane. This is contradictory to many other experiments in previous years.

Results from a comparative test of newer nitrogenous materials again shows calcium cyanamid to rank third in order. The urgency of combining some of the work done in the last few years into new experiments suggests the necessity of discontinuing this experiment. Calcium nitrate does not yet seem to be on the market as a fertilizer and its use at this station has been discontinued.

The experiment with varying quantities of phosphoric acid, together with a constant ration of nitrogen, was carried on second-year stubble. Five hundred pounds of acid phosphate used with five hundred pounds of tankage gave an increase over two hundred and fifty pounds of acid phosphate and five hundred pounds of tankage, which a little more than paid for the extra amount of plant food. The failure of this experiment to yield tonnage equal to that obtained during the past four years could be explained by a deficit in the nitrogen balance, caused by continuously growing sugar cane on land for three years, though more likely second-year stubble is not thrifty enough to use profitably the large amount of plant food which was added.

VARIETIES AND SEEDLINGS.

Four foreign varieties of sugar cane were received and
added to the collection; two known to produce unusually large tonnage in various countries; one said to be resistant to the cane borer and one resistant to disease. Due to unsuitable greenhouse conditions, no Louisiana seedlings were obtained during the year. The Louisiana seedlings L511 and L231 came up to the high standard expected of them, both at this station and on some of the plantations where they have been placed for trial. Twenty-seven packages of these varieties, together with some L218, L219, L253, and L454, were sent out by request of sugar planters. Requests for shipments to be made in 1917 are already being received and filed.

CORN.

The work of developing a white flint corn was continued. This variety was planted on clover fallow, and though injured by heavy winds, produced as much as sixty-three bushels per acre.

Experiments as to the time of applying fertilizer to corn were temporarily abandoned in order to use the plot for variety tests of sugar cane.

Those so-called prolific varieties of corn that are recommended by the Experiment Stations of other southern states in this latitude were obtained and tested against native Yellow Creole, and it was found that none of them gave superior yields.

All other experiments with corn (Fertilizers) were continued, and no feature not already reported was developed.

FORAGE AND HAY.

Alfalfa was again grown successfully as an annual.

An attempt to increase the value of hay grown on Johnson grass infested lands, by growing clover on them, was made. The one year's work indicates that red clover especially can be successfully grown and two cuttings of clean clover made before the Johnson grass gets headway, but that the earlier growing period allows clover to finish its
growth too early to enable the cutting of a mixed Johnson grass-clover hay.

Observations on the eradication of Johnson grass by kudzu were continued. There seems to be no question but that this plant will completely choke out the grass in a very few years.

FIELD DAY.

The ninth annual field day of the Louisiana Sugar Planters' Association was held on the station grounds on June 8th, with a very large attendance of all classes of men interested in the development of the sugar industry.

ENTOMOLOGICAL WORK.

The Bureau of Entomology of the United States Department of Agriculture maintains an office at Audubon Park for the investigation of sugar cane insects, especially the sugar cane borer. The life history of this insect has been thoroughly studied, the territory in which it occurs has been mapped out, and the damage due to it has been carefully estimated. Various experiments have been conducted both at the Experiment Station and on plantations, relating to improved methods of control. Some of these are very promising and with the accumulation of additional data some new agricultural practices may be recommended. The introduction from Cuba of parasites of the borer was started in 1915 and was discontinued on account of lack of funds, but will again be taken up in 1917. Two men will be sent to Cuba, where they will search for the parasites and send them to the Experiment Station. It is hoped ultimately to distribute them throughout the sugar belt.

Another pest of sugar cane is the mealy bug, which is being studied in a similar way. A lady beetle which attacks this species has been obtained from California and is being reared for distribution to the plantations. The control of the Argentine ant in sugar cane fields is also being studied.
RESEARCH CHEMICAL DEPARTMENT.

In 1915 it had been shown that the dark coloring matter of cane juices is mainly due to iron compounds of
(a) Natural tannin bodies of the cane,
(b) Decomposition products of glucose.

The investigation was continued along this line and the preliminary results published in Bulletin 157, 1916, "The Coloring Matter of Cane Juices." The conclusions therein reached are as follows:

(1) The eyes and tops of sugar cane contain polyphenols which pass into the juice.
(2) Traces of iron are sufficient for the production of a very dark color in such juices.
(3) Reducing agents, such as sulphur dioxide and hydrosulfites are only temporary remedies. The dark color returns on oxidation or cooling of juices and syrups.
(4) The dark shade of plantation white sugars, increasing in storage, is due to traces of phenol iron compound.
(5) A permanently light colored juice may be obtained by:
   (a) Complete elimination of all traces of iron and complete avoidance of contact of liquors with iron during further stages of manufacture.
   (b) Elimination of polyphenols by boneblack, vegetable charcoal, etc.
(6) The polyphenol content of juices could be reduced by topping the cane low, using tops for planting. This would result in a distinct improvement of the color of the juices.

A method of clarification was suggested, based on the principle of iron elimination (5a) by sodium aluminate combined with subsequent working in copper evaporators. A trial given this method in the Station sugar house, which has an all iron equipment, could not produce the intended results. On the contrary, the white sugar produced possessed to a higher degree the fault of plantation white sugars, i. e., darkening in storage, for alkali decomposition products had been formed which, like the natural tannin bodies, produce black iron compounds. This experiment,
therefore, rather demonstrated the necessity of working at distinct acidity, if iron evaporators as usual are used.

We also had the opportunity of seeing demonstrated here one of the clarifying agents mentioned under (5b), a vegetable decolorizing carbon, Norit. This, like a similar preparation, Eponit, possesses to a much higher degree than boneblack the power to absorb the objectionable tannin bodies. The high cost, however, seems to stand in the way of their general use in the sugar house. Their manufacture is a trade secret, and this department is engaged in an investigation on the decolorizing power of carbons.

**Project 2.** The analytical problem of direct sucrose determination in the presence of reducing sugars by destroying the rotary power of the latter by heating with alkali, was continued, and the results thus far obtained published in Bulletin 156 (July, 1916).

Since then a means was found to reduce the objectionable small residual rotation of reducing sugar to 00 by the use of lead alkali solutions. This method yields quite satisfactory results with artificial mixtures of sucrose and invert sugar. In fact, on invert sugar syrups the results are more accurate than those of the Clerget inversion method, which shows an apparent sucrose content where secondary condensation products of fructose are really present. The application of this new modification to sugar house products has not been satisfactory, and this work is to be continued.

**BACTERIOLOGICAL DEPARTMENT.**

WM. L. OWEN.

**Project No. 1.—A Study of the Deterioration of Sugars and of Principal Factors Affecting Same.**

This project has been continued throughout the past year, and as the major project of the department has commanded the greater portion of the bacteriologist's time.

A number of samples of sugars were again collected from plantations throughout the State. These were divided into triplicate portions, two of which were inoculated and
the third kept as a control, and the three samples stored at room temperature and kept under observation for twelve months. Only ten per cent of the inoculated samples showed a greater deterioration than the controls. These results indicate that the original infection of the majority of these samples was sufficient to cause their deterioration when suitable conditions for this action obtained. Sixty-six per cent of the samples were safe for storage according to the factor. Of these apparently safe sugars for storage, one-third deteriorated, which was a much higher percentage than for the previous year. This was most probably due to the fact that small quantities of water were added to all sugars, either as inoculating fluids, or as sterile distilled water in the case of the controls. Of the sugars regarded as unsafe according to the factor, 42 per cent did not deteriorate. Of the sugar samples which were regarded as safe for storage as judged by the factor, and subsequently deteriorated, 84 per cent had absorbed some atmospheric moisture.

Experiments were conducted to determine the relative rate of deterioration of a sugar with varying amounts of absorbed moisture. A sugar was selected and allowed to absorb varying amounts of moisture, giving a series with moisture contents varying from .4 to 2.33 per cent, with factors of safety varying from .177 to .594, respectively. In this series deterioration only occurred in those samples having a factor higher than .250. The deterioration of the samples with a factor of .301 was 1.45 per cent.

In order to determine the relations between the rate of deterioration of a sugar and the density of the films of molasses surrounding its crystals, special experiments were made upon the keeping quality of laboratory-made sugar with molasses films of known composition. A series of sugars were made from standard granulated sugar crystals, and varying proportions of final molasses and a standard granulated sugar syrup. The series of sugars thus obtained had factors of safety varying from .136 to .677 with molasses films varying in density from 69 to 79 Brix. The
deterioration of these samples during three months' storage was 0.7 per cent on the sugar with a factor of .677, 0.6 per cent on the sugar with a factor of .369, and 1.42 per cent on the one with a factor of .472. The unexpectedly small deterioration on the sugar with a factor of .677, which would ordinarily be considered very unsafe, was probably due to the lack of certain impurities usually present in plantation granulated sugar, which was supplied in neither the standard granulated sugar crystals, nor in the water with which the white sugar syrup was made. Experiments upon the influence of cold storage upon the keeping of sugars, showed that the rate of deterioration of samples stored at 200 C, was only 5 per cent as rapid as the same samples stored at 340 C. As the samples in both cases contained over 3 per cent of moisture, the moisture was not the limiting factor in the experiment. These experiments suggest the possible utilization of cold storage for the warehousing of our white sugar in this climate.

Project No. 2.—Study of the Species of Micro-organisms Causing the Deterioration of Sugar.

This project, in conjunction with the preceding one, has constituted the principal investigations of this department during the past year. The work on this project has consisted in the following series of experiments, viz. (1) The relative deteriorative powers of the various species of micro-organism, when acting singly or in mixed cultures; (2) The maximum densities within which these species retain their deteriorative power; (3) The minimum nutrient requirements of the various species of micro-organism occurring in sugars; (4) The acquisition of deteriorative power by the same species as those found in sugars when isolated from sources other than sugars or sugar products, when grown for successive generations in sugar solutions.

Experiments upon the relative deteriorative powers of the eighteen bacterial cultures that had been isolated from sugars, and sugar products, show some cultures to have as much as four times the deteriorative power,
of certain others. Only two of the twenty torula-cultures showed any sucrose inverting power, and this was very slight as compared with the action of the bacterial species.

While the most active inverting torula species only caused a loss of 15 per cent of sucrose in a 50 per cent sucrose solution during a month's incubation, the bacterial culture caused a loss of 40 per cent in the same solution within one-half the time. Mixed inoculations of torula and bacteria invariably resulted in a deterioration greater than that produced by the torula, and much less than where pure cultures of bacteria were introduced alone. No symbiotic relationship between the two is therefore indicated in the results of these experiments.

The maximum limit of density of the bacterial cultures was found to be between 60 and 72 Brix, while no limit has yet been found for the activity of the torula in fermenting invert sugar. Above 65 Brix the action of the torula upon sugar solutions containing both sucrose and invert sugar is exclusively confined to the latter, thus explaining the decrease in invert sugar during the storage of sugars with low factors of safety. The bacterial species associated with the deterioration of sugars have a very low minimum nutrient requirement. Standard granulated sugar and distilled water in a 35 per cent solution, showed a loss of sucrose 2.69 per cent when inoculated with cultures of deteriorative bacteria. Plantation granulated sugar showed a loss of 2.9 per cent under the same condition. The addition of 1cc of a 1:1000 molasses solution to 100 cc of the standard granulated sugar solution gave a deterioration of 2.8 per cent, while the same addition to the plantation granulated resulted in a deterioration of 4.9 per cent. The addition of 1cc of a 1:1000 dirt suspension caused a deterioration of plantation granulated of 8.3 per cent. These experiments emphasize the importance of cleanliness in the manufacture of white sugar of keeping qualities.

Experiments upon the acquisition of deteriorative power
by the same species of bacteria as those found in sugars, but isolated from sources other than sugar or sugar products, showed the following: A culture obtained from the Museum of Natural History, New York City, showed an increase in deteriorative power of about 1100 per cent when grown for successive generations in sugar solution. This would indicate that the most active infection of sugar comes from old sources of contamination in the house, rather than from the dirt immediately introduced into the juice from the soil adhering to the cane.

Project No. 3.—A study of the Persistence of Sugar Deteriorative Micro-organisms throughout the Successive Stages of Sugar Manufacture, with Special Reference to the Source of Infection of Sugars.

This investigation was formerly included as a part of the preceding one, but owing to its continually broadening scope, has recently been made a distinct project. The investigation, which was instituted a year ago, was continued during the operation of the Experiment Station sugar house the past season. Comparative tests were made of the relative effectiveness of the plate and frame filter press, the Sweetland, and the bag filter, in eliminating the micro-organisms from sugar products. Experiments were made upon the retention by unwashed sugars, of the micro-organisms contained in their respective massecuites. In these experiments it was found that on an average 13 per cent of the micro-organisms of the massecuite was retained by the sugar crystals. Washing reduced their number by approximately one-half.

Project No. 4.—A Study of the Micro-organisms Associated with the Various Spontaneous Fermentations which Cane Juice Undergoes.

Owing to the large amount of time which the foregoing projects have demanded this project has received but little attention. Many interesting cultures have been isolated, however, and preliminary experiments made upon their action in pure cultures upon cane juices.
Project No. 5.—A Study of the Causes and Means for Preventing the Fermentation of Cane Table Syrup.

Although this project has been under contemplation for a long time, it has only been recently that it has appeared possible to find the time to give it the attention that its importance warrants. A number of samples have been collected through the courtesy of the Penick & Ford Company, of New Orleans, and it is to be hoped that much progress can be made upon it during the present year. The work of the department has been greatly facilitated by the cordial co-operation of the planters in donating sugar samples. The thanks of the bacteriologist are especially due the management of the Ashland Sugar Factory, from whom we obtained comparatively large quantities of white sugar, and white sugar syrup. Also the management of Reserve and the Wilbert Company for white sugar syrup. Thanks are also due the Penick & Ford Company for donation of syrup samples, and to the American Sugar Refining Company, who kindly donated a large quantity of coarse granulated sugar for our laboratory experiments.

STATION NO. 2, BATON ROUGE.

A. P. KERR, Assistant Director.

The work of this station has been carried on with most of the previously planned projects and the addition of a few new ones where more information along certain field and animal industry work was necessary at this time. To meet the requirements of these additional projects it was necessary to rent one hundred acres of land adjoining the station.

The silage production test has been carried on as previously outlined. Corn and soy beans seem to be our best silage crops. Japanese cane produces a large tonnage, but the quality of silage is not first class and harvesting must be done by hand. This greatly increases the cost of production over that of corn and soy beans.

An effort was also made to determine the value of Jap-
Japanese cane as a grazing crop for steers, the idea being to carry them through the winter for early spring feeding. Although the fall and winter was very cold and wet nearly the entire season, twenty steers were practically maintained on Japanese cane for sixty days.

The production of pork in the four-year rotation—corn and cowpeas, soy beans, sweet potatoes, and stock beets—confirm the results of previous years, as follows: One bushel of corn produces from 12 to 16 pounds of pork, depending a great deal on the crop of peas in the corn. And 2½ to 3 bushels of sweet potatoes are about equal in feeding value to 1 bushel of corn. The beets in this rotation are used entirely as a maintenance ration. The yield of soy beans is so variable it is impossible to draw accurate conclusion as to the amount of pork per acre that can be produced. This crop is a very important one in the rotation, however, as it is ready to graze between the end of the corn and peas and the sweet potatoes. It being a legume also helps to maintain the soil fertility.

CORN EXPERIMENT.

Commercial fertilizer applied at different times to corn seems to show that it makes very little difference whether it is applied before planting or during cultivation.

On the plots where commercial fertilizer has been used alone continuously for the past twenty-two years, the average yield of corn is around 16 bushels per acre. The plots where the same amount of commercial fertilizer is used in connection with a crop of clover and stable manure the yield of corn is 60 to 70 bushels per acre, showing the intelligent way of using commercial fertilizer.

The tests of varieties of corn were carried on the same as usual, using those varieties that were the most popular in the state. This is possibly the only method of eliminating those varieties that are not desirable from the standpoint of production and keeping qualities.

The selection plot of corn has been continued for seed for use at the station.
The two-year rotation with corn, cotton, oats and clover is still in progress. This particular kind of field tests requires the average of a great number of results to be able to draw any conclusion whatever.

HOG CROP.

A new project was inaugurated during the year to determine the effects of different grazing crops, such as corn, soy beans, peanuts, and sweet potatoes, on the bodies of hogs. We expect to publish a preliminary report, giving one year's results, on this project some time during the coming year.

Alfalfa was planted during the fall as heretofore. The problem of getting this crop to remain growing during the summer here is yet unsolved.

Various new crops were tried as usual and those that seem to have any value for this section will be tried again next year.

DEPARTMENT OF ANIMAL PATHOLOGY.

HARRY MORRIS.

The work in the Department of Animal Pathology has been a continuation of the projects which have been under investigation for several years. This includes a study of some of the most serious animal diseases in the state.

ANTHRAX.

Anthrax or charbon is one of the most common diseases of live stock in certain sections of the state. During 1916 the study of the common blood-sucking insects as carriers or disseminators of the disease has been continued. A special study has been made of the time element in which infection could be produced through the biting of flies and mosquitoes; also the carcasses of animals dead of anthrax as a possible source of infection. Special attention was
given the subject of contamination of the fecal matter of insects after having fed upon anthrax blood. A report on this subject will be made in bulletin form.

During the past year there was a marked decrease in the loss from anthrax in this state. Fewer blood samples were examined in this laboratory than in past years. The decrease was due, no doubt, to the more strict observance on the part of farmers of the rules and regulations of the State Live Stock Sanitary Board and the continued use of anthrax vaccines.

COTTON SEED MEAL POISONING.

The study of the problem of cotton seed meal poisoning has been continued. The toxicity of cotton seed meal and its feeding value as compared to other so-called toxic feeds has been studied. The subject will be continued.

DEPARTMENT OF PLANT PATHOLOGY.
C. W. EDGERTON.

There was no change in the nature of the project from the previous year. During the year, however, two of the projects were completed and were discontinued after the results were published. The projects discontinued were the bean disease project, and the cotton boll rot project. The final results were published in Bulletin 155, and in an article of the October number, 1915, of Phytopathology.

The sugar cane disease project received considerable attention throughout the year. Data on the effect of the different diseases organisms on germination of cane are being obtained. The Red Rot fungus (Colletotrichum Falcatum) seems to be very very important in reducing the percentage of germination of the buds of the cane. Tests have been carried on for several years at New Orleans and at Baton Rouge and the results obtained agree quite closely. One more season’s test will be made before results are published. An article published in the Sugar Planter during the year gave some of the results of the investigation.
The tomato wilt project has received more attention than any of the others. The investigation has included a study of the organism, its relation to other wilt organisms, the effect of the environment such as temperature on its development, the variation of pathogenicity of different strains and an attempt to produce wilt resistant strains and hybrids. A new method of selecting for wilt resistance has been worked out, which aids considerably in the work. The seed bed soil is first sterilized by steam and then inoculated with the tomato wilt organism. The wilt organism grows very rapidly under these conditions and young plants which develop in the soil will succumb before they are ready to transplant if they are susceptible to the disease. This method also enables us to test out the susceptibility of the different tomato varieties and also the pathogenicity of the different fungus strains very readily. This method was described in an article in Science, in December, 1915.

The eggplant disease project has also received considerable attention. The life history of the organism and the effect of different environmental factors, such as temperature, have been investigated.

The cotton wilt project has received some attention. The fact that fairly resistant strains can be obtained in a few years' time by careful selection has been demonstrated. The organism causing the disease has also been studied in comparison with the tomato wilt organism.

The projects on alfalfa diseases, Sclerotium wilt disease, and rice diseases were not pushed much during 1915-16. The work was limited to field observations.

WORK AT THE EXPERIMENT STATION DAIRY DURING 1916.

The work at the Experiment Station Dairy has consisted of growing and feeding different forage crops to the dairy cows to obtain results as to the best rotations to grow on the dairy farms of the State. The principal crops grown have been oats, corn, soy beans, sorghum, Japan-
ese cane, turnips, carrots, stock beets and lespedeza hay. Oats and silage have been fed for the purpose of obtaining the comparative values of each for milk production. The results obtained were in favor of the oats, when the weather would permit the cattle to graze on them; however, it has been difficult to find a substitute for silage in the way of a succulent crop, for the reason that the continuous rains in the winter time will not permit the cattle to graze the oats and other forage crops.

After growing and feeding a number of silage crops, we have come to the conclusion that soy beans and corn make the best crops for silage, these two crops when planted together and at the same time, also harvested together, make a most excellent quality of silage.

The root crops grown have given very good results, and the stock beet has been found to be a good milk producer, and is possibly the best root for spring feeding, while the rutabaga is better for feeding during the winter.

During the year five pure-bred Holstein cows were added to the herd, one pure-bred Holstein bull and a Jersey bull, both of exceptional value and backed by cows of high production.

The purpose of keeping the two breeds is to conduct experiments to determine as near as possible which is the best suited to Louisiana conditions.

Twenty pure-bred heifer calves have been raised during the year which will soon add much to the production of the herd. A number of pure-bred bull calves have been raised and sold to Louisiana dairy farmers.

A recent annual test that was made of the herd for tuberculosis found the herd to be free of this disease, and they were also found to be free of any other contagious diseases.

A concrete silo of 130 tons capacity was constructed during the year which will give ample space for storing silage for the milch cows during the fall and winter months. A calf house that will accommodate 30 calves was constructed according to latest methods of building calf...
houses. This house is constructed so that the calves may be separated into groups for the purpose of conducting feeding experiments.

NORTH LOUISIANA STATION, NO. 3, CALHOUN.

C. E. HESTER, Assistant Director.

The work at the North Louisiana Station has been carried entirely on the state fund this year. The tests have been conducted along lines similar to that of previous years. Rotation experiments, variety and fertilizer experiments with crops suited to this section, pork, beef, fruit and silage experiments have all been continued. The experiments along trucking lines have been discontinued. Increased attention has been paid to pork production and to the enlarging of the pasturing facilities for the accommodation of the increasing herd of beef cattle.

RAW ROCK PHOSPHATE VS. ACID PHOSPHATE IN A THREE-YEAR ROTATION.

In this test one-third of the area is devoted to cotton, one-third to corn and cowpeas, one-third to crimson clover followed by velvet beans. The velvet bean vines are turned under in the fall with raw rock phosphate at the rate of 2,700 pounds per acre, thus each plot receives an application of raw rock phosphate every three years. The acid phosphate is applied to the cotton and corn every year at the rate of 300 pounds per acre. The acid phosphate gave a little higher yield of both cotton and corn than the raw rock phosphate.

The cotton thinning test has been continued with results tending to be slightly in favor of the old method of thinning.

The cotton and corn variety tests have been continued with the varieties that have been recommended by the station, leading most of the new ones tried. Of the new varie-
ties that have been tried none of them seem to merit special mention.

The tests of corn fertilizers in different amounts have been continued along the same line as before. The gray sandy loam soils show the most need of nitrogenous fertilizer with the need of phosphorus standing next. The addition of kainit did not give any increase over the check plots.

The cowpea variety test verifies the results of previous years that the best varieties for that section are the Groit, Brabham, Whippoorwill, and New Era.

The sweet potato storage house that has been in operation for the past few years was operated again successfully this year. About 400 bushels of sweet potatoes were stored during the fall of 1915, and were kept in perfect condition until July, 1916, when they were disposed of. In order to compare this method of storing with the old way of banking them in the open, about 200 bushels were used and as usual a large per cent were lost from rot.

ANIMAL PRODUCTION.

The hog grazing experiment was carried out as usual with a three-year rotation of corn and cowpeas, peanuts and sweet potatoes.

The hundred-ton silo was filled with corn and soy beans. This silage was used for carrying cattle over the winter. An effort is being made to determine the cost of carrying cattle through the winter, using the available feed stuffs.

The work of grading up the common cattle with a short-horn bull is getting along with very encouraging results.

HORTICULTURAL WORK.

The Bureau of Plant Industry, United States Department of Agriculture, supplied the station with several varieties of muscadine grapes which were set out in March, 1914. Three of these varieties, the Luola, Memory, and Smith, produced their first crop. They have an excellent
flavor and promise to outclass the varieties now in the vine-
yard.

The work on selecting seedling peaches has been carried
on this season by cutting out those that are no longer
worthy of further propagation.

The apple crop was a complete failure on account of
blight; also all of the pear trees have been destroyed with
blight with the exception of the Wallace Keiffer and what
is known as the Blight-Proof pear.

The magnolia fig continues to be a hardy grower and
a prolific producer, but the apex bears an opening which
causes it to become sour before ripening.

NORTH LOUISIANA AGRICULTURAL SOCIETY.

The North Louisiana Agricultural Society held its
monthly meetings on the grounds of the Experiment Sta-
tion during the year and the Station staff frequently took
part in the programs and assisted in getting speakers for
the gatherings.

The twenty-fourth annual fair of the North Louisiana
Agricultural Society was held upon the grounds of the Ex-
periment Station on October 25, 26, and 27. The various
exhibits were up to their usual standard.

THE RICE EXPERIMENT STATION, CROWLEY.

F. C. QUEREAU, Assistant Director.

Conducted in Co-operation with the Bureau of Plant Industry, United
States Department of Agriculture.

All experiments mentioned in last year's report were
continued in 1916.

FERTILIZER EXPERIMENTS.

These experiments, covering 19 quarter-acre plots, were
continued. In these experiments the same kind and amount
of commercial fertilizer has been applied to the land each
year since 1910, and the plots planted in rice continuously. It is believed that sufficient data has been gathered during the past seven years to warrant discontinuing experiments which involve the continuous use of commercial fertilizer in an attempt to force land to grow rice year after year without rest or crop rotation.

It may be stated briefly that on all plots in which available phosphate was used five profitable crops of rice were grown. The highest yield was 28 barrels per acre. The two last crops were not profitable, the yield being considerably less than the checks. This is due to the heavy growth of water grasses which seem to thrive on land fertilized with acid phosphate. The water crab grass and the barn-yard millet or foxtail grass, as it is sometimes called, seem to make the heaviest growth.

Profitable yields were obtained the first year in the experiments with potash. Since the first year the yield has been but little more than the checks. There are no water grasses in the potash plots or in the checks.

Cotton seed meal or manure seems to be profitable when applied to Honduras rice. The increase in yield is not so marked in the case of Shinriki or Blue Rose,

**ROTATION EXPERIMENTS.**

The rice during this year was very good on all of these experiments, the average yield being 16.5 barrels. The corn yield was very poor. A very good crop of cowpeas was produced. From the results obtained it is believed that the long rotation is better than the two or three and four-year rotation. The longer the rotation the greater the interest on money invested in drainage ditches in the case of high-land crops and in the levees in the case of rice.

**INSECTS AND DISEASES.**

Oil experiments have been continued with the idea of preventing damage from the root maggot or the larvae of the Lissorhopterus Simplex. From the experiments on
the Station and on surrounding farms where oil has been used it is believed that 15 gallons will increase the yield from 25 to 40 per cent. Forty gallons of crude oil have been used on a single acre without injury to the rice. Oil does not injure rice, if the leaves are not resting on the surface of the water. If the land is drained and allowed to become dry fifteen days after the initial irrigation the damage of the maggot is largely prevented.

Continued experiments seem to indicate that if irrigation is delayed or if the land is drained and allowed to become dry during the growing season there is little if any danger of "straight head." Straight head "disease" seems to occur on land containing a large amount of vegetable matter. The cause of straight head is not known.

PIRICULARIA

Or the Rotten Neck disease does not seem to attack the commercial varieties of rice now being grown in Louisiana to any great extent. The principal remedy for this disease seems to be selection of varieties which are known to be largely immune to the disease.

MISCELLANEOUS CROPS.

The following were planted this year: Sorghum and peas for soiling; sudan grass, three varieties of velvet beans, two varieties of soy beans, mungo beans, broom corn, teosinte, two varieties of peanuts, three varieties of sweet corn, pop corn, two varieties of millet, kafir corn, Mexican beans, alfalfa, oats, red clover, alsike, crimson clover, garlic, and sweet potatoes. Following are those deserving special mention:

GREEN MUNGO BEANS.

This bean made a very heavy growth of vine, with the exception of the velvet bean it made the heaviest growth of any legume at the Station. It would not be as difficult to harvest as the cow pea. The yield of seed is very small.
It is believed that it would be cheaper to import the seed from the Islands of China than to attempt to save the seed produced in this country.

**THE BILOXY SOY BEAN.**

This seems to be the best bean that we have yet tested at the Rice Station. It makes a heavy yield of threshed beans on ordinary rice land; the pods do not open readily when the stalk is cut and becomes dry. It is possible to harvest and thresh this variety of soy bean with a very small loss from shelled beans. It makes the heaviest yield of any soy bean that has been grown at the Station.

**VELVET BEANS.**

The Reuter 90-day bean produced the heaviest growth of vine and harvested beans of the three varieties tested this year.

**GARLIC.**

This seems to be a winter crop of promise for rice land. A yield of 2000 pounds per acre was secured this year. It was planted on ordinary rice land, with 200 pounds per acre of equal parts acid phosphate and cotton seed meal.

**CLOVERS.**

The results are very poor. The seed was inoculated with farmogerm and the land limed 2000 pounds per acre. Red clover grew about six inches high. The alfalfa made a very poor growth and at least 50 per cent of the stand was destroyed during the summer.

**JAPANESE CANE.**

This produced a yield of 16.8 tons per acre.

**TEOSINTE.**

Teosinte produced a yield of 26.9 tons per acre.
SORGHUM AND PEAS (FOR SILAGE).

These produced a yield of 12.85 tons per acre.

SUDAN GRASS.

Sudan grass produced three cuttings during the season; yield per cutting was about 2200 pounds per acre.

CORN VARIETY EXPERIMENT.

Sixteen varieties of corn were planted. There were two rows 210 feet long in each variety. The results were very poor. This was due to the stalk borer and bud worm.

OATS.

Oats made the poorest crop ever produced at this Station. This was due largely to rust.

WORK OF THE U. S. B. P. I.

The experiments of this department are largely devoted to variety work in rice and experiments with irrigation of rice, and to experiments with rice diseases. They have fifteen varieties of rice which are of great promise. This year there were over 3000 varieties planted on the Station.

EXPERIMENTS ON RECLAIMED LAND AT FLORENCE, LA.

Ten half-acre plots and ten 0.7-acre plots were laid out on the Alley Farm, at Florence, La. This work was done on reclaimed land in co-operation with the White Lake Land Company. Ten half-acre plots were devoted to fertilizer experiments with corn. Ten 0.7 acre plots were devoted to fertilizer experiments with rice. About two acres were planted to miscellaneous crops, including sixteen varieties of corn.

The results were striking. The unfertilized checks in
the corn experiment made 1.12 bushels per acre; where the phosphate was used the yield was 13 bushels per acre. In both the rice and corn experiments 200 pounds of 16 per cent acid phosphate seemed to produce the best results. Lime does not seem to increase the yield of land of this kind.

HORTICULTURAL DEPARTMENT.

G. L. TIEBOUT.

In the Horticultural Department investigations and demonstrations in the production, shipment and marketing of new truck crops for this section have been continued. Brussels sprouts, winter cauliflower and bell peppers have received special attention.

Brussels sprouts have been successfully produced and marketed, and are being grown by truckers for the first time this season. It has also been found that bell peppers can be cultivated and sold at the North to good advantage, and more extensive plantings among growers are recommended. Preliminary investigations with broccoli are under way.

MECHANICAL ENGINEERING DEPARTMENT.

This department was conducted along lines previously indicated, until October 1, 1916, when Prof. Kerr resigned to accept a position elsewhere. The results of the work on the different projects under this department were published in Bulletins 158, 159, 160.