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Twenty-Fifth 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-FIFTH ANNUAL REPORT

OF THE

AGRICULTURAL
EXPERIMENT STATIONS

OF THE

Louisiana State University and Agricultural and Mechanical College

FOR 1912

TO THE GOVERNOR

By W. R. DODSON, Director
Louisiana State University and  
A. & M. College  

Louisiana State Board of Agriculture  
and Immigration

EX-OFFICIO.

GOVERNOR LUTHER E. HALL, President.
T. JONES CROSS, Vice-President of Board of Supervisors.
E. O. BRUNER, Commissioner of Agriculture and Immigration.
THOMAS D. BOYD, President State University.
W. R. DODSON, Director Experiment Stations.

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W. G. TAGGART, B. S., Assistant Director, Audubon Park, New Orleans.
FRIEND C. QUEREAU, M. S., Assistant Director, Rice Exp. Station, Crowley.
W. E. CROSS, Ph. D., Chemist, Audubon Park, New Orleans.
WM. L. OWEN, B. S., Bacteriologist, Audubon Park, New Orleans.
J. K. McHUGH, Secretary and Stenographer, Audubon Park, New Orleans.
J. E. HALLIGAN, B. S., Chemist, Baton Rouge.
A. P. KERR, M. S., Assistant Chemist, Baton Rouge.
G. D. CAIN, B. S., Assistant Chemist, Baton Rouge.
J. M. JENNINGS, B. S., Assistant Chemist, Baton Rouge.
S. BYALL, B. S., Assistant Chemist, Baton Rouge.
I. SELECTER, B. S., Assistant Chemist, Baton Rouge.
ROGER P. SWIRE, Treasurer, Baton Rouge.
J. B. GARRETT, B. S., Entomologist, Baton Rouge.
E. S. TUCKER, Associate Entomologist, Baton Rouge.
G. L. TIEBOUT, Horticulturist, Baton Rouge.
C. W. EDGERTON, Ph. D., Plant Pathologist, Baton Rouge.
E. W. KERR, M. E., Professor Mechanical Engineering, Baton Rouge.
HARRY MORRIS, D. V. M., Assistant Veterinarian and Bacteriologist, Baton Rouge.
MRS. E. L. STRONG, Secretary and Stenographer, Baton Rouge.
MISS M. FLOWER, Mailing Secretary, Baton Rouge.
A. J. PARENT, Farm Manager, Baton Rouge.
E. J. WATSON, Horticulturist, Calhoun.
MISS C. JACOBS, Scientific Assistant in charge of Seed Laboratory, detailed by U. S. Dept. of Agriculture.
To His Excellency, Luther E. Hall,
Governor of Louisiana:

Sir—In compliance with the provisions of an act of the National Congress of March 2, 1887, commonly known as the Hatch Act, and of March 2, 1906, known as the Adams Act, providing for Federal appropriations for agricultural experiment stations of the several states, I submit herewith a report of work done by the stations during the year 1912 and a financial statement for the government fiscal year, July 1, 1911, to July 1, 1912.

While the receipts and expenditures of the various funds received from the State of Louisiana have been published twice annually, June 1 and December 1, as provided by state law, I have combined these two reports and submit them along with the statement of Federal funds, so as to show the total receipts and expenditures for twelve months. The accounts have been examined and approved quarterly by the Supervisor of Public Accounts.

I have had the research members of the staff submit reports, and I have used these in the preparation of my report, sometimes making material condensation of statement and sometimes quoting verbatim without designating the portion that is the exact language of the party writing the report to the Director.

Very respectfully,

W. R. Dodson,
Director.
The supervision of the Sugar Experiment Station continued under the direction of Mr. S. G. Chiquelin until October 6th, 1912, when he accepted a position as general superintendent of a sugar company in Mexico, at a much greater salary than we could pay. After his departure the duties of Acting Assistant Director were entrusted to Mr. W. G. Taggart.

The field work on sugar cane has been carried on under three distinct parts: (1) Experiments tending to show the merits of different fertilizing materials when used alone and when combined. (2) Testing foreign varieties of sugar canes when grown under Louisiana conditions. (3) Propagating, growing and testing canes from seed.

Many of the old experiments in fertilizers have been discontinued and in their stead a new series of experiments taken up with the view of contrasting the influence of nitrogenous fertilizers. This embraces some new forms of nitrogen now becoming popular that were not available when the old series of experiments were planned. It seems that the results thus far would indicate that though there are substances associated with some of these nitrogenous fertilizers which are poisonous to animal and plant life, the detrimental effect is not apparent when used as a fertilizer; on the contrary, the growth of the cane has seemed to be more vigorous where these fertilizers have been used.

The potash experiments in combination with nitrogen as a fertilizer for cane have now been running through three years. Although our soils are rich in potash, it has seemed to many that a cane harvest makes such a heavy draft on this component of the soil that it might not be available as rapidly as the growing crop would require it for maximum yields. The results so far have not been conclusive, and of necessity the experiments must be continued for a long series of years.
A third plot was a continuation of experiments of many years, nitrogen in form of tankage, and cotton-seed meal was applied with acid phosphate. First, using one part of nitrogen to one part of phosphate, and, second, using one part of nitrogen to two parts of phosphate; and, in addition to this, an experiment was made using calcium cyanamid with acid phosphate in comparison with the other nitrogenous fertilizers. Here again the results of a long series of years must be accumulated before conclusions should be drawn.

FOREIGN VARIETIES OF SUGAR CANE.

We have one hundred and forty-eight varieties of cane which were imported from Demerara, Porto Rico, Trinidad, Japan, China, Mexico, and Java. While some of these are fairly good, none have proved promising enough to justify our planting them in very large acreage.

SEEDLINGS.

We are paying especial attention to the work of propagating Louisiana seedlings, and now have 385 varieties of our own germination in our field. During the year seed were received from the Experiment Station, Mayaguez, Porto Rico; J. R. Bovell, Bridgetown, Barbados; Hawaii Experiment Station, Honolulu, T. H.; F. Evans, Botanical Department, Trinidad; J. B. Harrison, Georgetown, Demerara; S. M. Bowman, Ganahl, Mexico; Estacion Experimental, Santiago de las Vegas, Cuba; Department of Agriculture, Kingston, Jamaica; Experiment Station, Pasoeroean, Java; and from Dr. F. Miles, Fort Myers, Florida.

The seed above mentioned were put out in our propagating rooms. After many of the seed had germinated, and we had a good number of new varieties, disaster overtook us in the form of the April hailstorm which destroyed a majority of the plants. We still have twenty varieties which have been transplanted to our plats, and thirty-eight in the Horticultural Hall. Also, we are working with the seed from Florida, and hope to secure seedlings from seed grown on the American continent. It is very gratifying to know that some of the best varieties are still yielding results which are even a little better than the D. 74.
cane. These varieties have been planted in larger areas, and in the near future we expect to have enough cane from them to draw definite conclusions, and to distribute among our planters.

During the harvest season the station has been called upon to ship cuttings of its best varieties to points in Louisiana, Florida, Texas, Kentucky, Ecuador, and Brazil.

MISCELLANEOUS.

One cane harvester, owned by G. D. Luce, is now on our grounds and will be tested out after January 1, 1913. Two others, owned by C. E. Platt, and Mr. Cockrell, have been tried out on the plantations. They have brought forth some favorable comment.

The regular practical course of the Audubon Sugar School was given in the sugar house and laboratories. A new feature in which much interest was shown was a short course in bacteriology and fermentation, under W. L. Owen. The class consisted of nineteen fourth and fifth year students.

The Federal Bureau of Entomology, in co-operation with the station, has done good work. Mr. T. E. Holloway has been very active in his work on cane insects, and has found parasites combating the ravages of the cane borer. Mr. E. R. Barber has written several pamphlets on the Argentine Ant, Laphygina and X-ray experiments.

The station has continued to grow a series of forage and fibre crops that have been of more or less interest.

The olive trees maintained on the station for quite a good many years have all been destroyed. It seemed that we had sufficient indication that olive growing could not be made a profitable industry on account of the great uncertainty of the trees bearing.

Quite extensive repairs have been made in the sugar house by the aid of a special appropriation made by the Legislature of 1912. Also, we have extended the city water supply to the laboratories and have installed electricity, lighting the sugar house and laboratories from the city plant. These improvements have greatly added to the comfort of the office and laboratory work of the station.
CHEMICAL DEPARTMENT.

The work of the Chemical Department, under Dr. Wm. E. Cross, has shown much progress during the past year. The investigations have been continued in the two main directions previously outlined, viz., clarification of the juice and syrup, and the more accurate analysis of sugar cane and its products. The following is the report of Dr. W. E. Cross:

The investigations along the lines of methods of analysis have been completed, and published in Bulletin 135. The work included research in accurate and practical methods for the analysis of molasses, syrups, etc., and a new method of direct determination of sucrose in presence of reducing sugars. Several other important aspects of sugar house control were worked out, for particulars of which reference should be made to Bulletin 135 referred to above.

The work on clarification and other aspects of the sugar manufacturing process was continued with much success. A modified double carbonatation process, as well as an efficient process of single carbonatation, was perfected as far as possible for Louisiana juices, and it was shown that a very good grade of white sugar could be made by this process. The question of alkaline clarification (liming before sulphuring) was further studied, and it was shown that this method is probably better for green or soured cane, although probably less convenient for Louisiana conditions than the sulphur-lime process ordinarily in use. An important study was also made on the sulphitation and clarification of syrups. This matter is very important to the manufacturer of high-grade consumption sugars and our results on this work promise to be of considerable technical interest.

The question of the occurrence of inversion in sugar house work also came under investigation, the work being planned to show exactly what degree of acidity could be used with safety in sugar manufacture. It is intended to publish a complete report of this work in a short time.

During the year 79 miscellaneous analyses (soils, fertilizers, cane, molasses, etc.,) were made by the department.

The referee work on sugar and molasses for the Association of Official Agricultural Chemists of the United States was again assigned by that body to this station, Dr. Wm. E. Cross being
referee for the third successive year. This work on analytical methods is planned each year by the referee, who secures the co-operation of prominent authorities in different parts of the country in testing out the methods worked upon. This year several new methods which had been worked out by this department (see Bulletin 135) were tested in this way, with gratifying results.

DEPARTMENT OF BACTERIOLOGY.

As designated in the last annual report Mr. W. L. Owen was given a leave of absence from the fall of 1911 to the summer of 1912, during which time he pursued his investigations under the direction of Dr. Koch in Berlin, Germany, returning to the Sugar Experiment Station the first of September, 1912. The following report is rendered by W. L. Owen on his work:

The investigation of the bacterial deterioration of sugars commanded the greater part of the attention of this department during the period embraced by this report. Some attention has been given to problems closely related to the main research project of the department but such work has been of a preliminary character looking to future lines of research. Among the most important of these preliminary researches may be mentioned the investigation of the influence of the addition of various substances upon the fermentation of Louisiana molasses and the causes of gum formation by various cultures of yeasts.

The work on the deterioration of raw sugars has consisted partly in the repetition of certain of our formerly conducted experiments with modified methods of analytical determinations, and partly to a continuation of experiments on the inoculation of raw sugars. The vicrometric method was substituted for the alcoholic precipitation method of gum determination and gave highly satisfactory results. Experiments on the influence of acidity upon the formation of gum by the bacteria of sugars were repeated with the difference that in this case organic acids were employed instead of sulphuric in furnishing the desired acidity of solutions. In these experiments varying percentages of malic, tartaric, acetic, and lactic acids were used, and their relative influences compared. Although the results showed a difference in the reaction of the organisms to the different acids
used, yet the general action of these acids did not differ materially from that of sulphuric in that the gum formation was retarded by acidity and accelerated by neutral or slightly acid solutions.

Much attention has been given to the perfection of some method for the determination of gum in sugars. Of the various methods thus far tried the one that has given most promise is that of dialyzing the sugar to be tested through a colloidal membrane which is permeable for the sugar, but which intercepts the passage of gums. It is believed that perhaps a modification of this method may prove successful in the detection of levan in those sugars in which it occurs to any appreciable extent.

The experimental work upon the influence of invertase on the gum fermentation of sugars has been repeated with pure invertase as the inverting agent instead of yeast cultures as was employed in our former experiments. The results of these experiments show that in the presence of invertase the development of gum by the bacteria is decreased in direct proportion to the amount of inversion of sucrose due to the invertase, which confirms even more conclusively our theory of the direct formation of gum from sucrose.

Much attention has also been devoted to the comparison of various culture media as a means of estimating the bacterial content of raw sugars. Quite a number of culture media of varying compositions were employed and their relative merits compared. It was found that sucrose agar gave better results than peptone agar, both in the aggregate of colonies developing during the incubation period, and in the promptness with which the maximum growth was attained.

The influence of the moisture content of raw sugars on their rate of deterioration has received much attention, a series of experiments having been conducted on the acceleration of the rate of deterioration of sugars by the addition of varying percentages of moisture. The influence of moisture on the development of bacteria in sugars has also been noted.

During the past grinding season at the station two series of investigations were begun, the purpose of which was to establish certain scientific principles that should govern the bacteriological control of sugar houses. One of these investigations was that of
a thorough comparison of various culture media as a means of estimating the bacterial content of the various sugar house products. In these experiments the raw juice, clarified juice, molasses, syrups, massecuite and sugars of three separate runs of the sugar house were collected in sterile containers and plated out upon the following culture media: Sucrose, Peptone, Raw Sugar, Raw Sugar Peptone, Raw Juice, Raw Juice Peptone, Molasses, and Molasses Peptone Agar. The comparative merits of these media for the various products investigated were duly noted.

The other investigation was a comparison of a number of commonly used germicides as regards their efficiency in the elimination of micro-organisms from the sugar house. The germicidal agents under investigation are Milk of Lime, Formaldehyde, Lime and Carbo lic Acid mixture, Bisulphide of Lime, Potassium solution, Ammonium Fluoride, and Sodium Hydrochloride. The products upon which these agents are being used are fermented juices, and molasses. The plan is as follows: The highly infected juice or molasses is placed in wooden containers in which it is allowed to remain for several hours, after which time it is emptied and sterile water poured in. A bacterial count is then made of the number of bacteria in the water, and then one of the germicides is used and another count made after the agent has been allowed to act for the required period. The relative efficiency of the various germicides can in this way be established.

With a view of renewing our supply of sugar samples used in the investigations of this department, letters were sent out to various planters requesting their cooperation in the matter. The number of offers to donate the required material, and the promptness with which the planters responded to our requests was highly gratifying, and the great variety of samples that we have received will prove of great value in our investigations.
Station No. 2, State Station,
Baton Rouge.

The office of the Director is maintained on the campus of the Louisiana State University. All bulletins are issued from this station and the laboratory for the analysis of fertilizers, feed-stuffs and Paris green for the State Board of Agriculture and Immigration is also located here. The work of the several different departments is herein summarized.

FIELD WORK.

The field work, covering experiments in the use of fertilizers, rotation of crops, forage crops, fiber crops, miscellaneous and medicinal plants, has been continued along lines outlined in previous reports.

During the year a number of shipments of ramie stalks were made to two inventors in the East who are working on a ramie deorticating machine. This work has resulted in a request from the Federal Department of Agriculture, Division of Fibre Crop Investigations, that we plant two acres in ramie for 1913 with a view of having a small mill constructed on the grounds here for running tests under the joint supervision of the U. S. Department of Agriculture and the local station. Arrangements are being made to try out this crop on this quantity of land.

The field experiments in grazing hogs have confirmed results previously gotten on the same line, some of the fields practically duplicating results published in Bulletin 124 of this station.

During the year the University purchased sixty acres of land adjoining the Experiment Station grounds on the north, which can be devoted very largely to experimental purposes and will enable the station to take up field experiments that we were previously unable to conduct on account of lack of suitable land.

DAIRY FARM.

The dairy farm of eighty-seven acres, southeast of Baton Rouge, has been further improved.

A public dipping vat was constructed on the farm the past year and several thousand cattle have been dipped there dur-
ing the summer, so that this has been an important factor in helping to diminish the number of cattle ticks in the community. A great many cattle that were driven out from the west side of the river by the overflow water were dipped before they were returned to the west side, so that they went back free of living ticks.

A public dipping vat was also constructed on the grounds of the Experiment Station proper, and about six thousand cattle were dipped there during the summer and fall.

EXPERIMENT STATION DAIRY.

The dairy work has been continued very much along the same lines as indicated by previous reports, under the management of Mr. C. H. Staples. Quite a number of young cows of our own raising are now coming to milk and are showing every evidence that we will soon have quite a number of cows of high producing power that have been raised on the grounds. The herd is now reaching a number that we will have to restrict from further increase by selling off the progeny so as to prevent accumulating more animals than we now have. Results again emphasize the value of silage, root crops and green pasturage for an abundant flow of milk, especially in the winter time.

HORTICULTURAL DEPARTMENT.

Mr. Geo. L. Tiebout has continued to devote his entire time to this department. During the year he has grown commercial quantities of egg plants, peppers, and other perishable spring and summer crops, shipping to the northern and eastern markets, and as a fall crop he has grown something over five acres of cauliflower with very satisfactory results. Part of the work that Mr. Tiebout has in hand is shipping vegetables to the different portions of the country and tabulating data on the carrying quality to distant markets, and relative returns after deducting express and commission charges. The department has given assistance to other departments in their work in helping to provide material for experimental purposes and for carrying out practical demonstrations in the control of plant diseases.
DEPARTMENT OF VETERINARY SCIENCE AND ANIMAL PATHOLOGY.

Dr. W. H. Dalrymple has had a very large part of his time taken up in correspondence in consultations and serving as a member of the Live Stock Sanitary Board, particularly giving attention to the work of eradication of the Texas fever cattle tick. Various other duties have been performed by him. He has been especially successful in organizing branches of the Tick Eradication League and in securing the construction of dipping vats in parishes where the Live Stock Sanitary Board has not actively taken up the work of tick eradication.

Dr. Harry Morris has continued his investigations on anthrax and cotton seed meal poisoning throughout the year. The results of the anthrax work are published in Bulletin No. 136, just now coming from the press. The work on cotton seed meal poisoning, carried on in conjunction with Dr. C. W. Edgerton, will have to be continued for another year, though considerable valuable data has been accumulated.

DEPARTMENT OF PLANT PATHOLOGY.

Dr. C. W. Edgerton renders the following report of his work for the year:

Bean Diseases. The study of the two bean diseases, the blight and the anthracnose, has been continued. These diseases have been under observation for a number of years and their courses of development are quite thoroughly known. The work of the past year has been mostly along the line of prevention. It has been found that the anthracnose can be entirely controlled by the use of home-grown seed, especially seed that is grown in the fall. While we have found no method that will control the blight entirely, we have been able to reduce it to a remarkable extent by seed treatment. Treating the seed before planting with corrosive sublimate or benetol kills the bacteria that are on them and reduces the chances of infection in the field. The results of the work on these diseases are to be published in bulletin form in the early part of 1913. If the recommendations of this bulletin are followed, it is believed that the truckers will have much less trouble with these diseases.

Cotton Boll Rots. The study of the cotton boll rots has continued through the year and the work has been practically
completed, except to further test practical application of information resulting from the investigation. The results of the five years work on these troubles were published as Bulletin No. 136 in December, 1912. Some articles on these troubles were also published in scientific journals during the year.

Sugar Cane Diseases. Much time was given to the study of the sugar cane diseases during the year. The red rot and the stem rot have been carefully studied; the latter disease has not previously been recognized in the state. The stem rot disease, caused by the fungus, *Gnomonia ühiau*, has evidently been confused with the root rot diseases in the past. The fungus has been studied and its life history worked out. The disease is especially severe in the northern part of the state where the farmers bed their seed cane for the winter. The fungus develops in the beds and infects all the cane. Some attention has also been given to the rots of seed cane. Part of the poor germination in the state seems to be due to the action of certain fungus parasites. The work on all of these troubles will be continued during the coming year.

Tomato Wilt or Blight. The tomato wilt is very destructive in parts of the state and an attempt was made to select a variety or strain that is resistant to the disease. We have been able to select a strain from the common Acme tomato that has this characteristic. The plants of this strain often bear until frost, while common plants die just as they begin bearing. The wilt resistant tomato is not as early as desired, however, and an attempt is being made to obtain some hybrids that will not only be wilt resistant but also early. Crosses were made with the Earliana in the spring and seed obtained. Some of these seed were planted in the fall and seed of the first generation obtained. An attempt is being made at present to grow a generation in the greenhouse during the winter. If we are able to mature the seed before planting time, we will have grown three generations in a year. By doing this much time is saved. We shall be able to have plants of the third generation to work with the first year after the crosses were made.

Damping Off Diseases. A study of the fungus Rhizicetonia was commenced several years ago in connection with an alfalfa disease. We have since studied the disease it produces in a number of other plants and will continue to do so.
Besides the diseases mentioned in the above paragraphs, some attention has been paid to the Sclerotium Wilt Disease, the Cotton Wilt, the Eggplant Blight, and also to a general survey of the diseases of the state.

The study of the problem of cotton seed meal poisoning has also been continued during the past year. A portion of the results obtained were published in bulletin form during the year, Louisiana Bulletin No. 134.

Besides the two bulletins mentioned above, the following articles have been published in scientific journals during the year:


ENGINEERING DEPARTMENT.

The work of this department has been continued under the directions of E. W. Kerr, Professor of Mechanical Engineering.

The following is a report of the work done on sugar house investigations during the past year under the Adams Fund. The investigations have been made for the purpose of determining heat transmission in vacuum evaporators and other sugar house heating apparatus. This work has been carried on by means of tests on a specially designed single vacuum evaporator installed in the mechanical laboratory of the University and by tests made upon the evaporating and heating apparatus in the sugar factory of the Adeline Sugar Factory Company, Adeline, Louisiana. This factory has a maximum capacity of 1,500 tons of cane per 24 hours. The tests upon the laboratory apparatus were made in order to study heat transmission as affected by height of boiling, temperature level, air in the heating steam or vapor, density of steam, density of juice or syrup, quality of steam (wet or superheated) dimensions of tubes, downtakes, also entrainment as affected by the rate of boiling, height of boiling, velocity of the vapors leaving the boiling surface, height of vapor space, and length and diameter of tubes. A large number of tests were made upon this apparatus during the months of June, July, and August of the present year, a total of 167 tests. Since that time the data from these tests have been worked up
and embodied in Bulletin 138, which will be finished by the printers within a few days. This bulletin contains in the neighborhood of seventy-five pages of matter and sixteen illustrations.

The tests upon the evaporating and heating apparatus of the Adeline sugar factory were made for purposes similar to those named above for the laboratory apparatus. These investigations included tests upon the vacuum pans, quadruple evaporators, mill juice heaters, clarified juice heaters, syrup heaters, and granulators. In the tests on each of these machines observations sufficient for heat balance determinations were also made. With the data secured in these tests it is expected that deductions can be made regarding the transmission of heat under regular working conditions. In addition to the tests of the evaporating and heating apparatus in this factory, power tests of the engines and pumps of the houses were also made for the purpose of making a complete heat balance of the factory. The data secured from the Adeline factory are now being worked up and a report will be embodied in a bulletin. In this bulletin will be included other data secured in tests upon sugar house machinery in 1911. The tests upon the experimental evaporator in the laboratory were made by the writer assisted by Messrs. A. J. Isacks, A. Guell, and W. P. Denson. The work of preparing Bulletin 138 was done by the writer assisted by A. J. Isacks. The tests at Adeline, which were made during the last grinding season during the months of November and December, were made by the writer, A. J. Isacks, H. A. Nadler, and B. J. Beranger. Mr. Nadler, though an employee of the Guanica Sugar Company, was, through the co-operation of the managers, detailed to assist in the tests without cost to the Experiment Station. Mr. Beranger is a graduate student in the Audubon Sugar School of the University.

I also wish to call attention to the co-operation of the Ohio Blower Company, which loaned a 10" separator used in the laboratory experiments for separating entrained sugar juice from the vapors leaving the evaporator; the Harrison Safety Boiler Works, which loaned an oil separator of its make for the same purpose; the Builders Iron Foundry, which loaned three Venturi meters used in the tests at Adeline; and the Sanborn Evaporator Company, which constructed a calandria of the
type manufactured by them to fit the experimental evaporation plant with which the experiments recorded in Bulletin 138 were made. This latter apparatus, which was quite expensive, will be of great value in further experiments regarding the effect of air and other incondensible gases upon heat transmission. To all of these the station is largely indebted. Further work upon the laboratory apparatus will be carried on during the balance of the year.

The following articles have been published in the *Modern Sugar Planter*:

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<tr>
<td>Bagasse Drying</td>
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<td>Grate Surface for Bagasse Furnaces</td>
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Many of these articles have been reprinted or abstracted by foreign sugar and engineering publications.

**DEPARTMENT OF ENTOMOLOGY.**

January 1st, 1912, Mr. E. S. Tucker was added to our staff to give his entire attention to entomological work, relieving Mr. J. B. Garrett, who was devoting half of his time to this work. Mr. Tucker has devoted his time to a study of insect injury to stored rice. The following is his report of the progress of the year's work:

Satisfactory progress has been made in determining the life history of the principal species of insects injuring stored rice, and practical methods for their control. Results are being prepared for publication. The need for investigations in this line arose from frequent appeals made in former years by the milling companies and warehouse owners dealing in rice at various places in Louisiana, requesting information as to the best means of suppressing insect pests and preventing an extensive loss which they caused every year by attacking stored rice and its by-products. During 1911 and 1912 less rice was stored and complaints of insect damage have been few.
Since the methods and conditions under which rice is stored and milled differ from the handling of other grain, and owing to the distinct nature of rice itself, the usual methods employed for control of insects in ordinary grains were found unsatisfactory in attempting to restrain infestations of insects in rice stored in the mills and warehouses. Although the pests were found to be common grain insects, yet very little was known about their development and habits. On account of the importance of obtaining some practical measures for the control of the pests, action was taken instituting an investigation conducted on the following lines:

(1) A study of the life history, habits, relative abundance, hibernation and parasites of the species infesting both clean and rough rice in storage, and the relation of stored by-products and warehouse sanitation to the increase and abundance of the insects.

(2) The resistance of the species in their different stages to the action of hydrocyanic acid gas, sulphur fumes, carbon bisulphide, heat and cold under known conditions of space, temperature, pressure, time, moisture and dosage.

After visiting mills and warehouses in New Orleans, Donaldsonville, and Crowley, at which places collections of infested rice were obtained, as many as 16 species of insects were found infesting rice and its by-products. A list of their scientific names need not be given here, but it includes 9 species of beetles, 2 species of moths, 3 species of rather obscure forms, and 2 species of mites. Then, in addition some parasites and predators have appeared as enemies of certain pests.

To work out the complete life history of all these species presented quite an undertaking. The first need being a knowledge of the more important kinds, these were accordingly selected for study.

The rice weevil (Calandra oryza) is one of the most prevalent destructive pests, evidently preferring milled rice, either whole or cracked, but it also occurs in unhulled grain. Its methods of attack and development have been carefully studied. Probably the most damage to rough grain is caused by the lesser grain borer (Rhizopertha dominica), whose only visible sign of injury is a small hole which the beetle cuts when it emerges
from a grain. The Angoumois grain moth (*Sitotroga cerealella*) also seems to prefer rough grain in which to breed, and the worm feeds and develops within the grain in a manner similar to the grain borer.

The cadelle (*Tenebroides mauritanicus*) is not believed to injure whole grains, but will live in ground products or in accumulations of dust among bags of rough rice. It has shown a tendency to prey on the real destructive pests and in fact will devour one another. Attempts to breed the rust-red flour beetle (*Tribolium navale*) have failed to show that it does any appreciable injury to whole grains, but it seems to depend upon finding crushed or powered products in which to breed.

Fumigation experiments conducted by Mr. J. B. Garrett were made in special tight chambers, using carbon bisulphide, hydrocyanic acid gas, and fumes of burning sulphur, but the power of penetration of these agents into bags of rice was found insufficient to kill insects buried deeply in the grain. Heating of rice at a temperature of 120° F. killed all insects, but caused the grain to fracture and therefore had to be abandoned.

Placing rice in cold storage through the warm months of the year has been found to be an effective means of protecting stock from insects. Owing to the expense, however, the rice companies store only the choice grades in this manner. General cleanliness around mills and warehouses and the prompt disposal of refuse material have shown their value by lessening the abundance of insects.

Believing that a substantial grade of bagging would serve to protect perfect rice from becoming infested by insects, Mr. Garrett prepared material for a bagging test. The outcome after fourteen months subjection to badly infested stock resulted as follows: In a bag made of fine drilling, the rice was slightly infested and damaged. In a bag made of 8-ounce duck, scarcely an insect or evidence of one could be found among the contents. But the grain kept in a 10-ounce duck bag passed through the test in absolutely perfect condition, which appeared remarkable considering the extreme infestation of grain surrounding this bag as was also the case with the others. These results afford the nearest solution of the problem of checking insect pests, and the simplicity of the method is much in its favor.
Owing to the small amount of stored rice which was carried through the past season, a scarcity of insects naturally resulted. Should the time come when large stocks of rice are held in storage from year to year, then we will likely be called on for advice concerning means of controlling the infestations by insects.

A number of popular and scientific contributions have been submitted for publication during the year. The ones that have appeared under the authorship of Mr. E. S. Tucker are the following:

Value of Entomological Investigation (Farm and Ranch, v. 31, No. 13, March 30, p. 8).

Beware of the Fly (Farm and Ranch, v. 31, No. 16, April 20, pp. 6 and 7).


The following was prepared by Mr. Garrett:


SEED-TESTING LABORATORY.

The Seed Laboratory of the United States Department of Agriculture established a branch laboratory at this station and Mr. J. M. Moss was assigned to duty here. The basis of cooperation was to the effect that the U. S. Department of Agriculture should furnish a trained botanist to make determinations of purity and tests of germination of all farm and garden seeds that might be sent in by the farmers of the state and the states adjacent to Louisiana. This station was to furnish laboratory space, heat, gas and light and such stenographic assistance as was necessary.

Circulars were sent out advertising the establishment of the Seed Testing Laboratory and some farmers sent in seed for purity and germination test, though the laboratory was not utilized to the full extent that we expected it to be. The laboratory was closed during the summer, and on the first of November was reopened, with Miss Cora Jacobs, a graduate of the University of Illinois, in charge. We have been making an effort to get the work before the farmers with the hope that they will avail themselves of the opportunity of having their seeds tested
It is a matter of very great importance, and even should the laboratory not be worked to the full capacity, it will have a most beneficial effect in deterring unscrupulous parties from putting inferior and adulterated seed on the market, from the known possibility of having these seeds tested here and the results published.

LABORATORY FOR FEEDSTUFFS, FERTILIZERS AND PARIS GREEN.

The work of the laboratory for the year 1911-12 has been of about the same volume as for the past few years. The following is the report of Mr. J. E. Halligan: For 1911-12, 2,322 analyses of fertilizers covering 6,989 samples; 2,829 analyses of feedstuffs covering 9,866 samples, and 178 analyses of Paris green covering the same number of samples were made. The above figures show the great amount of work that was performed by this laboratory. We make perhaps more analyses of these commodities than any other laboratory of its kind in this country. Some states have much larger tonnage than Louisiana, but there is a great deal more work done per man, and for less money, in this laboratory than in any other state. Practically all of the time of the chemists is taken up with the performance of the work connected with fertilizers and feedstuffs. Occasionally when we have a little time we make miscellaneous analyses for the farmers. However, the force has very little time for this kind of work.

The laboratory has been used more for the past year as a trade laboratory than ever before; that is, sales of fertilizers, feedstuffs and lime are made with the understanding that our reports will be used as a basis of settlement.

Phosphate rock is being used as a source of phosphoric acid more extensively than for any previous year. The other fertilizing materials are holding their same place in proportionate sales. There were more Paris green shipments than for any of the past five years.

Mr. A. P. Kerr has performed some chemical work in connection with the investigations of cotton seed meal poisoning by the departments of plant and animal pathology. The publications of the laboratory, namely, the Fertilizer and Feedstuffs Bulletins are receiving the usual demand among the trade.
EXHIBITS AT THE STATE FAIR.

The Experiment Stations again made an exhibit of their work at the State Fair at Shreveport. While the previous exhibits have laid stress on field experiments, the exhibits of this year laid stress on the scientific work, particularly on the work being done by those engaged in research work, setting forth the work being carried on in sugar, rice and diseases of plants and animals. It is believed that these exhibits do a great deal of good in attracting attention to what the station is doing to further knowledge of agriculture.

SPECIAL AGRICULTURAL TRAIN.

The Experiment Stations furnished a very large portion of the exhibits for the Demonstration Train that operated over practically all of the railroads of the state from March 4th to May 13th, 1912. The train made more than two hundred stops throughout the state, and we had a total attendance at the lectures and demonstrations of something like 145,000. The attendance would have been considerably larger if it had not been for the excitement incident to the high water that prevailed during the latter portion of the tour. The train carried exhibits of beef cattle, dairy cattle, different breeds of hogs, poultry, farm implements and machinery and general agricultural exhibits. We see many evidences of the good that has been accomplished by the operation of this train. The State Board of Health extended us free of charge the use of their sleeping car, which greatly reduced the expense of operating the train. The Farm Demonstration Agents of the Farmers’ Co-operative Demonstration Work of the United States Department of Agriculture assisted us in nearly every portion of the state. The State Superintendent of Education installed a very instructive school exhibit in a portion of one of the cars and accompanied the train a considerable portion of the time, and at other times had a representative from his office to assist in the lectures and explanations of the exhibits.

All of the railroads took a very active interest in the work and did everything possible to make the tour a success.

FARMERS’ SHORT COURSES.

The members of the station staff took a prominent part in the lectures and demonstrations given at the Short Course at
the University in January, and the Short Course given at Belle-
vue, in Vernon Parish. They have also taken a prominent part
in farmers' meetings throughout the state during the entire year.

Station No. 3, North Louisiana
Experiment Station
Calhoun

Mr. S. E. McClendon was in charge of this station through-
out the year. His resignation was submitted to take effect De-
cember 31st, and Mr. J. B. Garrett, Assistant Director at Baton
Rouge, has been transferred to the Calhoun Station for the year
1913.

Most of the experimental work was a continuation of work
previously outlined.

We have spent considerable money in improvements during
the year. The new residence for the Assistant Director was com-
pleted about the first of February, but we have found the extra
expense of renewing fences, putting in plumbing, completing the
painting, etc., has added quite materially to the cost. During
the year we have almost completely renewed the fences around
the farm, making between four and five miles of new fence, most
of it hog-tight. This was necessary partly from the bad condition
of the old fences and partly to reset the fences to the lines of the
new survey and to include twenty acres of land purchased on
the north side of the station grounds and forty acres purchased on
the east side and twenty acres on the southeast corner. These
purchases have previously been reported, but we did not gain
possession of them until the present year.

Some money was also spent in providing accommodations for
the crowds attending the annual fair.

Mr. E. J. Watson resigned to go into private work, but after-
wards decided to remain with the station, so he has been reas-
signed as horticulturist, and there was an interruption of only
a short period in his work.

The grape crop on the station this year was very
good indeed, confirming results previously secured, and seems
to indicate that the hill land there may be well suited for grape culture. Some of the varieties have poor shipping qualities, but in a small way we tested them out for making grape juice and find that they make a good quantity and an excellent quality, and I believe there is a possible future for the grape juice industry on the hill lands in that portion of the state.

Several hundred of the seedling peach trees bore this year. Most of them, however, were poor quality and will have to be discarded. The work is encouraging, however, in that several of the seedlings are worthy of propagation and may become quite valuable. It will take a number of years to demonstrate their worth.

The hog experiments have given very satisfactory results this year on all of the crops grazed. The results of these experiments will be published at an early date in bulletin form, giving specific data regarding crops and the gains made on each.

NORTH LOUISIANA AGRICULTURAL SOCIETY.

This organization has continued to hold its meetings at the Experiment Station grounds throughout the year, the principal meeting being the annual camp meeting and fair. It is generally considered that the fair of September, 1912, was the best that we have ever had. The season was favorable for the production of miscellaneous crops in that portion of the state, so that excellent material was available, and marked improvement was noticeable in the artistic manner in which nearly all of the displays were arranged.

The premiums for this fair are secured by subscription from the citizens of Ouachita and adjoining parishes and from some of the fertilizer and implement dealers who do business in that territory. The Police Jury also gave an appropriation, as usual, and have heartily supported the work.
Station No. 4, Rice Experiment Station
Crowley

The following is the report of Mr. F. C. Quereau, Assistant Director, who has had charge of the work for the past year:

All of the experiments outlined in the report of 1910 have been continued. The results of three years' experiments have been tabulated and are believed to be of enough importance to be published in bulletin form. During the past two years the station has had considerable correspondence with people of the North who are interested in Louisiana lands and rice culture. There is a growing demand by the rice farmers for information regarding rice fertilizers, rotation of crops, and the eradication of red rice and other weeds. In order to meet this demand for information properly, a bulletin is necessary. We propose to publish a co-operative bulletin with the U. S. Department of Agriculture early in the present year.

COMMERCIAL FERTILIZERS.

We have twenty-seven different plots devoted to the testing of commercial fertilizers. The amounts used vary in price from $1.25 per acre to $12.75 per acre. The three principal elements of plant food, phosphorus, potash and nitrogen, are used alone in different quantities, also in various combinations. We propose to continue these experiments without variation for ten or fifteen years, and by this means gather data which will enable us to answer any question that the rice farmer may ask with reference to any combination of commercial fertilizers or the elements when used alone, also the effect of their continuous use upon the soil without rotation of crops. There are numerous checks on these experiments, among which is the use of stable manure with and without commercial fertilizer. Eight plots are devoted to a test of raw rock phosphate as a source of phosphorous against 16% acid phosphate and Thomas slag meal. The rotation employed in this experiment is rice, corn, and cowpeas.

ROTATION EXPERIMENTS.

We are directing every effort toward the discovery of a profitable crop rotation for rice. The only rotation practiced in
this section is pasturing the land while it is "resting," or allowing it to return to sod. This is not profitable, and is of little value in eradicating red rice or weeds. We have one three-year rotation, which is rice followed by corn and cowpeas with a winter cover crop of oats, followed by cowpeas alone, fallowed during the winter, and planted to rice next spring. Rice is grown on the land once in three years. There are two two-year rotations—corn and cowpeas followed by rice. On one of these rotations a winter cover crop is grown, and on the other rotation the land is fallowed during the winter. All possible vegetable matter is turned under. We have one four-year rotation consisting of rice two years and grass or lespedeza two years.

IRRIGATION EXPERIMENTS.

Three plots are devoted to irrigation experiments with the object of determining the proper amount of water for profitable irrigation. The rotation highland crops are irrigated when it is necessary.

MISCELLANEOUS CROPS.

We have several plots on which we plant any seed which may be desirable as rotation crops on rice land. Sugar cane, soy beans, sorghum, broom corn and sweet potatoes seem to have considerable promise as rotation crops.

CO-OPERATION.

Mr. J. M. Jenkins of the Bureau of Plant Industry of the U. S. Department of Agriculture, has continued the work of rice breeding. He has greatly extended the work in the seed nursery during the past year. A number of new head selections have been made, the selection of promising hybrids has been continued, and some new foreign varieties have been propagated. It may be said with reference to the work of Mr. Jenkins that the red rice with which the land was badly infested prevented any effective work in seed breeding prior to 1911.

Mr. J. L. Webb of the Bureau of Entomology, U. S. Department of Agriculture, carried on during the summer, investigations of the life history of the rice root weevil and other insects. He has made marked progress in this work, which, when completed, will be of great value to the industry.
IMPROVEMENTS.

During the past year we have erected a shop 20'x28', having concrete floor and foundation. A part of this building is used for blacksmith and carpenter shop and a part for the engine and force pump of the water system. The water is pumped into a tank elevated on a 30-foot steel tower. A system of pipes connect the tank with the buildings and grounds, which insures ample water supply for the plantings and for fire protection. A residence which will cost $3,200 is being constructed for the use of the Assistant Director.

The revenues from sale of farm products, seed, etc., for the year amount to $944.71.

NEEDS OF THE STATION.

The station is in need of funds to construct a small rice mill for testing out the character of grain to make our experiments complete. In the study of the influences of fertilizers on rice, the problem is only half solved when we learn the influence of the different elements on the quantity production of grain. There is a large variation in the amount of milled rice secured from a barrel of rough rice, and we have been unable up to the present time to tell how the milling quality is influenced by fertilizers, methods of irrigation and manner of handling the grain. The average rice mill requires a large quantity of rice to make a test for milling quality, but we can have constructed a special mill that will give reliable data, using only a sack of rice or so for each test. Such milling equipment would cost approximately $3,500 to $4,000. It ought to be provided at the earliest possible date. The station should also purchase four acres of land which adjoins it on the east. This land is required for pasture purposes. A soft plug sprinkling system should be installed in the laboratory and in the barn. This would prevent loss by fire and the reduced insurance would soon pay for the installment. Unless protected by a system of this kind the insurance on a laboratory risk is excessive. The insurance premium on the laboratory alone is $90.00 a year. We should be provided with a small pump and engine for drainage experiments. A gas machine is necessary to furnish lights for the station buildings. All buildings are provided with gas pipes.
Changes in Experiment Station Staff.

Mr. S. E. McClendon resigned as Assistant Director, Calhoun Station, January 1, 1913, and was succeeded by Mr. J. B. Garrett.
Mr. F. S. Craig resigned as Secretary to the Director July 1, 1912, and was succeeded by Mrs. Edith Strong.
Mr. R. G. Fuller resigned as Assistant Chemist October 1st, 1912.
Mr. Rene Baus resigned as Assistant Chemist November 15th, 1912, and was succeeded by Mr. I. Selecter.
Mr. W. McClendon resigned as Farm Manager, Baton Rouge Station on December 1st, 1912, and was succeeded by Mr. A. J. Parent.
Mr. S. G. Chiequelin resigned as Assistant Director of Audubon Park Experiment Station on November 1st, 1912, and was succeeded by Mr. W. G. Taggart.
Mr. Victor Jorda resigned as Farm Manager at Audubon Park Experiment Station.
Mr. J. E. Bryan resigned as Farm Manager at the Calhoun Station on November 1st, 1912.

Needs of the Stations.

The work of the Experiment Stations has grown more rapidly during the past few years than the funds have increased for taking care of it.

The Calhoun Station particularly needs better facilities for taking care of both live stock and agricultural exhibits at the annual fair that is held on the station grounds. Also, we are in need of more scientific assistance for carrying on the work of that station. An addition of $2,500.00 per year for operating expenses would enable us to put on another man to further the scientific work for which there is urgent need.

The Sugar Station is in need of additional equipment in the sugar house, and for machinery that would enable us to carry out experiments that we are now unable to give attention to. Sugar house machinery is quite expensive, and the money that we have had available has not allowed us to keep pace with
developments in a way that would make our work most efficient in aiding in the improvement of sugar-house methods. Also, we need additional scientific assistance in carrying on the work there. There is a demand for more work than we can give attention to with the present funds.

The State Station at Baton Rouge is in need both of considerable additional equipment and of assistance in the clerical and scientific force. We are also greatly in need of additional funds for the issuance of publications. Our bulletins are quickly exhausted, and with the present funds we are unable to have reprints made. The growing demand for information regarding the results of experimental work has increased so greatly that the expense of issuing publications has become quite heavy. We have need for quite a number of bulletins that we are unable to issue on account of lack of funds. We ought to have at least $5,000.00 a year in addition to what we now have for printing and for clerical help. During the past year an average of about one thousand personal letters per month were written, and the time of the Director and the available clerical force is so completely taken up with correspondence that they are unable to give the proper attention to study of experimental work, proper filing of reports and compilations for publication.

We also need some new buildings on the Experiment Station farm. We have only one building that was especially constructed for the use to which it is now devoted. The barns and sheds were on the grounds before it was used for experimental work and are by no means representative of what people expect to find on the Experiment Station grounds. No progressive farmer would want to construct the kind of cowsheds or horse-barns that we are using.

Also, we ought to have some specific sum available for demonstration trains, for the preparation of exhibits for advertising purposes and for miscellaneous expenses not provided for under the present plan of operation.
**Financial Statement.**

**RECEIPTS AND DISBURSEMENTS OF ALL FUNDS.**

**HATCH AND ADAMS FUNDS.**

<table>
<thead>
<tr>
<th>Dr.</th>
<th>Hatch Fund</th>
<th>Adams Fund</th>
</tr>
</thead>
<tbody>
<tr>
<td>To receipts from the Treasurer of the United states as per appropriations for fiscal year ending June 30, 1912, under Act of Congress approved March 2, 1887 (Hatch Fund), and of March 16, 1906 (Adams Fund)</td>
<td>$15,000.00</td>
<td>$15,000.00</td>
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By Salaries | $9,249.85 | $12,188.84 |
Labor | 3,610.30 | 564.56 |
Publications | 581.25 | |
Postage and Stationery | 37.10 | 36.63 |
Freight and Express | 1.70 | 102.44 |
Heat, Lights, Water and Power | | 302.09 |
Chemical Supplies | | 203.94 |
Seeds and Sundries | 148.38 | 97.57 |
Fertilizer | 75.75 | |
Feeding Stuffs | 696.20 | 135.47 |
Library | | 110.85 |
Tools, Implements, and Machinery | | 197.99 |
Furniture and Fixtures | | 67.54 |
Scientific Apparatus | 90.40 | 545.75 |
Live Stock | | 89.70 |
Traveling Expenses | 4.07 | 329.14 |
Contingent Expenses | 25.00 | |
Building Expenses and Repairs | 480.00 | 27.49 |

Total | $15,000.00 | $15,000.00 |

**STATE FUND.**

Received from the State Treasurer | $21,416.60 |
Miscellaneous Sales | 4,014.48 |
Payment of Accounts Fertilizer and Feed Stuff | 3,000.00 |
Fidelity Phenix Fire Ins. Co | 281.35 |
Detroit Fire and Marine Ins. Co | 281.35 |
Peoples National Fire Ins. Co | 237.28 |
Deficit Nov. 30, 1912 | 9,514.90 |

Total | $38,745.96 |
### Disbursements—

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<td>Tools, Implements and Machinery</td>
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<td>Furniture and Fixtures</td>
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<td>Live Stock</td>
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<td>Scientific Apparatus</td>
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**Total** ................................................. $38,745.96

### Fertilizer and Feed Stuff Fund.

- Received from the Commissioner of Agriculture .................................. $21,000.00
- Miscellaneous Sales ......................................................... 25.90

**Total** ................................................. $21,025.90

### Disbursements—

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<th>Item</th>
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<td>Deficit Nov. 30, 1911</td>
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<tr>
<td>Cash on Hand</td>
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**Total** ................................................. $21,025.90
AUDUBON SUGAR EXPERIMENT STATION REPAIR FUND.

Receipts—
Received from the State Treasurer.............. $ 3,000.00

Disbursement—
Building and Repairs......................$ 1,588.79
Cash on Hand......................... 1,411.21

Total..................................... 3,000.00

These accounts have been examined and approved by the State Supervisor of Public Accounts. They have been sworn to by me in prescribed form, and I have here given a true and correct copy of reports made to the State Supervisor of Public Accounts.

Respectfully,

W. R. Dodson,
Director.

Publications Issued During 1912

Twenty-fourth Annual Report.
Bulletin 134, Some Studies on Cotton-Seed Meal Poisoning.
Bulletin 136, Carrion Feeders as Disseminators of Anthrax or Charbon.
Report of Analyses of Commercial Feed Stuffs for Season 1911-1912.
Press Circular, Treatment for Worms Injuring Corn.

Every member of the Station Staff who is at the head of a department has written more or less for the agricultural press, giving in a popular way the results of experiments or giving summaries of important information of current interest pertaining to Louisiana crops.