1931

Report of the agricultural experiment stations for the years 1929-1931.

C T. Dowell

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REPORT OF THE AGRICULTURAL
EXPERIMENT STATION FOR
THE YEARS 1929-1931

By
C. T. DOWELL
Director

Fig. 1. A general view of a part of the Agronomy plats.

LOUISIANA STATE UNIVERSITY
and
AGRICULTURAL AND MECHANICAL COLLEGE
AGRICULTURAL EXPERIMENT STATIONS
AGRICULTURAL EXPERIMENT STATION STAFF*

ADMINISTRATION
Carr T. Dowell, Ph. D., Director.
W. G. Taggart, B. S., Assistant Director.
Nathalie Poirrier, Secretary to the Director.
J. K. McHugh, Librarian.

STATE STATION, BATON ROUGE

AGRICULTURAL ENGINEERING
*H. T. Barr, M. S., Assistant Professor of Agricultural Engineering.

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R. L. Thompson, Ph. D., Agricultural Economist.
R. J. Saville, M. S., Associate Agricultural Economist.
G. H. Reuss, M. S., Assistant Agricultural Economist.
T. Lynn Smith, A. M., Assistant Agricultural Economist.

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John P. Gray, M. S., Associate Agronomist.
A. H. Meyer, Ph. D., Associate, Soil Technology.
M. B. Sturgis, M. S., Assistant, Soil Technology.
John R. Cotton, B. S., Assistant in Agronomy.
S. J. Landry, Farm Foreman.

ANIMAL INDUSTRY
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*M. G. Snell, Ph. D., Associate Professor of Animal Industry.

ANIMAL PATHOLOGY
*Harry Morris, D. V. M., Associate Professor of Animal Pathology.

DAIRY HUSBANDRY

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C. L. Stracener, B. S., Assistant in Entomology.

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Douglas Harper, Farm Foreman.

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E. C. Tims, Ph. D., Associate Plant Pathologist.
A. G. Plakidas, Ph. D., Assistant Plant Pathologist.
P. J. Mills, M. S., Assistant in Plant Pathology.
L. H. Person, M. S., Assistant in Plant Pathology.
Don E. Ellis, B. S., Assistant in Plant Pathology.

POULTRY
C. W. Upp, M. S., Associate Poultry Husbandman, In Charge of Poultry Research.

SUGAR ENGINEERING
*William Whipple, S. B., Professor of Steam Engineering.
SUGAR CANE

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C. B. Gouaux, M. S., Associate, Outfield Work.
S. J. Breaux, Jr., B. S., Assistant in Outfield Work.
E. C. Simon, M. S., Assistant.
D. J. DeAreensburg, Farm Foreman.

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J. H. Jolly, B. S., Assistant Chemist.
Jesse L. Farr, M. S., Assistant Chemist.
C. C. Moreland, B. S., Assistant Chemist.
W. P. Denson, B. S., Assistant Chemist.

APICULTURE

Warren Whitcomb, Ph. D., Assistant Apiculturist, Bee Culture Investigations.
Everet Oertel, Ph. D., Assistant Apiculturist, Bee Culture Investigations.

CEREAL INVESTIGATIONS

Hugo Stoneberg, M. S., Specialist in Cereal Investigations, B. P. I.

APICULTURE

C. E. Smith, M. S., Specialist in Truck Crop Insects.
Norman Allen, M. S., Assistant Specialist in Truck Crop Insects.
P. K. Harrison, M. S., Assistant Specialist in Truck Crop Insects.

ENTOMOLOGY

DELTA STATION, ST. JOSEPH

C. B. Haddon, B. S., Superintendent.
Douglas Moore, Assistant.

FRUIT AND TRUCK STATION, HAMMOND

B. Szymoniak, B. S. A., Superintendent.

NORTH LOUISIANA STATION, CALHOUN

Sidney Stewart, B. S., Superintendent.

RICE STATION, CROWLEY

J. Mitchell Jenkins, B. S., Superintendent.

*The members of the station staff who teach are indicated by an asterisk. The words "associate" and "assistant" indicate respectively that the member has the rank of associate and assistant professor. The phrase "assistant in" indicates that the rank is below that of assistant professor. Those who teach are given the same title as that given in the list of the faculty.
REPORT OF THE EXPERIMENT STATION

C. T. Dowell
Director

When the last report from this Station was made, I went into some detail telling the purpose of an Experiment Station and what the policy of the Louisiana Station was. It is not necessary for me to repeat what was said at that time, except that we are trying to develop and maintain a program of investigation which includes major problems of the various agricultural industries of the State.

The results obtained are published in many cases before final conclusions are drawn. Reports on the work are given through the media of newspapers, mimeographed and printed bulletins. This report does not cover the work that is being carried on at the four Substations of the State. The Substations are located at Crowley, Hammond, St. Joseph and Calhoun. The Superintendents of these Stations have made separate reports covering the last two years. These reports will be ready for distribution in the very near future.

NEW BUILDINGS

There has been but a small amount of money spent by the Station during the last two years for the providing of new buildings. We found it to be necessary to erect five or six small buildings for experimental work with poultry. Some new work was undertaken in the curing of sweet potatoes which made it necessary to build a small potato curing house. Our equipment in the way of buildings for research work with sheep was inadequate. To meet this need a feeding shed was built. These small buildings are all that we have added during the two years.
NEW LINE OF WORK

There have been quite a number of new projects undertaken since the last report. The purposes of these projects are stated by the heads of the different departments. It might be mentioned that last year some work was undertaken with citrus fruit in cooperation with County Agent Dethloff in Plaquemines Parish. It is hoped that results will be obtained from this work that will be of benefit to the citrus industry of the State. Work on the fertilization of Irish potatoes was started last year near Alexandria.

Two fellowships have been obtained during this period. One is known as the Potash Fellowship. This fund is used for carrying on work with potash at the Central Station and at a number of places in the State. The other fellowship was given by The Grasselli Chemical Company. The purpose of the work done under this fellowship is to test the insecticidal properties of barium fluosilicate.

AGRICULTURAL ECONOMICS

At the time the last report was made, very little work had been done in the field of agricultural economics. Since that time, Dr. R. L. Thompson of the College of Commerce, has been made Head of the Department of Research in Agricultural Economics. Dr. Gertrude Sunderlin, who was carrying on investigations in home economics until the end of the last fiscal year, resigned. It was decided not to continue work in home economics, but instead to undertake investigations in rural sociology. Mr. Lynn Smith was appointed to undertake this work. He is devoting the major portion of his time to investigations along this line. A small part of his time is devoted to teaching.

CHANGES AND ADDITIONS TO STAFF

When the last report of this Station was made, the Director was also Dean of Agriculture. Dr. Jas. M. Smith, President of the University, decided at the end of the last fiscal year that it would be in the interest of both teaching
and research to have the office of Dean and Director divided. Since the beginning of this fiscal year Professor J. G. Lee, Jr., Head of the Department of Agricultural Education, has been Dean of Agriculture. Since then all of my time has been devoted to the work of the Experiment Station.

I have already mentioned that Dr. R. L. Thompson was made Head of the Department of Agricultural Economics, Dr. Gertrude Sunderlin resigned, and that Mr. Lynn Smith was appointed to begin investigations in rural sociology. The work in rural sociology is a part of the Department of Agricultural Economics.

Beginning with this fiscal year the work of teaching and research in the Departments of Animal Husbandry and Poultry was divided. Dr. C. I. Bray, who had been Head of the Department of Animal Husbandry, is in charge of the research work in Animal Industry and Professor J. B. Francioni is in charge of the teaching. Mr. C. W. Upp, who was Head of the Department of Poultry, is devoting his entire time to research work in that field.

Dr. Herbert Spencer of the Department of Entomology resigned in October, 1930. It was decided not to make a new appointment to succeed him, but to place Mr. B. A. Osterberger, who was already a member of the department, in charge of some of the projects of the department.

**Publications**

It was decided to include a list of publications of the Station as a part of this report. It will be noted that in the list given below are included bulletins, both printed and mimeographed, and articles written by members of the Staff and appearing in scientific journals. No popular publications are included.
8

PRINTED BULLETINS

Bulletin
No.

214 "Damage by the rice water weevil proved negligible", By J. W. Ingram and W. A. Douglas. (8 pages—2,500 copies)—August, 1930.


218 “Tractors and trucks on Louisiana Rice farms, 1929”, (With supplementary data on labor requirements), By R. J. Saville and G. H. Reuss. (39 pages—5,000 copies)—December, 1930.


220 “Home canning of meat under conditions in Louisiana”, By Gertrude Sunderlin. (8 pages—3,000 copies)—January, 1931.

221 “Cotton Price—quality relationships in local markets of Louisiana”, By C. W. Farrington. (55 pages—2,000 copies)—May, 1931.

222 “Soil fertility investigations—Sugar cane district of Louisiana”, By A. M. O’Neal and S. J. Breaux. (45 pages—2,000 copies)—June, 1931.

223 “Studies on Sugar Cane Roots”, By T. C. Ryker and C. W. Edgerton. (37 pages—2,000 copies)—July, 1931.


MIMEOGRAPHED BULLETINS

“A preliminary report of certain variety and fertilizer tests—Conducted by the Agronomy Department”—1930—La. Experiment Station—Agronomy Dept. (55 pages—150 copies.)

“Comparisons of Windrowed and standing cane—Seasons of 1929-30 and 1930-31”, By E. C. Simon. (14 pages—150 copies.)

“Field results at Sugar Station”, By W. C. Taggart. (7 pages—150 copies.)
Bulletin
No.

"Bean Investigations—1930", By Julian C. Miller and W. H. Kimbrough. (14 pages—500 copies.)
"Cabbage Fertilizer Experiments—1931", By Julian C. Miller and W. D. Kimbrough. (9 pages—600 copies.)
"Potato Investigations—1931", By Julian C. Miller and W. D. Kimbrough. (22 pages—800 copies.)

ARTICLES

Agricultural Economics Dept.:  

Agronomy Dept.:  

Animal Industry Dept.:  

Animal Pathology Dept.:  
1 "Santonin as an Anthelmintic for Swine", By Harry Morris and J. A. Martin. Journal of the American Veterinary Medical Association, April, 1931—Vol. LXXIII. N. S. Vol. 31, No. 4. (Page 531.)
Bulletin No.

2 "A study of Intestinal Parasites in Horses and Mules in Louisiana, with Special Reference to the Control of Colic", By Harry Morris. Journal of the American Veterinary Medical Association, January, 1932—Vol. LXXX. N. S. Vol. 33, No. 1. (Pages 11-17.)

Dairy Research Dept.:
1 "Chemical Composition and Yields of Pasture Grass During 1930", By R. H. Lush. Proceedings 32nd Annual Convention Association of Southern Agricultural Workers.

Entomology Dept.:
4 "Results of Trichogramma Colonization on Sugarcane Borer Eggs in 1931", By W. E. Hinds and B. A. Osterberger. (To be published in Journal of Economic Entomology during 1932.)

Horticultural Dept.:

Parasitology Dept.:
1 "Studies on Coccidiosis I—The Effects of Coccidiosis upon the Weights of Chickens Artificially Inoculated During the Seventh Week", By R. L. Mayhew. (In Press—Poultry Science.)
2 "Studies on Coccidiosis II—The Effects upon the Weights of Chickens Artificially Inoculated During the Thirteenth and Fourteenth Weeks", By R. L. Mayhew. (In Press—Poultry Science.)


Plant Pathology Dept.:


5 "The 'June Yellows' of Strawberries', (Abstract), A. G. Plakidas. Phytopathology. (Presented December, 1931.)

6 "Infection Studies with Mycosphaerella fragariae and Diplocarpon earliana", (Abstract), A. G. Plakidas. Phytopathology. (Presented December, 1931.)

Sugar Engineering:

Note:—This list does not include circulars or popular articles.
SOILS AND CROPS

It is the aim in the soils and crops investigations to gather information concerning underlying principles of crop production that is of fundamental importance, and also to gather definite facts in regard to the use of fertilizers, varieties, cultural methods, etc., which may be of direct practical value to the farmers of the State.

The following outline gives a brief reference to most of the projects under way and the more important results.

SOILS WORK
FERTILIZER INVESTIGATIONS

Rate of Aging of Reverted Phosphates—The object of the experiment is to determine whether the soil phosphates fixed through phosphate fertilization become less available with age. In other words, may phosphate fertilizers be used as effectively by applying, say every second year or fourth year, as by applying every year, keeping the total amount of phosphates added to the soil for a given period constant.

As this experiment covers a period of 4 years, no results will be available until the end of the test. Incidentally, laboratory work in connection with this field test indicates that the soluble phosphates added to soils in the general fertilization practices revert immediately to the less soluble forms of soil phosphates. Under proper soil moisture conditions and intimate contact with soil, the reversion to the less soluble soil phosphates is largely completed in 24 hours.

Source of Nitrogen—The source of nitrogen test was started in 1927 and has covered a period of 5 years. The purpose of the experiment is to determine the most economical, efficient nitrogen fertilizer. At present, 30 pounds of nitrogen, 160 pounds of 30% superphosphate, and 100 pounds of muriate of potash are used, and only the source:
of nitrogen is varied. In 1931, the superphosphate was decreased from 600 pounds 16% to 160 pounds 30%, and the potash was increased to 100 pounds.

The average results from a 5 year period indicate in most cases that on an acid soil a physiologically acid fertilizer is not near as effective as a basic nitrogen fertilizer. In the order of their cost efficiency, the nitrogen fertilizers rank in the order given, commencing with the highest, nitrate of soda, 2/3 nitrogen from nitrate of soda and 1/3 from ammonium sulphate; nitrate of soda potash; calcium nitrate, 1/2 nitrogen from nitrate of soda and 1/2 from cotton seed meal; calurea; ammonphos; cyanamid; calnitro; leunasalpeter; urea; and sulphate of ammonia. The tests on calurea and calnitro cover only a period of 2 years.

Newer Sources of Nitrogen—Owing to the addition of several new sources of nitrogen fertilizers on the market, another experiment was started in 1929 to test the newer sources in comparison with the old established form. In this test, ammoniated phosphate, ammonphos 13-48, synthetic nitrate of soda, ammonium nitrate and nitrate of potash are compared with Chilean nitrate of soda as a standard. Thirty pounds of nitrogen with 48 pounds of phosphorus from superphosphate and 100 pounds of potash from muriate of potash were the basic amounts of fertilizer ingredients used in the experiment.

On a profit basis, the average results from 2 years indicate the following rank of the nitrogen materials: nitrate of potash, synthetic nitrate of soda, ammonium nitrate, Chilean nitrate of soda, ammoniated superphosphate, and ammonphos 13-48.

Source of Phosphorus Test—The object of the experiment was to determine the most efficient source of phosphorus for cotton production. The amount and ratio of plant food were kept constant, being 600 pounds of a 5-8-5, and only the source of phosphorus was varied. The nitrogen was furnished as nitrate of soda and the potash as muriate of potash. The results for one year indicate that citratus and superphosphate have about the same
value. The order of efficiency of the others was as follows: Ruhm's lime phosphate, colloidal phosphate, raw rock phosphate, and basic slag.

**Home-Mixed Versus Factory-Mixed and High Analysis Fertilizers**—In 1929 an experiment for studying the efficiency of high analysis, factory-mixed, and home-mixed fertilizers was initiated. The amount and ratio of plant food were kept constant except in Nitrophoska No. 2 where the phosphorus and potash are in variance with the selected amounts, 30 pounds of nitrogen, 60 pounds of phosphorus, and 30 pounds of potash. The materials studied were Nitrophoska No. 1, Nitrophoska No. 2, factory-mixed 5-10-5, and home-mixed 5-10-5. In the home-mixed fertilizer, nitrate of soda, superphosphate, and muriate of potash were used.

The results from 2 years indicate that the Nitrophoska No. 2 gave the largest profit, followed rather closely by home-mixed fertilizer. The Nitrophoska No. 1 showed a smaller profit.

**High Analysis Cotton Fertilizer Test**—The high analysis fertilizer test was started in 1929 in cooperation with the DuPont Ammonia Corporation, Wilmington, Delaware. Owing to the severe potash starvation, no reliable results were obtained in 1929. In 1930, the land in the experimental field was taken over by the State Highway Department for highway experimental purposes after the cotton had been planted. It is planned to continue this work in 1932.

**General Fertilizer Experiments at Main Station, Sub-Stations and Outfield Stations**—The purpose of the general fertilizer tests is to determine the ratio and amount of plant food most profitable for the production of cotton and corn on the major agricultural soils of the State of Louisiana. In all tests, the nitrogen is derived from nitrate of soda, phosphoric acid and from superphosphate, and potash from muriate of potash. The basic fertilizer used is 5-8-4 based on a 600-pound application, except as noted.
The most profitable combinations of the various tests are as follows:

<table>
<thead>
<tr>
<th>Location</th>
<th>Soil Type</th>
<th>Crop</th>
<th>Most Profitable Planting Production Based on 600-lb. Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baton Rouge, La.</td>
<td>Mississippi River alluvial soil</td>
<td>Cotton</td>
<td>7-4-0</td>
</tr>
<tr>
<td>St. Joseph, La.</td>
<td>Mississippi River alluvial soil</td>
<td>Cotton</td>
<td>7-8-2</td>
</tr>
<tr>
<td>Raceland, La.</td>
<td>Mississippi River alluvial soil</td>
<td>Corn</td>
<td>5-0-0</td>
</tr>
<tr>
<td>Thibodaux, La.</td>
<td>Mississippi River alluvial soil</td>
<td>Corn</td>
<td>5-0-4</td>
</tr>
<tr>
<td>Monroe, La.</td>
<td>Coastal Plain alluvial soil</td>
<td>Cotton</td>
<td>7-4-8</td>
</tr>
<tr>
<td>Melrose, La.</td>
<td>Red River alluvial soil</td>
<td>Cotton</td>
<td>7-0-6</td>
</tr>
<tr>
<td>Dixie, La.</td>
<td>Red River alluvial soil</td>
<td>Cotton</td>
<td>5-0-0</td>
</tr>
<tr>
<td>Baton Rouge, La.*</td>
<td>Olivier silt loam</td>
<td>Cotton</td>
<td>6-4-12</td>
</tr>
<tr>
<td>Baton Rouge, La.</td>
<td>Lintonia silt loam</td>
<td>Corn</td>
<td>7-0-0</td>
</tr>
<tr>
<td>Gilbert, La.</td>
<td>Lintonia silt loam</td>
<td>Cotton</td>
<td>6-4-6</td>
</tr>
<tr>
<td>Sunset, La.</td>
<td>Olivier silt loam</td>
<td>Cotton</td>
<td>5-8-8</td>
</tr>
<tr>
<td>Hammond, La.</td>
<td>Caddo very fine sandy loam</td>
<td>Cotton</td>
<td>5-8-8</td>
</tr>
<tr>
<td>DeRidder, La.</td>
<td>Ruston fine sandy loam</td>
<td>Cotton</td>
<td>4-8-8</td>
</tr>
<tr>
<td>Homer, La.</td>
<td>Ruston sandy loam</td>
<td>Cotton</td>
<td>5-4-6</td>
</tr>
<tr>
<td>Calhoun, La.</td>
<td>Ruston sandy loam</td>
<td>Cotton</td>
<td>7-8-8</td>
</tr>
<tr>
<td>Calhoun, La.</td>
<td>Ruston sandy loam</td>
<td>Corn</td>
<td>4-0-0</td>
</tr>
</tbody>
</table>

*Basic fertilizer changed from 5-8-4 to 5-8-8 in 1931.

Place Effects of Fertilizers on Corn—This work was started in 1929 in cooperation with a committee representing the American Society of Agronomy and the National Fertilizer Association. The object of the experiment is to obtain preliminary information on the most desirable depth and placement of fertilizer with reference to seed. It includes a study as to what extent climate and soil enter into the problem.
The local results indicate that the 250-pound application of a 4-10-6 fertilizer gave the highest yield of corn and that it was most efficient when the fertilizer is placed in hill in two parallel bands, 1½” wide, 10” long, 2½” apart, ¾” above seed level, and seed planted midway between bands. The national results have not been published.

*Rate of Potash Fertilization*—A comprehensive study of the rate of potash fertilization is being conducted on the major soil types of the state of Louisiana. This project includes work on time and method of application of potash.

Each test included 6 plats of 4 series. The amount of nitrogen and phosphorus was kept constant and the rate of potash varied from 0 to 8% with 2% intermediate increments. The basic amount of fertilizer used was 600 pounds of a 5-8-0 mixture in all places except Crowley and Lacassine, where a 5-12-0 mixture was used. In the case of the 8% potash a comparison was made between bedding on before planting and side dressing at first cultivation.

Owing to the high fertility of the test field, no significant results were obtained at Calhoun and Mer Rouge.

At Homer, owing to the dry weather, only small gains were obtained from each additional increment of potash. Eight per cent potash gave the highest yield. There was no apparent advantage from side-dressing at first cultivation.

At St. Joseph, the 4% potash gave the highest yield, and the results from side-dressing seem to be somewhat better than from bedding on just before planting.

The test at Baton Rouge showed significant increases in yield of cotton from each increment of potash used. There was no apparent advantage from side-dressing.

At Crowley, the 6% potash gave the highest yield, and again there was no advantage gained from side-dressing.

The largest benefits from potash fertilization were obtained at Lacassine. Even the 8% potash fertilizer did not entirely prevent rust. Owing to the dry weather, side-dressing was not as efficient.
PLACE EFFECT OF FERTILIZERS ON COTTON

Meyer-Barr

In 1930, the Louisiana Experiment Station began to cooperate with the Bureau of Agricultural Engineering and the Bureau of Chemistry and Soils of the United States Department of Agriculture and with a joint committee on Fertilizer Application in a study of mechanical application of fertilizers to cotton. The work is conducted on Lintonia silt loam, Baton Rouge, Louisiana. The object of the experiment is to determine the best depth and placement of fertilizer with reference to the seed. The fertilizer was placed by a mechanical distributor developed by the Bureau of Agricultural Engineering.

Owing to the inclement weather the early part of April, an unsatisfactory expected stand was obtained. However, the results gave certain indication which may be of value with the accumulation of additional data.

CHILEAN NITRATE OF SODA FERTILIZER EXPERIMENTS

Mitchell

The purpose of the nitrate of soda experiments was to determine the most profitable rate, time, and place of applying nitrate of soda to cotton, corn, and oats.

The most profitable rates of applying nitrate of soda for the production of cotton and corn are given in this report under the discussion of fertilizer results at the main station, substations, and outfield work.

Results of tests on the place of applying fertilizer to cotton show that nitrate of soda bedded on two weeks before planting gave the best yields at Delhi and Calhoun. Nitrate of soda bedded on at planting gave the best results at St. Joseph and Natchitoches, while side-dressing at planting gave the best yields on bench land at Baton Rouge. On alluvial soil at Baton Rouge, side-dressing at chopping gave the most desirable results. On Olivier silt loam soil
at Sunset, the highest yield was received when 50 pounds were bedded on at planting and 150 pounds applied as a side-dressing at chopping out.

Results on the time of applying nitrate of soda to corn give the highest yields on the alluvial soil at Baton Rouge, St. Joseph, and Belcher when bedded on at planting. On Lintonia silt loam soil at Baton Rouge and Delhi, the best yields were received from the side-dressing when corn was knee high. The side-dressing of corn when waist high were the most profitable at Natchitoches, while at Sunset the application of the side-dressing when corn was bunching to tassel gave better yields. However, in the latter two cases very little rainfall was received and in no treatment was fertilizer profitable due to the extreme drought and consequent low yields.

Experiments show the most profitable rates to apply nitrate of soda to oats to be: 100 pounds at St. Joseph and Baton Rouge (bench soil); 200 pounds at Delhi, Calhoun, Natchitoches, and Baton Rouge (alluvial soil). At Sunset, the 400-pound application gave the best yield. These oats were pastured. This probably affected results.

The time of application of nitrate of soda to oats test shows the early application of February 1 to give the best yield at St. Joseph, the February 15 application to give the best results at Baton Rouge (alluvial soil), the March 1 application to give the best results at Delhi and Baton Rouge (bench soil), and the March 15 application to give the best results at Natchitoches, Calhoun, and Sunset.

**SOILING CROPS**

*Winter Cover Crops*—Realizing the great economic importance of green manuring in enhancing the fertility of the soils in Louisiana, work along this line was started in 1928 by Dr. H. B. Brown on the main station and by Mr. C. B. Haddon of the Delta Experiment station, St. Joseph, Louisiana. In 1929, similar work was started by Mr. Sidney Stewart, North Louisiana Experiment Station, Calhoun, Louisiana.
The purpose of this work is to study the degree of soil improvement that can be obtained by turning under green manure crops. At Calhoun, the project was enlarged and made to include a study of lime and fertilizers for winter cover crops.

At the main station, Baton Rouge, Louisiana, oats, rye, Melilotus indica, vetch and Austrian winter peas were the cover crops turned under. A limed plat of Melilotus indica, a check and a plat with a treatment of 240 pounds of nitrate of soda were included. All plats had a basic application of 600 pounds of a 0-8-5 fertilizer bedded on in spring at time of turning under the cover crop.

The cover crops, save a fair stand of oats and rye, were a failure in 1929. In 1930, there was a heavy spring growth of all cover crops except of Melilotus indica on the unlimed plat. The heaviest yield was obtained from the Melilotus indica on the limed plat, being 12.9 tons of green matter.

Cotton was used as the experimental crop. From the rye and oats cover crop plats, an increase in yield of 113 pounds and 106 pounds, respectively, of seed cotton was obtained. The Melilotus indica limed plat gave an increase of 752 pounds of seed cotton; the Melilotus indica unlimed plat 538 pounds; the Austrian winter pea 704 pounds; the hairy vetch 839 pounds; and the nitrate of soda plat 443 pounds. The results of the study indicate that nitrate of soda is a more effective nitrogen fertilizer than rye and oats, but not nearly as effective as the accepted standard leguminous cover crops. The yield of the no cover crop was 1459 pounds.

At the Delta Experiment Station, no fertilizer was used except 150 pounds of nitrate of soda on one plat for comparison. Rye depressed the yield, but all leguminous cover crops with good stands gave an increase ranging from 647 to 1407 pounds increase of seed cotton over check of 1144 pounds. The increase from 150 pounds of nitrate of soda was only 363 pounds of seed cotton. Vetch
gave the best account of itself in the test. The depression of rye on the yield of cotton was considerably less in 1931 than in 1930.

The basic fertilizer used at Calhoun was 600 pounds of a 0-8-5 fertilizer. Comparative studies of the value of applying fertilizer in fall just prior to the planting of the cover crop instead of prior to the cotton crop were made. The effects of lime and potash on the yield of the cover crop and cotton crop were observed.

As only one year's results are available, the 1931 results should not be taken as final. Fertilizer applied to the cover crop gave in every case a larger tonnage of green matter than where no fertilizer was added; though in spite of this fact the yield of cotton was higher where the fertilizer was applied just prior to the cotton. Lime increased the yield of the cover crop and the succeeding cotton crop over the unlimed plat. Potash applied in fall increased the yield of the cover crop, and the yield of cotton on that plat over that where the potash was applied in spring.

From the standpoint of nitrogen efficiency in the production of cotton, the cover crops on the limed plats were superior to that of 240 pounds of nitrate of soda. There was no significant difference between hairy vetch and Austrian winter peas, though a slightly higher yield, 32 pounds of seed cotton, was obtained from the former plat.

Effect of Date of Turning Under Soybeans on Yield of Corn—The object of the experiment was to ascertain the best time to turn under a crop of soybeans and corn planted together in rows. October 1st, December 1st, and March 1st were the dates tried. Corn was used as the measure crop.

There were no differences of yield of corn obtained as a result of the time of year of turning under the cover crop. There was a high rate of nitrification on all plats in the fall and during warm weather in the early winter. Later in the season, there was practically no nitrification on any plats which condition prevailed until about June
1st, and there actually appeared a condition of nitrogen starvation as evidenced by the appearance of the corn crop. The field and laboratory results indicate that a light application of nitrogen is necessary even though a cover crop as mentioned has been turned under. Indications also were that the later plowing was preferable from the standpoint of getting rid of winter weeds. Incidentally the test also showed that in the dry seasons, of 1929 and 1930, the planting of soybeans in the same rows with corn, reduced the yield of corn 71.1 and 56.8% respectively.

SOIL BACTERIOLOGY

The Effects of Additions of Nitrogen on the Decomposition of Sugar Cane Trash Under Field Conditions—Although legumes are being effectively employed in the maintenance of soil nitrogen in the cane belt the relatively high removal of nitrogen from the soil under the conditions that prevail in the growing of sugar cane makes desirable the use of all field residues of the crops for the support of the highest state of soil fertility. Sugar cane trash is material of a wide nitrogen-carbon ratio but due to the fact that a large yield per acre is produced a very appreciable amount of nitrogen can be returned to the soil directly through its use. Practical difficulties are met with in the utilization of sugar cane trash, for it is tough and bulky and commonly has to be plowed into the soil at that season of the year which is least conducive to rapid decomposition. The purpose of this experimental work has been to determine the conditions under which sugar cane trash can be used in conserving the soil nitrogen and organic matter without the lack of available nitrogen for crop growth ensuing from the excessive stimulation of soil micro-organisms.

The trash was applied to the soil, Sharkey silty clay loam, at the rate of 12 tons of moist field trash per acre and varying amounts of ammonium sulphate were added
with it. The rates of decomposition were studied and the effects of the various treatments on the available and total nitrogen in the soil determined.

Trash that was chopped and mixed with the surface soil on March 10 caused a marked lowering of the nitrate nitrogen in the soil. The depressive effect lasted for three months. While trash that was applied in the same manner on October 27 had decomposed sufficiently by the following April to have ceased to lower the available soil nitrogen, both ammonia and nitrate. By the addition of inorganic nitrogen with the trash at the rate of five pounds of nitrogen per ton of fresh trash and the incorporation of the mixture within the surface five inches of soil, the rate of decomposition was increased and the presence of available nitrogen insured. Since nitrate nitrogen disappears from the surface soil during winter and spring, an early application of the trash alone with the supplemental nitrogen being added directly ahead of the crop would prove the more practical method for the use of sugar cane trash. Application of the trash to the soil increased the soil nitrogen and organic matter. The gain in soil nitrogen from the use of the trash was, within the limit of experimental error, equivalent to the nitrogen content of the trash. The addition of nitrogen with the trash increased the yield of corn 19 per cent where the trash and fertilizer were put into furrows and completely covered but controlled results indicated that much higher results could be expected from an intimate mixture of the materials with the surface soil.

The resultant decomposition following from the application of the trash increased the availability of phosphorus during the earlier stages of decomposition.

A method for the determination of the carbohydrate material of the soil as reducing sugars was improved for this study and the disappearance of the carbohydrate fraction was found to serve well as a measure of the rate of decomposition of cane trash in the soil under field conditions.
The lignin fraction of cane trash undergoes slow decomposition and tends to accumulate in the soil when the trash is buried but when the trash is turned into the surface soil, there is no excessive accumulation from the lignin. True lignin of the plant material gradually changes to lignin-humus material in the soil. Lignin-humus decomposes much more rapidly in summer than in winter and spring.

**CROPS WORK**

**COTTON INVESTIGATIONS**

As mentioned in our previous report, much attention is being given to cotton breeding work looking toward the development of more satisfactory varieties for different sections of the State. Numerous individual plant selections and crosses are made and the new strains thus produced are tested in progeny rows, new strains tests, variety tests, etc. Rather extensive breeding work has been carried on at Baton Rouge on both Bench and Alluvial Land, at the St. Joseph Branch Experiment Station in cooperation with Mr. Haddon, and at the North Louisiana Branch Experiment Station in cooperation with Mr. Stewart. The best of our new strains and other prominent varieties have been further tested at nine Outfield Stations located in various parts of the State. Our strains have ranked high in these tests. In 1931 the leader and three of the five ranking varieties were our productions.

Delfos strains continue to give good returns in the Delta regions of northeast Louisiana and on all other alluvial land of the State except in certain areas where cotton wilt prevails. Delfos-531 made the best record in 1931. For the hill and prairie lands of the State, D. & P. L. No. 4-8, and No. 10 are good varieties. No. 10 which is a recent introduction made a splendid showing in 1931. It is somewhat earlier and more prolific than 4-8 but does not have as high lint percentage. Stoneville 2, and Stoneville 3, are
good early prolific varieties of rather wide adaptation. Dixi-Triumph appears to be the most productive wilt resistant variety for Louisiana conditions.

Uniformity of staple length is a desirable quality in cotton. It has been thought that the present lack of uniformity may be due, in part at least, to the heterozygous condition of the plants grown. More uniformity may be attained by inbreeding. In 1928, an inbreeding experiment was started with eight varieties representing different types to see what effect inbreeding has on the growth and production of cotton plants. Three years inbreeding has had no decided effect.

A cotton date of planting experiment which has been conducted on the Bench land soil at Baton Rouge gives average yields of seed cotton as follows:—April 1, 1795 pounds; April 11, 1893 pounds; April 22, 1939 pounds; May 2, 2022 pounds; and May 11, 1832 pounds. Fungal diseases are worse on the earlier cotton and stands are poorer. Boll weevils are worse on later cotton but may be controlled with poison.
With rows four feet apart best yields were obtained, over a period of three years, on both Bench and Alluvial land at Baton Rouge, from a row spacing of two stalks per hill, in hills 20 inches apart.

Cotton root pruning by means of deep and medium cultivation retarded the growth of plants in height in 1931, but had no significant effect on yields. The average height of plants was as follows: After deep cultivation, 39.54 inches; medium cultivation, 30.57 inches; shallow cultivation, 32.19 inches.

An experiment to determine the relative effect of high and low bed cotton culture gave rather striking results in 1931. This was a moderately dry year at Baton Rouge. The cotton on the low bed rows was planted on beds approximately 4 inches high and given level cultivation. The high bed cotton was planted on beds approximately 12 inches high and cultivated during the season to keep the beds high. The plants on the high beds early began to appear more growthy than the others and on July 22 measurements showed them to be 3.39 inches taller on the average. Later the difference appeared to be greater. The low bed plants were earlier and appeared to have more rust. The low bed rows yielded 33.7% more cotton the first picking and 5.6% more for the year.

Studies of the root development of cotton plants showed that on the Bench land soils more than 90% of the roots were in the upper eight inches of soil and that rarely was there a tap root that penetrated the soil deeper than this. On the alluvial land soils, the tap roots regularly penetrated the soil to a depth of two feet or more and secondary roots were frequent in deeper layers of soil.

Ceresan dust well distributed over cotton seed at a rate of 3 ounces to a bushel of seed increased the germination 20.2%, and decreased the number of diseased plants by 51.1%. The increase in yield was insignificant.
The corn breeding work in co-operation with the U. S. Department of Agriculture consists of (1) making selections in and maintaining selfed lines from several varieties; (2) making single, double, and other crosses involving the selfed lines; and (3) testing the crosses for yield and quality in comparison with the best local variety. Of 113 crosses tested in 1931 (selfed lines from Cocke’s Prolific crossed with the open fertilized parent variety), 50 yielded more, 50 less and 13 yielded the same as the check. The three highest yielding crosses produced yields 31, 36, and 37 per cent above the check.

Another line of corn breeding work underway is the development of a high yielding, weevil resistant variety of yellow corn. Crosses have been made between Cocke’s Prolific, our best white variety, and Yellow Creole, Hill’s Yellow, and Clovelly Yellow. The hybrid strains produce well and have good quality, but are not yet pure yellow.

Mass selection work is being carried on with Cocke’s Prolific corn in an effort to increase its weevil resistance and make the type more uniform.

Corn variety tests were conducted in thirteen different parts of the State in 1931. The prolific varieties made the best yields in most areas. Cocke’s Prolific had the highest ranking in the statewide tests. Hill’s Yellow Dent and Clovelly Yellow ranked high in the southern part of the State. Sentell’s White Dent is a good one-ear variety for the northern part of the State.

In 1929, an experiment was started to test the comparative effect of level and ridged cultivation on corn production on Bench land soil. The corn was planted on a low bed in one case and on a 12-inch bed in the other and culti-
vated to maintain the high bed. The plants on the high beds appeared to make more growth during the season and were larger at harvest. The ears from the high bed rows appeared to be larger. Two of the years the experiment has been run were comparatively dry and the other seasonable. The yields of the high bed rows have been greater every year the experiment has been run. The three year average for the low bed rows has ben 38.6 bushls per acre while that of the high beds has been 43.1 bushels.

In an experiment to test the effect of soybeans in the row of corn on the yields of present and succeeding crops, the beans reduced corn yields 23.6% the first year; reduced yields 46.9% the second year which was a dry year; and increased yields 12.7% the third year.

In an experiment to test the production of hay, in case of soybeans, and grain, in case of corn, when the two were planted in the same and in alternate rows, the alternate row plats yielded 36.6 bushels grain per acre, and 6371 pounds of hay in 1929, and every row plats yielded 40.7 bushels of corn and 6044 pounds of hay. In 1930, a dry year, the alternate row plats led in production of corn by a 20.7% margin and also made slightly more hay. In 1931, the every row plats led in yields by a small margin. From results thus far, it appears that the every row planting gives best results.

In an experiment to test the effect of different rates of soybean seeding in corn rows at planting time, Oototan soybeans were planted at the rate of 20, 30, and 40 pounds per acre. From a three year average it appeared that the different rates of seeding mentioned had but little effect on the weight of corn stover or grain produced but did have effect on the weight of soybean hay. The heaviest seeding gave the greatest production of hay.

In a corn spacing test on Bench land in 1931, with soybeans in the corn row, a spacing of 1.16 ft. gave a yield of 38.2 bushels per acre; 2.30 ft., 31.0 bushels; 2.93 ft., 28.6 bushels; 3.39 ft., 26.4 bushels.
On Alluvial land, a three-year average of the results from the different spacings was as follows:

1 foot .................. 43.6 bushels per acre
2 feet .................. 39.1 bushels per acre
3 feet .................. 36.4 bushels per acre
4 feet .................. 32.8 bushels per acre

The rows were 4 feet wide in both experiments.

Seed corn dusted with semesan dust at a rate of 2 ounces per bushel increased the field germination 9.73%. An extra amount of seed was planted, and consequently, after the corn was thinned all rows had near the same number of stalks. No gains in yield were obtained from the treatment.

**Soybean Investigations**

Louisiana climate is adapted to the production of late maturing soybean varieties, having a possible growing season of approximately 200 days. The long growing season permits a larger yield of hay. While the main soybean crop may be composed of the later maturing varieties, yet there is a place for the earlier varieties in sections of the State where an early pasture or hay crop is needed or as a crop following oats. The great variation in maturity of the different varieties or that which results from the planting of the same variety at different dates makes it possible to have a succession of forage throughout the summer and fall.

The soybean is a versatile crop widely adapted to various conditions and in Louisiana must utilize labor at a time when it is not needed for other crops. It is one of the most dependable crops known. The chief objection to the soybean for hay is that it has rather coarse, woody stems. This may be partially overcome by giving proper attention to the time of harvesting, heavier rates of seeding, and by growing a good forage variety.
Fig. 3. Soybeans make splendid growth in Louisiana.

**Soybean Breeding**—Individual plant selections and crosses are being made each year and the progeny studied in plant-to-row plats. Promising strains are added to the field tests and some are being increased for distribution to farmers. Considerable work has been done in a correlation and inheritance study of some of the morphological characters of soybean plants which will be reported later.

**Soybean Variety Studies**—Variety tests with soybeans have been conducted at Baton Rouge since 1920 and over the State since the Outfield tests were established in 1929. The late maturing varieties led in the yield of hay over the State the past 3 years, with Otootan, Louisiana Selections 60 and 20—and Biloxi being consistently high; followed by Tanloxi, Laredo, Mammoth Yellow, and the earlier varieties, Haberlandt and George Washington. Several U. S. Strains were also high at Baton Rouge.

**Soybean Culture**—In response to frequent inquiries concerning the growing of soybeans in Louisiana, definite experiments are in progress to obtain data regarding the date, rate, and method of seeding this crop and some of the effects of the different treatments upon the yield and quality of the hay and seed. In all the experiments, 2 and 3 row plats, 100 feet long were grown in 4 series.
Date of Seeding—Biloxi and Biloxi Hybrid-60 soybeans were planted at intervals of 3 weeks from March 17 to August 10. The difference in the yield of cured hay was not great between the different dates to and including June 8 for both varieties; however, the maximum yield for the B. H. 60 was produced from the June 8th planting. A fair yield of hay and seed was produced from the June 29th planting. The plants seeded August 10th yielded a small amount of seed by the latter part of November.

Rate of Seeding—Two standard varieties, the Biloxi and Otootan, were grown in seven rates of seeding beginning with 5 pounds, 10 pounds, and with increasing intervals of 10 pounds to and including 60 pounds per acre. There was a continued increase in the yield per acre of cured Biloxi hay from 4057 pounds for the 5 pound rate to 5746 pounds for the 30 pound rate, although the yield of the 20 pound rate was almost as high as the heavier seedings. The 20 pound rate seemed sufficient for seed production. With the Otootan, there was little apparent difference in the yield of cured hay or seed per acre above the 10 pound rate.

The number of branches per plant and the diameter of the stalks decreased with the heavier rates of seeding. The diameter of the stalks from the 60 pound rate was approximately a third that of the 5 pound rate for both varieties, while the number of branches per plant was about half. Stalks with smaller diameters produce hay with finer stems. A thick, woody stalk, difficult to cure is one objection to the Biloxi and other upright growing varieties. Since an upright growing variety facilitates the use of modern harvesting machinery, this objection may be partially overcome by heavier rates of seeding.

Method of Seeding—Otootan soybeans were grown in rows varying in width from 8 feet to 1 foot, with an adjoining plat sown broadcast. There was a continued increase in yield per acre of cured hay from 3363 pounds for the 8 foot row to 6863 pounds for the 1 foot row and 5745 for the broadcast plat. There was, likewise, a similar increase in the yield of beans per acre.
Fig. 4. Louisiana Red Rust Proof oats that yielded 84 bushels per acre.
Since many farmers in Louisiana use the 4 foot rows, a comparison was made on the basis of the rows 4 feet apart. In considering the yield of hay, the 3 foot row produced 111% of the 4 foot rows; the 2 foot rows 133%; the 1 foot rows 138%; the broadcast plats 115%; the 6 foot rows 86%; and the 8 foot rows 68%. As would be expected, the number of branches per plant and the diameter of the stalks decreased with the narrower rows and in the broadcast plats.

In considering the different methods of seeding soybeans, the additional amount of seed required for the closer spaced rows and in sowing broadcast should not be overlooked. Broadcast sowings and 1 foot rows tend to result in increased competition of weeds in wet seasons and a decreased yield of hay and seed during dry years. There will also be more labor required in cultivating soybeans grown in rows as compared with the broadcast method, but this is usually justified by increased yields with less weeds. Where closer spacing is desired the 2 foot row is recommended. It permits some cultivation and the close spacing results in favorable yields of fine stemmed hay.

OAT INVESTIGATIONS

Oat production in Louisiana is handicapped by winter killing on occasionally severe winters and by damage from crown rust injury. Oat breeding work has been confined to a study of the yielding ability, disease resistance, winter hardiness, and other factors of economic importance in oat production in order to find varieties best adapted to Louisiana conditions. Cooperation is given the U. S. Department of Agriculture in conducting a uniform rust nursery and winter hardiness nurseries in Louisiana.

Oat Variety Tests—Oat variety tests were conducted at St. Joseph, Calhoun, and Baton Rouge for the purpose of
securing information concerning the varieties best adapted to Louisiana conditions. These tests were conducted in co-
operation with those in charge of the branch stations.

The past season was almost ideal for oat production; the winter was mild and no varieties winterkilled. There was practically no injury from crown rust at St. Joseph and not over 30% at Calhoun, while at Baton Rouge the injury ranged from 1 to 5% for the rustproof varieties to 70 or 80% for the susceptible varieties. Therefore, sus-
ceptible varieties probably ranked higher at St. Joseph and Calhoun than would be expected with the normal rust infes-
tation together with more severe winter growing condi-
tions.

All seed was treated for smut and sowing was done October 10-15 inclusive.

The leading varieties were strains of the red rustproof oats, including Louisiana and Texas Red Rustproof, Appler, Fulghum, Nortex, 100-Bushel, and Ferguson 922.

Oats should be sown early with a drill if possible on a well prepared seedbed. The seed should be treated for smut.

**GENERAL FORAGE CROP INVESTIGATIONS**

The Louisiana climate lends itself beautifully to forage crop production over a large portion of the State. Lespedeza, white clover, and some grasses provide an abundance of pasture and hay as well as a profitable seed crop. However, there are periods and areas over which the ample annual rainfall is not evenly distributed. Droughts during the critical growing period when rain is most essential occasionally cut the yield of corn severely, thus forcing the farmer to seek other feed crops. This has resulted in an increased demand for information concerning grain sorghums and other substitute or catch crops.

*Grain Sorghums*—Experiments have been conducted with grain sorghums and sorgos at the Calhoun, St. Joseph, and Baton Rouge Experiment Stations in cooperation with
those in charge of the stations. Variety tests, date of planting, and midge damage were some of the problems studied. This work will be continued. Highest yields of forage and seed were made from sagrain, kafir, feterita, and hegari, and seeded ribbon and sumac of the sorgos.

It would seem that grain sorghum may be planted from April to July with fair yields, therefore adapting itself particularly during years when prospects for corn production are poor as a catch crop or for general planting as a forage crop.

At Baton Rouge two crops of forage and grain were produced when planted April 9, 1931. Soybeans were planted in the same row and the crop was harvested with a corn binder. Grain sorghum stubble grown in 1930 survived the winter and produced a good crop of forage and seed in 1931 at Baton Rouge.

Alfalfa—Lime was found to be the limiting factor in alfalfa production in a lime and phosphate experiment conducted at Baton Rouge on bluff soils. All plats not having lime added died after the first cutting although some received an application of 250 pounds and 500 pounds of superphosphate. Creditable gains were made from superphosphate when lime was added.

Three cuttings were secured. Ground oyster shell was added in amounts of 3000 pounds to 12000 pounds per acre in 1/25 acre plats in 2 series. Superphosphate was added in 250 pound and 500 pound rates. Oyster shell alone produced a gain of from 3,583 pounds of cured hay for the 3,000 pound rate to 4,345 pounds for the 6,000 pound, and 4,765 pounds for the 9,000 pound applications.

250 pounds of the superphosphate added to the 3,000 pound application of oyster shell produced 3,986 pounds of cured hay per acre or a gain of 403 pounds. 500 pounds of superphosphate increased the yield to 4,191 pounds or a gain of 608 pounds. 250 pounds of superphosphate added to the 6,000 pound application of oyster shell produced a yield of 4,634 pounds or a gain of 289 pounds; while 331
pounds were gained from the 500 pounds of superphosphate added. No gains were shown from the superphosphate applications with the 9,000 pound and 12,000 pound rates of oyster shell.

_Crotalaria, Beggar Weed, Velvet Beans, and Teosinte—_ In a miscellaneous group of legumes and grasses, 6 species of crotalaria produced from 10 tons to 15.6 tons of green forage as compared to 15.7 tons of velvet beans, 16.5 tons of beggar weed, and 17.6 tons of teosinte. Crotalaria may have merit as a green manure crop in areas not adapted to soybeans, clover or other legumes, since most species are not palatable to livestock. It would seem that there are many other legumes that might be grown for green manure and utilized for hay and grazing instead should occasion demand.

_Clovers and Grasses—_Experiments are being conducted with clovers and grasses to obtain information concerning their possibilities in Louisiana. Results of this work will be reported later.

**SUGAR BEET INVESTIGATIONS**

*Brown*

The prevalence of sclerotial root rot seems to be the chief limiting factor to sugar beet growing in southern Louisiana. At present an attempt is being made to develop strains of beets that have some resistance to the disease. Selections of apparently healthy roots made in a field of beets in which most of the roots were diseased have not given satisfactory results due partly to the fact the mother beets selected have failed to produce seed after transplanting. It has been found that by planting in September or early October that about 30% of the beets produce flower stalks the following spring. A limited amount of good seed has been obtained from some of these plants.
Outfield experiments in Louisiana were established in order to gain reliable information regarding the performance of varieties and field crops, and their fertilizer requirements when grown on the various soil types and under the different climatic conditions of various parts of the state. Practices successful in some sections often prove a failure in other regions.

Experiments including variety tests with cotton, corn and soybeans and fertilizer tests with cotton were carried on at nine different places in the state in 1930 and 1931. Some twenty varieties of cotton, twelve varieties of corn, ten varieties of soybeans and sixteen different rates of applying fertilizer were studied.

These tests were conducted at the following locations:

*Gilbert, Louisiana*, located on Macon Ridge soil, very similar to the bench land at Baton Rouge. The rainfall here is several inches less per year than in the southern part of the state.

*Monroe, Louisiana*, located on the Ouchita Valley alluvial land of moderate fertility with about the same rainfall as Gilbert.

*Homer, Louisiana*, located on North Louisiana hill land somewhat above the average in fertility for its type. The rainfall is slightly lower than at Monroe and Gilbert.

*Dixie, Louisiana*, located on Red River alluvial land well adapted to cotton, and of rather high fertility; rainfall about the same as Monroe.

*Melrose, Louisiana*, located on Red River alluvial land in a large cotton growing district where the soil is about the same as at Dixie, but rainfall is slightly heavier.

*DeRidder, Louisiana*, located on Western Louisiana hill land very similar to Homer. The growing season here is slightly longer and rainfall heavier than that of Homer.
Sunset, Louisiana, located on Prairie soil of rather higher fertility than most soils of this type in the state. The rainfall is about the same as Baton Rouge and 6 or 8 inches more than North Louisiana stations.

Hammond, Louisiana, located on southeast Louisiana pine plats of rather low fertility and difficult to drain. The rainfall is possibly a little higher than at Baton Rouge.

Thibodaux, Louisiana, located on bayou LaFourche alluvial land in the sugar cane section. The soil is rather fertile and the rainfall is 8 or 10 inches more per year than North Louisiana.

The same type of experiments are carried on at three of the branch stations in conjunction with their regular program. At the Rice Experiment Station, Crowley, Louisiana, J. M. Jenkins, superintendent, located on prairie soil of south Louisiana, of moderate fertility; at the Delta Experiment Station, St. Joseph, Louisiana, C. B. Haddon, superintendent, located on Mississippi River alluvial land of high fertility; at the North Louisiana Experiment Station, Calhoun, Louisiana, Sidney Stewart, superintendent, located on North Louisiana hill land of average fertility for this type of soil. The rainfall at Calhoun and St. Joseph is some 4 to 8 inches less than at Crowley, and the growing season 10 to 20 days shorter.

Fellowships

Two fellowships, Chilean Nitrate and N. V. Potash Export. My., Inc., were made available to the Agronomy Department of the Louisiana Agricultural Experiment Station since the last biennial report. The Chilean nitrate work was started in the fall of 1929 and terminated January 1, 1932. The potash fellowship was started May 1, 1931 and is still being continued.

The purpose of these fellowships is to furnish funds for the expansion of experimental work in soil fertility.
Agricultural Economics

Financing Production and Marketing of Louisiana Strawberries and Suggested Reorganization

This study was confined to the strawberry area of the Florida Parishes in Louisiana and had for its purpose the assembling and analyzing of data pertaining to organization, production credit and marketing the strawberry crop for the season 1929-1930 and the development of a more efficient organization for handling the industry.

Louisiana Bulletin Number 219, published in January, 1931, contains the results of this study. A brief historical sketch of the strawberry industry is presented emphasizing changes in production, yields, prices and organization, and comparisons are made with competing areas. An analysis is made of the factors influencing prices paid from day to day and prices received by farmers at different shipping points at given periods of time. These factors include such items as time and method of picking and handling the berries, type of car used, inspection, refrigeration, method of selling and the like.

Attention is given to economies that might be had in better methods of buying supplies, such as fertilizer, crates and other major items used on the farm.

General Conclusions:

(1) There are too many local associations in the berry area, and these are costing the farmers out of proportion to the services rendered.

(2) Farmers are paying prices for marketing service, mercantile service and credit service out of line with the income and services they receive.

(3) Many dollars can be saved through efficient cooperative action in securing credits and purchasing major farm supplies, as fertilizer, crates and feed for cash.
(4) The present system of handling the berry crop is not conducive to large gains for any of the agencies involved. A change in this method will not affect adversely the profits of those engaged in handling the crop, but a change for the better, after adjustments are made will be beneficial to merchants, bankers, and all who depend on the berry industry for an existence.

(5) There is sufficient evidence to show that the type of car in which berries are loaded reflects itself in the prices paid. These inferior cars should be relegated to the trash heap, or placed in freight service where more durable commodities are hauled.

(6) There are no substantiating facts that will lead to the conclusion that buyers voluntarily control the price of berries on the Hammond Auction.

(7) There is not that high correlation as some suspect, between the type of car and the claims that come back on the Auction. However, there appears to be some relationship. Further study on this particular point is necessary before definite conclusions can be reached.

Recommendations:

(1) A consolidation of all existing associations at each of the shipping points, or a complete reorganization, with one strong local cooperative association at each of the main shipping points is desirable. At those points near each other where insufficient berries are produced to load in car lot consistently, one association could serve two or more of these points. One label or trade mark to be adopted for each shipping point, to keep down mixed loading. To keep down duplication of effort and reduce expenses of operation to a minimum, but maintaining the maximum efficiency is of prime importance in any industry.
(2) To organize a central selling organization cooperative in nature and made up of local cooperative associations.

(3) To locate this central organization in Hammond, and equip its offices with modern bookkeeping machinery, where the accounting for the entire organization, including locals, can be centralized and efficiently done.

(4) A sales manager be employed and placed in charge of the central organization. This manager to have had successful experience in the berry business and should be the best that money can buy.

(5) The central organization to maintain a Credit Corporation, capitalized at such a rate that a line of credit of $3,000,000 can be obtained if found necessary.

(6) This credit corporation to be managed by a hired manager to be selected on the basis of business ability and banking experience.

(7) The central organization to maintain a purchasing department, through which all crates, hampers, fertilizer, and feed can be obtained. This department will make it possible to utilize hired management and clerical forces more efficiently.

(8) Every transaction to be put on a cash basis this to be made possible through the proper functioning of the Credit Corporation.

A suggested outline for reorganizing the berry industry is given in the appendix of this publication.
This project was outlined in February, 1931, the Division of Agricultural Finance, Bureau of Agricultural Economics cooperating. The purposes of this project are to determine:

(1) The change in general property taxes during the past two decades, with special reference to agricultural taxation.

(2) The ratio of farm taxes to farm incomes.

(3) The equality of assessment as between (a) large and small farm and city properties (b) individual farm properties within given sized groups, (c) farm properties and other types of properties such as industrial, residential and forest properties.

(4) The distribution of the tax burden as between the various occupational groups, and different classes of property.

(5) Possibilities of tax revision that will meet the growing demands for revenue and at the same time will not increase the burden for the already heavily taxed groups.

This study is under way at the present time and has not developed to the point that definite conclusions can be stated.

Projects

During the biennial, two projects have been in process, namely: Purnell projects 256 and 257. Project 256 was completed in one year and Project 257 was continued for a period of two years.

*Project 256:* “Recent developments of Farm Power Utilization on Louisiana Rice Farms.” This project has been completed and report published in Louisiana Agricultural Experiment Station Bulletins 216 and 218.
This report contains analyses and tables showing the significant factors in the costs of operating and acres of rice flooded for 42 Diesel engines and 18 electric motors used in irrigating rice in 1929. Data presented consist of the operating and overhead outlays per acre and the acres of rice flooded by make, age and rating of engines or motors used. The significant finding is in the relation of the type and size of plant to the volume of flooding to be done. As the acreage to be flooded increases, Diesel engines become more advantageous and electric motors less desirable. This is due chiefly to the behavior of overhead costs and certain non-varying current expense items connected with the operation of Diesel engines. Installation of Diesel engines requires a high initial outlay and operation makes a fixed amount of man labor necessary. These charges when distributed over a large acreage become very low, but on small acreages are almost prohibitive. Electric motors have a low installation outlay and require little or no labor for operation. Their cost is largely a cost for energy used. As the acreage of rice to be flooded increases, costs increase almost as rapidly. For Diesel engine operation variations in the cost were found to be from $10.38 per acre of farms having one hundred to two hundred acres of rice, to $6.50 for farms operating over 300 acres of rice.

This bulletin contains analyses and tables showing important factors in the economical use of tractors, and trucks on rice farms in 1929. Data are presented showing the distribution of tractors by ages and makes, according to the acres of rice operated. The John Deere and McCormick-Deering tractors comprise 63% of the tractors found on these farms.
The important feature is the adjustment between the volume of work to be done by a tractor and the kind of tractor used. Tractors spend 61% of their time in the preparation of rice land for seeding, 25% of the time is employed in cutting and thrashing rice. Tractors were used less than 2% for crops other than rice. On the average, tractors replace about two men and eight mules per farm. The outlay and accomplishment for tractors are presented for the important makes. The average hours per tractor for the two important makes of tractors was 650 per year. The costs of operation were $7.82 per day for McCormick-Deering 10-20; $8.64 for John Deere 15-27; and $10.51 for McCormick-Deering 15-30. In order to obtain low cost performance, farmers must get a large acreage per tractor. This enables the overhead costs of depreciation and interest to be distributed over a large acreage and large usage.

Sixty-one per cent of the farmers owned a truck. The chief usage consists of hauling fuel oil, seed rice, fertilizer, and marketing rice. Hauling to market amounts to over 65% of the time put in on rice, hauling fuel oil 17%, and fertilizer and seed 18%. It was found that the average annual outlay for motor truck operation exclusive of the driver varied from $198.00 on farms having 100 acres of rice or less, to $289.00 on farms having over 300 acres of rice. On the competitive basis it appeared that hauling over 2,100 bags of rice at customs rates is necessary to equal annual outlay for motor truck operation. Two-thirds of the total outlay is for current operation expenses.

In the use of work stock, 90% of the rice farmers purchased feed. The outlay for purchased feed averaged about $30.00 per head, and home-grown feeds at $8.00 per head. Depreciation was less than $10.00 per head. For farms operating without a tractor, investment and depreciation per head were increased materially and the acres of rice per farm and per head were far below average. The hours per head of work stock for rice alone were about 400 per year. Work stock utilization is a comparatively insignificant factor in the operation of rice farms where the acreage is sufficient to permit ownership of a tractor.
Economies in man labor are possible as the acreage of rice is increased. Important savings appear in the requirements for pump operation, levee construction and supervision, and in land preparation. The introduction of the tractors rather than the use of work stock permits the greatest saving in man labor.

**Historical and Statistical Study of Louisiana Trade Centers From 1901 to 1931**

The purpose of this study is to discover as far as possible the factors which account for the growth and development of some trade centers and the decline of others. Special consideration is to be given to the study of the influence of certain features of the social structure upon the rise and decline of trade centers. In other words, are certain features characteristic of the centers which grow and others of these which go back, and if so what are these features? Closely allied to this is the determination of what sizes and types of centers are consistently successful in offering each of the types of service.

Up to date several parts of the work have been completed.

1. A classification of all types of service found in these trade centers, as listed in Bradstreet's Books of Commercial Credit Ratings has been worked out.

2. For the years 1901, 1906, 1911, 1916, 1921, 1926 and 1931 all the services listed in Bradstreet's have been classified according to this scheme, for every hamlet, village, town and city in Louisiana.

3. These data have been punched on Hollerith cards and are now ready for analysis.
I. Farm Power Study:

A study of power costs and use on sugar cane farms for the year 1929 was carried on in the spring of 1930. Seventy-four farms were surveyed on the details of power and labor requirements and upon the expenditures for mule and tractor use.

Labor and power requirements varied but little between small and large farms. However, the variation between farms was largely due to differences in soil type, plantation layout, and individual managerial ability. Under the prevailing system of cane and corn both labor and power distributions showed high requirements in the spring and fall with a low summer and winter needs. The use of tractors offered a means of leveling somewhat the spring peak of requirements, but their usefulness was much limited by their apparent inability to greatly decrease the need for mule power in harvest and by the fact that no one type of tractor fitted well into both land preparation and cultivation needs. The operation of small tractors cost $7.90 per day and the straddle-row or 15-30 size required outlays averaging $11.27.

Cane plantation mules were fed in 1929 at a cost $154.00 per head. Other outlays brought the total cost to $209.53 per year. Mules on tractor farms were maintained at somewhat lower cost. This decrease together with the replacement of mules showed a slightly smaller total power cost for farms using tractors and mules than for farms using mules only. This difference did not exist on all farms nor is it large enough to be considered as conclusive.

A detailed report on this study giving labor and power requirements for the various crops, feed fed workstock, itemized statements of power costs has been published as Louisiana Bulletin No. 215, "An Economic Study of Factors Affecting Farm Organization and Power Utilization of Sugar Cane Farms, 1929."
II. The Organization and Returns of Small-Sized Cane Farms:


The farms studied averaged 163 acres in size of which 97 were in crops. Investments average $95.37 per acre of crop land. Crop sales accounted for most of the cash income received, however, livestock particularly cattle and hogs returned a small cash income in addition to produce for home consumption. Cane occupied 39.1 per cent of the crop land, corn 45.2 per cent, and cotton 9.8 per cent. The greatest concentration of cotton was found in the Teche and Western sections, while cane specialization was more common on the River. Truck crops were grown on the river and in smaller amounts on the Teche. Crop yields were as follows: Cane 14.7 tons, corn 17.6 bushels, cotton 670 pounds of seed cotton, and sweet potatoes 20 barrels.

Seventy-one per cent of the farms studied made some net cash income. The average for all farms was $4.38 per crop acre or $426 per farm. Thirty per cent made more than enough net cash income to pay depreciation, family labor, and interest on invested capital. However, on the average all farms lacked $4.50 per acre or $438 per farm of returning enough to pay these charges.

The following factors were correlated with net returns: Size of farm, proportion of cotton, truck crops, and cane, labor expense, and cane yields.

The size of farm did not markedly affect the net income per acre, but brought out the effect of other factors when considered on a per farm basis. The range of profit and loss increased directly as the size of farm.

Cotton included in the organization to any considerable proportion of the crop area was associated with a decrease in both net cash income and labor income.
Farms on the Eastern area which grew truck crops on a commercial scale or relied upon these as a sole source of cash income made relatively high net cash returns per acre, but due to this small size were very low when considered on the farm basis. Truck growing was associated with large amounts of family labor which in most instances did not return prevailing wage rates through its use in the production of these crops.

Labor income and cash income increased as the proportion of cane was increased up to approximately fifty percent of the crop area. After this point was reached, labor and feed expenses rose more than proportionately to gross income.

Labor expense per acre and crop acres per man as associated with income both indicate that labor efficiency is an important factor in determining profits. Excessive use of labor is the most pronounced cause of labor inefficiency although there is a tendency on some farms to over economize on the use of labor. The excessive supply of labor was, in most cases, the result of lack of adjustment between the size of farm or the crop organization and the available supply of unpaid labor.

Of the factors studied, the yield of cane was the most important in the determination of income.

III. Cane Harvesting Costs:

A detailed record of the harvest operations of three plantations was carried on in the fall of 1931. The analysis of these records will have as its object to determine the influence of (1) the variety of cane, (2) the straightness of the cane, (3) the yield, (4) the weather and road condition, (5) the type of equipment, (6) the balance of equipment and labor, and (7) the length of haul on the cost and rate of harvesting cane.

IV. Financial Records on Cane Farms:

Beginning in January, 1932, approximately forty financial records will be inaugurated on farms of the cane belt.
The records will be used to study the operation and organization of small to medium-sized farms and promising practices and types of organization.

V. Articles Written on Economies of Sugar Cane Growing:


During 1929 the cost of loading cane by using mule drawn power operated loaders was 13.3 cents per ton of which 11.7 cents were cash charges and 1.6 cents overhead expenses. Costs varied with the amount of cane loaded per day and with the number of days used per season. This variation was from 22.5 cents per ton for the high cost group of farms to 9.4 cents on the low cost group. The first group averaged sixty-two tons per day for thirty-nine working days and the second 155 tons for sixty-seven days. Costs for loader operation on farms having less than 175 acres of cane, or approximately 3500 tons, were without exception higher than hand loading outlays.

B. The Use of Motor Trucks in Hauling Cane—The Sugar Bulletin, August 1, 1931—Page 1.

Motor trucks both custom and owned have recently come to play a part in cane harvest operations. These trucks compete with the railways for hauls of from three to twelve or fifteen miles and are also used to replace carts on road hauls of two to five miles. Custom truck rates have been somewhat under rail rates for the distances at which trucks compete and when the hauling can be done on gravel or paved roads. Hoisting charges are also sometimes reduced by the use of custom trucks. Although no accurate cost data are presented, it is the belief of plantation managers that truck charges plus an additional hoisting charge are less per ton than cart costs for hauls of two to five miles on gravel roads. A study of owned trucks studied indicates that a considerable margin exists between the actual cost of truck operation and the custom rate in effect. The elapsed time between the loading of the cane and its grinding is less under trucking methods than by rail shipment.
Technical difficulties in design and size of body, etc., are being rapidly overcome and with the economies obtained trucks bid well to occupy an important position in cane harvesting.


This article discusses the custom method of cutting cane as compared with the older labor methods. Custom cutting has several advantages. Less supervision is required, fewer cutters are normally needed, inefficient cutters are easily eliminated, and on the farms studied the cash expense for labor was slightly decreased over that on plantations using day labor. Day labor for cutting cane preparatory to burning was somewhat lower than were custom rates for the same operations although the above advantages probably about equalize the total cost.

**Cotton Price Quality Relationships in Local Markets of Louisiana**

Note: The collection and tabulation of data for this study were conducted by the Division of cotton marketing, Bureau of Agricultural Economics in Cooperation with the Louisiana Agricultural Experiment Station.

Purpose of Study:

1. To determine the extent to which prices paid to farmers in local markets for cotton varied with length of staple.

2. To determine the relationship between premiums and discount for staple length on local markets and in central markets.

3. To determine the extent to which prices paid to farmers in local markets for cotton varied with grade.

4. To determine the relationship between grade differences in local and in central markets.
5. To determine the relationship between the average prices in local markets and in central markets.

6. To determine insofar as possible the factors affecting each of the above.

This study included ten local markets in Louisiana. These markets were selected to represent the various types of local markets existing in the State during 1928-29. These markets, each possessing certain special characteristics, were classified into two general groups, each containing five markets. These are designated as commission markets, and merchant markets. Each of the five markets in the general groups was designated by letter, and studied individually. Representative samples were collected from these various markets and the purposes of the project were effected.

Conclusions:

About 30 per cent of the central market premiums and discounts for staple lengths other than seven-eighths inch were reflected in prices received by farmers in the 10 local markets of Louisiana studied. The extent to which premiums and discounts for staple length were received by farmers differed considerably in the various local markets and types of local markets. Staple length was recognized to a considerable degree in the commission-buyer markets as a whole and especially in those in which the influence of ginner buying was absent. For all of the commission markets combined central market price differences were received by farmers to the extent of about 50 per cent.

Among the five merchant markets the data for only two of the competitive merchant markets, indicate positive reflection of central market premiums and discounts for staple length to any extent, whatsoever. The average percentage for these two markets was about 10. In the non-competitive merchant markets, there seems to have been a total disregard of staple premiums and discounts, with
farmers receiving approximately the same price for 13/16 inch cotton as for cotton with staple length of 1-3/16 inches.

Grade differences were received by farmers in the ten local markets studied to a slightly greater extent than were staple premiums and discounts. However, based on the grade designations of government cotton classers, only about one-third of the central market premiums and discount for grade were received by farmers in the market studied.

The average spread or difference between central market prices and corresponding local market prices, adjusted for differences in freight, and compressing charges, was considerably greater for merchant markets than for commission markets. This spread was greatest for the non-competitive merchant markets and smallest for the non-ginner commission markets. The adjusted spread was $2.20 per bale for all local markets, $1.95 per bale for all commission markets, and $2.95 for all merchant markets.

Adjusted local market prices for 13/16 inch cotton averaged $2.00 per bale above central market prices. The average adjusted prices paid to farmers for each of the other staple lengths were below corresponding central market prices, the amount per bale being for 7/8 inch; $1.40 for 15/16 inch; $2.95 for 1 inch; $5.70 for 1 and 1/16 inches; $6.25 for 1 and 1/8 inches and $8.90 for 1 and 3/16 inches.

A direct relationship was noted between the average spread between local and central market prices and the average staple length of cotton produced. This relationship indicates that, although communities which produced longer staple cotton received somewhat higher actual prices than other communities, the superior quality of the cotton was not fully reflected in average prices paid.

The seasonal change in the spread between local and central market prices was notably different in commission markets and merchant markets. For the commission markets this spread was relatively narrow during the middle
of the season and was wider at the beginning and end of the season—especially the latter. This change seems quite natural inasmuch as during the height of the season when buyers were receiving a large volume of business they could operate on a narrower basis than toward the beginning or end of the season when only a few bales were being marketed. For the merchant markets the spread was very wide at the beginning of the season and became narrower as the season advanced. This seasonal change was accounted for, largely, by the decrease in the average length of staple in these markets as the season advanced.

Marketing facilities available in local markets were found to have an appreciable influence on average local market prices. The least spread between central market prices and local market prices was for the two markets at which a warehouse was available and cotton was hauled direct from the gin to the warehouse, and then sold on warehouse weights and samples.

The average loss or gain in weight of cotton bales affects the prices paid for cotton. Some buyers reported no average loss in weight, while others reported an average loss of as much as 10 pounds per bale. Data secured at one market showed an average loss of nearly 6 pounds per bale between the gin weight on which the cotton was purchased and the weight on which it was sold by the buyers.

An analysis of the individual transactions in certain local markets on one day revealed the fact that in the commission markets there were numerous inconsistencies and irregularities in the prices received by farmers when these prices were classified according to the grade and staple length designations of government classers. In many cases, farmers received the same price for cotton called a short staple length as for cotton called a longer staple length. There was, usually, a wide range in the prices received for cotton all designated as the same grade and same staple length. Such inconsistencies were largely accounted for in Market A, however, by similar inconsistencies in the grade
and staple length designations of government classers and of local buyers. In the merchant markets analyzed, the farmers received about the same price for every bale regardless of its quality or any other consideration, and the level of prices was generally lower in the merchant markets.

A definite tendency on the part of the local buyers to call practically all of the cotton as one, two, or three of the middle grades and staple lengths was apparent. On the other hand, the government classers usually made a more or less normal distribution of the cotton throughout the range of grades and staple lengths.

It seems apparent from this study that the type-of-buyers and the degree of competition in a market are very important factors with respect to price quality relationships and average price levels, and that comparability and uniformity of cotton classing are prerequisites for an accurate reflection of quality values to farmers.

**Creep-Feeding of Beef Calves**

Creep-feeding experiments with grade-beef calves were conducted in 1930 and 1931. In 1931, ten calves were fed 99 days on a ration of ground ear corn, cottonseed meal, blackstrap molasses, and rice bran, (average ration 2.0 lbs. daily). These calves ran with the cows on pasture, and received feed once daily, the creep or pen being near the water trough where the calves could go in readily. These gained 1.96 lbs. per day and were valued at $6.27 per 100 lbs. at the close of the test. Ten calves equal in weight and type, running with their dams on pasture, with no extra feed, gained 1.52 lbs. per day. These were valued at $5.44 per 100 lbs. at the close of the test. Final average weights and values were as follows: Lot I, creep-fed, 493.5 lbs., value $30.95. Lot II, (check), 450.4 lbs., value $24.49, cost of feed per head, $2.45, balance in favor of Lot I, $4.01.

In the 1930 test, 120 days on feed, the weights and gains were as follows: Lot I, creep-fed, gain per day, 1.83 lbs., final weight, 476.3 lbs., appraised value, $8.37 per 100
lbs. Lot II, (check) gain per day, 1.44 lbs., final weight, 421.7 lbs., appraised value, $7.45 per 100 lbs. The margin of profit was only $2.41 in favor of creep feeding due to high feed costs. The creep-feeding of calves may not prove especially profitable where they are on excellent pasture, especially if the cows are good milkers, and feeds must be purchased at retail prices. Where the conditions are reversed, with pastures short, and the calves not growing well, a substantial increase in value may be obtained from extra feeding. Where it is convenient to do the feeding, and the feed is grown on the farm, this appears to be one of the most economical methods of producing beef.

**BRAHMAN VS. BEEF-TYPE SIREs**

A summary of three years' observations on calves sired by a Brahman bull compared to beef type bulls shows a consistently higher rate of growth in favor of the Brahman cross.

In 1931 eleven calves by a Brahman sire averaged 418 lbs. on September 3, as compared to 347 lbs. for 24 calves by beef-type sires. Gains on the Brahman half-bloods were 2.12 lbs. per day from birth, as compared to 1.72 lbs. for the other calves. The average weight on heifers retained for the herd was 500 lbs. and 451 lbs. respectively, on November 3, but this included only three Brahman half-bloods. Yearling heifers by the Brahman sire averaged 1.11 lbs. gain per day from birth to October 3, 1931, as compared to 1.00 lbs. per day for heifers of similar age by beef-type sires, average weights being 736 lbs. and 670 lbs. respectfully. Weights on dry two-year old heifers, November 4, 1931, were 1083 lbs. and 980 lbs. respectively. These results should be considered as applying only in the coastal plains area.
Pasture for Beef Production

Bray

To determine the beef produced per acre on alluvial land in Louisiana, a record was kept on the gains of yearling and two year old steers and yearling heifers on two different fields. Field 2, an improved pasture, containing 26.5 acres, produced 373.5 lbs. of grain per acre from March 23 to October 13, 1931 (332 lbs. to September 12), or an average of 255 lbs. per head. This field which was seeded to white Dutch clover in February, 1929, following a cultivated crop, has now an excellent stand of white clover and Bermuda. Grazing capacity was 38.8 cattle (averaging 500 to 700 lbs.), or 1.47 head per acre. Gains on Field 2 averaged 1.5 lbs. per day to August 3, and .83 lb. after that date.

Field No. 15, an unimproved field of 22.8 acres, containing some clover and Bermuda with coarse grasses and weeds, produced 69 lbs. of grains per acre to September 13, and carried an average of 13 head of cattle, making an average daily gain of .83 lbs. per day. Enough grazing remained to maintain cattle in good condition after that date, but gains had practically ended by September 13.

Field 15 has been divided into two equal parts, and one part disced and seeded to clover and improved pasture grasses. The remaining half will be allowed to develop naturally into white clover and Bermuda grass, with no other attention than mowing and drainage. The beef production on the two areas will be measured over a series of years.

Summer Fattening of Steers on Pasture, Grain on Grass, Compared to Grass Only

Bray

The two experiments covered by this report were similar to those conducted in 1928 and 1929, a comparison of feeding concentrates along with grass, as compared to grass alone for fattening steers, but in this test, only half the grass-fed steers were to be mar-
keted with the grain-fed steers in midsummer; the others being grazed until the end of the season.

The cattle in the 1930 test were high grade Herefords, with a few grade Aberdeen Angus, averaging 480 lbs. Estimated value at start of experiment $9.00 per cwt.

Extremely dry weather in early summer reduced gains, and resulted in some states in numbers of half-fat cattle being thrown on the market in July, causing a rapid decline in prices. The only cattle to break even in this test were those carried on grass until Nov. 1. Grains and prices were as follows: Lot I, grain fed, 148 days, gain 292 lbs., 1.97 lbs. per day, sale price, $7.91. Lot II-A, grass only, 148 days, gain 156.6 lbs., 1.06 lbs. per day, sale price, $6 64, per cwt. Lot II-B, grass only, 226 days, gain 284 lbs., 1.25 lbs. per day, sale price, $6.62 per cwt. Grain feed per 100 lbs. gain, (Lot I) was 254.5 lbs. corn, 80.3 lbs. cottonseed meal. Profit or loss on the three lots, per head: Lot I, $4.92 loss, Lot II-A, $6.62 loss, Lot II-B, $0.82 gain. Average profits for the two preceding years were $11.81 for the fed cattle and $5.52 on grass alone.

In 1931, there was an abundance of good pasture throughout the alluvial section, and cattle made excellent gains without extra feed. Daily gains and prices on the three groups in 1931 were as follows: Lot I, 9 steers, (grain fed), 2.01 lbs., average selling price, July 12, $6.92 per cwt., apparent profit, $4.13 (apparent profit not including rent of land). Lot II-A, 3 steers, (grass only), gain, 1.99 lbs. per day, average selling price, $6.60, apparent profit, $6.42, sold at same time as Lot I. Lot II-B, 4 steers, (grass only), sold October 17, 1931, gain, 1.37 lbs. per day, average selling price, $4.83 per 100 lbs., loss, $5.48.

Bloating was more severe than usual in 1931, and three steers in Lot II died from this cause. If this loss was charged against the remaining seven steers in this lot, Lot II would show a heavy loss instead of a profit. No serious bloating occurred in the steers receiving grain in Lot I. Lot I ate 134 lbs. of concentrates for each 100 lbs. gains.
HOGGING DOWN CORN

One comparison was made between dry-lot feeding and hogging down corn and soybeans on a field of 2.6 acres. Corn hogged down in the field gave a slightly more economical and efficient return for feed consumed. The crop was grown on light bench land and at least one-third of the area was damaged by drought. The yield was estimated from sample rows to equal 21.25 bushels per acre. On this basis, hogging down saved 58 lbs. of feed per 100 lbs pork, as compared to dry lot feeding, in addition to saving of labor and retention of fertility of the land. Gains per day were: 1.19 lbs. per day in the dry lot and 1.18 lbs. in the field. Gains per acre, 368 lbs. Value at six cents per pound, $22.08. Cost of supplementary feed, $4.22 per acre. Net value, $17.86 per acre. Calculated on the basis of feed replaced, as compared to the dry lot, one acre replaced $15.37 worth of feeds at market prices, including corn at 56c per bushel.

SWEET POTATOES FOR FATTENING SWINE

Tests on sweet potatoes in 1931 included two lots fed in the field, one with sweet potatoes fed with corn in dry lot, and one lot fed corn in dry lot as a check. A protein supplement of equal parts of shrimp bran and cottonseed meal was supplied to each lot in self feeders. A white sweet potato, containing more starch and less sugar than the Porto Rico yams, appeared slightly superior to the Porto Ricos. Although the daily gains were equal on each field, the white variety appeared to require less potatoes per 100 lbs. gain. Gains per day were as follows: Check lot. (Lot I), 1.9 lbs. Cost per 100 lbs. gain, $4.24, Lot II, corn and potatoes in dry lot, 2.0 lbs. per day. Lot III, white sweet potatoes in field, 1.61 lbs. per day. Lot IV, Porto Rico Yams, 1.62 lbs. per day. Credit for each 100 lbs. potatoes: Lot II, fed in dry lot, 31.5c, Lot III, 19.8c, Lot IV, 17.5c. Credit per acre of potatoes on basis
of corn at 56c per bushel: Lot III, white variety, $21.00, Lot IV, Porto Ricos, $19.51, after paying for all supplementary feed. It is evident that a greater value was returned per 100 lbs. of potatoes when fed in combination with a small amount of corn than when fed without corn in the field; both lots receiving protein supplements. Whether this will prove equally true in field tests will be determined in 1932 experiments. Compared to check rations of corn and protein supplements fed in dry lots, three years of experiments with sweet potatoes show values in different combinations as follows: Sweet potatoes alone, without supplement (2 trials, 9.4c per 100 lbs). Sweet potatoes, with protein supplement (3 trials, 17.4c per 100 lbs.) Sweet potatoes with corn and protein supplement (1 trial, 38.9c per 100 lbs.)

**Protein Supplements for Swine**

Dehydrated shrimp bran is a by-product of the shrimp canning industry, consisting of the heads and hulls of green shrimp, dried and ground into meal. Shrimp bran has proved to be superior to digester tankage as a supplement either with corn alone, or with corn and rice polish rations for fattening swine, where corn forms approximately three-fourths of the ration. Shrimp bran and cottonseed meal (equal parts) proved superior to shrimp bran alone, and tankage and cottonseed meal superior to tankage alone. The supplements, when self fed with shelled corn, ranked as follows: (considering average gains per day and feed per 100 lbs. gain) Shrimp bran-cottonseed meal, gain per day, 1.51 lbs., feed per 100 lbs. gain, corn, 270.7 lbs., supplement, 55.2 lbs. Tankage-cottonseed meal, gain, per day, 1.43 lbs., feed per 100 lbs. gain, corn, 285.4 lbs, supplement 56.0 lbs. Shrimp bran only, 1.42 lbs. gain per day, feed per 100 lbs. gain, corn, 306.4 lbs., supplement, 41.15 lbs. Tankage only, gain per day, 1.09 lbs., feed per 100 lbs. gain corn, 363.5, supplement, 43.5.
In the 1931 feeding test, with rice polish as the only basal feed for 70 days, the addition of cottonseed meal to either shrimp bran or tankage reduced gains and increased feed requirements. When corn replaced 75% or more of the rice polish, the cottonseed meal mixtures again proved superior to either shrimp bran or tankage alone.

**Pasture Crops for Swine**

Comparison were made on two pastures crops in 1931; sudan-grass and rape, and soybeans. Nine-tenths of an acre of sudan-grass and Dwarf Essex rape pastured 30 pigs for 66 days (May 31-August 3). The pigs on pasture required 124.3 lbs. less feed for each 100 lbs. pork produced than did a similar group fed in a dry lot. On this basis, an acre of this pasture was equal to 2,372 lbs. feed worth $30.93. An acre of soybeans pastured after August 3 furnished pasture for 15 pigs for 43 days (Lot III) and saved $3.27 on each 100 lbs. pork produced, or $22.15 per acre. Lot III was fed at a later date than the other two lots, with some change in ration, so that the results are only comparable in a general sense. The pigs were of similar type and size.

Comparisons are being made on winter oats and rape, and melilotus indica for winter pasturage. Experiments will be continued during 1932 on sudan-grass and rape, soybeans and white Dutch clover.

Observations have been made during two years on the effects of various rations and pastures, and the use of cod-liver oil and ultra-violet light treatment of sows, on the condition of pigs at farrowing, particularly in regard to weakness of legs and swollen joints in the young pigs at birth. No conclusive results have been obtained. Codliver oil appeared to give positive results in the 1931 test, but was entirely negative in 1930. The percentage of pigs dead at birth was greater in three lots receiving codliver oil (17.2%) as compared to 10.9% for all other lots. The living pigs from the three lots were graded slightly higher
in condition and vigor than in two check lots receiving no codliver oil. No difference could be observed due to the type of pasture. Sows treated with ultra-violet light, but receiving no codliver oil farrowed 100% living pigs. Differences in breed type and size of litters tend to obscure any other effects which might have been present. Rations containing 15% protein supplement were not noticeably superior to rations with smaller amounts. All sows received simple mineral mixtures of bone meal, ground oyster shell, and salt. Since the sows were the property of the University, no abnormal rations were fed.

**Blackstrap Molasses For Farm Work Mules**

Blackstrap molasses is a by-product of the sugar refinery and is produced in rather large quantities in the sugar cane area of southern Louisiana. It is commonly fed to livestock, and is usually low in price. Corn, which is the chief carbonaceous concentrate fed to mules on sugar plantations, would not be grown provided a satisfactory substitute could be found. Consequently, a feeding experiment with work mules was started in May, 1929, the objects being (1) to determine the feeding value of blackstrap molasses in comparison with corn, and (2) to find the extent to which blackstrap could replace corn grain in the work mule's ration. Seven teams, later six, were divided into two lots. The basal ration consisted of ground whole ear corn and hay. Blackstrap replaced corn grain pound for pound at the rate of 3 pounds in Lot I and 6 pounds in Lot II. After 252 days, the molasses levels were raised to 6 and 9 pounds respectively and continued for 266 days. After 126 days in each feeding trial the lots were revised in order to eliminate any variation due to individuality of the mules.

On the ration containing 3 pounds of molasses, the mules gained an average of 4.01 pounds; their mates receiving 6 pounds of molasses daily lost 13.38 pounds. During the second trial, the mules receiving 6 pounds of blackstrap gained 52.05 pounds, their mates on 9 pounds of
molasses gained 56.44 pounds. The differences in gains of the mules during either period are statistically insignificant, therefore it is concluded that cane molasses has a feeding value for farm work mules equivalent to that of corn grain pound for pound. It is furthermore concluded that as much as 9 pounds of blackstrap can be included in the daily ration of a farm work mule with good results.

When corn is selling at 20c, 30c, 40c, 50, 60c, 70c, 80c, 90c, or $1.00 per bushel, blackstrap molasses has the following values per gallon as a feed for farm work mules, 4.18c, 6.27c, 8.36c, 10.45c, 12.54c, 14.63c, 16.72c, 18.80c, and 20.88c.

Blackstrap Molasses and Corn-Soybean Silage for Fattening Yearling Steers

Snell

In the fall of 1929, a dry lot feeding project with yearling beef steers was started, the object being the determination of the feeding value of molasses and the effect of its inclusion in rations with and without silage. The rations were as follows: Lot I—ground whole ear corn, cottonseed meal, hay, and salt, Lot II was fed the same as Lot I, except that blackstrap molasses (2.2 pounds) replaced corn grain pound for pound, Lot III was fed the same as Lot I, except corn-soybean silage was full fed in addition to the ground whole ear corn, cottonseed meal and hay, Lot IV was fed the same as Lot III, except that molasses (2.2 pounds) was fed so as to replace corn grain, pound for pound.

This work was repeated during the year 1930-31, with the exception that a mineral mixture composed of bone meal, 40 parts, ground oyster shell, 40 parts, and salt, 20 parts, was self-fed to all lots.

The average daily gains were 1.96, 1.93, 1.94, and 1.97 pounds, respectively, for the four lots. The feed required for 100 pounds of gain was: Lot I, ground whole ear corn, 542 pounds, cottonseed meal, 104 pounds, hay 281 pounds; Lot II, ground whole ear corn, 400 pounds, molasses, 112
pounds, hay, 317 pounds; Lot III, ground whole ear corn, 529 pounds, cottonseed meal, 106 pounds, hay, 157 pounds, silage, 241 pounds; Lot IV, ground whole ear corn, 392 pounds, molasses, 109 pounds, cottonseed meal, 104 pounds, hay, 201 pounds, and silage, 306 pounds. In Lot I, the ground whole ear corn group, 100 pounds of ground whole ear corn plus 2 pounds of cottonseed meal was equivalent to 112 pounds of molasses plus 36 pounds of hay. In Lot III, the ground whole ear corn—silage group, 100 pounds of ground whole ear corn was equivalent to 114 pounds of molasses, 46 pounds of hay and 68 pounds of silage. On a dollar and cents basis, molasses was worth about \( \frac{1}{3} \) less than corn grain.

**The Effect of the Addition of Varying Amounts of Blackstrap Molasses Upon the Digestibility of the Various Nutrients**

Blackstrap molasses when included in the rations of fattening steers has given variable results. In some experiments, its feeding value has been equivalent to corn grain pound for pound; in at least, one feeding trial its feeding value has been negative. The question naturally arises as to the effect of the addition of varying amounts of blackstrap molasses upon the digestibility of the various nutrients.

Three yearling steers were used for these trials, each digestion period consisting of a 10-day preliminary period followed by a 10-day digestion period proper.

The basal ration fed in the first trial consisted of 8 parts ground whole ear corn, 2 pounds of cottonseed meal, and 3.5 pounds of grass hay; the ingredients being coarsely ground and mixed. In the succeeding trials, molasses replaced ground whole ear corn at the rates of 15 per cent, 30 per cent, 45 per cent, and 100 per cent of the grain content, one pound of molasses replacing one pound of corn grain plus its cob and shuck.
The digestibility percentages for the five trials in order are as follows: protein, 54.03, 66.26, 48.31, 48.25, and 47.68; ether extract 76.03, 77.94, 77.56, 75.77, and 67.45; nitrogen free extract, 59.65, 67.75, 72.22, 73.62, and 71.35; fiber, 27.18, 21.57, 31.91, 35.57, and 29.37; ash 35.70, 54.89, 63.42, 68.06, and 70.87.

The addition of molasses showed a slight depressing effect upon the digestibility of protein, but seemed to increase the digestibility of the fiber and ash.

**The Digestibility of Artificially Dried Soybean Hay as Compared to Sun Dried Soybean Hay**

Snell

The drying of fresh cut hay, or desiccating hay, as it is sometimes called, by means of hot air currents is of importance in Louisiana. A machine for this work has been developed by the Louisiana Agricultural Experiment Station. Some question has been raised as to the feeding value of this hay in comparison with hay cured by ordinary field method. A digestion trial was carried on with soybean hays in order to answer this question, three yearling steers being the experimental animals.

In the fall of 1930, one plot of Biloxi soybeans was cut and cured in the usual field method, another of the same variety and treatment was cut and the fresh green hay run through the desiccator and the water content reduced to approximately 14 per cent or less. The analyses, coefficients of digestibility and the digestible nutrients in 100 pounds of the two hays are shown.
<table>
<thead>
<tr>
<th></th>
<th>Protein</th>
<th>Ether Extract</th>
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<tr>
<td>Field cured</td>
<td>9.13</td>
<td>.80</td>
<td>29.77</td>
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<tr>
<td>Desiccated</td>
<td>12.13</td>
<td>2.45</td>
<td>36.72</td>
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<tr>
<td>Field Cure</td>
<td>61.43 40.83 53.01 55.25 58.85</td>
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<tr>
<td>Desiccated</td>
<td>51.28 66.72 62.28 41.63 37.04</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>DIGESTIBLE NUTRIENTS PER 100 POUNDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field cured</td>
<td>5.60 .32 15.78 26.13 4.21</td>
</tr>
<tr>
<td>Desiccated</td>
<td>6.22 1.63 22.87 13.32 3.11</td>
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</table>

Drying reduced the digestibility of the protein, fiber, and ash, but increased the digestibility of the ether extract and nitrogen free extract.

**Spring Lamb Production**

Thirty-eight native white-faced ewes were purchased locally and brought to the University during the first week of March, 1930. These were wormed and divided into two lots, Lot I being bred to a purebred Southdown ram and Lot II to a purebred Hampshire ram. The Southdown lambs averaged 7.3 pounds at birth, and the Hampshires 8.0. The average length at birth of the Southdown lambs was 20.84 inches, and that of the Hampshires 22.29. The heart girth of the Southdown lambs was 14.25 inches while that of the Hampshires was 14.35. These differences were still present at an average of 95 days of age. At this time, the Southdown lambs averaged 47 pounds, and the Hampshires 50 pounds. The Southdown lambs averaged 38 inches in length and 27 inches around the heart while the Hampshire figures for these measurements were 39 and 28 inches, respectively. The estimated net income per lamb was $1.29 for the Southdown grades, and $1.52 for the Hampshires.
Effect of Plane of Nutrition Upon Wool Production and Reproduction of Ewes

One of the problems of the wool grower in the cut-over areas of Louisiana is the shedding of wool by the sheep in the winter and spring months. This shedding seemed to be of a nutritional origin. In order to test this theory, forty native ewes were divided into four groups of ten head each, and placed in dry lot. The rations fed are as follows: Lot I, full fed, Lot II, full fed eight months, one-third full fed for four months, Lot III, two-thirds full fed, and Lot IV, one-third full fed. Wool samples are to be taken every 121 days, and the length, crimp and diameter of fiber studied.

In order to start this project, a sheep shed with feed room, the two totaling 100 x 16 feet, was built. Adjoining dog-proof dry lots were also constructed.

The first 112 days, results showed growth of the wool to be 3.75, 3.95, 3.20, and 2.75 centimeters for Lots I, II, III, and IV, respectively. The average diameters of fiber in ten-thousands of an inch were 10.36, 10.27, 9.52, and 9.50, respectively. The average crimps per inch were 6.79, 6.80, 7.43, and 7.93.

On January 22, Lot I had produced 2 lambs, Lot II, 2 lambs, Lot III, 5 lambs, and Lot IV, 4 lambs. Three of the lambs in Lot IV died within a few days after birth, apparently because their mothers had no milk.

Partial Survey of Wool Production in Louisiana

In the spring of 1931, a partial survey of wool production of Louisiana was attempted. A total of 737 fleeces were weighed, a sample of shoulder wool was obtained and a scouring test was run on this sample in order to determine the shrinkage. The results may be summarized briefly as follows:

1. The native piney woods ewe shears about 2.4 pounds of wool, 2.76 inches (7.00 c.m.) in length and shrinking about 40 per cent.
2. The native piney woods rams shear about 3.8 pounds of wool which is 2.89 inches (7.34 c.m.) in length and which shrinks 40 per cent.

3. The native wether shears a heavier fleece than the ewe or ram, his fleece weighing about 4.0 pounds, shrinking about 38 per cent and measuring about 2.50 inches (6.53 c.m.) in length.

4. Native sheep carrying some Cheviot breeding and run under fenced pasture conditions averaged 3.46 pounds per ewe, 4.07 for rams and 4.43 for wethers. The shrinkages for the three groups were 34 per cent, 37 per cent and 35 per cent, respectively.

5. A sheep seems to shear his heaviest fleece at two years of age (yearling fleece). The following years, his fleece seems to get progressively lighter. This tendency is most pronounced in the ewe and least in the wether. The lamb fleece (first year) is heavier than the fleece shorn the third year, but is not as heavy as the second fleece.

6. Sex has a very pronounced influence upon fleece weight, ewes shearing the lightest fleeces and wethers the heaviest.

7. Winter feeding apparently increases the wool production of ewes about a half a pound.

8. One effect of late shearing is an increase in weight due in part to an increase in shrinkage.

A STUDY OF THE DEFICIENCIES OF AGRICULTURAL IMPLEMENTS AS APPLIED TO SUGARCANE CULTURE

This project was undertaken because of the little or no satisfactory power operated field equipment being available for use on sugarcane plantations.

A three-row overhead beam cultivator for trailing behind a small tractor was designed, built and tried out. This machine satisfactorily demonstrated the feasibility of such machines; but needs some mechanical refinements.

Sets of disc, spring teeth cultivators, and a sweep were adapted to the Oliver No. 4 cane plow so that a minimum of cane roots would be cut and a satisfactory clean, mulched middle left back of the implement.

A five-foot, heavy disc, with 22-inch blades, loaded with 700 pounds additional weight, in two trips over the field gave the best job of stubble destroying. This required one hour and fifty minutes per acre with a 15-30 tractor.

Considerable time was spent in cooperation with several of the machinery manufacturers, looking towards their making machines better adapted to the sugarcane needs. During the past season special cane model tractors have been announced by Case, Caterpillar, and International Harvester Company. John Deere and Killefer each announcing heavy duty tool carriages with chisel teeth, middle bursters, or disc units.

The chiseling of sugarcane 12" to 16" deep in the bottom of the bar-off furrow gave a slight advantage on check plots, no material difference on the fertilized plots, and in no case sufficient gain to pay for the additional expense of chiseling. However on land having a hard pan layer 8" to 10" down, it is believed some advantage would be obtained, but we do not have any figures on the latter.
By a few changes in equipment it has been found entirely feasible to produce corn and soybeans with mechanical power on the Louisiana alluvial lands.

A considerable saving of tractor and man hours was made possible by the combining of three operations into one and changing the type of machine and operation used in seed bed preparation. The bedding, floating, and planting was performed in one trip through the field with a general purpose tractor. The rate of germination and stand was as good as that on beds which had stood for some time.

The plow in seed-bed preparation has been replaced by two strips of heavy disc. This has reduced the tractor and man hours 2.25 per acre with an acre yield slightly above that of any other block.

A single "Pulverator" unit for a 22-inch brush plow did a nice job of seed-bed preparation; but the blades and shaft failed to stand up under this use.

**LABOR AND POWER SUMMARY**

<table>
<thead>
<tr>
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<th>Hours per Acre</th>
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<td></td>
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<tr>
<td>General Purpose Tractor—Disc Preparation, 4-mule, 2-row cultivator</td>
<td>7.47</td>
</tr>
</tbody>
</table>

(The above does not include gathering)
IMPROVED METHOD FOR HANDLING HAY

Experiments were conducted to determine the possibility of storing hay by chopping and elevating with a recently developed hay chopper.

With a quarter-inch cut the storage space per ton of coarse soybean hay was reduced 66 per cent. With a mixed crabgrass and clover hay the chopped hay required 58% of the space required by the unchopped, and the baled 38% of that of the unchopped.

No difference in keeping quality can be found after five months storage between the whole, and chopped hay. At the time of storage the hay had a moisture content of 10 per cent. The humid climate of this location has not affected the keeping of the hays.

The cost of storing in the barn by chopping over a hay fork method will be about 25 cents per ton.

SUBSOILING OF COTTON LAND

Previous to bedding for cotton a single shank chisel was used in subsoiling a block of the bench land. The chisel was operated to a depth of 12 to 14 inches in the location directly above which the new bed would be thrown up. A much greater per cent of well-formed tap roots was produced on the subsoiled block. The unsubsoiled block showed a definite plow sole or very compact layer of silt loam 3/4-inch to 1-inch thick at a point 5 inches below the surface. In this unsubsoiled block the tap roots which succeeded in going through this layer were mostly spindly and very crooked.

The subsoiled plot yielded slightly more than the unsubsoiled but not enough to pay for the increased cost.

DRAFT OF CANE WAGONS

The draft of cane wagons was undertaken because of the difficult and expensive hauling conditions under which most of Louisiana's sugarcane is harvested. A preliminary study brought out
the fact that many of our plantation wagons weigh as much or more than the average load hauled.

A special cane wagon modified to our specifications was purchased for use in this work. Steel wheels of various heights and width of tires, as well as air wheels, are to be tested.

Dynamometer tests on several special cane wagons, typical plantation cane wagons, and our own wagon are now being carried on.

To date sufficient tests have not been made to warrant any conclusions.

**Artificial Curing of Hay**

Changes have been made in the hay drier at the University to improve the quality of the hay, to lessen the need of skilled supervision and to produce a drier of low first cost which would be dependable in drying all hay crops.

New type burners were installed which gave a more complete combustion of fuel and a higher quality product.

With direct radiation from the flame to the wet material eliminated, the process of drying was slowed down and higher outlet temperatures were necessary than when the incoming material was first heated by radiation and the drying completed by convection currents of hot gases. With this outfit the quality of the dried hay was excellent but the capacity of the drier could not be forced above one ton of dried hay per hour with an evaporation of 2½ tons of water per hour even with a furnace temperature of 1600°F.

The experiment station was asked to furnish design for a drier similar to the one at the station with improvements based on tests and as result there was built near Franklin, La., a similar drier with the incandescent flame in full view of the incoming wet hay. The rapid heating of the wet material by radiation followed by the slower evaporation
by convection as it was carried through the drum greatly increased the capacity of the drier without apparently lowering the quality of the dried hay.

The furnace of the University drier is being changed to bring the flame close to the incoming material.

In picking up the green material after mowing, a double cylinder loader handled alfalfa successfully from the swath; but would not handle green soybeans.

Soybeans planted in 22-inch rows and cut with a corn binder gave more economical field operations. At the drier this bundled material eliminated one feeder and enabled the cutter to produce a more uniformly chopped hay.

Feeding trials of dehydrated hays to both dairy and beef cattle are now under way.

AGRICULTURAL ENGINEERING

AN INVESTIGATION OF MILLING OF P. O. J. CANES

Whipple

A discussion of this project with the contact committee of the American Sugar Cane League resulted in the conclusion that a comparison of milling equipment, settings, speeds and pressures combined with figures for rate of grinding, amount and temperature of maceration water and reliable extraction figures would be of great value in helping to lessen the large loss of sugar in the bagasse of Louisiana mills.

Questionnaires were sent to all active sugar factories in the state in order to compare the mill settings. The work of the mills is being compared by the "lost juice figure" which represents the undiluted juice in bagasse percent fibre in bagasse as it was found that sucrose extraction figures were not comparable owing to the lack of necessary weighing equipment in most of the factories.

The figures obtained by the factory chemists are used in those factories which have chemical control, but these are supplemented by tests made by the experiment station in many of the sugar houses, samples of first expressed juice, mixed juice, residual juice and bagasse being taken for analyses.
Cane Freezing

Whipple

During the fall of 1930 experiments were made with a portable refrigerator built to freeze a row of standing cane 18 feet long in order to help study the problem of how to lessen the loss of damage from freezing on a crop of Louisiana sugar cane and the relative deterioration of different varieties.

Rows of cane 18 feet long of P. O. J. 234 and 36-M varieties were subjected to varying temperatures as low as 13 degrees F. One-third of the row was windrowed immediately, one-third after a lapse of a few days and the remaining one-third allowed to remain standing.

The standing and the windrowed canes were tested every seven days and the rate of deterioration determined by the drop in purity and the rise in acidity.

It was found that a minimum temperature as low as 23 degrees F., even though the temperature remained below 32 degrees for less than 2 hours, was sufficient to kill all the eyes as well as the bud. Cane in this condition deteriorated most slowly when windrowed immediately after the freeze. Cane with the bottom leaves and eyes not killed deteriorated faster when windowed than when kept standing. The tests indicated a much slower rate of deterioration in the 36-M than in the 234 variety.

Dairying

Dairy Work at North Louisiana Experiment Station

Lush

Ten grade Jersy cows were purchased to determine the value of a purebred bull in increasing production and to measure the returns from various grazing crops. The ten cows averaged 6181 pounds milk and 308 pounds fat in 1930 and 6292 pounds milk and 312 pounds fat in 1931 with 23 percent less grain fed. The difference is largely due to improvement in pasture and grazing crops. Six of the cows increased 9.2 percent in
production over previous owners' records. The feed and pasture cost per pound of butterfat was 30c in 1930 and 20c in 1931. With a whole milk market the cows returned $3.70 in 1930 and $3.45 in 1931 per day above feed and pasture cost to pay for labor, depreciation and other costs.

Nine heifer calves have been dropped in two years. The average feed cost of raising the oldest three to one year of age was $43.09 and four others in 1931 was $33.53. Liberal use of skim milk powder and grain at an early age are responsible for low cost and splendid growth. A satisfactory trench silo 8' X 7' X 6' by 56 feet long was constructed on a sloping hillside to insure drainage. One hundred and fifty man and 43 team-hours were used in construction. Sorgo fodder cut and uncut is being compared for silage. Silage has aided in maintaining milk production in 1931.

A satisfactory cooling tank was constructed of concrete and corkboard and is operated by an electric refrigerating unit. The cost of cooling 100 pounds milk effectively has been 7c with power at 3.5c per k. w. h. The total cost of operation is about 13c per 100 pounds or slightly over 1c per gallon. Costs are about twice as high in summer as winter.

The average length of milking each cow was 18.8 minutes per day during a week's trial.

PERMANENT PASTURE

Flat breaking ground in the fall left it too loose for pasturing or mowing. No treatment allowed rye grass seed to "drift". Discing appeared satisfactory. Of four clovers seeded, only the white Dutch and native hop have been persistent to date. All clovers are more prevalent on limed areas and on richer soils. Rye grass and rescue grass were more abundant on richer land. The paspalums are increasing and Bermuda has maintained itself on the better land. Weeds have been reduced by mowing and where
trees have been removed, grass is more abundant. This is especially true of a pine land pasture where no grass seed has been sown except through manure.

The use of 400 pounds of a 4-10-5 fertilizer as a top dressing gave a grass yield of 13,562 pounds in two cuttings in 1931. Without nitrogen the yield was about 10,000 pounds grass with or without potash. With no treatment there were 8,006 pounds grass per acre. The difference was more marked in early spring and the stand of clovers better on the fertilized areas. On land with a fair stand of clovers, 200 pounds of nitrate of soda with 400 pounds superphosphate or with lime gave 28,000 pounds grass. With one-half as much nitrate, lime alone or nitrate alone, the yields fell to approximately one-half as much. These results, while preliminary, indicate the importance of nitrate, phosphate and lime all being added to similar hill pastures.

**Temporary Pasture**

For winter pasture a mixture of Abruzzi rye and vetch withstood the cold weather of 1930, while oats and vetch were slightly superior in 1931. The respective acre values of rye, oats and barley on a basis of 40c per pound fat for 1931 are $9.77, $11.35 and $4.10. The oats also gave 2.61 tons hay per acre. This test is being continued to find a satisfactory winter grazing crop or combination of crops.

A 5.5 acre field of Sudan gave 251 cow days' grazing in 1930 and 5 acres 162 cow days in 1931. During the latter season Sudan increased milk flow 3 pounds per cow or 13.6 percent over permanent pasture. Sudan planted April 1, failed to make satisfactory growth. Cowpeas planted as a catch crop increased production 11.5 pounds per day for 9 cows during nine days.

Echindorf beets and Mammoth red mangels well fertilized in spring gave 18.7 and 14.5 tons per acre respectively in one trial. The cows relished the beets in September but apparently no increase in production occurred.
Kudzu crowns were successfully established on thin land by careful fertilization and setting in hills.

The value of all these pastures on the basis of dry feed replaced or saved by their use appears to be $16.43 per acre for 1930 and $10.83 per acre in 1931. In the past year 25 tons of hay was also produced on this 30 acres so that the value is much greater in 1931 in spite of low feed prices.

Cottonseed fed with legume hay in dry lot or on pasture up to 8 pounds per day has apparently no marked effect on health of four cows to date. Cows refused it without 20 to 25 percent corn meal, however. Milk production hasn’t been as satisfactory in either case as the regular herd ration.

**LIMITED GRAIN FEEDING FOR MILK PRODUCTION**

The purpose of this test was to determine the proper amount of grain to add to good pasture or roughage for most economical milk production. Two years’ results with three groups of nine cows, each fed varying amounts or no grain, indicate that pasture and roughage will give about 61 percent of their production on a full grain ration. Cows changed from a full grain ration to grain at the rate of one pound for each four pounds Jersey or six pounds Holstien milk with more roughage produced as much during the following year as previously. However a group of cows fed for two years at this rate produced only 90 percent as much the second year as the first. The results to date have been somewhat affected by irregular breeding, a dry summer in 1930 and limited roughage in 1931, but clearly indicate that when the market price for milk is $2.00 per cwt. or above, grain can be fed liberally. As the price of milk drops below 17c per gallon or $.50 per pound butterfat, less grain can be economically fed. At a price of 30c per pound fat, the most economical production occurs on roughage plus good pasture at prevailing feed prices for cows capable of producing 250 to 300 pounds butterfat per year. The highest production attained on roughage alone was 234 pounds butterfat in 10 months,
while the highest production on full grain was 340 pounds butterfat in a like period. Individual cows varied widely within the same groups, but ten out of twenty cows produced more on low grain and large amounts of roughage than when normally fed. All but one cow produced more on full grain than on roughage alone. Grain feeding caused a gain in weight and was of value in periods of short pasture. In every case pasture furnished from 50 to 80 percent of the nutrients consumed for the year and its condition was reflected in the milk flow.

**Composition and Yield of Pasture Grasses**

The feed cost of butterfat produced by the L. S. U. dairy during 1929 and 1930 averaged 21c per pound less during the eight pasture months than during four winter months. From March to August during the past three years, these cows averaged 64.6 percent of their feed nutrients from pasture. In terms of dry feed replaced with pasture, the respective values of pasture per cow are $51.37, $40.04 and $30.13 for those seasons.

To obtain pasture yields and composition of grass, caged areas were clipped at monthly intervals during the past two years. The average yield of grass has been 45,003 pounds and of air-dried hay 11,330 pounds per acre. Yields averaged 28 percent higher in 1931 than 1930. The highest plot yield was 18,751 pounds hay on rich low land. Areas treated with 100 to 200 pounds nitrate of soda or 150 to 300 pounds superphosphate apparently yielded no more grass nor difference in composition than untreated areas on bluff land and lowland. The fertility of this land is high.

The analyses from 163 samples of grass indicate similar seasonal trends from high protein and low fiber and carbohydrate content in early spring to low protein and high fiber in late summer. Twenty to 25 percent of the dry matter of March grass was protein and 9 to 12 percent in August. Rye grass and clover in January was over 26%.
protein. The ash and fat content varied but little. Grass is thus a watered concentrate and other feed should be adjusted to its seasonal composition.

Results obtained in cooperation with Professor J. L. Fletcher of Southwest Louisiana Institute indicate that 200 pounds nitrate of soda and 200 pounds superphosphate are extremely profitable at Lafayette. The former gave an increase of 54.2 percent and the latter 21.9 percent of hay on a clover field. Used together an increase of 67.6 percent or nearly 2 tons of hay more per acre was obtained. Liming with two tons ground oyster shell reduced the acidity and increased the grass yield 16.4 percent regardless of other treatment in 1931. On plots containing Bermuda and rye grass with clover, the same amounts of nitrate and phosphate trebled the yield of grass over an untreated area. In a pasture test covering 121 days previous to September 1, this treated pasture carried an average of 2.47 cows per acre, producing 5652.6 pounds milk per acre as compared to 1.59 cows and 4076.6 pounds from an untreated acre. The returns over feed and fertilizer cost per acre at 35c per pound butterfat were $14.56 greater for the fertilized than untreated pasture.

There was no significant difference in the chemical composition of hay cut the same date, regardless of treatment except on an ammonium sulphate plot with poor yield of clover. Hay cut four times during the season showed the same decline from high protein as grass clippings at Baton Rouge.

The results warrant the conclusion that fertility is important in determining total yield but of little importance in its effect on composition of the same vegetation. However, season of year or rate of growth is more important than type of vegetation in influencing the protein and fiber content of frequently clipped pastures.
A COMPARISON OF CONTINUOUS FEEDING OF COTTONSEED MEAL AND SOYBEAN MEAL ON GROWTH AND MILK PRODUCTION

The object here was to observe the effect of these high protein feeds on developing heifers. Yellow corn meal, 25 percent of the protein feed, ground oyster shell and salt plus silage or pasture constitute the sole ration of each group. No hay has been fed in over two years.

The results with nine Holstiens indicate soybean meal to be fully equal to high grade cottonseed meal in promoting growth, reproduction and milk production. Since freshening the soybean meal heifers have averaged 44.8 pounds milk compared to 38.6 pounds for the cottonseed meal group. No ill effects have occurred except in one heifer that was over-fed and she responded to a reduction in grain. An average of over 4 pounds of either soybean meal or cottonseed meal per day has been fed without any noticeable digestive disturbance. Growth and production have been entirely satisfactory without the use of hay or bulk in the grain ration. Because of a higher market price of soybean meal, the feed cost averaged $60.25 in that group as compared to $53.13 for the cottonseed meal heifers from 10 months until calving time. The feed cost per pound butter-fat produced is likewise slightly higher.

WHOLE COTTONSEED FOR MILK PRODUCTION

Because of the large supply of low-priced cottonseed available last fall, a three months' comparison of its feeding value with that of cottonseed meal was made. Eight cows were fed on soybean hay, silage, and a grain mixture of corn, oats and bran with either one-third cottonseed or one-fifth cottonseed meal for alternate 30-day periods. The results indicate that 100 pounds choice cottonseed meal is equal to 206 pounds of whole cottonseed under these conditions. If seed sell for $9, one can afford to buy meal at $18.54 per ton. No laxative condition developed even though
one cow averaged 7 pounds seed daily for a month. The quality of butter produced is being determined in cooperation with the University dairy department.

**GROUND DEHYDRATED SOYBEAN HAY FED AS A CONCENTRATE**

Due to the interest in artificial drying of hay, a small test was made in the summer of 1930 of its value supplemented with 20 percent molasses against a grain ration. Two groups of five cows each were used for alternate periods of 25 days, all cows having access to good pasture. The results indicate 20.4 percent more milk while on the grain ration than on the soybean hay mixture. Two cows refused to eat the soybean hay mixture consistently. Three other cows fed a dehydrated soybean hay as 37 to 66 percent of the grain during this time produced 91 percent as much as on grain. Evidently dehydrated soybean hay cannot replace a good grain mixture for cows on pasture in spite of a similar analysis.

**METHODS AND COSTS OF RAISING DAIRY CALVES AND HEIFERS***

To obtain data on the cost of raising good calves where whole milk is sold, a study was made of amount of milk and feed exclusive of pasture fed to purebred heifer calves in the University herd during the past four years. Current feed prices were used and milk valued at what it might be sold for if no surplus were produced. An average of 932 whole, 2251 liquid and 49 pounds skimmilk powder and 604 pounds grain were fed to one year of age.

On this basis, the average feed cost to six months was $45.65, to one year $70.80, two years $93.91 and first calving $97.98. When present feed prices are applied to feed con-

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*We are indebted to A. P. Kerr, Chief Chemist, and associates for analyses and to the L. S. U. Dairy for use of equipment and some records.
sumed and butterfat is marketed, the respective feed costs are $16.73, $29.42, $41.71 and $45.78. Nine heavily fed Holsteins cost $142.75 to attain the latter age.

Thirty yearling heifers made an average daily gain of 1.18 pounds from March 1 to December 5, 1931, on pasture alone. Holstein calves fed only six or nine pounds of whole milk per day and weaned at 50 days of age to a grain mixture containing 25 percent skimmilk powder failed to make satisfactory growth.

The results indicate that the whole milk dairyman can lower costs of raising the best calves by substituting skimmilk powder for part of the whole milk fed remixed or in the grain, feeding more grain to young calves and providing good pasture for heifers.
<table>
<thead>
<tr>
<th>Grass to date Cut</th>
<th>No. Samples</th>
<th>Ht. Inches</th>
<th>Dry Matter in 100 lb. Grass</th>
<th>Percent of Dry Matter</th>
<th>Nutritive Value of T. D. N. Grass</th>
<th>N. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White clover 1/15/31</td>
<td>1</td>
<td>4</td>
<td>13.67</td>
<td>27.94</td>
<td>4.39</td>
<td>12.8</td>
</tr>
<tr>
<td>Rye grass 1/15/31</td>
<td>3</td>
<td>5</td>
<td>16.69</td>
<td>26.68</td>
<td>5.10</td>
<td>13.5</td>
</tr>
<tr>
<td>Rye grass &amp; clover 3/5/31</td>
<td>4</td>
<td>2.5</td>
<td>18.28</td>
<td>20.18</td>
<td>4.29</td>
<td>17.6</td>
</tr>
<tr>
<td>Rye grass &amp; clover 4/6/31</td>
<td>4</td>
<td>4</td>
<td>17.33</td>
<td>19.82</td>
<td>4.26</td>
<td>13.5</td>
</tr>
<tr>
<td>Rye grass &amp; clover 5/5/31</td>
<td>6</td>
<td>7</td>
<td>16.55</td>
<td>18.32</td>
<td>4.69</td>
<td>14.5</td>
</tr>
<tr>
<td>Rye grass, clover &amp; Bermuda 6/4/31</td>
<td>6</td>
<td>5</td>
<td>28.42</td>
<td>15.76</td>
<td>2.91</td>
<td>8.9</td>
</tr>
<tr>
<td>Texas bluegrass 4/6/31</td>
<td>1</td>
<td>4</td>
<td>13.15</td>
<td>26.98</td>
<td>5.17</td>
<td>15.2</td>
</tr>
<tr>
<td>White clover 3/5/31</td>
<td>6</td>
<td>7</td>
<td>13.89</td>
<td>25.63</td>
<td>3.74</td>
<td>16.6</td>
</tr>
<tr>
<td>White clover 4/6/31</td>
<td>3</td>
<td>6.5</td>
<td>14.83</td>
<td>25.63</td>
<td>3.89</td>
<td>16.4</td>
</tr>
<tr>
<td>White clover 5/5/31</td>
<td>6</td>
<td>6.5</td>
<td>15.81</td>
<td>24.69</td>
<td>4.23</td>
<td>16.4</td>
</tr>
<tr>
<td>White clover, Dallis &amp; Bermuda 6/4/31</td>
<td>7</td>
<td>4</td>
<td>27.45</td>
<td>21.13</td>
<td>2.79</td>
<td>16.4</td>
</tr>
<tr>
<td>Pure Bermuda 9/15/31</td>
<td>2</td>
<td>4</td>
<td>35.29</td>
<td>11.63</td>
<td>2.74</td>
<td>16.4</td>
</tr>
<tr>
<td>Dallis Bermuda, Foxtail 9/15/31</td>
<td>6</td>
<td>4.8</td>
<td>31.17</td>
<td>9.52</td>
<td>2.98</td>
<td>16.4</td>
</tr>
<tr>
<td>Ave. grasses cut 3/5/31</td>
<td>10</td>
<td>5.2</td>
<td>15.65</td>
<td>23.45</td>
<td>3.96</td>
<td>16.4</td>
</tr>
<tr>
<td>Ave. grasses cut 4/6/31</td>
<td>13</td>
<td>6.4</td>
<td>15.47</td>
<td>23.95</td>
<td>4.10</td>
<td>16.4</td>
</tr>
<tr>
<td>Ave. grasses cut 5/5/31</td>
<td>12</td>
<td>7</td>
<td>16.18</td>
<td>21.51</td>
<td>4.48</td>
<td>16.4</td>
</tr>
<tr>
<td>Ave. grasses cut 6/4/31</td>
<td>13</td>
<td>4.5</td>
<td>27.90</td>
<td>18.65</td>
<td>2.85</td>
<td>16.4</td>
</tr>
<tr>
<td>Ave. grasses cut 7/10/31</td>
<td>11</td>
<td>4.8</td>
<td>20.22</td>
<td>13.04</td>
<td>3.14</td>
<td>16.4</td>
</tr>
<tr>
<td>Ave. grasses cut 8/14/31</td>
<td>12</td>
<td>7.8</td>
<td>28.35</td>
<td>12.48</td>
<td>3.86</td>
<td>16.4</td>
</tr>
<tr>
<td>Ave. grasses cut 9/15/31</td>
<td>12</td>
<td>4.8</td>
<td>31.24</td>
<td>10.36</td>
<td>2.95</td>
<td>16.4</td>
</tr>
<tr>
<td>Ave. grasses cut 10/29/31</td>
<td>12</td>
<td>3.4</td>
<td>31.80</td>
<td>11.06</td>
<td>2.31</td>
<td>16.4</td>
</tr>
<tr>
<td>Ave. all 1931 samples</td>
<td>95</td>
<td>5.5</td>
<td>24.67</td>
<td>16.81</td>
<td>3.45</td>
<td>16.4</td>
</tr>
</tbody>
</table>

28
AVERAGE FEED COST OF RAISING CALVES, L. S. U.

<table>
<thead>
<tr>
<th>Date dropped</th>
<th>6 mo.</th>
<th>12 mo.</th>
<th>24 mo.</th>
<th>All calves to date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1928</td>
<td>1929</td>
<td>1930</td>
<td>1931</td>
</tr>
<tr>
<td>No. calves</td>
<td>26</td>
<td>37</td>
<td>28</td>
<td>9</td>
</tr>
<tr>
<td>Days fed whole milk</td>
<td>103</td>
<td>88</td>
<td>72</td>
<td>78</td>
</tr>
<tr>
<td>Whole milk, lbs.</td>
<td>1060</td>
<td>891</td>
<td>832</td>
<td>863</td>
</tr>
<tr>
<td>Skim milk, lbs.</td>
<td>868</td>
<td>1070</td>
<td>1514</td>
<td>1238</td>
</tr>
<tr>
<td>Skim milk powder, lbs.</td>
<td>28</td>
<td>30</td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td>Cost of milk</td>
<td>$43.48</td>
<td>$43.19</td>
<td>$36.92</td>
<td>$26.02</td>
</tr>
<tr>
<td>Grain, lbs.</td>
<td>187</td>
<td>219</td>
<td>273</td>
<td>229</td>
</tr>
<tr>
<td>Cost of grain</td>
<td>$3.82</td>
<td>$4.23</td>
<td>$4.40</td>
<td>$2.30</td>
</tr>
<tr>
<td>Total feed cost</td>
<td>$49.40</td>
<td>$49.22</td>
<td>$43.06</td>
<td>$28.26</td>
</tr>
</tbody>
</table>
ENTOMOLOGY DEPARTMENT
SUGARCANE BORER: ARTIFICIAL CONTROL

By the use of dusts of Sodium and Barium fluosilicates applied to cane by hand, saddle or traction dusters for treatment of second generation borer larvae especially, it has been found possible to destroy more than 50% of the borer larvae at a time when natural control is usually very slight.

Studies of the borer population in hibernation have enabled us repeatedly to forecast quite correctly the prospect for borer scarcity or abundance in the early summer generations.

The principal medium for borer hibernation during recent years has been found in cane top trash. By tests of various methods of disposing of or treating this trash, it now appears that immediate partial burial of green trash is not advisable; that only about one-tenth of the hibernating larvae have survived in cuts where trash was thoroughly burned early in the winter as in similarly infested cuts where trash remained on the surface unburned until time for cultivation or where similar trash was partially buried in January; that the addition of 200 lbs. of Ammonium sulphate per acre at about February 1st, followed by partial burial of trash, resulted (in the single test made) in a marked increase in decomposition of trash and in a decrease in borer survival. Johnson grass and sorghum stubble may also serve as hibernation quarters for large numbers of borers and corn stubble is occasionally a serious factor.
SUGARCANE BORER ARTIFICIAL CONTROL

The principal effort of the biennium has been to determine the practicability of controlling the borer by field colonizations of the native egg parasite, *Trichogramma minutum* Riley, which is bred in the laboratory in enormous numbers during the winter, spring and summer upon the eggs of the Angoumois grain moths (*Sitotroga cerealella* Ol.) which are bred in stored corn or other grains. During five seasons these field colonizations have shown consistently beneficial results. In seven front cuts colonized at Cinclare the average percentage of borer eggs parasitized from June 11 to September 13 was 64.1%, while in the check areas uncolonized it averaged for the same period 11.8%. The rate of colonization in these fields was 22,000 per acre. A normal yield of cane was harvested here.

In 1931 tests, many more fields were under close observation and colonizations at rates of 5000 to 10,000 per acre were scattered from the middle of June to the first week of September. Among egg collections made from June 26 to Sept. 21, the following results were found:

<table>
<thead>
<tr>
<th>No. of Fields Averaged</th>
<th>Colonized, Adjacent or Check</th>
<th>Total No. Eggs Examined</th>
<th>Average % Parasitized for Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>Colonized</td>
<td>80,221</td>
<td>70.2</td>
</tr>
<tr>
<td>11</td>
<td>Adjacent</td>
<td>41,105</td>
<td>66.8</td>
</tr>
<tr>
<td>25</td>
<td>Check</td>
<td>35,234</td>
<td>19.4</td>
</tr>
</tbody>
</table>

These records show the destruction of 70% of the borer eggs for the season in colonized fields as compared with less than 20% average in uncolonized fields in 1931. The average rate of colonization was from 5,000 to 6,000 per acre for the areas protected.
Furthermore the emergence holes of borer moths, as found at harvest time, showed that there were fully developed throughout the summer in colonized fields only 1 moth per 6.21 stalks, in adjacent fields only 1 moth per 5.41 stalks, while in our check fields there was 1 moth per 3.96 stalks, and in the average of 7 heavily infested uncolonized areas there was 1 moth per 1.99 stalks.

The average percentage of joints bored in colonized and adjacent fields combined was 35.0%, while in uncolonized fields it was 53.5%. The amount of borer injury per infested joint was much heavier in uncolonized than in protected areas.

Improvements have been made in grain moth production, especially through the development of very inexpensive, yet satisfactory, home-made equipment for maintaining desired temperature and relative humidity control both in winter and in summer.

**Sugarcane Beetle Studies**

A close study of the effect of the destruction of the "mother stalk" (original sprout) in a stool by sugarcane beetle attack has shown for such stools a reduction in sugar produced at harvest time averaging 25% below that obtained in comparable, uninjured, adjacent stools. There is but one generation of these beetles annually. During a period of several weeks, after the mean temperature of surface soil reaches above 60°F., the overwintered beetles are depositing their eggs singly in the soil near where they are feeding. The grubs develop there and feed only on decaying vegetable matter in the soil—never on living roots. They transform to the adult stage mainly during August and September and then feed for a time on the rootstocks of cane, grasses or some other possible food supply until time to hibernate. They hibernate in the adult stage, spending the winter in chambers or cells which they form somewhere in the upper few inches of soil and in the immediate vicinity of where they became adult.
Sugarcane Rootstock Weevils

It has been known for twenty years that a small weevil species, with adults slightly less than one-eighth inch long, has been breeding in the rootstocks of cane. The injury caused by these weevils has not been considered serious. However, during the season of 1931, we have found that this type of injury may be a very serious factor in causing the loss in stand in stubble cane through the destruction of the eyes in the rootstocks. We have attempted to measure the seriousness of this problem in a preliminary way and find that infestation occurs in every field examined from Baton Rouge to the southern and western sections of the Cane Belt. The stand of cane in first year stubble was lost completely on some ten acres and very seriously reduced on some ninety acres more at Arnaudville in the spring of 1931.

Examinations of stubble stools have shown from 75 to 100% of the rootstocks infested, with from 1 to 23 stages per rootstock. All stages except the eggs have been found in the fields during September to December. Natural mortality has been less than 10% in all cases. From 30 to 50% of all eyes were destroyed before the end of December, and the injury was increasing steadily with no indication of hibernation at that time.

There is evidence also of serious injury to the eyes of cane planted in infested areas. In one case 20% of these eyes had been destroyed, and larval, pupal and adult stages were found present in the eyes, within two months after the cane was planted. These weevil stages had evidently migrated from other host plants to the planted cane during this period. Infestation occurs abundantly in some native grasses in uncultivated areas.

Two species of weevils belonging to same genus are associated in this work. The less common species is black in color and has been described as *Anacentrinus deplanatus*.
This species has been known to occur on the rootstocks of barnyard grass or cockspur grass, through the area from Louisiana and Texas northward to South Dakota. The other species, reddish-brown in color, is much more numerous and has proved to be a new species. It has now been described by Mr. L. L. Buchanan of the U. S. Bureau of Entomology as *Anacentrinus subnudus* Buch., and is known thus far only from the Cane Belt of Louisiana.

**Soil Animals Attacking Cane**

The principal injury to cane roots has been found to be caused by the tiny springtail known as "the scooter" (*Lepidocyrtus violentus*) and by two very delicate, slender, white *Symphyllids* which also eat off the delicate root hairs through which the plant absorbs its food and also cause many pits in the cortex of the roots. The reduction in root hair formation appears to be the most serious type of injury. Altogether these soil insects appear to retard the maturity of cane and to reduce the weight of harvested cane by about one-sixth (from 15 to 18%), and with a corresponding loss in sugar. This is shown by an average of a number of stools grown in galvanized iron cylinders, with steam sterilized soil in both check and soil animal drums.

**Corn Fumigation**

In the final summary on this work it was found that the "black weevil" or "rice weevil" (*Sitophilus oryzae* L.) is the most important enemy of corn grain. This, and the less important grain feeding species together, cause the destruction of nearly 10% of the corn produced in Louisiana. In attempts to control these insects by fumigation of the corn as stored in the bins, it was found that Paradichlorobenzene (P.D.B.) was very satisfactory for the treatment of seed corn or corn that is to be fed to work animals but that it should not be used with grain intended as food for
human beings, poultry, or dairy cows, on account of the persistance of a disagreeable flavor in products produced therefrom. The most satisfactory fumigating material found for general use was carbon disulphide (CS₂) applied in cribs which have been made really "tight" by lining preferably with sheets of galvanzied iron, the sheets so laid that the edges over-lap and are first painted with cold tar then closely nailed and finally painted all over to prevent rusting. This makes the cribs mouse and rat proof as well. The temperature should be well above 60° F. before and during the treatment for effective results and a dosage of at least twenty pounds (pints) per 1000 cubic feet is advised.

Preliminary tests of orthodichlorobenzene and of chlorpicrin indicate that these materials are promising as grain fumigants.

**Dutox Fellowship**

In April, 1931, the Grasselli Chemical Company, of Cleveland, Ohio, established a cooperative Fellowship Fund for a special study of Dutox. This is a new Barium fluosillicate insecticidal material. Mr. I. J. Becnel has been conducting this investigation which has been designed to discover the practical applications of this material to various crops and insect control problems of the South and especially in the Gulf Coast section. This material has been proven to be notably free from chemical burning effects on a number of kinds of plants on which arsenicals cannot be used safely and has also shown superior value in the control of a number of species of insect pests when compared with other insecticides.

The investigation is still in progress.
These have included special studies of the velvet bean caterpillar (Anticarsia gemmatilis) which has occasionally appeared as a serious pest on soybeans in Louisiana, the soybean hay caterpillar (Herculia psammioxantha Dyar) another tropical species which has occasionally injured soybean hay in the stacks or bales; and the salt marsh caterpillar (Estigmene acraea Drury) which sometimes becomes a serious pest on cotton and other crops in Southern Louisiana especially. Publications have been issued on all of these pests.

HOME ECONOMICS

THE ANTI-RACHITIC EFFECT OF ACIDOPHILUS MILK

Tests were made on 583 rachitic rats.* The following conclusions are drawn:

1. Acidophilus milk had no greater prophylactic or curative effect on rickets in rats than uninoculated milk. It did not produce a lowered fecal pH when fed in conjunction with either Steenbock's rachitic diet or the stock diet.

2. Acidophilus milk fed with Steenbock's rachitic diet modified by the addition of 25% lactose showed a definite prophylactic effect against rickets. This effect was largely, if not entirely, due to the lactose as a similar effect was observed when the modified rachitic diet was fed with uninoculated milk.

3. Lactose had a definite prophylactic effect against rickets when 25% was added to Steenbock's rachitic diet. The diets modified by 25% sucrose, dextrose or maltrose produced a slightly less severe rachitic condition than the unmodified diet, but the condition produced by the "lactose

* 341 rachitic rats in 1930; 148 in 1929; 140 in 1931. Total 629 (46 discarded). Total 583.
diet" was definitely less severe than that produced by the other modified diets. This difference was not marked, but it was definite.

4. In using the curative instead of the preventive technique there was little or no healing of the rachitic condition attributable to the 25% lactose added to Steenbock's rachitic diet.

5. That C. P. lactose, a substance free from minerals and vitamin D, had any effect upon the severity of the rachitic condition suggests a relationship between the reaction of the contents of the intestinal tract and rickets. On the other hand, the fact that this lactose, which keeps the intestinal pH at nearly as low a level as cod liver oil does, has a decidedly smaller prophylactic effect against rickets than cod liver oil has, indicates that the intestinal pH, with its effect on the solubility of calcium and phosphorus, is only one of the factors in the etiologic of rickets.

The Vitamin G Content of White Potato

The Bourquin* technique was used to determine the Vitamin G content of potatoes of the Rural New Yorker variety. The experimental period was of 4 weeks duration, after the depletion period of 16 to 20 days. Daily supplements of freshly peeled, raw white potato were fed.

In these preliminary tests, 28 vitamin B and G depleted rats were fed varying amounts of potato, in addition to the modified diet containing an alcoholic extract of ground whole wheat as the source of vitamin B. The technique was not entirely satisfactory, as there was considerable variation in the response of rats in the same series. Only tentative conclusions can be drawn because of the small number of rats used. The average gains per week on the different diet modifications are shown in Table 1 and Chart 1.

The rats fed a daily supplement of 2 grams of potato averaged a gain of 5.4 grams per week more than the control rats on the vitamin G deficient diet.

These few data would indicate that the white potato tested contained at least 1 Bourquin unit of vitamin G per 2 grams of potato or at least 0.5 unit per gram.

If there is a connection between the deficiency of vitamin G in the diet and the occurrence of pellagra, increased potato consumption in pellagrous districts would be of value.

**Chart 1.** Curves showing average gains in weight of vitamin G deficient rats fed varying amounts of white potato as daily supplements. The amount of potato fed daily to each rat is indicated at the end of the curve.
TABLE 1.—AVERAGE GAINS PER WEEK OF VITAMIN G DEFICIENT RATS RECEIVING DAILY SUPPLEMENTS OF WHITE POTATO.

<table>
<thead>
<tr>
<th>Number of rats</th>
<th>Daily supplement Gms. of potato</th>
<th>Average weekly gain 4 wk. period in gms.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>0</td>
<td>1.4</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>6.8</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>9.2</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>12.8</td>
</tr>
</tbody>
</table>

HOME CANNING OF MEAT—LOUISIANA BULLETIN 220

Sunderlin

Seven hundred and seventy-nine pounds of beef and pork were canned in February, 1929 and 1930, with the following variables: Canning in glass and in tin, processing in the pressure cooker and in the boiling water bath, storing at room temperature and in the basement.

The glass jars were found to make perfect seals which were maintained during the storage period. The meat canned in glass showed no spoilage attributed to leaks or imperfect seals. Due to unexplained reasons, some spoilage due to imperfect seals or leaks occurred in the meat canned in tin cans in 1929, but none occurred in the meat canned in 1930.

There was no spoilage due to underprocessing in any of the meat processed for either 45 or 60 minutes at 15 pounds pressure in the No. 2 cans or pint jars. This was also true of that processed four hours in the boiling water bath. However, processing canned meat in the boiling water bath is not recommended in this climate because of the possibility of poisoning from botulism.

The meat stored in the basement showed more spoilage than that stored at room temperature. Even the basement temperatures were warm during the summer.
A TEST FOR THE VITAMIN D CONTENT OF SHRIMP MEAL AND SUN-DRIED SHRIMP

Both shrimp meal and sun-dried shrimp gave negative tests for vitamin D when fed at 1, 3, 5, 8 and 10% levels. The curative technique was used. Steenbock's rachitic diet 2965 was fed to 25 to 28 day old albino rats for 21 days. The diets modified by the addition of the shrimp meal and the sun-dried shrimp were fed for 5 to 6 days. A +2 line test at the end of that period was considered a positive test for vitamin D. The control rats that were fed cod liver oil at 1/4% level showed a +2 line test, while none of the rats fed the test rations did.

The calcium and phosphorus content of the shrimp bran and the dried shrimp samples used had been determined and the CaCo₃ percentage in the ration was modified to keep the calcium-phosphorus ratio between 4.82 to 1 and 4.92 to 1. Twenty-eight rats from five litters were used.

HORTICULTURE
A. VEGETABLES

1. ASPARAGUS INVESTIGATIONS

The purpose of this investigation is to determine the best cultural practices for asparagus growing in Louisiana.

The four phases of culture to be especially studied are:

(1) The time of the year the spears are cut.
(2) The effect of sex of plants on yield and grade of spears.
(3) The age to begin cutting.
(4) Fertilizer requirements.

The crowns have been growing in the field for one year. New shoots were put out at approximately one month intervals. The tops made excellent growth until late in the growing season, when a combination of dry weather and a cercospera disease were somewhat injurious.

This study of asparagus will include field plots and chemical studies in laboratory.
2. **Bean Investigations**

*Miller-Kimbrough*

Experiments are being conducted to determine the fertilizer requirements, time of planting, planting distances and varieties of snap beans. Spring plantings of beans are made on plots located at Houma and at L. S. U. The fall crop is being grown at L. S. U. only. The variety used is the Giant Stringless Green-pod. Fertilizer was applied at the rate of 800 pounds of 4-8-4 per acre, except in rate of application tests. Beans were planted at equal intervals except in the planting distance test.

At Houma the application of nitrogen was profitable up to 6%, while at L. S. U. the application of nitrogen was of doubtful value. The application of phosphate was more consistently profitable than applications of nitrogen or potash. The most economical gains from phosphate were obtained, however, from the 4 to 8% applications. Results obtained from the application of potash were somewhat variable, with 2% proving more consistently profitable. A 4-8-4 fertilizer was applied in amounts varying from 0 to 1200 pounds per acre. From 200 to 400 pounds per acre have produced as high or higher yields than heavier rates of application. The fall crop has shown less response to fertilizer than spring crop.

Earlier plantings in the spring where good stands were obtained produced larger yields and were more profitable than later plantings.

Where the drill method was used and a good stand was obtained, the 2 to 3 inches spacing produced the best yields. Where the hill method was used, the spacing of 6 inches apart in the row and 3 seed to the hill was best.
3. CABBAGE BREEDING

One of the objects of this project is to study the mode of inheritance of premature seeding in cabbage. Results have been obtained from crosses between strains which are resistant to seeding and those which are susceptible. The results of such crosses indicate that premature seeding behaves as a recessive character. Additional crosses are being made to obtain data from a wide range of varieties of cabbage. It has been found that by inbreeding most of the plants which seed prematurely the first generation of inbreeding can be recognized and discarded. Data have been obtained which indicate that the percentage of seeders found in fields of cabbage produced under normal weather conditions is due to segregation from natural crossing with other members of the Brassica family, which seed more readily than cabbage. By selfing these normal seeders, many of the members of the Brassica family have been recovered, such as Sprouting broccoli, Kohl-rabi, Kale and leafy plants which resemble the wild cabbage.

Desirable strains which are resistant to premature seeding have been bred and seed from one of the best strains of Copenhagen Market have been sent to Denmark for reproduction.

Considerable attention has been given to methods of handling mature heads of cabbage from which seed are desired. The following method has proven best for local conditions: The seed should be planted to beds in July and transplanted to the field the latter part of August or first of September. The plants will mature during late fall and early winter. After selecting the desired plants, the mature head can be cut and examined for interior characters, such as core height and size, compactness of head, and for color and quality of the head. Stems possessing the root system of the desired head are dug and transplanted to the breeding plot. All but about five sprouts growing from the stem are removed. The sprouts develop
into small heads from which seed stems will grow during the early spring. The mature seed is ready to harvest the latter part of May.

4. CABBAGE FERTILIZATION

Experiment are being conducted to determine:

(1) The most economical percentages of nitrogen, phosphorus, and potash to apply.

(2) The most economical rate of application of complete fertilizer.

This experiment is being conducted on the bluff land soil at L. S. U. The Louisiana Copenhagen variety is being used in all tests. Except in the rate of application test, 800 pounds per acre of fertilizer were applied before plants were set in the field. All plots received 200 pounds of nitrate of soda as top dressings in two equal applications. Results for one year have been obtained.

The results obtained indicate that 6% nitrogen was most profitable, closely followed by 4%. In the superphosphate test, the application of 4% gave the highest yield. While the profits from the use of potash are not as large as from nitrogen and phosphorus, the results indicate that its application pays, with 4% showing the greatest return.

The rate of application test of complete fertilizer, 4-12-4, showed that 800 pounds per acre were the most economical.

5. CUCUMBER FERTILIZATION, VARIETY AND SPACING TEST

The test to determine which of the fertilizer elements gave the greatest returns showed this to be phosphorus. The addition of nitrogen or potash had little or no influence upon yield. The application of 400 pounds per acre of 4-8-4 gave a higher yield than the heavier rates applied. The addition of 4 tons of stable
manure to 400 pounds 4-8-4 per acre gave an increase in yield, but probably not enough to warrant its application.

Of six commercial varieties tested, the highest yielder was Kirby Stay Green, followed by Early Fortune and then Early White Spine.

The spacing test consisted of drilling seed in rows and when the plants were up, they were thinned to 6 inches apart; planting in hills 18 inches apart and 3 feet apart and thinning to two plants to the hill. The rows were 7 feet apart. The 18-inch spacing produced the largest yield of No. 1 cucumbers per acre.

6. IRISH POTATO INVESTIGATIONS

To obtain information over a range of soil and climatic conditions, experiments were conducted at Houma, at Louisiana State University and at Alexandria. The Triumph variety of potatoes was used in all the experiments and all, other than the fertilizer tests, were given similar fertilizer treatment. The fertilizer at the rate of 800 pounds per acre was applied in the furrow at planting time and mixed with the soil before the potatoes were dropped. The seed pieces were accurately cut so as to average 1.5 oz. each. The seed pieces were placed 12 inches apart in the row and the rows were 3.5 feet apart at Louisiana State University and Alexandria and 5.5 feet apart at Houma. To partially overcome soil variation, each treatment was replicated five times.

Experiments are being conducted to determine:

(1) The fertilizer requirements of the potato in Louisiana.
(2) The effect of the size of the seed piece on yield.
(3) The effect of the planting distance on yield and grade.
(4) The value of ethylene chlorohydrin for breaking the rest period.
(5) The best cultural practices.
In some of the fertilizer experiments nitrogen, phosphoric acid and potash were varied in order to determine the most profitable percentage of each to use. It was found that, in 1930, a very dry year, 2% nitrogen was most profitable. In 1931, however, nitrogen was profitable in all tests and gave increased profits to the maximum application which was 6%. The 1931 season was very favorable to potato production. From 8 to 12% was the most profitable range of phosphoric acid. Variable results were obtained from the application of potash. In some of the tests profitable returns were obtained from applications as high as 8%, while in others potash applications did not pay.

A 4-8-4 fertilizer was applied in rates ranging from 400 to 2000 pounds per acre. The higher rates of application were most profitable. Increases obtained from applications above 1000 pounds were small however. Nitrate of soda at the rate of 200 pounds per acre applied to plots receiving 800 pounds of 4-8-4 per acre gave more profitable returns than the heaviest application of complete fertilizer alone. Three different sources of inorganic nitrogen were applied as top dressings and all gave profitable returns. Also muriate of potash applied as top dressing gave a profit.

Concentrated fertilizers, as Ammophoska and Nitrophoska, were tested in comparison with a 4-8-4 fertilizer. Rates applied were based on nitrogen equivalents. No significant differences were obtained between the concentrated fertilizers and the 4-8-4.

In the size of seed piece test the following sizes were tested: 0.5 oz., 1.0 oz., 1.5 oz., 2.0 oz. and 2.5 oz. The best returns were obtained with 1.0 oz. and 1.5 oz. seed pieces, with no significant difference between them.

The following intervals were used in the planting distance test: 8 in., 10 in., 12 in., 14 in., and 16 in. For the two years of this test the 14 in. spacing has been superior to the closer spacings.
Ethylene chlorohydrin has been tested for its effect on hastening the sprouting of fall grown potatoes used for seed. The treated potatoes, in the tests at Houma, showed that the treatment had a slight hastening effect on germination. Yields obtained were also somewhat higher. Tests at Baton Rouge showed no advantage for the treatment.

The cultural practices experiment included the following: Narrow rows, 3½ ft. wide, with half the area planted to potatoes and half to corn; wide rows, 7 ft. wide, with corn planted in the middles; wide rows, 7 ft. wide, with double rows of potatoes and no corn in the middles. The wide rows produced higher yields where equal areas were planted to both potatoes and corn. The narrow single rows showed greater returns than an equal area planted to wide double rows.

7. LEGUMES AS A SOIL BUILDER FOR TRUCK CROPS

This experiment contained the following treatments:

(1) Check—no improvement crop.
(2) Soy beans.
(3) Austrian winter peas and oats.
(4) Soy beans and Austrian peas and oats.
(5) Stable manure at rate of 15 tons per acre.

Irish potatoes were planted uniformly over the entire plots and fertilized with a 4-12-4, at the rate of 800 lbs. per acre plus 200 lbs. of nitrate of soda as a top dressing.

The soy bean plots produced the largest yield of U. S. No. 1 potatoes and were followed by the stable manure plots. The combination of soy beans as summer crop and the Austrian winter peas and oats and a winter crop did not produce any larger yield than did the check where no legume crop was used. The Austrian winter pea and oat plots showed the lowest yield of any of the treatments. The Austrian winter peas and oats were turned under three weeks before the potatoes were planted.
8. BREEDING OF ONIONS AND OTHER BULB CROPS

Miller

So far most of the time devoted to this project has been given to the selection and breeding of Creole onions. This work was started in the fall of 1929, by selecting as nearly uniform onions as could be found from the best sources in the state. To date the method used in breeding has been to inbreed by selfing and to discard the off-type bulbs. After the first generation of inbreeding, many of the selection were considered worthless for further study and were discarded. The off-type bulbs in the better strains were thrown out and the desirable bulbs were stored to determine their keeping quality and for further inbreeding. The different selections showed a marked variation as to color of bulbs and tops, size, shape, number of splits and keeping quality. The bulbs have now been planted to the field for the second generation of inbreeding.

9. SELECTION AND BREEDING OF THE CAYENNE AND TABASCO PEPPERS

Miller

Since starting this project, in 1929, two generations of inbreeding and selection have resulted. To date three strains of Cayenne and one strain of Tabasco have been isolated which growers and manufacturers of pepper products consider superior to any strains they have had before. All of the other strains except the ones mentioned above will be discarded. While these strains are now relatively pure, further inbreeding will be practiced to fix the type. So far very little, if any, vigor has been lost by inbreeding. Crossing between similar strains of Cayenne will be made to determine if additional vigor can be obtained.
10. SWEET POTATO INVESTIGATIONS

(a) FERTILIZER INVESTIGATIONS

This is a study of the fertilizer requirements of the Porto Rico sweet potato, planting distances and different sources of seed potatoes. Fertilizer was applied at the rate of 600 pounds per acre, except in the rate of application test. Plants were set 12 inches apart in rows 3½ ft. apart. Plats are located on the bluff land type of soil at L. S. U.

In the nitrogen test 2% was found to be as profitable as higher rates of application. Slight increases were obtained from phosphate up to the application of 12%. Potash applied at the rate of 2% was as profitable as the higher rates. A 4-8-4 fertilizer was applied at the rate of 0 to 1000 pounds per acre. No significant difference in yield was obtained from rates varying from 200 pounds to 1000 pounds per acre, with the yield from 600 pounds being the highest. Concentrated fertilizers, as Ammonophoska and nitrophoska, were as good sources of plant food as a standard 4-8-4.

The results of the spacing test, where intervals varied from 9 to 21 inches, showed that the 12-inch spacing was best, closely followed by the 15 inch spacing.

The source of seed test showed considerable variation in yields, but these were not consistent for a two-year period.

(b) A STUDY OF THE MUTATIONS OF THE PORTO RICO SWEET POTATO

Since the sweet potato plant almost never produces viable seed in the United States, it is believed that many of our varieties originated in this country by means of somatic mutations. It is, therefore, the purpose of this experiment to study, first, the kinds and frequency of the mutations; second, the difference in chemical composition of the mutations found;
and third, the progeny from high yielding hills to determine if the sweet potato mutates for high yielding ability as it does for color and shape.

To date the following mutations have been collected:
(1) white skin; (2) white flesh; (3) white skin and flesh; (4) pink skin and white flesh; (5) white striped skin; (6) gold skin; (7) purple skin; and (8) vineless or bunch.

The Porto Rico normally has light yellow skin and a flesh color of orange yellow to salmon.

Chemical analysis of the white skin and white flesh mutation showed that it was higher in water and starch and lower in sucrose and glucose than the normal Porto Rico.

(c) STORAGE INVESTIGATIONS

A study is being made of curing and subsequent storage of sweet potatoes. Comparisons will be made of moisture contents and shrinkage of cured and uncured potatoes during storage. Potatoes dug at different times and which are different in moisture content at the start will be used in this work. The relation of moisture content of potatoes at digging to the advantages of curing will be especially studied.

B. FRUITS

1. SUMMER APPLES

The summer apple orchards planted at the North Louisiana Experiment Station at Calhoun, Louisiana, and at the Louisiana State University Agricultural Experiment Station have developed satisfactorily. The trees at Louisiana State University are much larger than those at Calhoun. This is partly due to the drouth in North Louisiana during the summer of 1930.
2. ORANGE INVESTIGATIONS

(a) FERTILIZER INVESTIGATIONS WITH ORANGES

This work is being carried on in the Buras district with the cooperation of parish agent C. C. Dethloff. A study of the effects of various fertilizer treatments on the growth and hardiness of trees and the yield and quality of the fruit produced is being studied. The work is being carried on in three different groves of different ages. The different ages of the trees at the start of the experiment were one, five and twenty years respectively.

The three phases of the problem to be especially studied are:

1. Rate of application of fertilizer.
2. The response of oranges to N, P and K.
3. The effect of rate and time of application of potash.

(b) FERTILIZATION OF SATSUMA ORANGES

The purpose of this investigation is to determine the response of satsuma trees to nitrogen, phosphorus and potash. This work is being conducted in a small grove of trees two years old at L. S. U. A few oranges were borne this year and the number of fruits on trees just prior to maturity were recorded. No difference in tree growth due to fertilizer treatment is yet apparent.

(c) ORANGE HARDINESS INVESTIGATIONS

The work to be done under this project is a study of cultural practices with satsuma oranges in relation to winter hardiness. The effects of six different cultural treatments on ability to withstand injury will be studied in the field and in the laboratory. This study will be made at L. S. U.
3. PECAN VARIETY TEST

The object of this experiment is to test some new varieties as well as some of the standard varieties which are generally recommended for south Louisiana conditions. The trees have made satisfactory growth.

PLANT PATHOLOGY

Tomato Wilt

The two wilt-resistant tomatoes, Louisiana Red and Louisiana Pink, which have been developed at the Louisiana Experiment Station have continued to be popular. In 1930, over 2500 pounds of Louisiana Pink seed were produced and sold by a seed grower in California.

During the past two years, the comparative yield of these varieties and certain other standard varieties on wilt-infested soil at Baton Rouge is shown in the table below. The yield of all tomatoes in 1930 was very unsatisfactory on account of the drought.

Results of tomato variety tests on wilt-infested soil at Baton Rouge.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield per acre, tons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1930</td>
</tr>
<tr>
<td>Louisiana Pink</td>
<td>2.76</td>
</tr>
<tr>
<td>Louisiana Red</td>
<td>2.17</td>
</tr>
<tr>
<td>Stone</td>
<td>.57</td>
</tr>
<tr>
<td>Marglobe</td>
<td>1.37</td>
</tr>
<tr>
<td>Norton</td>
<td>1.42</td>
</tr>
<tr>
<td>Earliana</td>
<td>.79</td>
</tr>
<tr>
<td>Kanora</td>
<td>1.29</td>
</tr>
<tr>
<td>Marvel</td>
<td></td>
</tr>
</tbody>
</table>
Field tests to obtain data on the actual loss caused by the sugar cane mosaic under Louisiana conditions have been continued for a number of years. Replicated plots have been planted with mosaic-infected and healthy seedpieces. Results which have been obtained during three years are given in the table.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Condition of seed</th>
<th>Yield in Tons Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1929</td>
</tr>
<tr>
<td>Striped</td>
<td>mosaic</td>
<td>17.9</td>
</tr>
<tr>
<td></td>
<td>mosaic-free</td>
<td>19.3</td>
</tr>
<tr>
<td>POJ 36M</td>
<td>mosaic</td>
<td>25.0</td>
</tr>
<tr>
<td></td>
<td>mosaic-free</td>
<td>26.3</td>
</tr>
<tr>
<td>POJ 36</td>
<td>mosaic</td>
<td>23.1</td>
</tr>
<tr>
<td></td>
<td>mosaic-free</td>
<td>25.4</td>
</tr>
<tr>
<td>POJ 234</td>
<td>mosaic</td>
<td>27.6</td>
</tr>
<tr>
<td></td>
<td>mosaic-free</td>
<td>29.3</td>
</tr>
</tbody>
</table>

Investigations over a number of years show that the direct losses from mosaic on the varieties tried is in the neighborhood of ten per cent.

Some interesting information on the behavior of the mosaic disease in different cane varieties has also been obtained. It has long been observed that tolerant varieties, like POJ 213, remain remarkably free of the mosaic disease. Planting tests using seedpieces known to be infected with the disease have been conducted for several years. For a number of years, these diseased seedpieces have produced a remarkably high percentage of healthy shoots. Furthermore, it was noticed that diseased plants would apparently throw off the disease during the growing season. During the past two years, however, a condition has developed which is somewhat different. At Reserve, it was noticed that fields of POJ 213 were showing an extremely high percentage of mosaic. It was further noticed that varieties
like Co 281 which had previously been practically free of the disease were becoming infected. When planting tests were made with diseased stalks from Reserve, it was found that these stalks produced nothing but diseased shoots. This strain of mosaic behaves differently from the common strain which has occurred generally throughout the State. This strain is also appearing now in other parts of the State.

2. RED ROT

The red rot disease has become a serious problem, especially on certain varieties. Investigations have shown that POJ 213, POJ 36M, and CP 807 are very susceptible, while POJ 234 and Co 281 are highly resistant. In the field, POJ 213 seems to be injured more severely than the other varieties. In the spring of 1931, the stands of POJ 213 in many fields were injured to quite a serious extent. The relation of this disease to stubble deterioration is definitely established.

3. POKKAH-BONG

The Pokkah-bong disease occurs to a greater or lesser extent throughout the state. POJ 234 is the only commercial or promising variety which is seriously affected. The fungus, *Fusarium moniliforme*, which is generally recognized as the causal organism occurs quite commonly on a number of cultivated plants. In inoculation tests, the disease has been produced with cultures obtained from corn and onion as well as from sugar cane.

4. ROOT ROT

It is generally recognized that the fungus, *Pythium arrhenomanes*, is one of the organisms concerned in the root rot problem of sugar cane. This organism attacks the younger roots especially during the winter and cooler portion of the spring. Inoculation tests in metal drums in the field have shown that shoots in infected soil grow very slowly during the cooler weather.
Pythium arrhenomanes also occurs on other plants, especially corn. Apparently, however, the root rot condition cannot be materially affected by leaving corn out of the rotation. Tests have shown practically as much Pythium root rot in fields in which corn had not been grown as in others.

It has been found that there are certain organisms in the soil, especially Actinomycete species, which are antagonistic to Pythium. In sterilized soil, it has been possible to reduce the action of Pythium to a considerable extent by inoculating the soil with some of these organisms. Under field conditions, the results, as yet, have not been satisfactory.

**Selections of POJ 36M**

| Tims-Edgerton | In order to determine whether it is possible to select a high sucrose strain of POJ 36M, individual stalks were selected in the fall of 1929 and planted. As a check, individual stalks of POJ 36 were also used. In the fall of 1930, many of these selections were planted in larger plots. Analyses have been made during the three years. While a few of the selections have consistently shown high sucrose, most of them have varied to a considerable extent. |

**Root Development of Sugar Cane**

| Edgerton-Ryker-Ellis | Investigations carried on in 1930 and 1931 have shown the importance of the roots on the seedpieces and on the stubble pieces. These roots are particularly important to the early growth of cane in the spring. The lowest temperature at which cane roots and shoots will grow varies to a slight extent with different cane varieties. For most of the varieties, this temperature varies between 54°F and 58°F. Co 281 will not start at as low a temperature as will some of the other varieties. |
As about 90% of the cane roots occur in the upper fourteen inches of soil, deep cultivation should not be practiced after the cane roots grow out in the middles. The soil should be cultivated deeply only before the roots have developed.

**BEAN BLIGHT**

The bean blight has been very common and serious in Louisiana during 1929 and 1930. A considerable part of the infection, in the neighborhood of 85%, has been of the Halo blight type (*Bacterium medicaginis* var. *phaseoloca*) and the remainder the common blight (*Bacterium phaseoli*). The organisms causing these diseases are carried over from year to year on the seed. Seed from no section of the country seems to be free of infection. No seed treatment yet tried has been efficient enough to be of value.

**ROOT ROT OF BEANS**

Root rot of beans has been a serious trouble in the alluvial sections of the State. Not much of the disease occurred in Livingston and Tangipahoa parishes but in Terrebonne, it was particularly severe especially in the heavy, poorly drained soils. A number of organisms including species of Rhizoctonia, Fusarium, and Pythium have been isolated from the diseased plants. In inoculation experiments, the species of Rhizoctonia and Pythium were shown to be pathogenic. These organisms occur naturally in the Louisiana soils and are not brought in on the seed. As these diseases develop more readily in soils with a high moisture content, only well-drained soils should be used.

**STRAWBERRY DISEASE INVESTIGATIONS**

Four years of spraying experiments have shown that the leaf blights of the strawberry—leaf spot (*Mycosphaerella fragariae*) and sorch (*Diplocarpon earliana*)—can be effectively controlled by spraying with 4-4-50 Bordeaux about every ten days,
beginning the first week in January and continuing until about the first week in March. The marked increase in yield by the sprayed plants makes this practice economically practicable. In 1930, the yield of the sprayed plats was 107\%\% crates per acre more than that of the unsprayed. In 1931, due to the longer picking season and the bigger crop, the difference in yield between the sprayed and unsprayed was even greater. The sprayed plats yielded 348 crates per acre and the unsprayed ones 129, or a difference of 219 crates per acre in favor of the sprayed.

Tests showed that Bordeaux spray does not injure the opened blossoms. The percentage of blossoms setting fruit was found to be practically the same on both the sprayed and unsprayed plats.

Temperature studies showed that the optimum temperature for *Diplocarpon* is about 10\degree F higher than that for *Mycosphaerella*. These findings are in agreement with the actual conditions in the field. In Louisiana, the leaf spot is primarily a cool weather disease, being at its worst during the winter and early spring months. The scorch, on the other hand, is most prevalent during the warm months.

Infection experiments have shown that with both *Mycosphaerella* and *Diplocarpon*, infection takes place primarily, if not wholly, through the under leaf surface. The former fungus enters the leaf tissues through the stomata; the latter by direct penetration of the epidermis.

Inoculations with the bud nematode, *Aphelenchus fragariae*, resulted in about 90\% of dwarf plants. These findings are in agreement with those of Brooks, from Florida. From yield tests, it appears that the dwarf disease is of relatively minor economic importance in Louisiana because the nematodes are inactive during the winter months, so that dwarf plants recover during the winter and produce a fair crop. It is estimated that the reduction in yields due to dwarf does not exceed 1\%.

Several strains of *Pythium*, a *Phoma*, a *Fusarium*, and a *Rhizoctonia*, which were isolated from decaying straw-
berry roots proved to be pathogenic to strawberries, to a greater or less degree, when plants were grown in pots on soil inoculated with these organisms. What effect these fungi have on the plants under field conditions has not been determined.

Weather conditions have been decidedly unfavorable during the picking season for the development of berry rots, and so the losses due to fruit rots have been insignificant during the past two years. It is of interest to note, in this connection, that the gray mold (*Botrytis*) rot, which ordinarily is practically absent from the Louisiana berry fields, has been the prevailing berry rot during the last two years, over 60% of all the berry rotting being caused by this fungus.

Another berry rot which was noted for the first time in Louisiana this year, was caused by a Sclerotinia fungus, probably *S. sclerotiorum*.

**RUBUS ROSETTE**

The limiting factor in commercial growing of blackberries and dewberries in Louisiana is the rosette or double blossom disease. It was in the hope of discovering the cause and possible control of this disease that this project was undertaken.

The investigations thus far have shown that a fungus is found constantly associated with the disease. This fungus can be easily isolated from the inside of rosette blossoms, but has never been isolated from healthy ones. Mycelium and spores of apparently the same fungus are found in the affected blossoms between the floral elements and between the scales of the buds.

Inoculations were made with this fungus on healthy blackberries this year. So far the disease has not been reproduced artificially, but it is rather too early to tell, for the disease does not appear in its typical form until spring.
A spraying experiment appears promising. It was reasoned that if a fungus is responsible for the disease, infection should be prevented if the plants are kept sprayed regularly with some fungicide. Accordingly, a lot of blackberries and dewberries which were known to be severely affected with rosette have been kept sprayed regularly with 4-4-50 Bordeaux since last May, and another set of the same lot have been left unsprayed as check. Thus far, (January 11), the sprayed plants have been completely free from the disease, while many canes of the unsprayed check plants show symptoms of rosette.

**DYING OF PINEAPPLE PEAR TREES**

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For the past several years, dying of pear trees has occurred in different parts of the state, but chiefly in the Florida parishes. This disease, which may affect trees of any age, appears to be typically a root rot. The large roots and the base of the trunk above ground become affected, and the tree finally dies.

Among the organisms isolated from affected trees are cultures of a *Sphaeropsis* sp. and of a basidiomycete, probably *Clitocybe parasitica*. Inoculations with the former resulted in the production of cankers, but these are not typical of the disease as it occurs naturally. The *Clitocybe* fungus has been reported from other states as causing root rot of apples and other trees, and it is likely that it is also the cause of the killing of pears in Louisiana. Inoculation experiments are being carried on with this and other organisms.

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**ANIMAL PATHOLOGY DEPARTMENT**

**ANAPLASTOMOSIS**

Several cases of anaplasmosis developed on the University farm during the month of October, 1927. One survival of this outbreak was retained for experimental purposes and is still under observation. This animal was a carrier of the disease for
a period of three and one-half years, as demonstrated by blood transfusions into susceptible animals.

Fly transmission of anaplasmosis from infected to susceptible animals has been studied. The large black horse fly, *Tabanus atratus*, and the horn fly, *Haematobia serrata*, were used as possible vectors. The tests were conducted in well screened rooms and the interrupted method of feeding was used. The results of the tests carried on during 1930 and 1931 were negative. All test animals were observed for a period of at least one hundred days after attempted fly transmissions. All negative animals were then inoculated with a virulent strain of anaplasmosis to demonstrate the absence of immunity to the disease.

**BLINDNESS IN CHICKENS**

*Morris*

The condition known as blindness in chickens continues to be a serious problem to the poultry industry. As high as forty per cent of some flocks are affected with this condition. It may be found in flocks that receive the best care and attention as well as the neglected ones. All attempts to produce or transmit blindness experimentally have given negative results.

**SANTONIN**

*Morris*

The report of the tests with santonin as an anthelmintic for swine was published in the *Journal of the American Veterinary Medical Association*, Vol. LXXVIII, N. S. Vol. 31, No. 4, April 1931. The results seem to indicate that santonin is a very efficient anthelmintic for round worms in swine when given in small doses if followed by a saline purgative. Large doses were non-toxic.

**INTESTINAL PARASITES IN HORSES AND MULES**

*Morris*

Investigations concerning control measures for intestinal parasites in horses and mules have been carried on for a period of four years. It has been found that colic can be practically eliminated by the control of parasites. A report of this

PARASITOLOGY
Coccidiosis in Fowls

Mayhew

Single Comb Rhode Island Red chickens were used in the experiments covered by this report. All the eggs were obtained from the same flock of hens which was free from white diarrhea. They were incubator-hatched and the chicks reared in a battery brooder under closely controlled temperature and sanitary conditions, and all received the same brand of commercial feed during the time of the experiments.

A portion of the experiments has been concerned with the effects of the Coccidiosis upon the chickens. The difference in weight has been found to be the most outstanding definitely measurable difference between chickens inoculated with Coccidia and controls. Three lots have been inoculated during the seventh week in which there were 30 inoculated and 22 control females, and 30 inoculated and 32 control males. At six weeks of age the inoculated groups were approximately the same weight as the controls in both males and females. At eight weeks of age the males weighed 21.8% less than the controls. This difference decreased to 7.3% at 20 weeks. The inoculated females were 17.8% less than the controls at 8 weeks, the difference decreasing to 2.8% on the 20th week. At no time between the 8th and the 20th weight do the inoculated chickens equal or exceed the controls. When the inoculation is made during the 12th and 13th weeks the same general results are obtained, the inoculated males being 20% less and the females 20.7% less than the controls on the 15th week. These differences decrease to 10.1% in the males and 91.1% in the females on the 24th week. These differences do not include the loss by death.
Four lots of chickens have been used in checking the effects of powdered buttermilk in the treatment of Coccidiosis. Approximately half of each lot was inoculated on the day following the 6th weekly weight. The regular ration was fed until the 7th day after the inoculation, when both the inoculated and the controls were divided into two groups, and one group of each given the commercial mash to which 35% powdered buttermilk was added for about 2 weeks, while the other group was given the regular mash. A comparison of the weight records does not reveal any acceleration in the rate of growth of the inoculated chickens receiving the buttermilk which would enable them to regain their loss in weight due to the disease. Neither is there any consistent acceleration in the rate of growth of any group receiving the buttermilk when compared with the ones receiving the regular mash. These experiments are being continued to obtain additional data.

During the progress of the experiments on Coccidiosis 27 cases of paralysis have developed. These chickens have been reared under the same conditions and received the same feed as the others. There is usually a marked atrophy of the muscles on the limb affected. Death sometimes occurs within a week, while other individuals have lived several weeks or even months in a paralysed condition. Two have nearly completely recovered, one a male and one a female. The fecal examination records reveal the fact that 13 of the 27 cases of paralysis showed no infection with Coccidia or intestinal parasites. The accuracy of the examinations is suggested by the fact that 191 control chickens were raised in 16 lots under the same conditions without infection.

POULTRY

Storage of Louisiana Eggs

This department has co-operated with Swift & Upp Company of New Orleans for the past five years on the problems involved in the cold storage of Louisiana eggs. The results of these experiments justify the following statements:
Eggs produced in Louisiana under practical conditions, if properly cared for and marketed while fresh, will store successfully for six to eight months under commercial storage conditions. The average per cent loss on such eggs has been 1.5% to 3% including those broken in handling.

Louisiana eggs, when properly produced and cared for, are practically equal to eggs produced in other sections of the U. S. when stored under identical conditions.

The occurrence of olive-colored or dark yolk eggs need not be a serious problem with eggs produced in this state. Excessive feeding of cottonseed meal will cause olive yolks. It therefore should not be used in laying rations in amounts exceeding 5% of the total feed consumed during the season when eggs are stored, if there is any chance of the eggs being held more than two weeks. It is a good protein supplement for chickens and may be used more liberally at other seasons. Excessive feeding of rape, shepard’s purse, green alfalfa and probably certain other green feeds should likewise be avoided during the storage season.

Tests have demonstrated that olive-yolked eggs can be used successfully for cooking, but due to the decidely unsightly appearance of such eggs when broken out raw, they cannot be sold, and hence are an absolute loss. The olive yolks regain a bright yellow color when cooked.

Bacteriological studies have not revealed any bacteria, nor any mold that is particularly associated with olive yolked eggs.

This past season eggs that were produced during the latter part of June were stored satisfactorily. These eggs had been subjected to routine good care and were about four days old when placed in storage.

The practical application of the results of this project is illustrated by the experience of a nearby commercial producer. This poultryman had not dared to attempt storage of his eggs until he learned of the results of this experiment. Based on this knowledge he stored 3,000 cases of eggs this past season with very satisfactory results both as to qual-
ity and as to price received for the eggs when removed from storage. It is planned to issue a bulletin during the current year which will give in detail the results of the five year's work.

RICE BY-PRODUCTS FOR LAYING HENS

Rice bran, rice polish, and brewer's rice have been used in various proportions and combinations in laying rations during the past five years. The data accumulated justify the following summary:

1. Rice by-products frequently lower the cost of poultry feeds.
2. The use of rice by-products in laying ration is an efficient means of utilizing feed produced abundantly in the state.
3. Rice-fed hens have produced as well as hens on standard rations when rice products comprise up to 20 to 25% of the total ration.
4. Rice bran or rice polish, or the two together, may be used to replace wheat by-products, ground oats, or not to exceed half of the yellow corn meal, in laying mashes.
5. Brewer's rice may comprise as much as one-third of the scratch grain. Because of the small size of the particles it is advisable to trough feed scratch grain which contains brewer's rice.
6. The eggs from rice-fed hens are excellent for market and they keep well in storage.
7. The use of rice by-products in the rations of breeding birds does not impair the fertility nor the hatching quality of the eggs produced.
8. The body weight of laying hens receiving rice by-products in the ration is normal.
RICE BY-PRODUCTS FOR GROWING CHICKS

Rather extensive tests have revealed that rice by-products may be used successfully in rations for chicks as well as for hens.

Rice bran as 10 to 15% of the ration has given particularly gratifying results. There is some evidence that rice bran has an especial value because of its mineral content. Rice polish has also been used with satisfactory results. Formulas for chick rations and laying rations containing rice by-products may be obtained, by request from the poultry research department.

DOES HEAVY LAYING AFFECT HATCHING RESULTS

Three years' careful study of the individual egg production records and hatching records of breeding hens has shown that heavy laying prior to the hatching season is not as a rule injurious to the breeding ability of a hen. The fertility and hatchability records of Leghorn hens and of dual purpose hens that had laid a large number of eggs prior to the hatching season were equal to those of similar hens that had laid only a few eggs prior to the hatching season. The chicks of high-producing hens lived as well as those from hens that had laid appreciably less prior to the hatching season.

During the past two years approximately half of the hens on this experiment were "forced" by the use of all night lights and supplementary feeding of wet mash each day. Preliminary information indicates that this type of "forcing" is not detrimental to fertility and hatchability. This experiment is being continued as the data available are too meager to be definitely conclusive.

SHRIMP MEAL A PROTEIN SUPPLEMENT FOR HENS

Shrimp meal (or bran), a Louisiana product, shows promise of being a good protein feed for laying hens. Tests conducted the past two years indicate that shrimp meal may be used to replace meat meal in laying rations, with satisfactory results. Further tests
are being made before specific recommendations are issued. Tests with shrimp meal as a protein feed for chicks are also planned. A considerable number of poultrymen in south Louisiana use this product in laying mashes and obtain good production with it.

**Simple vs. Complex Rations**

The farmer often feels that the laying rations recommended by Experiment Stations are too complex. To test simple rations vs. more complex ones, pens of layers have been fed on these types of rations for two years. These tests indicate that birds will produce much better on "complex" rations than on simple ones. They also demonstrate, however, that a well-balanced simple ration will give fairly good production if an adequate protein feed is a part of the simple ration. Recommended rations will be given upon receipt of requests.

**Keeping Chickens in Confinement**

To combat poultry diseases and parasites many poultrymen of Louisiana have adopted the practice of raising chicks in houses with wire floors and of keeping them off the ground entirely for at least eight to twelve weeks. Others have gone even further and keep the laying hens confined to the house. Two years ago an experiment was started in which different lots of chickens grown and kept under varying conditions of confinement. The results of this experiment, to date, are not conclusive. This past year no significant difference was noted in the egg production or hatching results of hens in the various lots. The chicks grown in confinement on wire floors have had less mortality and have grown more rapidly than have chicks which were raised otherwise.
MITE CONTROL

Tests of the efficiency of "Crewood Oil", a southern by-product of wood distillation, in the control of mites in the poultry house have been underway for two years. The results to date indicate that this material is satisfactory for this purpose. Further trials are planned to test the durability of the treatment and the concentration or strength of solution needed for efficient control.

SUGAR CANE

During the biennial, all work as outlined and approved for sugar cane has been pushed along. Through the able assistance of Mr. Simon, who was appointed at the beginning of the period, much more information has been secured and passed on to the industry.

VARIETIES

Every year new varieties of seedling canes were secured from the Office of Sugar Investigations.

The "28" series produced some very interesting canes, two of them showing great promise of early maturity and satisfactory tonnage. Neither of these canes has as yet shown any signs of troublesome diseases which infest sugar cane in Louisiana. Both varieties are now under intensive cultivation, and seed cane of one of them has been placed on all of the test fields for propagation.

The "29" series showed an unusual number of promising canes, some of them of good diameter, and early maturity. We have had these cane varieties now under test for one year, and have not attempted to carry any of them further than the increase stage of production. Should they hold up in their performance through the current year, then the best of them will go forward to the plantation test fields.
In 1930, two new varieties of sugar cane, which have been thoroughly tried out by the University and the Government Station, were released to the sugar planters. One of these canes, Co 281, though not an early maturing cane, shows ability to make a good tonnage of rich cane early enough in the milling season, to warrant full consideration as a plantation cane. The other variety C. P. 807 grows heavy tonnage all over the state, but is slow in maturity and should be planted in small acreage, until more is known about its habits of growth, maturity, and milling qualities.

One other variety Co 290 has attracted a great deal of attention. Here at Baton Rouge, this cane has done well. It like C. P. 807 is not an early maturing variety, and should not be planted on extra fertile soil. On heavy soil and soil of medium fertility, this cane seems to be able to make tonnage and sucrose with a minimum of attention. The variety has been put out for test on a number of plantations. It has not yet been released for plantation use.

**Rotation**

Data gathered during the past two years confirm our last report to the effect that the use of legumes in a sugar cane rotation is the first essential to economic sugar production in Louisiana. Our records now show that a crop of legumes which was turned under in 1927-28 in comparison with a crop of the same legume when harvested for hay continues to show its effect in increased yield in 1931. We strongly recommend that no land be planted to sugar cane which has not had at least one crop of legumes grown on it and this legume crop turned under. Our rotations indicate that one crop of legumes (soybeans) grown and turned under in an ordinary sugar cane rotation in Louisiana on land which has been improved or built up is sufficient to maintain production. That two continuous years of legumes (beans or peas), while seeming to increase the yields of crops which follow in the rotation will not prove profitable, unless the soil in the beginning was in a rundown state.
If a planter has allowed his land to go backward, and if his yields, after fair cultural treatment are found to be unsatisfactory, it will no doubt prove highly profitable to him to crowd as many legume crops into his rotation as is possible, until he has built back the organic matter, and fertility of his soil. Once this stage is reached, then we believe that he can hold his lands up to a profitable yield basis, most economically by turning under one good crop of beans per rotation period.

**Fertilizers**

Under our system, we continue to find that it is not profitable to fertilize plant cane. We do find that it is, on the average, profitable to fertilize stubble cane, according to the treatment which the land has had. Not more than thirty-six to forty pounds of nitrogen should be applied to first or second stubble cane. The choice of materials for furnishing this nitrogen is wide, and all planters should buy that source of well known nitrogenous material which gives him the desired plant food at the smallest cost per pound of nitrogen.

In general, we do not find that any other commercial fertilizer is profitable when crops of legumes have been turned under regularly in our rotation. Heavy crops of beans when grown on land and turned under render quantities of mineral plant food available. We have several tests, particularly on plantations near Lafayette and Bunkie, where, while phosphate was required on one plantation on which the soil was low in organic matter, adjoining lands rich in organic matter failed to respond to phosphate. This is another strong argument for the proper use of legumes in all sugar cane rotations. There are some soils where it is known that phosphate will pay, and one strip of land along the western edge of the cane belt where phosphate is necessary in order that nitrogen may pay. We recommend to the
planters particularly those on the river and bayou soils, to fertilize with nitrogen until they have tested their soil as to phosphate requirements.

**Harvesting**

During the several years in which we have studied the POJ canes, we have found that during dry warm weather, shortly after these canes have been cut for the mill, say after twenty-four hours, they suffer a loss of sucrose and a drop in purity. After that first drop, they may not show any measurable loss for two or three days when deterioration may set in at such a pace that good canes may become unfit for sugar making. This is not a rule without exception, weather conditions have a great deal to do with the matter. During wet weather without much sunshine, canes keep better than during bright warm weather, and during cold weather canes keep much better than during warm weather.

While there are notable exceptions to the rule, it holds well enough to justify every effort to mill canes as close behind the cutter as is humanly possible. Particularly is this true in the case of immature cane. Cane that is low in sugar content is much more prone to deterioration than is rich cane.

The station recognizes the great advantage to the industry that it would be to find new varieties which would not be so prone to this deterioration. In work with new canes, the point is constantly in mind, and some data have been secured that indicate that one or two varieties now in hand may prove better adapted to Louisiana harvest conditions than the POJ canes.
Tests at the Baton Rouge Station show that in a comparison where corn was included in the rotation as against no corn in the rotation, a small increase in yield of cane was shown for the “no corn,” but not enough increase to justify the elimination of corn.

There has been a great deal of interest shown in the question of fertilizers for corn. This station finds that it is a profitable practice to fertilize corn following stubble cane. One hundred pounds of nitrate of soda on corn following stubble cane gave 11.6 bushel increase over no fertilizer. (This was a profitable investment).

Two hundred pounds of nitrate of soda on corn following stubble cane gave a 14-bushel increase over no fertilizer (the extra hundred pounds of fertilizer did not pay for itself).

Fertilizer after one and two years of beans when turned under did not pay for the investment. Corn following one year of beans turned under and not fertilized made as much as corn following two years of beans turned under.

Sugarcane Extension work in the sugarcane growing areas of the State is conducted mainly in cooperation with County Agents. In this line of work, cane farmers are assisted with existing field problems, and improvements in the system of farming are made by giving information on these problems and by practical field demonstrations. The information and data used in sugarcane Extension work is based on proven results obtained at the Louisiana Sugar Experiment Station at Baton Rouge and also from supervised tests; demonstra-
tions and test fields located in the various cane-growing localities of the cane belt. During the seasons of 1930 and 1931, an outlined program of the most important projects was made, and the work was conducted during the four periods of the year as given below.

(1) Winter period. Information and advice were given on preliminary cultivation operation, including stubble-shaving, scrapping plant cane, off-barring, drainage and deep early work.

Fertilizer demonstrations. During the season of 1930, a series of 17 Nitrate of Soda and Superphosphate demonstrations, on a five acre basis, was conducted with planters of the cane parishes. The results of this work were prepared in the form of a mimeograph report and mailed to the cane farmers by the Louisiana State University Extension Service. A similar series of ten demonstrations was conducted during the 1931 season.

A series of 21 Potash tests on cane was conducted in 1931 in cooperation with the N. V. Potash My., and the results of this work are now being prepared.

Fertilization. Cane farmers were assisted with their fertilization programs on cane and corn. Information was given on the best and most economical fertilizers to use, and the proper time and method of application.

(2) Spring period. Recommendations on methods of cultivating cane and corn were made, based on methods of the Sugar Experiment Station.

Information on proper time of dirting early germinating and early suckering varieties of cane and late germinating and late suckering varieties of cane was furnished to the planters.

(3) Summer period. Information and recommendations on cane cultivation were stressed.

(4) Fall period. Recommendations given for proper land preparation and turning under of legumes.

Field cane varieties: Advice on fall cane planting; adapting varieties to proper soil types; proportions of varieties
proper time and method of planting. This information was prepared in the form of an article and published in the American Sugar Cane League Bulletin.

Melilotus indica. This legume was recommended as a winter cover crop on fall plant cane. Information was given on Melilotus indica, as to rate of seeding, method of planting and method of handling in the spring.

A number of demonstrations have been started by County Agents in Iberia, St. Mary and Lafourche Parishes. The resulting improvements from sugarcane Extension work are quite apparent in all section of the cane belt. In general, sugar planters are following better methods of land preparation and turning under of summer legumes. More intelligent use of commercial fertilizers for both cane and corn is in evidence in all sections. The planting of cane has been performed with more care and attention and also with a definite purpose of following out recommendations as pertaining to adapting varieties to proper soil types and proper time of planting. During the season of 1931, distinct progress was made in cultivating cane according to the method of the Sugar Experiment Station, and in each of the five sections of the cane belt there were a number of planters using the new method. In most cases it has been entirely satisfactory, and will be adopted for general field practice.

EXPERIMENT STATION TEST FIELD WORK

During the fall seasons of 1930 and 1931, new fall plant cane variety fields were planted at the six established Experiment Station test fields. The test fields, which are 2 to 2½ acres in size, were measured and laid off into one-twentieth acre three-row plots. The varieties were planted in checkerboard fashion of mostly five replications. The usual field planting method of two stalks and a light lap was uniformly used with all varieties.


The variety fields are visited and inspected throughout the year at monthly intervals. Germination counts, growth measurements, observations on disease and insect pests and variety characteristics are made. The data and information are prepared in the form of monthly mimeograph reports, which are presented to a Contact Committee of the American Sugar Cane League and members of the Louisiana Experiment Station staff on sugar work. Summaries of these reports are published in the American Sugar Cane League Bulletin.

The results on Experiment Station test fields for the season of 1930, consisting of field and chemical data on four second stubble variety fields, six first stubble variety fields and six fall plant variety fields, located at Cinclare, Napoleonville, Reserve, Meeker, Franklin and Youngsville have been published as Louisiana Bulletin No. 226, Part I, "Sugar Cane Variety Test Fields". This bulletin was released to the planters of the state in July, 1931.

The test field variety work for the season of 1931 consisted of six fall plant variety fields, six first-stubble variety fields, three second-stubble variety fields, and one spring plant variety field; all located at the same test field locations, with the additional spring-plant field at Broussard.

RESULTS OF TEST FIELD VARIETIES FOR SEASONS OF 1930 AND 1931

In order to obtain comparative results of the varieties, the average results of plant, first and second stubble figures were calculated on a sucrose contract basis; according to the method used in Louisiana Bulletin No. 226. The results of these calculations bring out the information presented below.
P. O. J. 36 AND P. O. J. 213

In the plant cane tests, P. O. J. 36 was lower in sucrose and tonnage at Cinclare, Glenwood, Reserve and Meeker than P. O. J. 213. While at Sterling and Youngsville, P. O. J. 36 was higher than P. O. J. 213.

The first stubble results show that P. O. J. 36 and P. O. J. 213 compare very closely in sucrose and tonnage at the test fields of the alluvial soil section; while in the western area P. O. J. 36 is decidedly better.

The second stubble results show that P. O. J. 36 ranked ahead of P. O. J. 213; while P. O. J. 234 was third ranking variety.

The Youngsville second stubble averages show that the varieties were in the following order: P. O. J. 36, P. O. J. 213, P. O. J. 36-M and P. O. J. 234.

P. O. J. 234, CO. 281 AND P. O. J. 36-M

These varieties are being compared in this manner because they produced the highest sugar per ton yield. The averages of plant and first stubble indicate that P. O. J. 234 produced the highest sugar per ton yield, followed by Co. 281 and P. O. J. 36-M. Co. 281 was slightly higher in field tonnage than P. O. J. 234; while P. O. J. 36-M was lowest.

CANAL POINT SEEDLINGS

There are two Canal Point seedlings at the six established Station test fields. These two seedlings are C. P. 177 and C. P. 807. The results with C. P. 177 indicate that this variety on account of its low sucrose, poor ratooning and milling qualities is quite inferior to the standard field varieties, and therefore should be entirely discarded.

C. P. 807, which was released in the fall of 1930 for field planting, gave a very good performance in showing highest field yields as plant and stubble at all test fields. The sucrose content of this variety was entirely unsatisfactory at Cinclare and Meeker, where the averages show
that it is consistently under P. O. J. 213. At Glenwood and Reserve, there is a little increase in yield of sugar per ton, comparing closely with P. O. J. 213. From a sucrose per ton standpoint, C. E. 807 made it best showing at Sterling and Youngsville, being much higher at these places than at the other test fields, and comparing favorably with P. O. J. 213.

The present data on C. P. 807 indicate that even in the Franklin and Youngville sections, where it made its best sucrose performance, general field plantings should not be made until it has been proven out by the factories that it can be utilized as a commercial field variety.

Co. 281

Co. 281 which was released at the same time with C. P. 807, has proven to be more of a general purpose cane, and according to the present data and information can be used as a field variety in all sections of the cane belt. This variety has given a better performance in the alluvial soil section than in the Teche and western areas of the state.

Co. 290

Co. 290, which is an unreleased variety, was on trial as plant cane at all of the Experiment Station test fields during the 1931 season. It has proven to be a cane of early and good germination, early suckering and excellent growing qualities, with large barrel stalks of low fiber content. The final results for the present season show that it produces field yields slightly under C. P. 807. It is also consistently lower in sucrose content than C. P. 807. The Co. 290 variety made its best showing from a sucrose standpoint at Glenwood, Sterling and Broussard; however, at each of these places it was lower in sucrose content than P. O. J. 213.
Cyanamid Fellowship

Work under a scholarship given by the American Cyanamid Company was continued. Studies on rate of application, time of application and combinations of cyanamid with superphosphate were done. Here again it was found that cyanamid is a good source of nitrogen for sugar cane and that applications of cyanamid to stubble cane proved to be a profitable investment.

Investigations on the Sugarcane Soils of Louisiana

Soil investigations on the sugarcane soils of Louisiana, carried on under a cooperative agreement with the Division of Soil Fertility Investigations, U. S. Bureau of Chemistry and Soils, were started in February, 1929. Since the 1930 Annual Report did not enumerate the activities, a brief outline of the projects will be given.

Reconnaissance Survey

The reconnaissance survey was made to determine the distribution of the principal soil areas and the dominant soil types of each. More detailed surveys of each district will be made from time to time. This important work is the foundation of any fertility program.

Detailed Soil Surveys

Detailed soil surveys of localities where fertility test fields were to be located were necessary in order that the importance and distribution of the soil series and types might be determined. During 1930 surveys were made of the Mandalay and Crescent Farm Areas near Houma, Cinclare Area, Cinclare, and Belle Terre Area near Donald-
sonville. In addition, detailed surveys on a large scale were made of the variety test fields at Cypremort and Raceland. Other soil surveys will be made as time permits.

FERTILITY TEST FIELDS

The Sugarcane District of Louisiana is made up of five major soil areas. Since these areas embrace soils possessing different characteristics, depending upon the sediments from which they have been formed and the forces of nature to which they have been subjected since deposition, it seems logical to believe that they would require different fertilizer treatments. Consequently test fields have been laid out on uniform bodies of the more important and extensively developed soils of each area. While averages of many seasons' work may be necessary before definite conclusions may be drawn, the trends are important and interesting. The results for the two years, 1930 and 1931, do not justify the recommendation of any specific analyses for the different soil types, but they do tend to show the limiting requirements to be mixtures containing 12 per cent or more of nitrogen and 4 to 8 per cent phosphoric acid and potash. The total amount of plant food of each mixture applied to the cane was 60 pounds. Among the highest yielding mixtures were 20-0-0, 16-0-4, 16-4-0, 12-4-4, 12-0-8 and 12-8-0, stated in the order of nitrogen (N), phosphoric acid (P₂O₅), and potash (K₂O).

The results of the experiments on Yazoo very fine sandy loam, the most extensive type of the Mississippi alluvium, First Bottom soils area, tend to show that mixtures with 12 per cent nitrogen and either 8 per cent phosphoric acid or 8 per cent potash, or a complete mixture containing 12 per cent nitrogen, 4 per cent phosphoric acid and 4 per cent potash, produce consistently high yields of cane and sugar per acre. On bodies of Lintonia silt loam of the Mississippi alluvium, Terrace soils area, the highest yields of cane and sugar in 1930 on POJ 213 first stubble were obtained from nitrogen alone, but in 1931 with POJ 36 first stubble the
highest yield was from an 8-0-12 mixture. More results are required to determine the best average mixture for this soil type. The nitrogen and potash mixtures, as a whole, gave higher yields than combinations of nitrogen and phosphoric acid. The Yahola very fine sandy loam of the Red River area also responds best to the higher nitrogen applications, but small amounts of phosphoric acid or potash tend to increase the yields of both cane and sugar. The mixtures 16-0-4 and 16-4-0 have given consistently high yields.

The results from a single experiment started in 1931 on Franklin very fine sandy loam indicated that nitrogen alone was most needed, though consistently high yields were obtained from the 16 and 12 per cent nitrogen mixtures with 4 to 8 per cent phosphoric acid or potash.

In addition to the tests made on the various soil types to determine the best fertilizer mixtures, a test to determine the rate and source of nitrogen likely to give the best results was also started. Four rates, 20, 40, 60 and 80 pounds of nitrogen per acre, were used—the more common nitrogen carriers, sulphate of ammonia, nitrate of soda, cyanamid, calcium nitrate and Calurea, being employed. The results for the one experiment in 1930 seemed to indicate that 40 pounds of nitrogen per acre was most profitable for first stubble on land that had a good cover crop of soy beans turned under. There seemed to be but little difference in the action of the different carriers of nitrogen.

By referring to the bulletin, "Soil Fertility Investigations Sugar Cane District of Louisiana," published by the Station in 1931, a better understanding can be had of the different fertilizer mixtures included in this report.

**RELATIONSHIP OF SOIL TYPE, PH, SUGAR CONTENT OF SUGARCANE AND TONNAGE**

During 1929 and 1930, an exhaustive study of the pH reaction of the more important soils of the district was made. The results indicate that while there is a correlation
between pH and soil type, there is practically no relationship between tonnage, sucrose content of cane and pH reaction.

THE INFLUENCE OF SOIL TYPES ON THE GROWTH AND YIELD OF SUGARCANE

The growth of sugarcane on different soil types of the same area has been carefully observed. The results of experiments carried out on controlled areas seem to indicate that this project, which will be continued, may prove of great value.

OBSERVATIONS OF UNUSUAL CROP CONDITIONS ON RESTRICTED SOIL AREAS

Throughout the Cane Belt, small areas are found where cane growth is below normal. Many of these bodies seem to be closely associated with soil type differences and the poor growth due to some peculiarity of the soil profile. A study of many of these areas has been under way and will be continued as it is hoped such investigations will throw some light on a better method for handling certain soil types.

The work reported on by Mr. O'Neal and Mr. Breaux has been done in cooperation with the Bureau of Chemistry and Soils of the U. S. Department of Agriculture.

The work reported by Mr. Smith, Dr. Whitcomb and Mr. Stoneberg is being done in cooperation with the U. S. Bureaus of Entomology and Plant Industry. These men and their associates have been detailed to this Station for the purpose of carrying on investigations that are of interest not only to Louisiana, but to a part, if not all, of the South.

SPOTTED CUCUMBER BEETLE

In Louisiana the study on this species consisted of observations and experiments on its life history, seasonal habits, and control. The control experiments consisted of
trap crops during the winter and early spring, and insecticides which included arsenicals, fluosilicates, and potassium hexafluosaluminate.

In the Mississippi Valley and adjacent territory the seasonal habits of this species was made a special study during the seasons of 1930 and 1931. Life history experiments, with special reference to the number of broods produced, were conducted at Ames, Iowa, in 1931.

CHEMOTROPISM

A. Tomato fruitworm: The purpose of this study was to try to find a substance that would strongly attract the moths and might be utilized in destroying them before the females laid eggs. A large number of chemicals, mostly aromatic, were tested as possible attractants.

B. Cabbage looper: Experiments were conducted to determine if chemicals attractive to the adult or moth could be utilized in controlling the species by trapping the females before they laid eggs. Five chemicals and several of their fractions, previously found to be attractive to the moths of the looper group, were exposed in specially designed trap cages under field conditions.

STRAWBERRY INSECTS

Although strawberry insects do not have an outlined project status, the different pests of the crop receive some attention when they occur in damaging numbers and come to our attention. In 1930 an experiment was conducted with arsenicals used as soil treatments for the control of white grubs with special reference to their effects on the plants. In 1931 the strawberry weevil did rather severe damage to the crop over considerable areas. Several insecticides including pyrethrum, pyrethrum products, fluosilicates, potassium hexafluosaluminate, sulphur, and sulphur and lime were tested as possible remedies.
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TURNIP APHID

The turnip aphid was made a project during the latter part of 1931. This was made possible by an increase in appropriation that became available July 1, 1931. A study of the biology, habits, and control of the insect has been started. Norman Allen has been placed in charge of this problem.

Personnel:

Chas. E. Smith
P. K. Harrison
Norman Allen

BEE CULTURE

SOUTHERN STATES BEE CULTURE FIELD LABORATORY*

BIENNIAL REPORT OF PROJECTS

The Southern States Bee Culture Field Laboratory was established at Baton Rouge, Louisiana, in 1928, to study the beekeeping problems peculiar to the states of Texas, Louisiana, Arkansas, Mississippi, Alabama, Georgia, North Carolina, South Carolina, and Florida. The work of the laboratory was divided into two main projects; first, the problems relating to the shipment of bees and queens; and second, a study of honey plants, nectar sources, and the effect of various environmental factors on the collection of nectar by bees.

1. The shipment of Bees and Queens. The first need of the shipper of bees and queens seemed to be a more standardized shipping container and work was immediately started on that phase of the project. This has resulted in the publication of Circular No. E-287 "Recommendations for Shipping Cages for Bees." The work has now been ex-

* The Southern States Bee Culture Field Laboratory of the Division of Bee Culture Investigations, Bureau of Entomology, United States Department of Agriculture, is maintained cooperatively by the Louisiana State University and the United States Department of Agriculture.
panded due to the demand from southern beekeepers to include studies on cage design and the food requirements of bees during shipment; the problem of the supercedure of bees during shipment, and various other seasonal studies which will finally give more information relative to the safe and economical methods of producing and shipping bees.

2. Honey Plants and Nectar Sources. This problem has received the attention of Doctor Everett Oertel, and is showing excellent progress. The diversity of honey plants throughout the Southern States has made it necessary to confine the work largely to Louisiana, although the collection of honey plants and the study of nectar sources is being studied in other localities, particularly the well known Tupelo section along the Apalachicola river in Florida. Colonies of bees on scales are located in areas where a single honey plant is abundant and daily weighings are made during the honey flow to determine the value of a nectar source under certain soil and environmental conditions.

It has been necessary to considerably enlarge the first project outline formulated for the laboratory. Work is now being carried on by Mr. Harry Laidlaw on the hand insemination of queen bees, and studies for the improvement of bees by means of hand mating are being started. In connection with the work toward the improvement of bees, several problems are being carried as time and season permit.

The following is a complete outline of the projects being carried by the laboratory at the present time.

1. HISTOLOGICAL AND PHYSIOLOGICAL STUDIES ON QUEENS AND PACKAGE BEES

a. Effect of Shipping on Bees and Queens—Included studies of such factors as size and design of cage, influence of age and condition of bees, methods of handling, influence of food and of temperature, humidity and exposure to environmental factors.
b. *Feeding and Death Rate Studies*—A critical study under controlled laboratory conditions of the effect of various foods on bees, the normal death rate of bees under various conditions of temperature and humidity, and the effect of cage type and design upon package bees kept under controlled conditions.

c. *Supercedure of Queens After Shipment*—A study of the reasons for, and methods of prevention of, the 10-15% loss from supercedure of all queens shipped in packages.

d. *Colony Management*—Studies and observations regarding those methods of management necessary under Southern conditions. Should include also practical methods of comb storage to prevent damage from wax worms.

e. *The Reproduction System of Queens and Drones*—A detailed histological and morphological study of the reproductive system of queens and drones, as these factors relate to the artificial insemination of queen bees.

f. *Queen Rearing and Artificial Insemination*—Studies relating to the improvement of methods of queen rearing, especially those factors of colony strength, amount of food, condition and ages of bees as they affect the size, prolificacy and stamina of queens and drones. A study of methods of artificial insemination of queen bees as a basis for breeding work for the improvement of races of bees.

g. *Egg Tubule Studies*—A critical study of the correlation between the number of egg tubules in the ovary of the queen and colony characteristics and productivity. Includes also a study of the influence of methods of rearing on ovarian development.

h. *Biometrical Studies of Breeding Queens*—Investigation of the variation in size of various parts of the bee during the season and the effect of controlled mating on the offspring.

2. **HONEY AND POLLEN PLANTS IN THE SOUTHERN STATES.**

a. *Collection, Identification and Preservation of Plants*—A study of honey and pollen plants collected from known localities and preserved for future comparisons.
b. Studies on Nectar Secretion of Important Plants—
An investigation by means of colonies of bees on scales, of the importance of various nectar-secreting plants in various localities. Will include also critical studies on influences of various environmental factors on nectar secretion and nectar secretion of plants kept under controlled conditions. A histological study of the nectaries of various plants and of the effect of environment on nectarifous tissue.

c. Plant Distribution and Environmental Studies—A study of the distribution of various honey and pollen plants in the South, their value, and the amount of nectar secreted as related to conditions of soil and environment.

d. Phenological Data—A critical study of the blooming dates of various plants together with data on length of nectar secretion periods, value to bees, type of honey produced and other factors.

e. Pollination Studies (contemplated)—Will be started in 1932. A study of the value of bees as pollinating agents for white clover (trifolium repeus) especially in those districts where seed is produced as a cash crop.

Submitted by

WARREN WHITCOMB, JR.,
In charge Southern States Bee
Culture Field Laboratory.

CORN BREEDING

HUGO STONEBERG
Assistant Agronomist

The corn-breeding project at Baton Rouge, Louisiana, cooperative between the Louisiana Agricultural Experiment Station and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, was continued during 1930-31 along the same general lines as in previous years.
The ultimate object of the work is the production of higher yielding and better strains of corn than the present varieties and to determine certain fundamental facts about corn.

The work deals with the selection within selfed lines and subsequent utilization of the lines in \( F_1 \) and double crosses, and with the testing of these hybrids for yielding ability and other desirable qualities in comparison with the best local varieties.

Selfed lines and \( F_1 \) crosses between them from several varieties adapted to the South Atlantic States were introduced as a nucleus for the work at Baton Rouge, Louisiana, in 1923. New selfed lines of the best local varieties have been added from year to year. The latter lines are better adapted and offer greater promise than the older lines brought in from other states.

About 5000 self-pollinations and 700 cross-pollinations are made annually to continue the selfed lines and to obtain crosses for comparison.

In the selection of selfed lines, those showing deleterious characters such as, weakness of stalk or roots, involved leaves, and excessive leaf spotting, are discarded, and only those showing desirable characters, such as prolificacy, sturdy symmetrical plants and dark green foliage are saved. Records on numerous other characters that may prove of importance as time goes on are also kept.

Crosses involving lines with long and tight husks have been produced that have excellent close fitting husks but only a few of these have proven superior in yielding ability to the best local varieties. Almost complete resistance to damage by insects to the ear has been secured by long close fitting husks.

Several \( F_1 \) crosses involving lines of local varieties have produced significant higher yields than the parent varieties.

Due to the difficulty in making a sufficient number of crosses between the better selfed lines to accurately determine the value of the lines in the crossed condition, the fol-
lowing method was begun in 1930. The selfed lines were planted in two isolated plots in alternate rows with Cocke Prolific in one plot and Yellow Creole in the other, and by detasseling the selfed lines, a large amount of crossed seed was obtained. It is hoped by this method that the value of the lines can be more easily and rapidly determined.

In 1931 many of these crosses produced yields higher than their parent varieties.

Studies of selfed lines with reference to their resistance or susceptibility to the mosaic disease were continued.
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In 1931 many of these crosses produced yields higher than their parent varieties.

Studies of selfed lines with reference to their resistance or susceptibility to the mosaic disease were continued.
**FINANCIAL REPORT, AGRICULTURAL EXPERIMENT STATIONS, LOUISIANA STATE UNIVERSITY**
**JULY 1, 1929, TO JULY 1, 1930.**

### RECEIPTS—

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### FINANCIAL REPORT, AGRICULTURAL EXPERIMENT STATIONS, LOUISIANA STATE UNIVERSITY

**JULY 1, 1930, TO JULY 1, 1931.**

#### RECEIPTS—

| State Fund | Delta Sta. University Fund | Delta Sta. Parish Fund | Special Sugar Cane Fund | Specialized and Feed Fund | Hatch Fund | Adams Fund | Parcell Fund | Soil Survey Fund | Chilean Nitrate Co. (Fellowship) | Among Yugoslav Co. (Fellowship) | American Yamam Co. (Special) | Forest Prods. Co. (Special) | Egg Laying Contest | Grossell Chemical Co. (Phiship.) | TOTAL |
|------------|----------------------------|-----------------------|-------------------------|--------------------------|-----------|------------|------------|----------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|---------------------------|-----------------------------|--------|
| Balance, June 30, 1930. | $2,432.00 | $212.50 | $895.16 | $12,055.04 | $10,277.50 | $160.28 | $421.69 | $339.14 | $894.05 | $72.84 | | | $28,695.26 | |
| State Appropriation. | $56,000.06 | $10,000.00 | | | | | | | | | | | | | $100,000.00 |
| Refunds. | $1,789.39 | | | | | | | | | | | | | | $1,461.57 |
| Sales. | $21,989.17 | | | | | | | | | | | | | | $27,632.19 |
| Industrial Fellowship | | | | | | | | | | | | | | | |
| Concordia Parish | | | | | | | | | | | | | | | |
| U. S. Government Appropriations. | | | | | | | | | | | | | | | |
| Commission of Agriculture. | | | | | | | | | | | | | | | |
| Fees. | | | | | | | | | | | | | | | |
| Total. | $76,544.16 | $10,212.50 | $2,359.16 | $52,397.67 | | | | | | | | | | | $277,118.92 |
| Transfer. | 129.77 | 129.77 | | | | | | | | | | | | | |
| | $76,642.09 | $10,342.33 | $2,359.16 | $52,397.67 | | | | | | | | | | | $277,262.92 |

#### DISBURSEMENTS—

1. Salaries: $25,434.25
2. Labor: $28,349.50
3. Stationery and Office Supplies: $4,520.50
4. Scientific Supplies: $4,000.00
5. Feeding Stuffs: $2,477.63
6. Sundry Supplies: $3,108.52
7. Fertilizer: $1,730.00
8. Communication Service: $3,729.55
9. Travel Expense: $3,000.00
10. Transportation of Things: $1,065.00
11. Publications: $419.30
12. Heat, Light, Water and Power: $1,195.72
13. Furniture and Fixtures: $580.41
14. Library: $210.00
15. Scientific Equipment: $112.27
16. Livestock: $2,015.41
17. Tools, Machinery and Appliances: $3,578.31
18. Buildings and Land: $5,885.01
19. Contingent Expenses: $379.50

| Total | $73,864.74 | $10,342.33 | $2,359.16 | $52,397.67 | $35,797.93 | $15,000.00 | $60,000.00 | $60,000.00 | $60,000.00 | $160.28 | $2,421.69 | $1,698.64 | $72.84 | $1,398.42 | $1,000.00 |
|-------|-------------|-------------|------------|------------|-------------|-------------|-------------|-------------|-------------|----------|------------|-------------|--------|----------|----------|---------------|
| Balance, June 30, 1931. | $586.25 | $865.41 | $865.41 | $585.84 | | | | | | | | | | | | $355,032.61 |
| | $76,650.99 | $10,342.33 | $2,359.16 | $52,397.67 | $35,797.93 | $15,000.00 | $60,000.00 | $60,000.00 | $60,000.00 | $160.28 | $2,421.69 | $1,698.64 | $72.84 | $1,398.42 | $1,000.00 | $277,126.92 |