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Research in Agriculture

1954-55

Annual Report

AGRICULTURAL EXPERIMENT STATION

LOUISIANA STATE UNIVERSITY

AND

AGRICULTURAL AND MECHANICAL COLLEGE

BATON ROUGE, LOUISIANA

J. N. Efferson, Director

Compiled by I. L. Forbes from Reports of Heads of Departments and Project Leaders

Year Ended June 30, 1955
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Letter of Transmittal

Baton Rouge, Louisiana
April 1, 1956

Governor Robert F. Kennon
Baton Rouge, Louisiana

My Dear Sir:

I have the honor to transmit herewith, through the Dean of the College of Agriculture and the President of the Louisiana State University and Agricultural and Mechanical College, the report of the work, receipts, and expenditures of the Louisiana Agricultural Experiment Station for the year 1955, as required by the Hatch Act, which provided for the establishment of agricultural experiment stations in the several states.

Copies of this report will be sent to the United States Department of Agriculture in Washington, D. C., and to the other experiment stations, as required by the Hatch Act, and a sufficient number will be printed to enable us to supply members of the Legislature, Public Boards, libraries, and leading agriculturists.

Very respectfully,

J. N. Efferson, Director
Louisiana Agricultural Experiment Station
The Cover

As a result of popular demand for experimental work on ornamentals, the Legislature appropriated money in 1948 for the establishment of a research program on ornamentals at the Louisiana Agricultural Experiment Station, Baton Rouge. Dr. W. D. Kimbrough and Dr. R. H. Hanchey have been in charge of the research.

Experimental plots of many ornamentals are open to the public for observations. Among the ornamentals of greatest interest are camellias, roses, gladiolus, daylilies, hibiscus, and native iris.

The cover photograph is of a Ville de Nantes camellia flower.
Agricultural Chemistry and Biochemistry

Metabolic Studies on Preadolescent Girls

In cooperation with other southern states participating in the Southern Regional Project S-28, "Requirements and Utilization of Selected Nutrients in Preadolescent Children," in progress since 1954, the nitrogen and energy (caloric) balances were determined on six normal healthy girls 7 to 8 years of age. This is a continuation of the work described in last year's report. The results reported there were for Louisiana subjects, while the results given below are for subjects who were housed and maintained in Tennessee under the same experimental conditions as were the Louisiana subjects, namely: for 16 consecutive 4-day replicate periods from October 11 to December 17 the subjects received a controlled diet which met the National Research Council's standards for the 7-9 year age group. The Kjeldahl nitrogen analyses and bomb calorimetric determinations* were made on 4-day composite samples of all food eaten and of all body excreta. The average daily nitrogen intake was about 10.2 grams. The group of subjects stored nitrogen throughout the experiment. The average retention for the 64-day period was about 12 per cent of the intake. The average daily gross energy intake per subject was about 1860 calories, of which 92 per cent was utilized, thus yielding a metabolizable value for the food intake of 1711 calories per day.—William H. James

Attractants for Honeybees

The limiting factor in the production of honeybees is the availability of pollen, which is the sole source of their dietary protein. Attempts to find an acceptable substitute for pollen have been handicapped by a lack of information about the chemical composition of pollen and by insufficient knowledge of the nutritional requirements of the honeybee. If an attractant, or scent, could be found that would induce bees to carry synthetic rations (artificial pollens) into hives, the problem of finding a satisfactory substitute for natural pollen would be simplified. A screening procedure has been developed for testing various substances, natural and synthetic, as attractants for honeybees.

The experimental colonies consisted of 2 to 3 pounds of bees and a laying queen on dry combs. Each colony, contained in a

*The bomb calorimetric determinations in this laboratory were financed in part by the Human Nutrition Research Branch of the Agricultural Research Service, Washington, D. C.
screened cage and provided with water and sugar syrup, was deprived of pollen for at least one week before the tests began. Randomized petri dishes containing the experimental materials were offered to the colony on a tray placed several inches below the top of the cage. Within 20 to 30 seconds, the bees found and began collecting the preferred substances. Replications of the tests on different colonies at different times showed that the bees' choices were always clear and the substances which they preferred were always the same. The non-nutritive powdered cellulose that was used as a carrier for the scents was not attractive to the bees; neither was cellulose treated with the aqueous extract of pollen, nor the pollen residue obtained by extracting pollen first with water and then with petroleum ether. Materials which were attractive included natural pollen; different residues remaining from the extraction of pollen with water, acetone, alcohol, or petroleum ether; cellulose treated with soluble fractions extracted from pollen with organic solvents; green soybean leaves which had been dried and pulverized; powdered clover petioles and leaves.

During the past year, more than 100 different pure organic compounds have been tested. These included 18 acids, 22 alcohols, 9 aldehydes, 4 amides, 33 amines, 5 esters, 4 ethers, 13 nitro and halogen derivatives, 6 hydrocarbons, 17 ketones, and 10 phenols. None of these pure compounds were attractive to bees.

—William H. James and Stephen Taber

**Growth-Promoting Effect of Pollen**

Pellets of mixed pollens collected by bees chiefly from berries (*Rubus*), willow (*Salix*), and clover (*Trifolium repens*) were dried and ground to a powder. A bomb calorimetric determination indicated that the gross energy of this material was 4,654 calories per gram; the nitrogen content was 3.8 per cent. By using the U. S. P. vitamin A test diet as the standard ration, albino rats as the experimental animals, and ad libitum food consumption and growth rates as the criteria for evaluation, the intakes and growth efficiencies of isocaloric, isonitrogenous rations containing different proportions of pollen were compared. When pollen furnished 10 per cent of the calories in the diet, the ad libitum food intake was increased 16 per cent without affecting the growth efficiency, presumably due to a greater palatability resulting from the proportion of pollen. The increased palatability of the ration evidently was not due to sucrose in the pollen, since the substitution of an amount of sucrose, calorically equivalent to that in the pollen, for starch in the standard

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1 Mr. Taber is Apiculturist in the U. S. D. A. Bee Culture Laboratory.
ration, affected neither the ad libitum food intake nor the growth rate. The nature of this "palatability factor" in pollen is unknown.
—William H. James and Stephen Taber

Nicotinic Acid Metabolism in Female Rats

A study was undertaken of the relation of nicotinic acid intake to its body storage in pregnant and non-pregnant rats and to the excretion of metabolites of this vitamin by these rats.

Twenty-four female rats from four litters were divided into two groups when 75 days old. Half of each litter were kept on the stock diet (Rockland) and the remainder placed on a synthetic diet containing 25 per cent vitamin-free casein, 3 per cent cottonseed oil, 2 per cent cod-liver oil, 4 per cent salt mixture, and 66 per cent corn starch. To each kilogram were added 1.5 gm. choline, 1.5 gm. para amino benzoic acid, 12 mg. thiamine, 12 mg. riboflavin, 12 mg. pyridoxine, 15 mg. calcium pantothenate, 150 mcg. vitamin B₁₂, and 150 mg. of alpha tocopherol.

When the rats were about 120 days old half of the females on each diet were mated and the remainder kept as controls. After mating, each rat was placed in a metabolism cage for three days before collections of urine were started. Collections were made on the controls at the same time. During the time collections were made all animals were fed ad libitum, but a careful record was kept of the food intakes.

The stock diet showed a niacin content of 65 micrograms per gram and the synthetic diet only 0.2 microgram per gram.

The urines were made to volume, filtered, and kept frozen until analyses could be made. The microbiological method was used to determine the free nicotinic acid and the total nicotinic acid, i.e., that found after autoclaving in N/1 sulphuric acid for one hour at 15 pounds pressure. N'methyl nicotinamide was determined by the fluorometric method of Huff and Perlzweig. Nicotinic acid determinations were made on feces composites from nine females on the stock diet and on nine from the synthetic diet.

Four non-pregnant females from each diet were chloroformed, the skin and digestive tract discarded, and the bodies and livers analyzed for nicotinic acid.

The pregnant females on both diets excreted more of the metabolites of nicotinic acid than did their non-pregnant controls. The average excretion of pregnant females on the stock diet was about 30 per cent more than that of the non-pregnant, while those

¹ Mr. Taber is Apiculturist in the U. S. D. A. Bee Culture Laboratory.
on the synthetic diet excreted about 60 per cent more than their controls.

In the case of the animals on the synthetic diet the greatest increase in excretion during pregnancy was in N’methyl nicotinamide, while in those on the stock diet the increase in the two metabolites was about equal.

Both pregnant females and their controls on the synthetic diet had a greater urinary excretion of N’methyl nicotinamide than similar animals on the stock diet. The excretion of total nicotinic acid (free and combined) was similar from animals on the two diets.

The fecal excretion of nicotinic acid was more influenced by the diet than the urinary excretion. However, on the synthetic diet 10 times as much nicotinic acid was excreted in the feces as was ingested in the food, while on the stock diet the fecal excretion accounted for only 36 per cent of the intake.

Analysis of the bodies and livers of the rats showed only 11 per cent more nicotinic acid in the body and 9 per cent more in the livers of rats from the stock diet than in those from the synthetic diet.—Martha E. Hollinger

The Preparation of Adenosine Deaminase from Bacterium cadaveris (Gale)

The adenosine deaminase of Bacterium cadaveris (Gale) has been prepared in cell-free form by sonic disintegration of washed cell suspensions. The sonic extracts were purified by salt fractionation with ammonium sulfate and electrophoresis. The adenosine deaminase was characterized as a globulin and found to possess characteristics similar to the adenosine deaminases prepared by other workers from non-bacterial sources.

—Virginia R. Williams and Russell T. McIntyre

The Role of Biotin in Carbohydrate Metabolism of Yeast

The possible involvement of biotin with the enzyme hexokinase has been studied by the use of cell-free sonic extracts of Saccharomyces cerevisiae 139. By employing 2-desoxy-D-glucose as a substrate it was possible to study the hexokinase reaction exclusively, since the product of the phosphorylation reaction is not further metabolized by the yeast extract. An appreciable difference in rate of phosphorylation was observed with sonic extracts of yeast grown on media containing high and low biotin concentrations. These results are interpreted to mean that (1) biotin is involved in the synthesis of hexokinase or (2) biotin is required as a coenzyme
of hexokinase action. Further experiments are being conducted to determine the correct interpretation.—Virginia R. Williams

**Growth Factor in Alfalfa for Neurospora sitophila**

Phytological concentrates prepared from alfalfa, watercress, and parsley have been shown to contain an unidentified growth factor for *Neurospora sitophila*. Further attempts to isolate and characterize this substance have been made and certain physical and chemical properties have been ascertained. The factor is stable to heat and light, including ultraviolet light. It is stable in acid, neutral, and slightly alkaline solutions. The factor is soluble in water, ethanol, and methanol and to a lesser degree in ether and chloroform. Fractionation with precipitation agents such as phosphotungstic acid and basic lead acetate were not satisfactory because of the difficulty involved in recovering the active material. Absorption techniques are promising since the substance is absorbed on columns of such agents as norit, Darco, and fuller's earth, and can easily be eluted. Chromatographic procedures are now being investigated for further isolation and concentration.

—A. F. Novak and V. R. Williams

**Detoxication of Tung Meal**

The possibility that treated tung meals which are nontoxic to chicks might be toxic to the albino rat has been explored. They are not. Both species require the same steps of alcohol extraction, moistening, and steaming to produce completely nontoxic meals.

The quality of the detoxified tung protein for the rat is low. Lysine is the first limiting amino acid. Detoxified tung meals do not offer much promise as economical sources of protein for cereal supplementation.—Jordan G. Lee

**Dietary Protein and the Development of Rat Lathyrysm**

Casein, casein hydrolyzates, lactalbumin, and gelatin are effective in minimizing the growth depression and skeletal change induced in the rat by feeding Singletary pea seed. Zein is not so effective. Casein is also effective where low levels of $\alpha$-aminopropionitrile are fed as lathyrogenic agent. Diets containing casein exacerbate a paralytic effect of the seed to produce a reversible paralysis which is independent of skeletal change.

Methionine is the first limiting amino acid in the seed protein, but neither it nor any other of the essential amino acids is the factor supplied by the casein which minimizes the growth depression and skeletal change induced by the rations containing the seed.

It is suggested that the skeletal and growth effects of the ef-
fective proteins stem from a reversal of an interference with amino acid metabolism, protein providing either a select group of amino acids or a specific peptide. The exacerbation of the specific paralytic effect is then caused by the stress of more normal growth abetted by larger toxin intake.—Jordan G. Lee and Harold P. Dupuy

**Shrimp Research**

**Effect of Chlorotetracycline Ice and Salt Ice upon the Quality of Stored Shrimp**

Work has continued on the effect of chemicals in ice used for storage of shrimp. Recently sea water ice has been reported effective in prolonging the storage life of marine fish. It was decided, therefore, to prepare a salt ice containing 20,000 p.p.m. sodium chloride and 2,000 p.p.m. calcium chloride. The lack of effectiveness of chlorotetracycline ice for preserving shrimp suggested that the time interval between catching and treating with this ice was a factor. Therefore, two members of the staff were aboard a trawler and handled the shrimp immediately after the net was emptied. The shrimp were headed and washed and then one-third were dipped in 55 p.p.m. chlorotetracycline solution for 15 minutes and then packed in 10 p.p.m. chlorotetracycline ice. Another third were dipped in 20,000 p.p.m. sodium chloride-2,000 p.p.m. calcium chloride solution for the same length of time and were then packed in salt ice. The remaining third were packed in commercial ice.

It was concluded from general observations that there were no differences in odor, firmness, or sliminess between samples stored in the three types of ices during the first 15 days of storage. Shrimp stored in the chlorotetracycline ice longer than 15 days had the least odor but after 21 days had a strong fishy odor. Shrimp stored in the commercial ice and the salt ice had respectively a putrid sour odor and a slight putrid odor. Also, at the termination of the test on the 21st day, samples stored in the chlorotetracycline ice had the smallest number of shrimp showing the feverish red color of spoiled shrimp, shrimp stored in the salt ice were firmest and had the least amount of slime, the chlorotetracycline ice-stored shrimp were intermediate, and the controls were the softest and the most slimy. Neither the salt ice nor the chlorotetracycline ice was as effective as commercial ice in delaying the development or the severity of black spot.

The objective tests for quality, amount of soluble orthophosphate and trimethylamine, indicated that salt ice and chlorotetracycline ice were effective in delaying deterioration in quality. Both of these ices were of equal value in reducing bacterial development, but in no case were the plate counts excessively high. In fact, counts obtained during the latter part of the storage period were much
lower than have been obtained in previous work and can be ascribed to the rapid handling and thorough washing of the shrimp on board the trawler.

—E. A. Fieger, A. F. Novak, M. E. Bailey, R. T. McIntyre, and James Oertel

Vitamin Content of Fresh and Frozen Shrimp

Frozen and fresh shrimp procured from several coastal areas in Louisiana were assayed for their vitamin content by microbiological procedures. Broad variations were obtained for each vitamin and can be attributed in part to different methods of handling and storing prior to obtaining samples for testing. Vitamin values in micrograms per gram were: thiamine, 0.08-2.80; riboflavin, 0.07-3.90; nicotinic acid, 11.50-46.00; pantothenic acid, 1.24-3.25; and pyridoxine, 0.08-4.30.

—A. F. Novak, M. E. Bailey, and E. A. Fieger

Changes in Vitamin Content During Ice Storage

Changes in vitamin content of freshly caught shrimp stored in ice for three weeks were also investigated. All B complex vitamins assayed decreased quantitatively during this time period. Gradual losses were reported for thiamine, riboflavin, nicotinic acid, pantothenic acid, and pyridoxine. Tryptophane values also declined, and may be indicative of quality alterations produced by protein decomposition.—A. F. Novak, M. E. Bailey, and E. A. Fieger

Oyster Research

Frozen Oyster Studies

Freshly shucked oysters were washed either with water or saline and packaged in Marathon #5 cartons. Some of the cartons were over wrapped with Tyton and then frozen; the remainder were frozen and then glazed with either water or saline. At the same time similarly washed oysters were packed in cans and vacuum sealed. The various samples are being tested monthly.

The total scores based on flavor, juiciness, texture, and saltiness of cooked oyster samples do not differentiate between any of the frozen stored samples after 6 months’ storage. All samples were judged acceptable.

Laboratory examination of the thawed samples showed that the volume of drip increased from 12.7 per cent to 19.3 per cent and the pH of the meat and drip decreased during 6 months’ frozen storage. The glycogen content and the salt content did not appreciably change. Washing or glazing oysters with saline resulted in slightly higher values for salt content than for those samples washed or glazed with water.—E. A. Fieger, M. E. Bailey, and A. F. Novak
Fresh Oyster Studies

Samples are being collected monthly by Louisiana Wildlife and Fisheries personnel under the direction of Dr. Lyle S. St. Amant from high and low salinity waters of three areas along the Louisiana coast. These samples are being analyzed for various chemical constituents.

The chemical composition of oysters taken from various places along the coast of Louisiana is quite variable. Data obtained indicate that the volume of liquor and the water content of the oysters increase during the summer months. The concentration of glycogen markedly decreased, while protein and some of the B vitamins decreased slightly from May to October.

—M. E. Bailey, A. F. Novak, and E. A. Fieger

Protein Studies

The majority of the protein material in the oyster is classified as globulin. Myosin, a muscle protein, is the main component. Suspensions and solutions of this protein were susceptible to structural changes (denaturation) by the effects of air, heat, and freezing. Changes in salt concentration and pH altered the degree of denaturation. The albumin (water-soluble) protein fraction is heterogeneous. Electrophoretic analysis indicated at least three components are present.

Electrophoretic patterns of unfractionated drip indicated gross heterogeneity. Chemical analyses indicated hexoses (sugars) and hexosamines, as well as protein, were present in appreciable quantity. This may indicate that the viscosity of drip is dependent on a polysaccharide or mucoprotein rather than protein itself.

—Russell T. McIntyre

Rice Research

Amino Acid Content of Rice

The content of lysine, methionine, phenylalanine, threonine, isoleucine, valine, and tryptophane was determined in 32 samples of rice covering four varieties and four stations. The samples included both brown rice and white rice. The determinations were carried out by standard microbiological procedures. Tryptophane was liberated from ground fat-free rice by enzymatic digestion at 32° for 32 hours with pancreatin and a hog mucosa preparation. The rest of the amino acids were set free by separate hydrolysis of the fat-free samples with 2.5 N HCl for 10 hours at 15 pounds pressure. The nitrogen and moisture content of the samples were also determined.

The results showed that different rice varieties grown at the same station differ in their content of the eight amino acids.
The same varieties grown at different stations also showed considerable variations in amino acid content. This indicated that in rice the genetic influence is partially modified by environmental factors.

Milling caused a decrease in the nitrogen content and also a decrease in the essential amino acid content. When expressed on the basis of 16 grams of nitrogen, the average content of isoleucine, leucine, and valine showed an increase upon milling. The average content of lysine decreased while the average content of methionine did not appreciably change.

The low nitrogen content rices showed a higher incidence of the essential amino acids in proportion to the nitrogen content of the grain than did the high nitrogen content rices. A reciprocal relationship between the nitrogen content of the rice and the amino acid content was generally noticeable in the same varieties grown at different stations and, to a less pronounced extent, among different varieties grown at the same station. The findings have relation to similar observations in the case of corn and wheat.

It is evident that a variety of factors influence the content of crude protein and amino acids in rice.

—E. A. Fieger and Krishna Kymal

Studies on Rice Amylose

The distribution of rice starch between linear and branched-chain forms of starch has been studied with respect to varietal differences and any differences which might result from time of planting and harvesting. Samples analyzing around 20 per cent amylose or linear form are the most satisfactory from the standpoint of giving a fluffy, non-sticky product when cooked. Rexoro and Zenith samples grown on control plots at various planting dates showed that the percentage of amylose increased for Rexoro variety for late spring seeding while for Zenith it decreased.

—Virginia R. Williams, Wei-ting Wu, and E. A. Fieger

Lipase of Rice

Investigations of the lipase of rice have been extended. Laboratory storage experiments have indicated that the hydrolytic rancidification of the oil contained in rice bran is inhibited by small concentrations of sulfur dioxide gas. Under the conditions of the test, 25 per cent less free fatty acids were formed in the treated bran than in the untreated control (after six days). Carbon dioxide and hydrogen sulfide treatments did not influence the rate of rancidity development.—Russell T. McIntyre

A New Test for Thermostabilized Eggs

Since thermostabilization of eggs became a more or less stand-
ard procedure for certain areas of the United States, a test for thermostabilized eggs seemed necessary, and various unsuccessful attempts to develop such a method appeared in the literature.

Based on the same principle of the change in stability of phosphates in milk as a result of heating, a study was made of such changes in eggs since similar conditions for the reaction between phosphates and carbonic acid exist there. It was found that the reaction actually does take place in eggs, but here the presence of tricalcium phosphate in the shell complicates the results. Another approach to the problem of testing thermostabilization also proved successful and even more practical for the needs of a test. It is based upon the change in hydration of ovalbumin particles as a result of the thermostabilization process. The simplest way to measure it is by determining the alcohol number of the ovalbumin solution in water.

Ten milliliters of homogenized egg white are diluted with water (1:3) and filtered. To 5 ml. of the filtrate, whose pH is around 8.5, 95 per cent alcohol is added at room temperature to cause flocculation in the solution. The number of milliliters of alcohol needed to cause this effect is the alcohol number of the solution. Examination of a large number of samples of thermostabilized and untreated eggs showed that the alcohol number of the first averaged 1.9 ml., whereas for the non-thermostabilized eggs the average alcohol number is around 3.5—Socrates A. Kaloyereas

A New Method for Testing Heated Milk

The method is based on the earlier discovery that the heating of milk during pasteurization creates a partial change of dicalcium phosphate to monocalcium phosphate. The created new equilibrium between monocalcium and dicalcium phosphate affects the stability of phosphates in the serum and the increase of such stability is a measure of the heated milk present in a mixture of raw and pasteurized milk. At present, methods for detecting the presence of raw milk in pasteurized milk are available but such methods, based on the phosphatase reaction of milk, can not be used to detect if pasteurized milk, and how much of it, is present in a mixture with raw milk. The final technique for such a test as it was developed in this laboratory is as follows:

To 100 ml. milk 4-5 drops of commercial "Marshall" rennet solution are added and the milk is allowed to coagulate at room temperature. The coagulated milk is shaken vigorously and 0.3 ml. of glacial acetic acid is added to bring the pH of the milk to 4.85-5.90. Filter to obtain a clear serum. Place 10 ml. clear serum in a 15 ml. centrifuge tube and heat it in a constant temperature water bath at 70° C. for 15 minutes. The tube is cooled in running water
and then centrifuged for 5 minutes at 2,000 r.p.m. In order to obtain the moist weight of the precipitate formed, pour out the supernatant liquid and place the inverted tube on a piece of filter paper. At the end of 10 minutes wipe the lip of the tube with filter paper and weigh. The moist precipitate of raw milk is around 2 per cent, that of pasteurized is 0.5 per cent and their mixtures have intermediate values according to the proportion of the two milks present in the mixture. For more accurate determination, run a xanthoproteic reaction on the precipitate and measure the color formed in a Klett photoelectric colorimeter using filter 42. The respective values for optical density of the color formed by the xanthoproteic reaction are 1.8 for raw milk, 0.4 for pasteurized milk, and intermediate for the mixture.—Socrates A. Kaloyereas

**Preservation of Longleaf Pine Seeds**

For the needs of a steady forestation program it is necessary to preserve forest tree seeds for more than one year because of the abnormal seed yield production of various species such as the longleaf pine. In order to study the conditions under which longleaf pine seeds could be stored without significant loss of their germinating power, experiments were started on seed preservation by various methods and at various temperatures. The applied methods were: gas storage, freezing storage, and various dehydrofreezing treatments. The results proved quite satisfactory, especially with the dehydrofreezing treatments. Pine seeds reduced to 8 per cent moisture by “aphydatosis” and stored at 0° F. did not show any loss of germination power after one year of storage. Other seeds reduced to 13 per cent moisture and kept at +25° F. were preserved very well without any significant loss of germination ability. With severe dehydration treatment to 5.5 per cent moisture the seeds were satisfactorily preserved even at 45° F. and at room temperature. Chemical examination of the preserved seeds gave indication that there is some correlation between the rancidity of the fat in the seeds and the loss of germinability.

—Socrates A. Kaloyereas and William Mann

1 Southern Forest Experiment Station, Alexandria Research Center, U.S.D.A.
Agricultural Economics

Cash Incomes from Farm Marketings in Louisiana

The average cash income per year from farm marketings in Louisiana during a five-year period ending in 1953 was $376,044,000. For the year 1954, the comparable income was $371,760,000. In terms of dollars, the 1954 income from marketings was about 255 million dollars more than it was in 1942. Making allowance for the fact that it takes roughly two 1954 dollars to buy as much as one 1942 dollar, the income from marketings in Louisiana in terms of purchasing is still some 65 to 70 million higher than it was in 1942. According to Census Reports, there were 111,127 farms in Louisiana in 1954 to share in the money received from the sale of farm products as compared with 150,007 farms in 1940. The greatly increased efficiency of farmers is indicated by an increase in the volume of production, while the number of gainfully employed workers in agriculture declined in Louisiana from 249,136 to 151,574 between 1940 and 1950. When data for 1955 become available, it is anticipated that a further reduction in the number of agricultural workers will be reported.

Although net cash to farmers during 1954 and 1955 has not been satisfactory when compared with larger corporate profits and higher industrial wages, farm conditions in Louisiana are still better than they were in any pre-war or early war-year. Also, Louisiana farmers as a whole are far better off than they are in many other states. While surpluses of important crops, such as cotton and rice, make the short-run view discouraging, the long-run view is that the level of living among farm people will continue to rise because of increased production per farm and per worker, and a better adjustment of price levels between agriculture and industry.—Bueford M. Gile

Contribution of Crops and Livestock to Cash Income from Farm Marketings in Louisiana

The relative importance of crops versus livestock in Louisiana as sources of cash from receipts changed very little from 1926 to 1936. Roughly, the sale of animals and their products contributed 20 per cent and crops sold, 80 per cent of the annual cash income from marketings. Since 1936 cash receipts from livestock sold have trended upward and now are about 30 per cent of income from marketings. A statistical study shows that the upward trend in the proportion of cash farm income from livestock and its products has
been due mainly to increased relative incomes from dairy products, cattle and calves. The diversion of acreage to pasture and feed grain crops as a result of allotments that reduced acreages in cotton, rice and sugar cane favors further growth in the importance of livestock enterprises.

In spite of the drastic reductions in cotton acreage since 1933, the amount of cash income from cotton lint and seed marketings in Louisiana during 1954 was about 32 per cent of all farm marketing receipts and equal to cash receipts from livestock and its products, including poultry. During the 1920's lint and cotton seed were the source for nearly one-half of the cash farm income from marketings in Louisiana. Rice ranks second and sugar cane third among field crops in contribution to cash farm income. In 1954, rice contributed about 15 per cent and sugar cane 11 per cent of total cash income from marketings. Among the minor sources of cash farm income for Louisiana as a whole, sweet potatoes, and fruits and nuts combined each contribute about 3 per cent. Forest products from farms and greenhouse and nursery products sold each contribute less than 1 per cent to cash farm receipts from marketings. In general, crops are the source for two-thirds and livestock one-third of the cash income from farm products marketing in Louisiana. Oklahoma is the only neighboring state that receives more income from livestock than from crops. (For detailed statistical data see the February 1956 issue of the "Louisiana Rural Economist.")—Bueford M. Gile, Joseph P. Montgomery, and John K. Hanes

The Cost of Producing Milk in the New Orleans Milkshed

Based on information furnished from a stratified (by size) random sample of 113 dairy farms, the average total cost of producing milk in the New Orleans marketing area for the period July 1953 through June 1954 was $6.75 per hundred pounds. This figure includes not only cash and direct costs such as purchased feed and hired labor but also indirect and non-cash costs such as interest and depreciation charges on capital invested and a 50 cents an hour charge for unpaid family labor. The average cost per hundred pounds without unpaid family labor was $4.90. Feed made up about 51 per cent and labor about 23 per cent of the total cost of producing milk in the area. About 60 per cent of total costs were actual cash costs on the average size farm.

The average daily amount of milk produced in the area was slightly less than 300 pounds per farm. Average costs of production per hundred pounds declined fairly rapidly with increasing output up to about 700 pounds per day, where the average total cost was $5.70. Further increases in output resulted in some additional decrease in cost, but at a much slower rate.
Average production per cow was 4,076 pounds of milk annually. Those farms with above average production rates per cow had average total costs of $6.00 per hundred. Those with below average production per cow had costs of $8.50 per hundred pounds of milk. Production per cow was to a large extent a reflection of quality of cows and amount of feed per cow. Farms with cows producing 6,000 pounds of milk or more per year had total average costs of $5.10 per hundred.

Farms that were above average in labor efficiency (amount of labor per cow) had average costs of $6.50 per hundred. Those that used more than the average amount of labor per cow had costs of $7.00 per hundred pounds of milk.

Farms that were above average in production rates per cow, labor efficiency, and feeding efficiency had average costs of $5.20 per hundred; those that were below average in all three of these efficiency factors had average costs of $8.50 per hundred pounds of milk produced.—Bill Bolton and Fred H. Wiegmann

Seasonal Changes in Cattle Prices

Prices of Good-to-Choice slaughter calves in Louisiana normally are highest in the spring and lowest in the fall. For the 30-year period 1925-54 the average seasonal range was from 94 per cent of the yearly average price in the fall to 107 per cent in the spring, a spread of 13 points. However, there has been considerable variation from year to year. For example, in 1953-54 the spread was 30 points and in 1954-55, 19 points.

Most other classes and grades of grass-fed cattle and calves follow the same general seasonal pattern as Good-to-Choice calves. High-grade, long-fed steers and heifers, on the other hand, have a different seasonal price movement, which is almost opposite that of other cattle. Prices of these fed cattle are highest in the fall and winter and lowest in the spring and early summer. The major cause of these characteristic seasonal price patterns is the seasonality of cattle marketings. Grass-fed cattle are most plentiful in the fall and relatively scarce in the spring. Long-fed cattle are available in greatest numbers in the spring, following the previous year's grain crop. Supplies of finished cattle are lowest in the fall and early winter.—H. J. Casso and M. D. Woodin

New Orleans Produce Markets

Nearly 20,000 carloads of fresh fruits and vegetables move through New Orleans produce markets annually. The efficiency of the facilities used in handling these perishable products is of considerable importance to growers, marketing agencies, and to the
consuming public generally. A study has been completed which appraises the adequacy of the produce markets, points out the major defects, and suggests means of effecting desirable improvements.

Major defects largely concern traffic and parking space, poorly designed buildings, absence of railroad sidings at produce houses, lack of concentration of market facilities in one area of the city, and certain operating practices. These conditions cause inefficiencies in handling produce, inconvenience to buyers and sellers, and losses in quality of products. The results are higher operating costs and an unfavorable market situation.

Some improvements in the present markets could be accomplished by changing some operating practices and by a general renovation of facilities. However, some of the major defects concern traffic congestion, poorly designed buildings, and lack of rail facilities. These factors are so important to efficient market operation that they weigh heavily in favor of the construction of new market facilities. A new market of the size and type needed would cost about a million dollars, but the possibilities of substantial savings in operating costs are good.

—A. J. Burns, A. C. Harper, and M. D. Woodin

Commercial Canning of Fruits and Vegetables

The 19 commercial canning plants operating in the 1954-55 season provided a market for nearly two million bushels of sweet potatoes and large quantities of okra, green beans, and a variety of other fruits and vegetables. The pack of 1,735,718 standard cases was 27 per cent smaller than the record production of the previous year but 30 per cent above the 10-year average. Sweet potatoes made up 78 per cent of the pack, followed by okra and green beans with 12 and 4 per cent respectively. The trend toward smaller containers continues, and No. 303 cans are rapidly replacing No. 2 and 2½ sizes. Nearly half of the 1954-55 pack was in No. 303 cans.

A better knowledge of the demand for canned fruits and vegetables and the most desirable merchandising practices is needed in order to expand the market for these products of Louisiana canneries. Research was begun during the year to help meet this need.

—A. C. Harper and M. D. Woodin

Costs and Returns for Large Sugar Cane Farms

Annual farm management studies of the operation of large sugar cane farms in Louisiana have shown that the most important single factor affecting the net returns of cane farmers is the yield of cane per acre. An average of 22.3 tons per acre during the 1953
crop season was the third highest obtained since the study began in 1937. With this comparatively high average yield, net income per farm averaged $13,428 as compared with $5,163 for 1952 and a loss of $4,264 for the five-year period 1947-51.

Although the 1953 crop season had a high average yield, yields on individual farms varied considerably. Farms in the low yield group averaged 17 tons and produced cane at a loss of $15 per acre. The medium yield group averaged 22 tons and made a net return of $14 per acre. The high yield group averaged 27 tons and made a net return of $40 per acre. Thus, the low and high yield groups had a difference of 10 tons per acre in yield and a difference of $55 in the net income per acre of cane.—Joe R. Campbell

Costs and Returns for Raw Sugar Mills

Results for the 1953 grinding season are based upon costs and returns information obtained from 26 raw sugar mills. The mills experienced an unfavorable year financially in that earnings were rather low. Net income per mill averaged only $9,025 in 1953 as compared with $28,998 in 1952 and $28,222 for the five-year period 1947-51.

The amount of sugar recovered per ton of cane ground had an important bearing upon unit costs and net returns earned by raw sugar mills. For the 1953 season, mills with a low recovery rate averaging 155 pounds of sugar per ton of cane ground had a loss of 37 cents per ton; those with a medium recovery rate of 167 pounds made a net income of 13 cents per ton; whereas, mills with a high recovery rate averaging 179 pounds per ton made a net return of 36 cents per ton of cane ground.

In most of the years since the study was started in 1937, the amount of sugar manufactured per ton of cane and the percentage of available sucrose recovered were greater for the large-capacity than for the small-capacity mills.—Joe R. Campbell

Consumer Reaction to Sized Sweet Potatoes

Consumer reaction to four sizes of U. S. No. 1 sweet potatoes was tested under controlled conditions (using the latin square experimental design) in five large retail stores in Baton Rouge and New Orleans. Sweet potatoes were sized according to diameter as follows: 1¾” to 2¼”, 2¼” to 2¾”, 2¾” to 3¼”, and 3¼” to 3¾”. For convenience these sizes are referred to as sizes “A,” “B,” “C,” and “D” respectively.

Displays were arranged to determine (1) the order and degree of preference for the different sizes, under the condition that all sizes are displayed in consecutive bins so that the consumer has a
choice, and (2) the degree of acceptance of each size, under the condition that at any given time only one size is available to the consumer in a particular store. All sizes were priced equally during the experiment.

When all four sizes of sweet potatoes were displayed in consecutive bins so that consumers had a choice they reacted as follows: Of the total number of pounds purchased from the display 38 per cent were size B, 25 per cent size C, 23 per cent size A, and 14 per cent size D. The difference between purchases of sizes B and D was highly significant. Amounts purchased from bins containing size A and size C were practically equal. Consumers showed a tendency to prefer size B over sizes A and C. By their purchases they also indicated a tendency to prefer sizes A and C over size D. In both cases, however, the differences in amounts purchased were not large enough to denote significance by statistical tests.

When consumers were confronted with only one size of sweet potato in a particular store at a time, their purchases were in a ratio of 28 pounds of size A to 32 pounds of size C to 33 pounds of size B. These differences were not significant by statistical tests. Size D was discontinued as a separate display during the first week of the experiment when it became obvious that consumers in this market would buy significantly fewer sweet potatoes if this was the only size available.

As a basis for determining sales effectiveness of the displays the amount of sweet potatoes sold from each was related to the amount sold from a control display containing regular U. S. No. 1 sweet potatoes. As a merchandising practice the display featuring all four sizes of sweet potatoes in consecutive bins ranked first with 6 per cent greater sales than the control. Five per cent more sweet potatoes were sold from the display containing only size B, and 2 per cent more were sold from the one containing only size C. When size A was displayed alone, 11 per cent fewer sweet potatoes were sold.—Jerry M. Law

Prepackaging Sweet Potatoes

A study is being made of the problem of prepackaging sweet potatoes. Preliminary findings of certain phases of this research are as follows:

1. Store trials with sweet potatoes prepackaged in 3-pound polyethylene bags showed favorable consumer acceptance in the New Orleans market area.

2. Bags made of .002-inch-thick polyethylene containing 32 holes ¼ inch in diameter showed no apparent adverse effect on keeping quality of sweet potatoes and gave satisfactory results in long distance shipping tests.
3. Packages of best appearance were obtained by using sweet potatoes of relatively uniform size and arranging them in a "shingle pack" length-wise in the bags. The use of sweet potatoes of uniform size also facilitated the packaging operation by making it easier to obtain a desired net weight per bag.

4. In experiments with different types of bag closures for pre-packaging sweet potatoes, bags on which a tape closure was used tended to come unfastened during shipping tests. Satisfactory results in shipments were obtained with wire staple closures and with covered wire bag ties. The latter were found to be more advantageous from the standpoint of facilitating the reopening of the bag in event that it becomes necessary to replace bad sweet potatoes.—Jerry M. Law

Marketing Ornamental and Floricultural Products

The production of ornamental and floricultural crops is becoming of considerable economic importance throughout Louisiana. The value of farm marketings of these crops amounted to more than 3 million dollars in 1954, an increase of approximately 1.4 million dollars over the farm sales in 1949. In 1954, a total of 228 growers reported 4,017 acres planted in ornamental crops, while 173 growers reported the production of more than 300 acres of floricultural products. Leading parishes in the production of these horticultural speciality crops are St. Tammany, Jefferson, Iberia, Lafayette, Rapides, Caddo, and Tangipahoa.

Marketing research has been undertaken to determine the sources of supply, operating practices, and market outlets of producers, wholesalers, and retailers of floricultural and ornamental plants in order to better understand and expand the markets for these products. Other work will be undertaken to determine the relative advantages of various packing and packaging materials, to discover new outlets and merchandising methods for flowers and plants, and to test the adaptability, to these products, of selected marketing practices successfully used on other commodities.

—A. C. Harper, M. D. Woodin, and R. H. Hanchey

Pen-Lot vs. Individual Selling of Cattle

The practice of selling cattle at auction in pen-lots, rather than individually, is well established in some sections of the country. In Louisiana most selling is of individual animals, although some auctions sell to a limited extent on a group or pen-lot basis. Pen-lot selling offers several advantages; namely, (1) buyers who desire a number of animals of the same class and grade are given an opportunity to bid on a group, thus eliminating some of the uncertainties
involved in buying one animal at a time, (2) buyers may examine and appraise animals with greater care, (3) the total time and cost of selling may be reduced. Possible disadvantages under present conditions include: (1) some small buyers may be eliminated and competition reduced, (2) animals of different ownerships may have to be mixed, (3) there may not be enough animals of a particular class and grade to make uniform lots.

The analysis of prices for groups and individual sales of slaughter calves at Louisiana auctions showed that group selling was advantageous in one sale, individual selling advantageous in another, and in other sales there was no significant difference. However, these results are not conclusive since grouping was not done according to best practices. Groups sold best when the supply of animals per buyer was relatively small, suggesting that the larger buyers were aggressive bidders in order to meet their needs from the limited supply. There was some indication that the larger groups may bring slightly lower prices than smaller groups. This situation has been observed in other areas, although in Virginia large groups averaging 43 head, sold for more than did small groups. In Louisiana the larger groups may not be of highly uniform quality, thus offsetting one of the advantages of grouping. Also, the smaller buyers are important in auctions, and when large groups of animals are offered for sale, competition may be reduced.

—H. D. Traylor, H. J. Casso, and M. D. Woodin

Grades of Cattle in Louisiana as Compared to the South

Approximately 43,000 head of cattle and calves have been graded at 35 representative auctions in seven southern states cooperating with the Louisiana Station in a regional study of livestock marketing. About 7,000 were graded in Louisiana.

The general level of quality for livestock sold through auctions in Louisiana was below that for the South as a whole. Only 1 per cent of Louisiana’s cattle and calves were of Prime and Choice grades, 33 per cent Good and Commercial, and about 66 per cent Utility and below. In the South, 5 per cent were in the top grades, 44 per cent Good and Commercial, and only 51 per cent Utility and below. However, Louisiana does not compare too unfavorably with respect to calves. In the South, 5 per cent of the calves were in the Prime and Choice grades and 56 per cent in Good and Commercial, while Louisiana had 1 per cent Prime and Choice and 53 per cent in Good and Commercial. Utility and below show 39 per cent for the South and 46 per cent for Louisiana.

Only 4 per cent of total marketings in Louisiana were veal calves as compared to 20 per cent for the South as a whole. The majority of calves in Louisiana were marketed at about six months
of age and weighed about 350 pounds. A slightly greater proportion of the total marketed in the South, as compared to Louisiana, were steers and heifers. About 39 per cent were in these classes for the South but only 32 per cent in Louisiana. The South also marketed proportionately fewer cows than did Louisiana.

—H. J. Casso and M. D. Woodin

**Feeder Calf Sales**

Most auction sales do not have a sufficiently large number of high-quality feeder calves to attract out-of-state feeder-buyers, and there is some evidence that the high grade calves do not bring prices commensurate with their grade. To concentrate relatively large numbers of quality calves and attract buyers, special sales appear to have a place in the livestock industry.

In 1955 a feeder calf sale was conducted at Delhi for Northeast Louisiana cattle producers. Of some 1,250 animals received, 1,015 were graded and sorted into pen-lots according to the Federal feeder calf grade standards. About 60 per cent of the calves graded Good and Choice, 38 per cent Medium, and only 2 per cent Common. Steer calves graded slightly higher than heifers. Weights averaged from 466 pounds for Choice to 368 pounds for Common.

Choice calves averaged $18.10 per cwt.; Good, $16.40; Medium, $15.30; and Common, $12.85. Steer calves outsold heifers, grade for grade, from $1.15 to $1.45 per cwt.

About two-thirds of the calves were sold in groups, varying in number from 2 to 21 animals. Most lots ranged from 4 to 7 calves. Choice calves sold in groups averaged $18.20 per cwt., while Choice calves sold singly brought $17.50, a difference of $0.70. The difference in favor of groups for Good and Medium grades was $0.70 and $1.15 respectively.—H. J. Casso and M. D. Woodin

**Effect of Grade, Dressing Percentage, and Weight on Price of Slaughter Calves**

An analysis of prices received for more than 2,000 slaughter calves sold at auctions showed that 70 to 85 per cent of the variations in price among individual animals were accounted for by differences in grade, dressing percentage, and weight. Grade was the most important of the three factors, accounting for 56 per cent of the variation; dressing percentage accounted for 17 per cent and weight 8 per cent. Dressing percentage and weight are determined to a large extent by finish, conformation, and quality, factors which make up grade. Therefore, dressing percentage and weight influence price mainly through their joint relationship with grade.
In fact, the combined direct effect of these two factors on price accounts for only 8 per cent of the variation.

Although there was a direct relation between grade and price, improvement in grade of slaughter calves was not always accompanied by a proportionate change in price. In the higher grades a change of a third of a grade was associated with a smaller price differential than was the case in the lower grades.

—D. B. Frickie, H. J. Casso, and M. D. Woodin

Economic Integration in Broiler Growing

In a recent study of the broiler industry in Louisiana a variety of channels for acquiring input factors and for disposing of outputs was found. The four main patterns of enterprise organization are: (1) non-integrated, meaning the grower and dealer are independent; (2) quasi-integration, where the grower purchases supplies on credit from a dealer but retains the managerial responsibility; (3) complete integration through cooperative associations that buy supplies for the grower members and market their output; and (4) complete integration through a dealer where the growers raise broilers for a fee or fixed salary.

Complete integration is recommended to growers when their credit position is weak and when broiler prices are low or unstable. The certainty of a definite income is advantageous to the new grower who has not accumulated financial assets.

Complete integration through cooperative associations is recommended when at least ten or more broiler growers are willing to work together to procure feed, chicks, and supplies. Members who are capable managers and financially responsible will be able to obtain credit for the purchase of supplies from a bank or PCA. If production costs cannot be substantially lowered or if growers are not willing to cooperate, complete integrative patterns through cooperative organizations hold little promise of success. Cooperative associations have played a large part in the development of the broiler industry in Louisiana.

Quasi-integration between a dealer and the grower through the use of credit is recommended when the grower is capable of managing his enterprise and would benefit from the counsel of feed dealers and others. The success of this plan depends on the margin of profit which the dealer is willing to accept for the production factors provided to the grower and the efficiency of the grower.

Non-integration is recommended for broiler growers with good managerial ability and financial resources adequate to absorb moderate losses during a period when market prices are below costs of production. Borrowing directly from credit agencies usually re-
duces interest costs. However, the study indicates that non-integration is not a feasible pattern to adopt in growing broilers on a large scale owing to the perishability of broiler output, the technological factors which require close coordination among all segments in the industry, and the competition which comes from more integrated structures.—Ewell P. Roy and Dudley Frickie

Cotton Quality Statistics

The quality of cotton produced in Louisiana prior to December 1, 1955, averaged lower in grade and longer in staple than a year ago. This variation is attributed largely to a very rainy season this year as compared to a drought that existed throughout the cotton season last year. Lack of rain during the growing season last year prevented full growth and maturity of the crop, thereby reducing the average staple length, while too much rain this season resulted in lower grades.

The grade index (middling white = 100) for ginnings prior to December 1, 1955, was 93.0 as compared with 95.7 in 1954. During the 1955 season 31.3 per cent of the crop graded middling or better as compared with 45.8 per cent in 1954. This decrease in the amount of cotton graded middling and better corresponded to an increase in the proportion of cotton graded low middling, 20.8 per cent in 1955 as compared to 11.8 per cent in 1954. Spotted cotton accounted for 7.4 per cent of the crop ginned in 1955 as compared to 5.1 per cent in 1954.

The average staple length in 1955 was considerably longer than in 1954, 33.8 thirty-seconds of an inch compared to 33.0. The longer average staple in 1955 was due to an increase in the proportion of 11/16 inch cotton, 63.8 per cent as compared with 35.7 per cent in 1954. There was a corresponding decline in the proportion of the crop one inch or less, 3.0 per cent in 1955 as compared to 23.6 in 1954.—James F. Hudson and George Joubert, Jr.

Cotton Classing and Market News

The Louisiana Agricultural Experiment Station cooperates with the Agricultural Marketing Service of the United States Department of Agriculture in providing free cotton classing and market news services for cotton producers in Louisiana. These services are provided under the Smith-Doxey Act passed by Congress in 1937. The services have increased the effectiveness of farmers in bargaining with cotton buyers and have encouraged the production of improved varieties.

To be eligible for the services under the Smith-Doxey Act, farmers must belong to a cotton improvement organization. There
were 33 cotton improvement groups in Louisiana during the 1955-56 season with a total of 24,950 members. These members planted 536,806 acres of cotton of which 496,732 acres were of an approved variety.

The proportion of the total cotton crop submitted for classification has been increasing and most of the farmers in the delta areas of the state are taking advantage of the service. Through December 2, 1954, approximately 389,500 samples were classed for Louisiana farmers. This represents approximately 70 per cent of the cotton ginned in the state as compared to the previous high of approximately 68 per cent of the ginnings submitted for classification from the 1953 crop. Since classification of cotton received under the Smith-Doxey Act is accepted as evidence of grade and staple length of cotton for CCC loan purposes, the increase in 1955 may be partly attributed to the close proximity of the loan value to the market price of cotton during the season.

—James F. Hudson and George Joubert, Jr.

Cottonseed Handling Costs at Gins in Louisiana

The Department of Agricultural Economics recently completed a study on cottonseed handling costs at gins in Louisiana. The purposes of the study were to determine the cost of handling cottonseed by ginners using the various methods and equipment and to determine the most economical methods and equipment available for handling cottonseed at the gin.

There were four major methods of loading seed out of storage in use by ginners at the time the study was made: (1) use of overhead seed houses with drop doors or chutes for loading; (2) use of ground level storage houses and the loading of seed with forks by hand; (3) use of ground level storage and the loading of seed by the use of conveyor in conjunction with forks; and (4) the use of air lines or conveyors to move seed directly from the gin into railroad cars.

The average cost of handling cottonseed by gins, not including depreciation, interest on investment and power costs, amounted to $3.04 per ton. Cost of handling varied from $6.35 per ton for gins ginning less than 1,000 bales to $1.99 per ton for those ginning 3,000 bales or more.

The study indicates that ginners may reduce their cost of handling cottonseed by (a) the use of cottonseed scales to replace various means of estimating seed weights, (b) the use of overhead chute type of seed house as compared to the fork method for loading seed out of storage, and (c) by increased volumes of ginning and thereby increased volumes of seed.—James F. Hudson
Trends in Irrigation in Louisiana

The Census shows that total acres irrigated in Louisiana increased from 576,775 in 1949 to 706,627 in 1954. Irrigation of crops other than rice increased from 13,603 acres in 1949 to 41,020 acres in 1954.

In cooperation with the Agricultural Extension Service a study of trends in irrigation has been underway since 1953. Summary results for 27 North Louisiana parishes through 1955 are shown in Table 1.

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</table>

Source: 1949 from the 1950 Census; 1953-55 data obtained by survey of county agents. Note: Excludes rice irrigated.

¹Note: 1955 data include some farms and acreage not actually irrigated but for which equipment and facilities had been made available. Many farmers prepared their land and acquired facilities for irrigation but in some cases rainfall made irrigation unnecessary.

The data indicate an 81 per cent increase in the number of farms irrigating and a 75 per cent increase in the number of acres irrigated (excluding rice) from 1954 to 1955.

—Fred H. Wiegmann and Kenneth Koch

Irrigation Requirements for Cotton in the St. Joseph' Area

Providing facilities for supplemental irrigation of crops and pastures often involves a considerable investment. A factor bearing on the wisdom of expenditures for irrigation is the degree of need for supplemental irrigation over a period of time. In connection with this problem a study was made of the rainfall as compared with estimated water requirements for cotton on two soil types in the St. Joseph area from 1914 through 1954. The need for supplemental irrigation was measured by the difference between rainfall and the water required by cotton and expressed as “irrigation required” and “inches of rainfall deficiency.” In this study “rainfall deficiency” was determined for the 50, 65, and 100 per cent levels of moisture depletion. The permissible percentage depletion of available soil moisture in the effective root zone has not been established.

It was found that supplemental water was needed during the
growing season for every one of the 41 years studied for both Mhoon and Commerce soils and for all three levels of moisture depletion. To the extent that future water requirements will be similar to those of the past 41 years, the probability that at least two irrigations will be needed for cotton on Mhoon silty clay loam at the 50 per cent level of soil moisture depletion, is 100 per cent. The number of irrigations needed on Mhoon soil at the 50 per cent level of soil moisture depletion ranged from two to eight per year, with an average of five. On Commerce soil four to eleven irrigations were needed per year, with an average of seven, at the same level of moisture depletion. (For details see Department of Agricultural Economics Circular No. 185, December 1955.)

—Fred H. Wiegmann and J. L. Holcombe

**Beef Cattle Market Prices**

Prices of cattle have been fairly stable the last two years. Prices have fluctuated from month to month but the trend has been almost level. Prices of good fed steers in the fall of 1955 were slow in beginning their usual seasonal advance. Prices began advancing in late September. Cattle values were held down in 1955 by the record numbers of cattle marketed. Cattle slaughter in August, which included many cows and some grass steers and heifers as well as fed cattle, was about 10 per cent greater than in August 1954, which itself was a record month.

In September, prices of feeder cattle were about the same as they were a year earlier. Slightly higher feeder prices had been expected, but the hot dry weather in the Western Corn Belt and Central Plains cut the estimate of the corn crop by more than 350 million bushels between August 1 and September 1, thereby reducing the demand for feeder cattle.

Prospects for 1956 point to continued emphasis on livestock production and to a continued large output of meat. Pork production may increase a bit more, but the outlook is that cattle numbers and beef production will ease off slightly. Prices will be affected not only by the supply of beef and competing meats but also by the strength of the consumer demand. The outlook is for employment and wages to remain high through 1956, and cattle prices should be at least as high as they were in 1955.—J. P. Montgomery

**Changes in the Federal Milk Marketing Order Regulating the Handling of Milk in the New Orleans Marketing Area**

During all months of the last six years, dairy farmers in the New Orleans area have produced more milk than was needed for Class I sales in the area. Production expanded from 180 million
pounds in 1948 to 281 million pounds in 1954. Class I sales increased from 166 to 202 million pounds during the same period. The expanded production resulted from an increase in the number of producers and an increase in the volume of milk delivered daily per producer. All handlers in the New Orleans area were adequately supplied with milk from dairy farmers in the local milkshed. Under these conditions, handlers are generally unwilling to take on new producers or any increase in production by dairy farmers already supplying such handler, since this results in a reduction in their blend price. Wide differences in blend prices among handlers indicate that the “surplus” milk on the market is not being shared equally among producers. As a result of these conditions it was necessary to find a way to simplify the movement of milk between producers and handlers as well as simplify other provisions affecting the equalization of Class I utilization among producers.

An analysis of the supply-demand situation for milk in the area during 1955 resulted in a recommendation for changes in the Federal Order. A major change in the method of pooling milk is recommended. It suggested shifting from an individual handler pool to a market-wide pool. Market-wide pooling and equalization of sales provides for equal sharing of the returns from Class I sales by all producers in the market. It is designed also to equalize the lower returns from reserve milk in excess of Class I sales among all producers in the market.

The study also considered the feasibility of expanding the marketing area to include the densely populated areas adjacent to New Orleans and other areas in Southwest Louisiana. It was found that the marketing area could be expanded considerably without bringing additional handlers and producers under regulation. The inclusion of certain additional areas would result in more orderly marketing conditions in the area.

Recommendations were made also for a change in the base operating period under the Order. It proposed to extend the base operating period from the 7 months currently used to the full 12 months, beginning with March of the current year and ending with February of the subsequent year. The 12-month base operation period would tend to adjust production more nearly in line with Class I sales. (For further details of the analysis, see Mimeo-graph Circular 177.)

—William H. Alexander and Chapman E. Dunham

Changes Needed in Shreveport Federal Order

The Federal Order regulating the handling of milk in the Shreveport Marketing Area has been in operation since April 1,
1955. An analysis of the relationship of supply and demand of milk in the area indicates that certain changes in the Order are desirable to bring about stabilized marketing conditions. An expansion of the marketing area to include the military reservation at Fort Polk would result in more orderly marketing of milk.

It was found also that an adjustment in the price of Class I milk is needed to encourage producers to expand production to provide consumers in the area with an adequate supply of milk. The study indicates that a supply-demand provision should be included in order to provide for an increase or decrease in the price of milk with changes in the supply relative to the demand. (For further details of the analysis, see Mimeograph Circular 183.)

—William H. Alexander and Albert J. Ortego
A precision hill-drop planter was evaluated at several different rates of planting speeds. It was found that neither the placement of hills nor the number of plants per hill was affected by changes in speed, ranging from 3.3 to 8.8 miles per hour.

Results from experiments during the 1955 season indicate that for the application of post-emergence herbicidal oils, two nozzles per row, spraying parallel to the ground forward or backward, were more effective in the control of weeds than either two or four nozzles spraying across the row or spraying down (45°). The width of sprayed band needed depends upon the condition of the seed-bed and the population of weeds. An attachment for a Farmall “Cub” tractor was designed that could be used for the application of pre- or post-emergence herbicides, which helps to simplify the equipment needed for a chemical weed control program.

The application of post-emergence oils with machine developed at L.S.U. This machine can also be used for the application of pre-emergence chemicals for weed control.
In studies of some different methods of cultivating cotton, following the use of pre-emergence herbicides, it was found that the L.S.U. developed rotary hoes, four per row, could be more simply adjusted and produce more effective results than any of several other commonly used implements. These rotary hoes produced uniformly cultivated rows and middles, leaving a uniform area for post-emergence herbicidal spraying.

Nozzle types and arrangements were evaluated for the application of defoliants. Results of these tests indicate that one flooding type nozzle per row, spraying overhead, gave more complete defoliation than any other arrangement tested. One boomjet nozzle covering seven rows gave only very slightly less defoliation than the flooding type nozzles; however, the applications using the boomjet nozzles suppressed regrowth longer than any other arrangement tested. This might be accounted for by the fact that the defoliant was applied directly on the crown of the cotton where regrowth is most prevalent. If this factor continues to prove successful, defoliation equipment could be simplified to a very great extent. At any rate, it appears as though it is not necessary to obtain complete coverage of the cotton stalk, especially near the bottom, to gain excellent defoliation.

—Carl H. Thomas and Walter K. Porter, Jr.
Weed Control in Sweet Potatoes

New chemicals are continuously being screened for weed control and injury to sweet potatoes. CIPC, applied as a post-planting spray at rates of 4 and 8 pounds per acre, gave no apparent injury to the sweet potatoes. Weed counts were low in all of the test plots. Karmex as a pre-planting spray in machine planted sweet potatoes has never given any apparent injury; however, in hand planted and post-spray treatments, it has been toxic to the plants. Dalapon gave some injury as both a pre-planting and post-planting spray. A new chemical under the code of 3Y9 has shown considerable toxicity to germinating weed seeds at 8 and 16 pounds per acre. It was slightly toxic to the plants at 8 pounds, but subsequent sweet potato yield on these same plots was very high. CIPC at a rate of 6 pounds per acre is suggested for field trial as a post-planting spray on machine transplanted sweet potatoes but should not be used as a pre-planting spray. For plants that are planted by the hand stick method, the soil must be firmed around the plants when planted if CIPC is to be used as a post-planting spray.

—Wiley D. Poole and Teme P. Hernandez*

Mechanization Studies of Sweet Potatoes

A sweet potato harvesting machine previously designed for harvesting sweet potatoes for stock feed and starch was redesigned with the idea of harvesting sweet potatoes that are to be canned. This machine digs, separates out the soil from the potatoes, and loads them into a cart all as one operation. The harvester is mounted on one of the standard types of two-row tricycle tractors and can be removed in two to three hours to free the tractor for other operations.

For maximum efficiency of operation for the harvester a very good and thorough job of removing the vines before harvesting must be done. This is accomplished by a special machine as an extra operation prior to harvesting. One man operating this machine can harvest from seven to eight acres of sweet potatoes per day. Using the old method of digging and gathering the potatoes by hand, it would take approximately 25 men to accomplish this same amount of work in this same time.

Since the harvester handles the potatoes rather roughly, it cannot be used to harvest sweet potatoes that are to be sold on the fresh market, since potatoes sold for this purpose must have no bruising.—Wiley D. Poole

* Staff member of the Horticulture Department.
Utilization of Farm Residues

Last year this department reported the development of a modified adobe brick using rice hull ashes and clay soils. The universal interest aroused led to many other possible uses of rice hull ashes.

Correspondence indicates that while companies and agencies in the countries of India, Thailand, Switzerland, Egypt, Taiwan, Portugal, Japan, the Philippines, Pakistan, Turkey, Mexico, the Dominican Republic, Guatemala, Venezuela, Costa Rica, Ecuador, and Cuba are interested in the bricks themselves, many United States companies are interested in the potential use of the ashes as a substitute for other substances now being used in plastics, refractory bricks, and porous plates and as a conditioner for ammonium nitrate.—John H. Hough

Small building being erected from "Soilash" bricks to test weathering.
Harvesting, Handling, and Conditioning of Small Grains

A survey directed toward determination of cause or causes of quality deterioration during the drying and storage period of on-the-farm rough rice drying and storage installations in Louisiana was initiated in November 1954. Fifty-four installations were inspected during the fall and winter of 1954-55. The drying operation had been completed by the farmer prior to the visit by the inspection team so that accurate detail of operating technique could not be obtained in most cases. However, the farm operator was interviewed and as much historical information as possible was obtained on growing, harvesting, and drying conditions. Operation data such as quantity of air ventilating the rice, final moisture content of the rice, etc. were obtained by the Experiment Station team. Quality of the stored grain was determined by an inspection team from the USDA Grain Inspection Office, Crowley, Louisiana.

Quality deterioration was noted in most of the installations visited. However, all installations used less than the minimum recommended rates of air flow for ventilation of the grain during the drying operation. Since accurate operational data were not available and causes of deterioration were difficult to ascertain, the survey was extended to include only seven installations to be closely observed throughout the 1955-56 season. This work is still in progress.

Research is also being conducted toward development of means for an accurate, economic, and practical system for control of relatively small quantities of heat used for conditioning the air used for drying in on-the-farm drying and storage installations. Currently available moisture testers are also being checked for accuracy and dependability.—Finis T. Wratten

Portable Underheat Electric Brooder

Poultrymen in the United States, Mexico, Central America, Canada, and Hawaii have evidenced great interest in the latest model designed by this department in cooperation with the North Louisiana Experiment Station and the Louisiana State University Poultry Department.

More than 1,100 requests for plans and information had been answered by January 1, 1956. Many poultrymen have modified the original plan to better meet individual requirements while still retaining the basic design principles.—John H. Hough

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Latest model of electric portable underheat brooder being tested at the L.S.U. Poultry Farm.

Above Ground Silo

An above ground silo was built for testing the feasibility of using several different materials. The walls were made of exterior plywood of two thicknesses, corrugated asbestos of two thicknesses, and 2" x 4" welded wire covered over with sisal kraft paper. The sides of this silo were 8 feet tall. In testing this silo, it was found that 8-foot sides are really too high for good self-feeding and are difficult to load. The plywood sides are satisfactory. The ¼-inch thickness is too thin; and while the ¾-inch was satisfactory, it is felt that 5/16-inch thickness would be adequate. For a six-month exposure, no difference could be detected between exterior plywood panels treated to Penta and those not having the treatment. The ¾-inch thick corrugated asbestos was satisfactory; however, panels can easily be broken by the wagon or tractor. The ¼-inch
thickness is too thin for this purpose. The welded wire covered with sisal kraft paper was not satisfactory; the paper did not hold very well.

A new type of self-feeding gate was tried on beef cattle. The gate was a horizontal slot in place of the "V" and allows more cows to eat at one time. This is a definite advantage when feeding young, small cattle.—Wiley D. Poole

Soil and Water Management Investigations of Mississippi Delta Region

Research on drainage and deep tillage is a joint undertaking of the U. S. D. A. Agricultural Research Service, Agricultural Engineering Research of the Louisiana Agricultural Experiment Station, and the Northeast Louisiana Experiment Station.

Drainage and Cultivation of Sugar Cane Land

Investigations have been under way for a number of years on the feasibility of grading sugar cane land to improve drainage. This work has been placed on a maintenance basis. A publication is now in the process of being edited. Prior to 1955, this work showed an average increase of 5.81 standard tons of sugar cane per acre. The flat-planted tests on graded land to reduce the maintenance of quarter drains showed an increase in yield over the row-planted areas in 1955. This year completes five years' work on this phase, and in the five years the flat-planted outyielded or equaled the row-planted cane on graded land.

The cooperative project on row spacing of sugar cane started in 1953 with the American Sugar Cane League, U. S. D. A. Sugar Crop Section, U. S. D. A. Soil and Water Conservation Research Branch, Cinclare Plantation, and the Agricultural Engineering Research Department at L. S. U., was carried through the stubble crop.

The cultivation of the 44-, 57-, and 72-inch rows planted flat on graded land was carried out satisfactorily with both the plant and stubble crops. A standard crop cultivator was used with adjustment for the 44-, 57- and 72-inch rows. No conclusive results as to the effect of row spacing were obtained.

The following yields of 96 sugar were obtained per acre: with variety CP 36/105 on 44-inch rows, the yield was 5,047 pounds, on 57-inch rows the yield was 4,662 pounds, and on 72-inch rows the yield was 5,356 pounds. With variety CP 44/155 on 44-inch rows the yield was 4,971 pounds, on 57-inch rows the yield was 4,281 pounds, and on 72-inch rows the yield was 5,229 pounds.

An adjacent plot, planted to CP 36/105 on mixed land which
had been graded, planted and cultivated flat, gave a yield of 31.69 standard tons of sugar cane per acre as compared to 19.50 standard tons per acre from regular plantation row-planted adjacent cuts. No harvesting difficulties were experienced on the flat-planted cane plots as the crop was harvested with the regular plantation mechanical harvesters.

**Grading Mississippi River Delta Cotton Land for Drainage and Irrigation**

Farmers and SCS agencies have been requesting information on the costs and methods of grading Delta land to facilitate drainage and irrigation. A typical area was graded at Newellton, Louisiana, using a Cat-7 tractor and Cat-60 scraper and a D-6 tractor with a 50-foot land leveler.

The area was given a rough smoothing, surveyed, cuts and fills computed, and land graded to the pre-determined levels. Time consumed in smoothing the field for surveying was 0.93 hour per acre. Grading the land with a heavy tractor and scraper required 3.07 hours per acre. The final smoothing was carried out with a tractor and scraper plus a tractor and land leveler requiring 2.00 hours per acre, or a total of 6.00 hours per acre. The average distance the soil was moved was 400 feet, with a maximum cut of .9 foot and 426 cubic yards of earth moved per acre. At $10 per hour for machinery this work averaged $60 per acre.

**Deep Tillage Trials**

Tests were set up in 1954 on three methods of deep-tilling land to increase the water-transmitting and storage capacity of soils. Two types of tests were used—one, to determine the effect of depth of subsoiling, and the other, using different methods of deep tillage. The depths consisted of the conventional method, chiseling 12 inches deep, 22 inches deep, and 28 inches deep. The deep tillage tests consisted of using the conventional middle-buster for a check; mixing (using Graham Hoeme 14 inches deep); edging (plowing 18 inches deep, setting the furrow slice on edge); and, lifting, using tool bar with sweeps 18 inches deep.

The 1955 deep tillage tests on Commerce silt loam did not show the response to treatment that had been experienced in 1954 at the St. Joseph Experiment Station. However, rainfall was heavy during the last half of July and throughout August, with adequate moisture for maximum plant growth. There was a difference in soil moisture charge during the early part of the year, and gypsum blocks placed in the different treatments within the test showed differences in rate of recharge during the summer. There was enough difference in uptake of water during the rains of April and May to carry the plants 4 to 5 days longer than on the conven-
Edging by plowing 18 inches deep, setting furrow slice on edge, Newellton, La.

tionally treated plots when they went into the dry period during June.

The conventionally treated plots in 1955 yielded 47.1 bushels of corn per acre, the 12-inch chiseled 52.8 bushels per acre, the 22-inch chiseled 56.4 bushels per acre, and the 28-inch 54.3 bushels per acre.

In the tests using different methods of deep tillage, cotton and soybeans were the indicator crops. Block readings indicated adequate moisture throughout the season except for occasional high individual blocks. There was very little average difference between treatments, with possibly the mixed plots reading a little higher than the other treatments. There was a marked response in plant growth to treatment, with the edged plots and the lifted plots exhibiting a much ranker and taller appearance. This was reflected in lower yields, the plowed and the lifted plots yielding less than the conventional or the scarified plots.

The St. Joseph plots in 1955 made an average seed cotton yield of 3,008 pounds per acre on the conventionally prepared land, 2,998 on the mixed, 2,711 on the edged, and 2,855 on the lifted. The soybean yield was 28.6 bushels per acre on the conventionally prepared and 30.8 on the lifted plots.
The 1954 yields of these plots showed: conventional—2,022, mixed—1,817, edged—2,614, lifted—2,857 pounds of seed cotton per acre.

Trials were set up in the sugar cane area with the same treatments, with a modification of the lifting treatment. In order to get more breaking, the profile was lifted at two levels—18 inches and 13 inches. Three of the test areas were on black clay land similar to Sharkey clay at Napoleonville, Jeanerette, and Raceland, Louisiana. On a standard ton basis, the increases were as follows: mixing—.69 ton, lifting—.39 ton, and edging—1.75 tons. The other tests were on heavy mixed land and showed an increase on a standard ton basis as follows: mixing—.85, lifting—1.50, and edging—2.63.

The above test was in 5 replications and the yield increase varied considerably over the area. A preliminary analysis indicates a close correlation between yield and soil density.

The above tests are of the first year's work. The rainfall was evenly distributed during the growing season, which would tend to limit the benefits of deep tillage.

—Irwin L. Saveson, Zane F. Lund, and Harold T. Barr
Animal Industry

Improvement of Beef Cattle for the Southern Region

The importance of beef cattle production in the economy of the state has shown a notable increase over a period of several years. However, the quality of the beef cattle has lagged behind the expansion of beef cattle numbers. Almost every breed or every cross of the breeds, including the dairy breeds, is to be seen in Louisiana beef cattle herds. Until recently, there has been a decided lack of information that would make it possible for livestock men to evaluate the performance of the different types of cattle.

Awareness of this lack of information has resulted in the initiation of a beef cattle breeding project by the Animal Industry Department which has as its principal goal an evaluation of several different breeds of beef cattle and crosses among these breeds. Information will thus be made available to livestock producers as to which types of cattle will perform most satisfactorily under Gulf Coast conditions.

The project has been designed to produce 20 groups of cross-bred calves and 4 purebred groups in the first phase. Six herds of 32 cows each, composed of 8 Angus, 8 Brahman, 8 Brahman-Angus, and 8 Hereford cows, were bred to bulls of six different breeds. Bulls of the Angus, Brahman, Brahman-Angus, Charolaise, Hereford, and Shorthorn breeds were used. A new bull is selected each year to represent each breed, and the herds are bred to a different breed of bull each year.

One of the primary criteria for evaluating the performance of beef cattle is the weaning weights of the calves. Data are available from three breeding seasons which show that Brahman and Brahman-Angus cows consistently wean heavier calves than do the Hereford and Angus cows. When weaning weights are examined with respect to the breed of sire, the data show that the calves sired by Charolaise bulls have been consistently heavier than the other calves, followed by the calves sired by the Hereford bulls. Calves sired by Angus bulls have been lightest at weaning.

In an attempt to find the particular matings that will yield the best calves at weaning, the 24 types of calves that are produced are of special interest. It is impossible to list all 24 types; however, the first five groups, when ranked according to weaning weight over a three-year period, are: Shorthorn x Brangus, Charolaise x Brangus, Shorthorn x Brahman, Hereford x Brangus, and Charolaise x Hereford.
All heifers produced in this project are retained for further studies in this project. All male calves are steered and, after weaning, fed out on a wheat pasture with a concentrate supplement. At the close of the feeding trial the steers are slaughtered in the University’s meat laboratory and detailed carcass records collected.


Comparison of Four Different Levels of Sugar Cane Bagasse and Blackstrap Molasses in Beef Cattle Rations

In a second experimental trial the nutritive value of four different levels of ground dehydrated sugar cane bagasse and blackstrap molasses was compared.

Four rations were formulated in which the combined percentage of sugar cane bagasse and blackstrap molasses in all rations totaled 70 per cent. The main components of the rations were as follows: ground sugar cane bagasse, blackstrap molasses, and a basal concentrate. The proportions for the 1, 2, 3, and 4 rations are given below in that order. Sugar cane bagasse—45, 40, 35, and 30 per cent; blackstrap molasses—25, 30, 35, and 40 per cent; the basal concentrate made up the remaining 30 per cent of all four rations and was composed of 13.5 per cent cottonseed meal, 10.0 per cent ground corn, 5.0 per cent dehydrated alfalfa meal, 1.0 per cent steamed bone meal, and 0.5 per cent salt.

Representative steer from Lot 4 at the end of 140 days on feed. Ration composed of 40 per cent blackstrap molasses and 30 per cent ground sugar cane bagasse.
Thirty-six head of commercial grade Hereford steers were equally divided on the basis of weight and condition and fed the experimental rations for 140 days. Water was allowed at all times. The rations were formulated to contain adequate minerals, carotene, and vitamin D. The rations contained approximately 9.0 per cent crude protein, which is equivalent to that of shelled corn.

The average daily gains, which are given below, were approximately equal in all four lots. Lot 1—1.66 pounds; Lot 2—1.67 pounds; Lot 3—1.88 pounds; and Lot 4—1.75 pounds.

The calves in Lot 4, which received the ration with the lowest level of bagasse (20 per cent) and the highest level of blackstrap molasses (40 per cent), had the highest average slaughter grade at the end of the experiment, which was "Good."

—Paul B. Brown, R. A. Damon, Jr., and C. B. Singletary

Inheritance and Effects of the "Double-Muscled" Anomaly in Beef Cattle

The objectives of this study are (1) the definite determination of the mode of inheritance of this anomaly, (2) the evaluation of how much, if any, impairment of the reproductive efficiency in beef cattle results from this condition, and (3) the detection of the effects on carcass quality.

Several theories have been advanced by different authors relative to the mode of inheritance, such as (1) an incompletely dominant gene, (2) quantitative inheritance, (3) a recessive gene, and (4) an incomplete recessive with variable expressivity. This project has not advanced far enough to offer any basis for a statement on the mode of inheritance.

Impairment of the reproductive efficiency is mentioned in the literature reviewed, but it has not yet been noticed on this project.

Thighs from anomalous calves are extremely thick and full with deep grooves between the semitendinosus (eye of round) and the two adjacent muscles. The grooves are due to hypertrophy of these muscles and not to a doubling of the muscles.

The semitendinosus, biceps femoris, quadriceps femoris, and semimembranosus muscles seem to be particularly enlarged but the statistical analysis is not yet completed.

An interesting observation is the lack of finish exhibited by these animals. The carcasses have a tendency to dry in the cooler if kept too long. The live grades of anomalous animals are usually higher than the corresponding carcass grades. Their full thighs and loins present a tendency for the grader to upgrade these
animals on foot, whereas their lack of finish swings the pendulum in the opposite direction.

Physical separation of the 9-10-11th rib roasts, right hindquarters, and right forequarters into lean, bone, and fat definitely shows a higher amount of lean and a lower amount of fat in cuts from "double-muscled" animals when compared to normal animals.

Since this project is in its infancy and these remarks are based purely on observation, statistical analyses are needed to verify these conclusions.


Pasture Development and Management for Beef Cattle

The purpose of this investigation is to study methods for the development and management of pastures for beef cattle which will have maximum carrying capacity.

From October 18 to 21, 1954, eight 6-acre pastures were seeded with winter grasses by means of a grassland drill in order to preserve existing sod. Two lots—one of Bermuda sod and one of Dallis grass sod—were seeded to each of the following grasses: fescue, rescue, rye, and wheat. Louisiana S-1 White Clover was seeded in all lots. One hundred pounds of ammonium nitrate per acre were applied on November 12, 1954, and again January 7, 1955, to all lots.

Grazing was started on the wheat lots on November 18, 1954, and on the other lots December 1, 1954.

The winter grazing from November 18, 1954, to March 24, 1955, resulted in average daily gains as follows: wheat, 1.14 pounds; fescue, 0.91 pound; rye grass, 0.73 pound; rescue, 0.66 pound. Each 6-acre lot carried seven head of heifers throughout the winter grazing season.

The number of cattle on each lot was increased to nine on March 24, 1955. During the first week in April the four Dallis lots were reseeded with Dallis grass.

On April 22-23, 1955, all lots were treated with 100 pounds of ammonium nitrate per acre. During the first week in April and the last week in August all lots were clipped to keep down undesirable weeds.

On October 12 to 17, 1955, all lots were clipped very low with a rotary clipper to prevent clogging of seeder and were seeded in the same manner as in 1954.

The spring and summer grazing from March 18, 1955, to October 20, 1955, resulted in an average daily gain as follows: Bermuda grass, 0.93 pound; Dallis grass, 0.88 pound.
On October 20, 1955, three heifers per lot were taken off and winter grazing continued.

Because of dry weather the grasses were slow coming up, and fertilization was held off until November 21, 1955, at which time 100 pounds of ammonium nitrate were applied. At this time all grasses were approximately one-half inch to one inch high.

On November 4, 1955, it was necessary to begin supplementing the pastures with hay—one bale per lot per day—in order to prevent excessive loss in weight. Further supplementation of two pounds of commercial range cubes per animal per day was begun December 2, 1955.

On December 15, 1955, one hundred pounds of ammonium nitrate were applied per acre on each lot.


A Comparison of Roughages for Winter Feeding and Maintenance of Beef Cattle

This study is the second experimental trial conducted to compare the nutritive value of our commonly grown roughages—sugar cane bagasse, grass hay, rice straw, and cottonseed hulls. In the first trial the rations were composed of 62.5 per cent of the roughages being studied, 20 per cent blackstrap molasses, and 17.5 per cent of a basal concentrate mixture. In this trial the rations were composed of 27.5 per cent of the roughages being studied, 40 per cent blackstrap molasses, and 32.5 per cent of a basal mixture. The ration for the control lot was composed of range cubes and hay.

Five lots of 32 bred cows per lot were used as experimental animals and fed for 41 days under range conditions.

The experiment was designed as a test of the rations for supplemental use in the maintenance of pregnant beef cows on the range or winter grazing. The supplementation of the range with 8 pounds of ration per cow per day was calculated to be sufficient to meet the daily nutritive requirements. This amount of ration per cow per day was calculated to supply 40 per cent of the daily nutritive requirement, and the range was estimated to supply the remaining 60 per cent of the daily requirement.

A daily loss per cow in all lots was incurred. Therefore, 8 pounds per cow per day was not adequate to supplement the range in maintaining the weight of the cows. However, the losses in some instances were negligible, proving that certain Louisiana roughages, when properly assimilated and mixed with other materials to take care of the nutrient deficiencies otherwise present, will make excellent winter maintenance rations for the beef breeding herd.
The average daily loss per cow for the duration of the experimental period was as follows: Lot 1, ground sugar cane bagasse—0.61 pound; Lot 2, grass hay—.24 pound; Lot 3, rice straw—.05 pound; Lot 4, cottonseed hulls—1.07 pounds; and Lot 5, range cubes and hay—.24 pound.

It will be noted that the cows receiving the rice straw ration made a daily loss of .05 pound, which is negligible.

Water was available at all times. No additional hay was fed. Minerals were available free choice; however, the rations were formulated to contain adequate minerals and vitamin A.

—Paul B. Brown, R. A. Damon, Jr., and C. B. Singletary

The Value of an All-Year Grazing Program on the Reproductive Performance of Swine

Ten sow pigs with an average initial weight of 66 pounds were divided into two groups for the purpose of evaluating green forage in the reproductive cycle of a brood sow.

This project was designed so that each gilt in the dry lot had a litter mate in the grass lot. A grain mixture and a protein supplement including alfalfa meal were fed separately and free choice to each group. The animals were allotted on May 27, 1955, and have been on test for a 233-day period.

![Typical animals used in project to test value of green forage on reproductive performance.](image)

The average age of the first noticeable estrous period for the dry lot gilts was 172 days as compared to 176 days for the green forage gilts. At 7 months of age the gilts in the dry lot attained an average weight of 239.8 pounds as compared to 233.8 pounds for those on grass. The dry lot group had an average daily feed consumption per head of 6.48 pounds of grain mixture and 1.34
pounds of protein supplement as compared to 4.50 pounds of grain and 0.46 pound of protein supplement for the gilts on pasture. The average weight of the gilts when bred was 327.2 pounds for those in dry lot and 284.6 pounds for the green pasture lot. One gilt from each lot failed to conceive at the first service and had to be rebred at the next heat period.

—C. B. Singletary and R. A. Damon, Jr.

Development of Inbred Lines of Swine

Detailed carcass studies have shown considerable differences among the offspring of sows and boars with respect to carcass quality. Emphasis in the carcass studies is being placed, to a large extent, on the area of loin and backfat thickness. While attempting to develop lines which rank high in these characteristics, other traits such as conformation, rate of gain, litter size, and feed efficiency are being maintained in the selected lines. Selection criteria used in this project are, in general, those which are followed nationally in the selection of certified meat-type litters.

The project was initiated by the formation of five one-sire lines. Evaluation of these lines has resulted in the culling of two lines up to the present time. Two lines are performing very well and show considerable promise. A third line has shown certain weaknesses, particularly in the loin area, which makes its future value doubtful.

It is felt that a great deal of progress has been made in im-

Inbred litter from sire-daughter mating of most promising meat type line.
proving the carcass quality of the original herd of swine, without decrease in the excellent traits of performance possessed by this herd originally. In the future, efforts will be concentrated on the two inbred lines which have performed most satisfactorily.

—R. A. Damon, Jr., C. B. Singletary, and R. M. Crown

Methionine Supplementation of a Corn-Degossypolized Cottonseed Meal Diet for Growing Fattening Swine

This trial was designed to study the most effective level of low-gossypol cottonseed meal as a source of protein to swine when supplemented with the amino acid methionine.

The rations were formulated to contain 14, 16, and 18 per cent total protein levels and compared with and without the methionine supplement. Sixty-five pound purebred Duroc pigs were fed to a market weight of 205 pounds over a 75-day period.

The low protein level of 14 per cent with methionine added proved significantly superior in gains and feed utilization to the high protein levels of 18 per cent with and without the methionine. This result indicates that the amino acid supplementation has a greater stimulus at the low protein level than at the high protein level. The 18 per cent protein level without the methionine supplement was more efficient in gains and feed utilization than the lot with an equal amount of total protein plus additional amino acid. The high protein level rations evidently had a proper amino acid balance without the methionine supplement, which created a depressing effect.

Crops and Soils

Fertilizers for Sugar Cane

In 1955 nine sugar cane fertilizer experiments were conducted. Three of these experiments were with plant cane and six were with stubble cane. The yields at one location were so erratic that significant differences between treatments were not obtained. Anhydrous ammonia, aqua ammonia, and ammonium nitrate were the sources of N, 20 per cent superphosphate was the source of $P_2O_5$, and 60 per cent muriate of potash was the source of $K_2O$.

Fertilizer Ratio Studies with Plant Cane

On Baldwin loam at Katy Plantation, the 60-40-60 treatment produced the highest yields of cane, 26.68 tons, and sugar, 5,111 pounds, per acre. There was a tendency toward a response to the minerals at all levels of nitrogen. Results on Baldwin silty clay loam at Idlewild Farms showed that the greatest response was to 40 pounds of nitrogen per acre. On Patoutville loam at Vaufrey Plantation, the highest yields of cane, 28.64 tons, and sugar, 5,617 pounds, were produced by the 60-40-60 treatment. The treatments containing nitrogen, phosphorus, and potassium or nitrogen and potassium yielded more tons of cane and pounds of sugar per acre than did the treatments which contained only nitrogen.

Fertilizer Studies with Stubble Cane

The treatments containing phosphorus and potassium in combination with nitrogen yielded significantly more cane and sugar, on Richland silt loam at Young's Industries, Inc., than did the treatments which contained nitrogen alone. All treatments in which the application of nitrogen was split produced significantly more cane than did the corresponding non-split treatments. The 80-40-60 and 100-40-60 treatments in which the applications of nitrogen were split yielded more cane than did the corresponding split treatments containing only nitrogen. In splitting the applications of nitrogen, one half of the ammonia was placed in the off-bar furrow in early spring. The other half of the ammonia was applied in the last cultivation. The highest yield of cane per acre, 30.67 tons, was produced by the 100-40-60 treatment in which the application of nitrogen was split, while the 80-40-60 split-nitrogen treatment produced the most sugar, 4,512 pounds. On Mhoon silt loam at Pecan Tree Plantation, the highest yields of cane, 32.71 tons, and sugar, 5,701 pounds, were received from the 120-0-0 treatment in which the application of nitrogen was split. Results on Mhoon loam at
Little Texas Plantation showed that the 100-0-0 split treatment produced the highest yields of cane and sugar. In this experiment Flo-Mix, a commercial liquid fertilizer, was used in comparison with corresponding treatments containing nitrogen and minerals from the solid materials. The use of the liquid materials did not increase the yields of cane and sugar above the yields produced by the solid materials. At Smithfield Plantation on Commerce very fine sandy loam, the highest yield of cane, 30.02 tons, was received from the 100-40-60 treatment in which the application of nitrogen was split, while the highest yield of sugar, 5,031 pounds, was produced by the 100-0-60 treatment. No better increases in yields were received from the liquid fertilizer treatments than from corresponding treatments in which the plant food was supplied from solid sources. On Jeanerette loam at Alice "B" Plantation, the 120-40-60 treatment in which the application of nitrogen was split gave the highest yields of cane, 35.89 tons, and sugar, 6,336 pounds. There was a response to applied potassium at all levels of nitrogen when phosphorus was not added. At the 100 and 120 pound levels of nitrogen this response was significant. All treatments in which the applications of nitrogen were split yielded more cane and sugar than did corresponding non-split treatments. Further, the split-nitrogen treatments with phosphorus and potassium yielded more cane than did corresponding split treatments of only nitrogen. The Jeanerette loam soil at this location is alkaline. Apparently there was some loss of nitrogen from the first application, which unbalanced the effects from the minerals, particularly potassium, when the second application of nitrogen was not added.

**General Remarks**

The work with fertilizers on sugar cane in 1955 shows greater responses to the higher rates of nitrogen, higher responses to minerals from stubble cane, and the need for further explanation of the responses from splitting the application of nitrogen.

—D. S. Byrns, Jr. and M. B. Sturgis

**Cotton Varieties**

Trials of commercial cotton varieties and new strains were conducted in 1955 on five Louisiana Experiment Station Farms. These tests were located at Baton Rouge, St. Joseph, Bossier City, Calhoun, and Lecompte.

The leading varieties and strains at Baton Rouge were DES 7343, Delta-pine 15, Louisiana DS 5349405, Louisiana DS 523-9, Louisiana DS 524-9, Louisiana DS 5240-5, and Louisiana DS 518-12; at St. Joseph the leading varieties were Delta-pine 15, Dortch 4106, Coker 100 52-27, Delta-pine 8389-D, Plains, Stoneville 7, and Stoneville 5A-3202; at Bossier City the leading variety was Fox; at Cal-
houn the leading varieties were Louisiana DS 518-12, Louisiana 33 X 14, Fox, Empire, Louisiana DS 524-9, and Plains. The varieties and strains at Lecompte did not differ significantly in yield of lint per acre.

A new variety of cotton, Louisiana DS 524-9, has been released to the cotton growers of Louisiana. This new variety has been named Stardel. Stardel yielded 7 per cent more lint per acre than the most extensively grown cotton variety at six locations in Louisiana during the years 1953-1955. The fiber strength is 10 per cent greater than that of any of the commercial varieties in use in this state. Seed will be distributed in 1956, to those who wish to grow the new variety, by the Louisiana Crop Improvement Association, Baton Rouge, Louisiana.—F. W. Self

Experiments with Corn Hybrids in Louisiana, 1955

In conjunction with the corn breeding program at the Louisiana Agricultural Experiment Station, yield tests of corn hybrids were conducted at the Perkins Road Experimental Farm, Baton Rouge, five of the branch Agricultural Experiment Stations, the School of Vocational Agriculture, Lecompte, and two outfield locations in Louisiana in 1955. The tests included experimental hybrids in the advanced stages of evaluation, hybrids recommended for the state, and some of the better open-pollinated varieties. The randomized block design was used in setting up the experiments so that the data could be analyzed statistically. Each plot at Baton Rouge, Lecompte, and the branch Stations consisted of two rows 20 hills long. Two-row plots 50 hills long were used in the outfield tests.

In addition to yield several other characteristics of economic importance were studied. Among these are percentage of erect plants at harvest, husk grade, and plant and ear height. Information gained from these tests is utilized in determining the best adapted and, therefore, the most desirable hybrids for the different sections of the state. A hybrid recommendation is based on the performance of a hybrid for three or more years at several locations.

Recommended Hybrids

Some corn hybrids frequently show a definitely restricted adaptability to varying soil and climatic conditions. Yield test results over a period of years indicate that different hybrid recommendations should be made for north and south Louisiana. North Louisiana is considered to be that part of the state north of Alexandria while the area south of Alexandria is referred to as south Louisiana.
The following hybrids* are recommended for north Louisiana:

Dixie 11 (white)  Dixie 18 (yellow)
La. 468 (white)   N. C. 27 (yellow)
Coker 811 (white) Dixie 22 (yellow)
Funk G-785W (white)

The following hybrids are recommended for south Louisiana:

La. 521 (white)    Dixie 18 (yellow)


Corn Hybrid Seed Stocks in Louisiana, 1955

In order to facilitate the production of double-cross corn seed of hybrids developed by the Experiment Stations and the U. S. D. A. a working agreement was reached several years ago between the Louisiana Agricultural Experiment Station and the Louisiana Hybrid Seed Corn Growers Association, Inc. At present there are seven members in this association. They produced in 1955 approximately 22,000 bushels of hybrid seed corn. This production was made up of the following hybrids: Dixie 18, Dixie 11, La. 521, La. 468, Dixie 22, and N. C. 27. Members of the Louisiana Hybrid Seed Corn Growers Association, Inc., are receiving assistance from the Louisiana Agricultural Experiment Station through work which involves the maintenance of inbred lines and assistance with the production of single-cross seed.

Pure seed of the 11 inbred lines in production in Louisiana is maintained in sufficient quantities to meet the demands of double-cross production. Isolated increase blocks on Experiment Station property at Baton Rouge and Curtis serve this purpose. In 1955, 13.5 acres planted to seven inbred lines yielded 4,300 pounds of seed. Surplus inbred seed stocks are carried over from year to year in the cold storage facilities of the Agronomy Department of Louisiana State University.

A total of 70 acres was utilized in the production of single-cross seed in 1955. Over 800 bushels of seed were harvested from that acreage. This supply of seed will be more than adequate for the 1956 double-cross acreage. Some members of the Louisiana Hybrid Seed Corn Growers Association, Inc., are constructing buildings in which humidity and temperature can be controlled. Surplus single-cross seed can then be stored under conditions favorable for maintaining high germination over a period of more than one year.

* Certified seed of the La. and Dixie hybrids as well as N.C. 27 is produced in Louisiana. The seed certifying agency in Louisiana is the State Department of Agriculture and Immigration.
These facilities are expected to insure the production of more corn hybrid seed for Louisiana.—Lee Mason

Adaptation of Forage Species

Forage yield trials were continued with new species, varieties, and strains of grasses and clovers in small plots. Mixture studies included the more promising winter grass species in combination with white clover and red clover. Over 100 species and strains of grasses and clovers from the Regional Plant Introduction Station were planted for observation. Seed were harvested from the most promising introductions and will be planted for further evaluation. All plantings were conducted on Olivier silt loam soil.

Clovers

Data from second year growth showed Louisiana experimental synthetic 5 white clover and Louisiana S-1 white clover were significantly higher in forage yield than other white clover strains for early spring growth. Ladino outyielded the Louisiana strains in total forage production. The yield of certified Ladino was 4,670 pounds of hay per acre as compared to 4,341 pounds of experimental synthetic 5. None of the white clover varieties or strains survived the second summer. This lack of survival was due to adverse weather and competition from Bermuda grass and crabgrass. Under these conditions, Ladino clover would have to be reseeded, since it does not produce seed under environmental conditions existing in Louisiana. The fact that Louisiana strains would reseed themselves creates a definite advantage for Louisiana strains of white clover over Ladino for permanent pastures in Louisiana.

Second year growth of white clover and grass mixtures was considerably earlier than first year growth. A mixture of prairie brome grass and clover produced a higher forage yield than other mixtures or clover alone. The amount of clover in this mixture was 50, 41, and 24 per cent in February, March, and May respectively. Prairie brome grass was the only grass that survived through the summer of the first year. Other grasses included were rye grass, phalaris coerulescens, and phalaris minor.

Red clover varieties in combination with prairie brome grass produced an average hay yield of 6,124 pounds per acre as compared to 5,048 pounds for clover alone. The average per cent grass in the mixtures for the first cutting was 31. The percentage of grass in a mixture can usually be increased with an application of nitrogen at the proper time to stimulate growth of the grass. Pennscott, a new strain of red clover, was included in a yield trial with Louisiana strain 1 and Kenland. No significant differences in total
forage yield were obtained among any of the red clover varieties or strains.

**Grasses for Winter Grazing**

Second year forage yields were obtained from six varieties and strains of tall fescue grass. Results show that differences among entries were not significant. The yield trial included Goar, Alta 144, Alta, Oregon 4-36, Kentucky 31, and 19 G 1-25 fescue.

Florida rust resistant rye grass and domestic rye grass were significantly higher in total forage yield than other rye grasses included in a forage yield trial. The Florida strain produced 4,163 pounds of hay per acre as compared to 3,746 pounds for domestic. The rust resistant strain matured early and the second cutting contained a large amount of seed heads. This early maturity prevented an adequate observation of its rust resistance.

A forage yield trial was conducted with two strains of rye grass, three species of phalaris, and four strains of rescue grass. Domestic rye grass was significantly higher in total yield than the other species and strains. Rye grass, phalaris minor, and phalaris coerulescens appeared to be superior for early forage production. These grasses were planted on October 1 and produced over 1,000 pounds of hay per acre when harvested on December 10.

**Grasses for Summer Grazing**

Forage yield data were obtained from 11 species and strains of summer grass. This test was planted April 1, 1954. During the first summer after seeding, the plots were topped frequently to keep down weeds so that the grasses could become established. Rhodes grass was the only grass that became established and would have furnished grazing during the first year. From two cuttings, it produced 4,500 and 2,600 pounds of hay per acre respectively. Other grasses in the test became established the first year but would have furnished very little, if any, grazing. Results from the second year show that Pensacola Bahia and Pensacola Bahia hybrid 14 x 108 were superior to other entries for forage production. The two Bahia grass strains produced over 9,000 pounds of hay per acre. The total yield of Rhodes grass for the two years was over 14,000 pounds as compared to the 9,000 pounds produced by the Bahia grasses for the same period. Rhodes grass did not grow as well during late summer as Bahia or Dallis grass.

A forage yield trial was continued with Coastal Bermuda, Pangola grass, and Dallis grass 625. These grasses were fertilized with 100 pounds each of nitrogen, P₂O₅, and K₂O per acre on May 2, 1955. Additional nitrogen was applied at the rate of 160 pounds per acre in a split application. Results from five forage harvests show that Coastal Bermuda produced a higher total yield than Dallis grass.
The difference in total yield for the season was not significant, statistically. Coastal Bermuda produced a total of 18,666 pounds of hay per acre as compared to 14,183 pounds for Dallis grass. Dallis grass was significantly higher in forage yield for the first cutting in early spring before fertilization. A greater response to high nitrogen fertilization was obtained from Coastal Bermuda than from Dallis grass. Protein content of Coastal Bermuda and Dallis grass showed no appreciable difference between the two grasses. Pangola grass began growing early in the spring but was killed back severely by a late frost. It revived later and gave favorable yields during August and September.

Ten varieties and strains of millet and Sudan grass were included in a forage yield trial. This test was planted in drills 3.5 feet apart, with 400 pounds of 6-8-8 per acre applied in the drill before planting. An application of 32 pounds of nitrogen per acre was made as a sidedressing after the first cutting. Results of three cuttings show that millet hybrid 1 was significantly higher in total forage production than other entries. The hybrid produced 8,979 pounds of hay per acre as compared to 7,666 pounds for common millet. Starr millet produced leafier growth and was later in maturity but yielded only 6,704 pounds of hay per acre. Tift Sudan was significantly higher in total forage yield than other varieties of Sudan grass in the trial. In previous tests, which were planted in 12-inch drills, Tift Sudan produced more total forage than millet. However, in drills of 3.5 feet the millet varieties appear to be superior to Sudan grass.—C. L. Mondart, Jr., and C. R. Owen

**Forage Crop Breeding**

**Dallis Grass Breeding**

The search for better forage types of Dallis grass which produce more viable seed was carried on through the evaluation of clones collected from the area approaching the northern limits of the adaptation range for the species. Evaluation was made in the nursery at Baton Rouge where the clones were transplanted in 1954. Clones from 13 different locations were grown in separate rows. After the second growing season they were scored for persistence and seed quality. Seed which were analyzed were produced on the clones during the 1954 season. The results indicate that the clones were variable for persistence and for quality of seed produced. None were found which produced seed equal in quality to the strains which had been previously isolated from natural stands from the central and southern part of the state. Some unusual vegetative types were discovered, however.

Breeding experiments with Dallis grass indicate that additional improvements may be made by selecting clones from within strains
isolated earlier. Tests showed that certain of the new strains are promising in that they produced clones with a wider range for seed quality and that such variation was inherited. Other strains similar in vegetative type did not appear as variable for seed quality, and the variation exhibited apparently was not inherited. Certain lines included gave rise to plants variable for vegetative type as well as for quality of seed produced.

During the past year attention has been given to the development of improved techniques for determining the portion of good seed in samples of Dallis grass seed. The method generally used is that of separating the light seed by an air blast seed separator, but hand separation is necessary to separate the disease infected seed from the viable portion. It was found that by the use of technical grade acetone most of the ergot infected seed were separated from the sound seed by floatation. Acetone apparently does not affect the viability of Dallis grass seed, since the seed left immersed in it for one hour germinated equally as well as those not exposed. About one-tenth the time is required to determine the percentage of sound seed in a sample by floatation as by hand separation. Unfortunately this method is limited to samples which do not contain weed and other crop seed.

**White Clover**

The program for producing foundation seed of Louisiana S-1 white clover was continued. The five parental clones are maintained at Baton Rouge in sufficient quantity for transplanting into the intercrossing block for the production of breeder seed. Sixteen experimental clones of white clover are maintained for use in the formation of new synthetic varieties.

Forage yields produced from seed of breeder and foundation classes grown on the Experiment Station farm and certified seed produced by seed growers did not differ sufficiently to raise a doubt concerning the stability of the synthetic variety after being two years in the hands of certified seed growers. No trials have been made beyond these.

**Red Clover**

Plantings of the seed of red clover types received from the Southern Regional Plant Introduction Station in 1954 were not successful during the past year because of the drought during late spring and early summer. Additional seed have been planted during the past fall from more varied sources. The breeding program is being continued with the aim of producing strains which are more resistant to powdery mildew (*Erysiphe polygoni*) as well as other fungus diseases.
Lespedeza Breeding

Nine new strains of common lespedeza were planted for evaluation of forage production during the growing season of 1955. Dry weather early in March hindered germination and the stand was too thin for making normal comparisons. Forage harvests were made in November but the difference between strains was not significant. Lespedeza seed secured from different areas of Louisiana and southern Mississippi were planted in a forage yield trial. The differences between these were highly significant.—C. R. Owen

The Effects of Sources of Nitrogen, Sodium, and Lime in Fertilizers for Cotton

Experiments designed to study the effects of sources of nitrogen, sodium, and lime in fertilizers for cotton were conducted on Olivier silt loam at the Louisiana State University Experiment Station, Baton Rouge.

The objectives of the experiments were to evaluate sodium nitrate as a source of nitrogen for cotton as compared to ammonium nitrate and ammonium phosphate both with and without dolomitic lime, and to study the effects of sodium on the availability of native and applied phosphorus as determined by chemical analysis of the plant material at the fruiting stage and yield of seed cotton per acre. Further interest was also directed toward the evaluation of sodium as a substitute for potassium, and towards further study of the effects of lime on soils low in available phosphorus and exchangeable potassium.

The plots and treatments used at Baton Rouge in 1954 were used again in 1955. Considerable damage from crinkle leaf, manganese toxicity, showed up in the plots in which ammonium nitrate was the source of nitrogen and where no lime was applied. Those plots where sodium nitrate or ammonium phosphate was the source of nitrogen did not show damage from crinkle leaf. Ammonium nitrate treatments supplemented with dolomitic limestone at the rate of 300 pounds per acre did not show damage from crinkle leaf.

The highest yield of seed cotton from the experiment at Baton Rouge was obtained from a 60-60-60 treatment using sodium nitrate as the source of nitrogen. This yield was not significantly higher than a comparable treatment using ammonium nitrate as the source of nitrogen supplemented with dolomitic limestone at the rate of 300 pounds per acre, nor was it significantly higher than a comparable treatment with ammonium phosphate as the source of nitrogen with or without dolomitic limestone.

An increase in yield of seed cotton from 30 pounds of $P_2O_5$ over treatments in which $P_2O_5$ was left out was highly significant
where sodium nitrate was the source of nitrogen as compared to an insignificant increase in yield where ammonium nitrate was the source of nitrogen.

An unbalanced cation-anion relationship in the soil and in the plant probably accounts for lower yields from some of the treatments than that obtained from the no-fertilizer plot. The yield of seed cotton was lower for those treatments receiving only nitrogen than was obtained from the no-fertilizer plot. A further decrease in yield was obtained from the 60-0-60 treatments. This unbalanced cation-anion relationship and its effect on yield of seed cotton may be expected to become even more pronounced from year to year as the experiment continues.

The value of sodium as a substitute for potassium where no potassium was applied was indicated in slightly higher yields of seed cotton for treatments containing sodium nitrate over similar treatments containing ammonium nitrate. These increases in yield were consistent but not significant.

The value of dolomitic lime is also illustrated by its use with the 60-0-60 and 60-60-60 treatments with ammonium nitrate as the source of nitrogen. The difference in yield of seed cotton was highly significant in favor of the lime treatment. No significant response in yield was obtained from lime with treatments containing sodium nitrate and 60 pounds of P₂O₅ or ammonium phosphate as the source of nitrogen.—B. E. Newman

The Effects of Sources of Lime, Phosphorus, and Sulfur on the Yield of a Mixture of White Clover and Bermuda Grass

A study was made at the Louisiana State University Experiment Station, Baton Rouge, of the effects of sources of lime, phosphorus, and sulfur on the yield of a mixture of white clover and Bermuda grass. The experiment was located on Richland silt loam. The fertilizer treatments were applied at rates equivalent to 833 pounds of 3-12-12 per acre. Ammonium nitrate was the source of nitrogen. Treble superphosphate and raw rock phosphate were the sources of phosphorus. Muriate of potash was the source of potassium. Oyster shell flour, applied at the rate of 3,000 pounds per acre, or its equivalent in dolomitic limestone was the source of lime. Flowers of sulfur and gypsum were the sources of sulfur.

Because the pasture mixture was planted in late spring of 1955 and the weather was too dry to get good and even stands, the differences in yield were not statistically significant although relatively high yields were obtained from all treatments.

—B. E. Newman and M. B. Sturgis

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Effects of Sources of Nitrogen on the Yield of Cotton on Olivier Silt Loam

An experiment was conducted at the Louisiana State University Experiment Station at Baton Rouge to evaluate different basic and non-basic carriers of nitrogen, and non-basic carriers with lime in the production of cotton. The effects of minor elements in a complete mixture with and without lime on the yield of cotton were also studied.

The experiment was located on Olivier silt loam. The pH of the soil was 5.4. Dolomitic limestone was applied in a wide band at the rate of 600 pounds per acre to half of the treatments in which ammonium nitrate was the source of nitrogen. Minor elements were also applied as Esminel at the rate of 25 pounds per acre to half of the treatments in which ammonium nitrate was the source of nitrogen. Fertilizer was applied in a band 3 inches below the seed zone at the rate of 600 pounds of an 8-8-8 per acre and bedded on.

The yield data indicate that the carriers of nitrogen containing the bases sodium and potassium or the non-basic carriers such as ammonium nitrate supplemented with dolomitic limestone were superior to non-basic carriers of nitrogen which were not supplemented with lime.—B. E. Newman and M. B. Sturgis

The Value of Lime in a Cotton and Corn Rotation on Olivier Silt Loam

Following a phosphorus fixation study and beginning in 1948, a study was made of the effects of dolomitic limestone and fertilizers on the yield of cotton and corn in a rotation on Olivier silt loam. The experiment was a split plot design in which half of the area was limed with 3,000 pounds of dolomitic limestone per acre. The area was then subdivided into smaller size plots which were fertilized annually with three levels of N, P₂O₅, and K₂O. The nitrogen was applied as ammonium nitrate, the phosphoric acid as ordinary superphosphate, and the potash as muriate of potash. All of the corn plots except the checks or unfertilized plots were sidedressed with an additional 48 pounds of nitrogen. The fertilizer treatments were applied at the rate of 600 pounds per acre under the seed just before planting.

Higher yields for both cotton and corn were obtained from the limed plots as an average of eight years' results. The highest average yield of corn, 67.1 bushels, was obtained from the limed plots which were fertilized with 600 pounds of 8-8-4 per acre. This yield was 8.9 bushels higher than that from plots receiving the same treatment without lime. The highest yield of seed cotton,
1,872 pounds, was obtained from the limed plots which were fertilized with 600 pounds of 8-8-8 per acre. This yield was 392 pounds higher than that from plots receiving the same treatment without lime. Response to additional increments of P₂O₅ and K₂O was greater on the limed plots than on the no-lime plots. Yield data and growth symptoms of the young plants suggest that liming the soil increased the availability of phosphorus and that liming is a very important factor on soils as acid as pH 5.4.

—M. B. Sturgis and B. E. Newman

The Effects and Interactions of Sources of Lime and Fertilizers on Yield of Cotton

A study of the effects and interactions of sources of lime and fertilizers on Richland silt loam soil was conducted at the Louisiana State University Experiment Station at Baton Rouge. The experiment was a split plot design in which dolomitic limestone, oyster shell flour, and no-lime treatments occupied the larger size plots. Fertilizer treatments at three rates each of N, P₂O₅, and K₂O occupied the smaller size plots. The sources of lime were applied three weeks before planting at the rate of 3,000 pounds of dolomitic limestone or its equivalent in oyster shell flour per acre. Fertilizer treatments were applied in a band and bedded on at the rate of 800 pounds per acre at planting time. The pH of the soil before the lime was applied was 5.6. The area of land on which the experiment was conducted had been planted in soybeans for two years. The soybean straw and stubble were plowed under. This soybean residue probably accounts for the high yield of seed cotton from an 0-8-8 treatment.

The yield in seed cotton from all but the 8-0-8 fertilizer treatment with the dolomitic limestone was consistently higher than comparable treatments with oyster shell flour or without lime. Significant differences in yield of seed cotton occurred only between comparable treatments with dolomitic limestone and treatments with no lime. Response to P₂O₅ was obtained regardless of the source of lime. The higher yields of seed cotton obtained from the 8-0-8 treatments where lime was applied than from the 8-0-8 without lime suggest that liming influenced the availability of native soil phosphorus. The absence of P₂O₅ and K₂O in some of the fertilizer treatments was expressed in peculiar growth and maturity of the cotton plants. Where no P₂O₅ was added in the fertilizer treatments the plants were dwarfed and late maturing. Where K₂O was left out of the fertilizer treatments premature shedding of the leaves and opening of bolls resulted. Phosphorus deficiency symptoms were more pronounced on the no-lime plots. Potash deficiency symptoms were also more pronounced on the limed plots, particu-
larly more so than on plots receiving no lime. More vegetative growth was obtained from fertilizer treatments containing the higher levels of nitrogen. This was more pronounced in the limed plots than in the no-lime plots, and, if the weather had been normal instead of wet, more response to nitrogen would probably have been obtained.—B. E. Newman and M. B. Sturgis

Minor Elements as Related to Crop Yield and Quality

Crop responses to minor element fertilization of soils used in greenhouse and field studies during the past nine years have been significant in a few cases, positive in some cases, and negative in most cases. The response varied with species of plant and type of soil. Work is under way on a project designed to study the means for evaluating the minor element status of the soils and micronutrient limitations on crop production. The first soils to be studied are those which have given some degree of crop response to minor element fertilization in either greenhouse or field experiments.

—William J. Upchurch

A Study of Chemical Methods Used for Determining the Available Phosphorus Content of Soils

A study has been initiated to evaluate chemical methods which are used for determining the available phosphorus content of soils. Attempts are being made to develop an extracting solution which will remove from the soil the forms of inorganic phosphorus in the proportions that they may be assimilated by plants.

Results obtained from the initial study indicate that the soils of the Mississippi pleistocene terraces as exemplified by Olivier silt loam contain two forms of inorganic phosphorus which are of importance to plants, namely acid soluble and "adsorbed" phosphorus. The four extracting reagents used were: .10 N HCl plus .03 N NH₄F, .025 N HCl plus .03 N NH₄F, .10 N HCl, and .05 N HNO₃. Bray's reagent (.10 N HCl plus .03 N NH₄F) removed the greatest quantities of phosphorus. The soils contained slightly more "adsorbed" phosphorus than acid soluble.

The factors influencing the reduction of phosphomolybdic acid by stannous chloride for the colorimetric determination of phosphorus were also studied.—William J. Upchurch

The Effect of Deep Plowing and Summer Legumes on Cotton Yields on Mhoon Clay Loam at Northeast Louisiana Experiment Station, 1952-1955

An experiment designed to measure the value of deep tillage and legume rotations in cotton production on Mhoon clay loam was
established at St. Joseph, Louisiana, in 1952. A summer legume, *Melilotus alba*, was used alone and in combination with two depths of plowing, 7 inches and 14 inches. In addition to *M. alba* a rotation that included one year of soybeans was included.

No increase in yield was obtained from plowing 14 inches as compared to the conventional 7-inch plowing. This lack of response to deep tillage on this soil was evident in treatments both with and without *M. alba*. No artificial compaction was observed at the plow depth in this soil. The soil immediately below the regular plow depth was finer in texture than the surface soil and it is unlikely that mixing this material with the surface soil would increase yields.

Marked yield responses occurred where *M. alba* was grown for one and for two years and followed by cotton. Growing *M. alba* in the rotation produced greater yields of cotton on all treatments, regardless of depth of plowing. The benefits from *M. alba* were very likely due to, first, an increased supply of nitrogen from fixation and, second, an improved soil structure caused by the very heavy root and top growth of legume obtained. In order to separate the effect of the increased nitrogen supply from the effect of the improved soil structure, 60 pounds of nitrogen per acre was added to all of the plots in 1954 and 1955. Since results from other experiments at this Station have shown that cotton does not respond greatly to higher amounts of nitrogen than this, the increase from *M. alba* in 1954 and 1955 was at least partly due to an improved structural condition of the soil. An analysis of the soil structure made by measuring the mean weight diameter of the soil aggregates showed that there was a tendency for the soil aggregates to be larger in the plots on which *M. alba* was grown and in the plots that were plowed 14 inches. Penetrometer measurements made in 1955 at depths of 3 and 6 inches to evaluate soil tilth and structure showed that the resistance to penetration was generally less where *M. alba* had been grown. Little increase of cotton was obtained from growing soybeans in the first year of the rotation.

The four-year rotation in which *M. alba* was grown one year and cotton three years produced approximately as much cotton as was produced when cotton was grown all four years. This indicates that on this soil the use of a proper soil-building crop will permit as much cotton to be produced in three years as can be produced in four years without the soil-building crop.

**W. H. Patrick, Jr., L. W. Sloane,* and John A. Hendrix**

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The Effects of Deep Tillage and Deep Fertilizer Placement on Yields of Cotton and Corn and on the Physical Properties of Certain Soils in Louisiana

In 1955, experiments involving deep plowing, subsoiling, and deep placement of fertilizer were conducted at three locations—at Baton Rouge with corn on Olivier silt loam, at Monroe with cotton and corn on Gallion very fine sandy loam, and at the Northeast Louisiana Experiment Station, St. Joseph, with cotton on Commerce very fine sandy loam.

In general, no responses great enough to be significant were obtained from the deep-tillage or deep-placement treatments in 1955. At Monroe on Gallion very fine sandy loam slight increases in corn and cotton yields were obtained by deep plowing. On Commerce very fine sandy loam at St. Joseph the plots that were subsoiled produced from 200 to 300 pounds more seed cotton per acre than similar plots not subsoiled. The largest yield was produced where the soil was subsoiled and the fertilizer applied at a shallow depth. There were no increases in corn yield from deep application of fertilizer or from subsoiling at Baton Rouge.

During the 1955 growing season, there were very few periods of deficient soil moisture. This largely accounts for the lack of response to deep tillage and deep fertilizer placement in the Monroe test in 1955. Marked responses to deep tillage were obtained at the same location in 1954. A five-week period with no rain occurred during the 1954 growing season. Another indication of a greater supply of water at Monroe in 1955 was a top corn yield of 95 bushels per acre as compared to a top yield of 60 bushels per acre in 1954 with the same rate of fertilization.

On Gallion very fine sandy loam at Monroe definite compaction by implements was evident at a depth of six to eight inches. The movement of water through this compacted layer was considerably slower than water movement through the soil above and below this compacted zone. Penetrometer measurements on Olivier silt loam at Baton Rouge and Gallion very fine sandy loam at Monroe showed that the resistance to penetration was considerably less in the deep-tilled plots than in the untreated plots.

Soil moisture measurements on Olivier silt loam at Baton Rouge showed that the moisture content in deep-tilled plots was generally higher than in the untreated plots. In the subsoiled plots the samples for moisture analyses were taken in and beneath the chisel path. The larger supply of moisture present in both the subsoiled and deep-plowed plots was reflected in a lower soil moisture tension. The moisture tension in the plots that were deep plowed and subsoiled was lower than in the plots that were subsoiled only.

—W. H. Patrick, Jr., and M. B. Sturgis
Effect of Soil Fumigation for Control of the Reniform Nematode on Yield and Lint Characters of Upland Cotton

Studies were made in 1953, 1954, and 1955 on the effect of soil fumigation on yield, boll and lint characters for a number of varieties of upland cotton grown at Baton Rouge, Louisiana, in an area heavily infested with Fusarium wilt and reniform nematode, *Rotylenchulus reniformis*. In these studies comparisons were made of wilt-resistant and wilt-susceptible varieties grown in fumigated and untreated small field plots. One resistant and 1 susceptible, 9 resistant and 2 susceptible, 11 resistant and 2 susceptible varieties were evaluated in 1953, 1954, and 1955 respectively.

All of the resistant varieties showed good resistance to wilt under this complex. The incidence of wilt was so low that its effect on the performance of this group of varieties was considered to be negligible. Response obtained to fumigation was attributed primarily to reduction in injury by the nematodes. Susceptible varieties showed high incidence of wilt in 1953 and 1954 but considerably less in 1955. Fumigation resulted in significant reduction of wilt for these varieties but not enough for satisfactory control except in 1955. Response to fumigation was attributed to direct control of nematodes with indirect control of wilt.

Fumigation increased yield of lint 25 per cent for the wilt-resistant variety and 71 per cent for the wilt-susceptible variety in 1953. Size of boll was increased significantly for both varieties, but seed index and lint percentage were not affected.

In 1954 the increase in yield ranged from 22.4 to 55.6 per cent for the 9 resistant varieties and from 73.3 to 118.0 per cent for the 2 susceptible varieties. Fumigation also significantly increased lint percentage and boll size for all varieties but showed no effect on size of seed. Lint samples were evaluated on the Arealometer for fiber weight fineness and its two components, wall thickness and perimeter. Weight fineness and wall thickness were significantly increased by fumigation but perimeter was not.

Response of the varieties to fumigation was quite different in 1955. Fumigation resulted in an important increase in yield for only 1 of the 11 resistant varieties. Yield of the 2 susceptible varieties was increased only 26.5 and 48.4 per cent, which was considerably less than that obtained in 1953 and 1954. Boll size was significantly increased, but lint percentage was not affected. Lack of agreement in results obtained during 1954 and 1955 may be partially explained by differences in distribution of rainfall. In 1954 there were several prolonged dry periods during the growing season, whereas in 1955 there was no prolonged dry period. Since feeding by the reniform
nematode causes serious injury to cotton roots, less response may be expected to fumigation when moisture is adequate.

—Jack E. Jones, L. D. Newsom,* and M. T. Henderson

Effects of Different Sources of Phosphorus, Magnesium, and Liming Materials on the Growth of White Clover on Ruston Very Fine Sandy Loam and Olivier Silt Loam

Studies have been continued in the greenhouse to determine the effects of different phosphates, magnesium, and liming materials on the yield, phosphorus and magnesium contents and absorption of white clover.

Two acidic soils, Ruston very fine sandy loam and Olivier silt loam, were used. Oyster shell flour and dolomitic limestone and a treatment receiving no lime were used with and without the addition of soluble magnesium as Sul-Po-Mag. The sources of phosphorus were superphosphate and treble superphosphate. Lime was applied at the equivalent rate of 1,000 pounds of calcium carbonate per acre on Ruston very fine sandy loam and at the equivalent rate of 3,000 pounds of calcium carbonate per acre on Olivier silt loam. All treatments received the equivalent of 24 pounds of nitrogen as ammonium nitrate, 96 pounds of $P_2O_5$, and 96 pounds $K_2O$ per acre. Magnesium was applied at the rate of 32 pounds $MgO$ per acre. Approximately 20 pounds of screened air-dry soil per pot was placed in three-gallon pots. Three harvests were made of the clover grown on Ruston very fine sandy loam and four harvests were made of the clover grown on Olivier silt loam. Each crop was analyzed for the phosphorus and magnesium absorbed and the average content of phosphorus and magnesium in the clover.

Results of the experiment with white clover on Ruston very fine sandy loam show that, when lime was not used, small increases in yield of clover, increases in the absorption of magnesium, and increases in the magnesium content were associated with the addition of soluble magnesium as Sul-Po-Mag. When oyster shells were used as the source of lime the addition of soluble magnesium increased the absorption of magnesium and the content of magnesium in the forage. The addition of soluble magnesium with oyster shell lime increased the yield and absorption of phosphorus when treble superphosphate was used, but the application of soluble magnesium as Sul-Po-Mag did not increase the yield when superphosphate was used. The yield from the treble superphosphate treatment limed with dolomite was significantly better than the yield from the treble superphosphate treatment limed with oyster shells. More phosphorus was absorbed from the treble superphosphate treatment

* Entomology Department.
limed with dolomite than from the treble superphosphate treatment limed with oyster shells. The response of the clover to magnesium was apparently conditioned by the presence of sulphates in the fertilizer.

On Olivier silt loam, significant increases in yield of clover were obtained from the lime treatments. Except when treble superphosphate was used, high yields were obtained from the treatments limed with oyster shells. When oyster shells were used as the source of lime, the addition of soluble magnesium as Sul-Po-Mag significantly increased the yield and absorption of phosphorus from treble superphosphate, but Sul-Po-Mag did not significantly increase the yield when superphosphate was used.—R. H. Brupbacher

Inheritance of Reaction to Root Knot Nematode in Upland Cotton

A genetic analysis was made of tolerance to root knot nematode found in the upland strain Cleve- wilt 6. Among a large number of varieties and strains tested under field conditions, Cleve- wilt 6 appeared to be the most tolerant. However, the genetic study was conducted entirely under greenhouse conditions. Preliminary studies indicated that a technique in which seed was planted in soil heavily infested with the nematode gave relatively reliable, rapid results, requiring only about 40 days for a complete test. Root knot index, a visual estimate of the proportion of root tissue damaged by the nematode, was used as the criterion of reaction.

The genetic study involved parents, F₂ and F₃ populations of a cross between Cleve- wilt 6 and susceptible Deltapine 15. The Cleve- wilt 6 parent was consistently lower in root knot index than Deltapine 15 in all experiments, although both varieties were infested and the difference was small. Nematodes caused a considerably greater reduction of plant height in susceptible Deltapine 15 than in the tolerant Cleve- wilt 6. It appeared, however, that secondary invasion of the roots by fungi causing root rot was a more serious factor in reducing plant height than the direct effect of root knot nematodes. Cleve- wilt 6 was apparently more resistant to root rot from secondary organisms than was Deltapine 15.

Although 350 F₃ plants were grown and classified, very little information could be gained from the F₂ data. The means of the parents differed significantly in root knot index, but there was the same range among individual plants of both parents from very minor infestation to the highest class recognized. The F₂ showed the same complete range and a mean essentially equal to that of Cleve- wilt 6. Thus, the F₂ data indicated that inheritance is probably quantitative in nature and heritability of reaction is low.

A total of 80 F₃ lines from randomly chosen F₂ plants were tested. Fifteen lines were as tolerant to nematodes as Cleve- wilt 6
while only 3 lines were as susceptible as Deltapine 15. The remaining lines had means and plant distributions between the parents. The higher frequency of F3 lines resembling Clewewilt 6 than Deltapine 15 suggests partial dominance for nematode tolerance. The apparent frequency of recovery of the susceptible parent type, 3 lines among 80 tested, suggests that 2 or 3 pairs of genes were segregating for reaction to nematode. The results indicate that selection of individual plants for resistance would not be effective because of low heritability of reaction but that selection among progenies of 20-30 plants would be effective in isolating tolerant lines.—S. L. Wright, M. T. Henderson, and J. E. Jones

The Efficiency of Native Vetch Rhizobia

The efficiency of the vetch nodule bacteria that are native in certain soils in Louisiana has been compared with that of a commonly-used commercial culture of the organisms by growing hairy vetch plants inoculated with the organisms from the various soils in sterile sand in the greenhouse. The soils that were sources of the native *Rhizobium leguminosarum* organisms were Sharkey clay, pH 6.5, Mhoon very fine sandy loam, pH 7.4, Commerce very fine sand, pH 6.6, Miller clay, pH 7.5, and Yahola silt loam, pH 8.1. The native organisms were isolated from the soils by growing hairy vetch from sterile seeds in each soil and isolating the bacteria from surface-sterilized nodules. Heavy suspensions of the bacteria from each soil and from a fresh commercial culture were used to inoculate sterilized vetch seeds that were planted in sterile sand in the greenhouse. Based upon appearance of the plants, yield, and nitrogen content of the plant material, the commercial vetch rhizobia were far superior to all the native vetch rhizobia tested in the sand cultures. Only the strain isolated from the Commerce very fine sand showed any efficiency, although all inoculated plants contained at least a few small nodules.

In testing the efficiency of artificial inoculation in addition to the native rhizobia already in the soils, the results were variable. The artificial inoculation with commercial bacteria and 600 pounds of 3-12-12 fertilizer per acre were applied to the five soils in soil culture experiments in the greenhouse. Controls without fertilizers or artificial inoculation were also run. Fertilizer increased the yield of vetch in the Commerce and Mhoon soils, but both fertilizer and artificial inoculation were necessary for maximum yield on the Commerce. Artificial inoculation alone was sufficient for maximum yield on the Mhoon very fine sandy loam. Commercial bacteria were superior to the native rhizobia in the Sharkey, Commerce, and Mhoon soils. No increase in the yield of vetch was obtained from treatments on Miller and Yahola soils. This indicated that the native rhizobia in these soils were as efficient as the commercial
culture. Maximum nitrogen fixation occurred in the Yahola silt loam which had the lowest nitrogen content. The efficiency of the strains of vetch rhizobia present in the soils varied from very low to a level almost equal to that of a fresh commercial culture. The degree of nodulation on the plant roots was not a reliable indication of nitrogen-fixing capacity. In some cases the larger and vigorous-appearing nodules on the roots of the vetch plants contained very inefficient strains of the rhizobia.

—E. K. Chandler and W. H. Willis

A Lysimeter Study on the Influence of Cropping Systems on the Nitrogen and Organic Matter Content of Richland Silt Loam

A lysimeter study on Richland silt loam soil, using three replications of four cropping practices, has been continued for a period of five years. The cropping systems being studied are continuous grass and white clover, continuous grass, a row crop following an inoculated legume used as green manure, and a row crop without green manure but with 72 pounds of fertilizer nitrogen applied each spring. The soil in all the lysimeters was limed to pH 6.5 at the beginning of the experiment. The purpose of this study was to determine the influence of the four cropping systems on the nitrogen and organic matter content of the soil. Phosphorus and potassium, as 400 pounds of 0-12-12 fertilizer per acre, were added to the soil in all the lysimeters each spring. All the nitrogen removed in harvested crops and that contained in the green manure turned under was measured. Half the forage produced on the grass and grass and clover plots was returned to the soil within a few days after harvesting. The nitrogen and organic matter content of the soil in each lysimeter was determined each year on samples taken about October 1. The percolation water from each lysimeter was caught, measured, and then analyzed for nitrate and ammonium-nitrogen content.

The average annual yield of forage on the grass and clover plots has exceeded that on the grass plots by 142 per cent during the five-year period in spite of three additions of 72 pounds each of fertilizer nitrogen that were necessary to maintain growth in the grass plots. No nitrogen has been applied to the grass and clover plots since the study was begun. The average yield of seed cotton following green manure has exceeded that obtained with the use of 72 pounds per acre of fertilizer nitrogen annually by 23 per cent.

The nitrogen content of the soil planted to a row crop following leguminous green manure has increased from 0.063 to 0.101 per cent and the organic matter content has increased from 1.15 to 1.38 per cent in five years. Lesser increases in nitrogen have occurred in the soil in the other treatments. The nitrogen content of the soil in the plots used for row-crop production with fertilizer nitrogen
applied each spring appears to have become stabilized at approximately 0.078 per cent. Little change has occurred in the soil in these plots during the last three years. No important changes in organic matter content have occurred in the other treatments except for a temporary reduction during the first two years.

The pounds per acre of nitrate nitrogen lost by leaching during the five-year period were 78 from the grass and clover plots, 42 from the grass, 175 from the row crop following green manure, and 140 from the row crop plots without green manure but with nitrogen fertilizer applied each spring.—W. H. Willis

The Effects of Fertilizer on the Yield of Soybeans on Yahola Silty Clay Loam

In 1955 the Louisiana Agricultural Experiment Station in cooperation with the School of Vocational Agriculture at Lecompte began studies on the effects of fertilizers on the yield of soybeans on soils of the Red River bottom. The purpose of this study is to evaluate the effects of various rates of phosphorus and potassium on the yield of soybeans.

A randomized block design with three replications of each treatment was used. The plots consist of four rows 42 inches wide and 100 feet long. Ammonium nitrate was used as the source of nitrogen, superphosphate as the source of phosphorus, and muriate of potash as the source of potassium. The fertilizers were applied by hand in a band three to four inches below the seed at or before planting. The planting, cultivation, and harvesting were done mechanically. The two center rows of each plot were used in obtaining the field weights.

The average yield of soybeans from the no-fertilizer treatment was 33.6 bushels per acre on Yahola silty clay loam at Lecompte.

The data show that an increase in yield of soybeans was obtained from the application of phosphate applied alone. There was an increase of 8.2 bushels per acre from the 0-60-0 treatment over the no-fertilizer treatment. The largest response to any single nutrient was to phosphorus.

Results also show there was an increase in the yield of soybeans from the application of potash. There was an increase of 8.4 bushels per acre from the 15-60-60 treatment over the 15-60-0 treatment.

The highest average yield in this experiment was 47.7 bushels, which was obtained from the application of 15 pounds of nitrogen per acre in combination with 60 pounds of \( P_2O_5 \) and 60 pounds of \( K_2O \) per acre. The yield from this treatment represents an increase of 14.1 bushels per acre over the no-fertilizer treatment.

—James Gregg Marshall, N. L. Bacot, and C. L. Mondart
The Effects of Fertilizers on the Yield of Cotton on Yahola Silty Clay Loam

In 1955 the Louisiana Agricultural Experiment Station in cooperation with the School of Vocational Agriculture at Lecompte began studies on the effects of fertilizers on the yield of cotton on soils of the Red River bottom. The purpose of this study is to determine the most efficient rate and economical use of nitrogen, phosphorus, and potassium in the production of cotton.

A randomized block design with three replications of each treatment was used. The plots consist of four rows 42 inches wide and 100 feet long. Ammonium nitrate was used as the source of nitrogen, superphosphate as the source of phosphorus, and muriate of potash as the source of potassium. The fertilizer treatments were designed to measure the effects of each plant food nutrient, the combination of the nutrients, and the various rates of the nutrients. The fertilizers were applied in a band three to four inches under the seed at or before planting.

The planting, cultivation, and insect control operations were done mechanically. The cotton was harvested by hand, and the two center rows of each plot were used to obtain the field weights.

The results of the experiment on Yahola silty clay loam at Lecompte show that the yields of cotton were far below normal in 1955. Several limiting factors were involved during the growing season that materially limited the cotton yields. A droughty condition that occurred immediately following planting retarded germination to some degree. A very wet condition prevailed from early in the fruiting stage until late in the growing season.

An insect control program was started when the boll weevil infestation reached 25 per cent. Although 15 dusting applications were made by plane, the infestation had increased to 98 per cent. Owing to lack of effective insect control and wet weather the plants produced rank vegetative growth and were unable to set and hold sufficient fruit to utilize the plant food nutrients applied.

The results of this experiment show there was an increase of 524 pounds of seed cotton per acre over the no-fertilizer treatment from the application of 72 pounds of nitrogen per acre. The data also show that the application of phosphorus increased the yield of seed cotton.

Had the insect control and fruiting conditions been favorable better results from fertilizers would have been measured.

—James Gregg Marshall, N. L. Bacot, and C. L. Mondart
The Effects of Fertilizers on the Yield of Corn on Yahola Silty Clay Loam

In 1955 the Louisiana Agricultural Experiment Station in cooperation with the School of Vocational Agriculture at Lecompte began studies on the effects of fertilizers on the yield of corn on soils of the Red River bottom. The purpose of this study is to measure the effects of various rates of nitrogen on the yield of corn.

A randomized block design with three applications of each treatment was used. The plots consist of four rows 42 inches wide and 100 feet long. Ammonium nitrate was used as the source of nitrogen, superphosphate as the source of phosphorus, and muriate of potash as the source of potassium. The fertilizers were applied by hand in a band three to four inches below the seed at or before planting. The plant population was adjusted to approximately 12,000 plants per acre. Sidedressings with various rates of nitrogen were applied when the corn plants were approximately 18 inches in height. The planting and cultivating operations were done mechanically. The corn was harvested by hand, and the two center rows of each plot were used to obtain the field weights.

Results show the addition of nitrogen at all levels produced increases in the yield of corn on Yahola silty clay loam at Lecompte. The highest yield obtained from the addition of nitrogen alone was 88.3 bushels from the application of 120 pounds of nitrogen per acre. This yield represents an increase of 36.9 bushels per acre over the no-fertilizer treatment.

The highest yield obtained in this study was 90.9 bushels per acre from the application of 120 pounds of nitrogen per acre in combination with 30 pounds of P₂O₅ and 30 pounds of K₂O per acre. This yield represents an increase of 39.5 bushels per acre over the no-fertilizer treatment. There was no significant response to either phosphorus or potassium at the 120-pound level of nitrogen. The results show that approximately 1 bushel of corn was produced from each 3 pounds of fertilizer nitrogen applied alone or with 30 pounds of P₂O₅ and 30 pounds of K₂O at the 120-pound level of nitrogen.

A dry condition at planting time retarded germination and limited growth in the early stages. A very wet condition was prevalent from about sidedressing time until the plants were near maturity. Some wind damage was noted late in the growing season.

—James Gregg Marshall, N. L. Bacot, and C. L. Mondart

Chemical and Mineralogical Properties of the Soils of St. Mary and Terrebonne Parishes

A large portion of the research during 1955 has been centered in Terrebonne Parish, although certain soils from St. Mary have
been investigated. A large number of soil profiles have been collected and are being studied for chemical, physical, and mineralogical properties.

A total of 15 profiles from Cypremort, Mhoon, Commerce, Alligator, Sharkey, Baldwin, and Patoutville soil series have been analyzed by X-ray diffraction for clay mineral content. Montmorillonite was the dominant clay mineral in all the soils except those of the Patoutville series. The X-ray of the Patoutville indicated very poor chrystalline structure and considerable weathering, even in the lower horizons.

Profiles from the Alligator, Sharkey, and the tidal marsh were very high in montmorillonite and indicated very good chrystalline structure. The X-ray results for the Mhoon and Commerce indicated considerable weathering but much less than in the Patoutville. Profiles of Baldwin and Cypremort were weathered slightly more than those of the Sharkey and Alligator. Other colloidal minerals found present in the 15 profiles mentioned above were illite, quartz, and small quantities of kaolinite.

Cation exchange capacity, exchangeable bases, organic matter, pH, available nutrients, and silicate analyses have been or are being made on the above mentioned profiles.

Research completed on the fresh and salt water marshes of Terrebonne Parish include the analysis of 151 profiles for pH, organic matter, total soluble salts, and soluble chlorides and carbonates of calcium, magnesium, sodium, and potassium. These data have been assembled and are being used to help in the classification of the marsh area of Terrebonne Parish.

The soil survey report of St. Mary Parish has been completed. The rough draft of this report is now ready for editing. The field data have been assembled and part of the report of the soil survey of Terrebonne Parish has been completed.

—B. N. Driskell and S. A. Lytle

**Sulfur in Rainwater**

In 1952 rainwater gauges were placed at the Experiment Stations located at Baton Rouge, DeRidder, Franklinton, and Homer. During 1953 a rain gauge was also placed at the Tung Station near Bogalusa. The purpose of this work has been to determine the annual sulfur accretion at various locations, especially near industrial areas. Similar cooperative work has been conducted in all of the southeastern states.

Rainwater was collected in three-month periods and the analysis for sulfur made by the United States Department of Agriculture
in cooperation with the Mississippi State College Experiment Station. A summary of results for 1953 and 1954 is reported here.

The annual accretion of sulfur was low at all locations. The Homer station was highest with approximately six pounds of sulfur deposited annually per acre. From the data collected, it is evident that large quantities of sulfur are not being deposited from the atmosphere near the large industrial areas of the state. These quantities of sulfur from the atmosphere alone would not supply the minimum needs for most crops other than grain or grass crops. Where the crop requirement for sulfur is large it must be largely supplied by quantities already in the soil or from commercial sources such as fertilizers.

Plans are being made to locate these rainwater gauges in other areas of the state in order to obtain more complete information concerning sulfur deposited from the rainfall.—B. N. Driskell
Dairy Research

Field Trial with Bovine Spermatozoa Frozen and Stored at −79° C.

Artificial breeding in the past few years has contributed significantly to the genetic improvement of dairy cattle in the United States. In 1955, over 5,000,000 cows, comprising 23 per cent of the dairy cow population in the United States, were artificially bred. In order to show genetic improvement on the future generations of artificial daughters, only sires with transmitting ability above that of the breed average for artificial offspring can be used. Sires with proven genetic merit are costly and difficult to obtain; thus the recent trend has been towards methods of prolonging the life and efficient utilization of semen.

In present day practices, semen is extended in egg-yolk-citrate extender and stored at 5° C. (This will be referred to as “hot” semen.) Under these conditions semen can be used for periods up to three days without a great decline in fertility. Many attempts have been made to prolong the storage time of semen, but without much success. The most recent and promising work in this field has been with the freezing and storage of glycerolated semen at temperatures of −79° C. or colder. Previous work at the Louisiana Station involving techniques in the freezing of semen indicated that motility can be maintained after freezing and storing at −79° C. The purpose of this trial was to compare fertility results of frozen semen with hot semen (5°) and to ascertain whether the use of frozen semen would be practical under Louisiana conditions.

Semen from six dairy bulls—two Jerseys, two Holsteins, one Guernsey, and one Hereford—was selected for the trial. A portion of semen from each bull was shipped as “hot” semen containing 10,000,000 live spermatozoa per c.c. and the remainder, containing 15,000,000 live spermatozoa per c.c. of extended semen, was frozen. Antibiotics were added to both extenders at the rate of 500 units penicillin and streptomycin per c.c. of extender for “hot” semen and 500 units of streptomycin per c.c. of the glycerolated extender. The semen was frozen in an alcohol dry ice bath and stored at −79° C. in an insulated box containing dry ice. Eighteen technicians used frozen semen for a period of five days. The technicians were divided into two groups, with the first group using frozen semen two to seven days following freezing and the second after a 10 to 15 day storage period. The “hot” semen was used by both groups over a 72 hour period. The non-return rates were based on a 60-90
day basis. A total of 119 cows were bred to "hot" semen as compared to 194 cows for the frozen semen. The 60-90 day non-returns showed only a small difference between the two treatments with 68.9 per cent for the "hot" and 68.0 per cent for the frozen. It would appear, therefore, on the basis of these results, that frozen semen could be used in Louisiana with no great loss in efficiency.

—H. C. Kellgren, T. E. Patrick, J. E. Johnston, C. Branton, and G. F. D'Arenshourg

Breeding Difficulties of Dairy Cattle in Louisiana

Studies of the factors affecting the fertility of dairy cattle which were begun in 1953 have been continued. Data on 63 randomly selected herds and 21 "problem" herds, a total of 84 herds, have been analyzed. Examinations have been made on 383 "problem" cows.

Management practices appear to be one of the major reasons for the low fertility in many herds. This is revealed by the fact that 27 per cent of the farmers were breeding cows within 45 days after calving, only 49 per cent of the herds had current brucellosis or Bang's disease tests and 70 per cent of the farmers had purchased replacements during the last two years. Also only 51 per cent of the farmers who had purchased replacements tested them for brucellosis and other contagious diseases which affect fertility. All of these practices as well as possibly inadequate nutrition in many instances can cause poor fertility.

A total of 139, or 36.3 per cent, of the 383 "problem" cows were found to be pregnant, leaving 244 cows that were open or not pregnant. The causes of breeding difficulties in the open cows are shown in Table 1.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeat Breeders</td>
<td>29.2</td>
</tr>
<tr>
<td>Granular vaginitis</td>
<td>26.6</td>
</tr>
<tr>
<td>Metritis</td>
<td>11.9</td>
</tr>
<tr>
<td>Anestrus</td>
<td>8.2</td>
</tr>
<tr>
<td>Leptospirosis</td>
<td>7.0</td>
</tr>
<tr>
<td>Cystic follicles</td>
<td>5.3</td>
</tr>
<tr>
<td>Vibriosis</td>
<td>4.9</td>
</tr>
<tr>
<td>Unknown</td>
<td>4.9</td>
</tr>
<tr>
<td>Brucellosis</td>
<td>2.0</td>
</tr>
</tbody>
</table>

In this study a cow was classified as a "repeat breeder" if she had four or more services at regular normal intervals and if she had no detectable diseases or reproductive organ abnormalities. Anestrus cows were those that were open with no heat periods
since last calving or since last breeding due to persistent corpora lutea (yellow bodies) or non-functional ovaries.

The data given on vibriosis, leptospirosis, and brucellosis in Table 1 may not be accurate since not all of the "problem" cows were tested for these diseases. However, the cervicovaginal mucus agglutination test has been performed on cows showing clinical symptoms of vibriosis in 19 herds. A total of 9 of these 19 herds had one or more cows which gave a positive reaction to this test. Thus, it appears that this disease is causing repeat breeding, abortions, and delayed breeding in several herds. Much more diagnostic work is needed to determine the prevalence of vibriosis in Louisiana. Also, the nature of other causes of repeat breeding needs to be determined.

—Cecil Branton, W. S. Griffith, J. G. Hall, J. E. Johnston, and T. E. Patrick

Seasonal Variations in Thyroidal Activity, Semen Production and Fertility of Dairy Bulls

Investigations were begun in 1954 to determine the interrelationships among blood plasma protein-bound iodine (PBI) levels (an estimate of thyroidal activity), semen production and fertility of dairy bulls and climate. A total of 15 bulls (5 Jerseys, 5 Guernseys, 5 Holsteins) was used in 1954. In 1955, 22 bulls (9 Jerseys, 8 Guernseys, 5 Holsteins) were used.

A summary of the data for 1954 is given in Table 1. It will be noted that all of the values followed the same seasonal pattern, being lower during the summer and fall than during the spring and winter. In 1955 the same general pattern was found. The PBI levels during May, June, July, August, and September were 4.5, 3.6, 2.6, 2.9, and 4.2 micrograms per 100 ml. plasma respectively.

The correlation coefficients between PBI levels of the bulls in 1954 and average monthly temperatures on a concurrent, one month previous, and two months previous basis were $-0.293$, $-0.655$, and $-0.718$ respectively. Each of these correlations was statistically
highly significant. These values clearly show that the PBI levels or thyroidal activity of the bulls and environmental temperatures were inversely related. The temperatures one and two months prior to the determination of PBI had more effect on the PBI than did the concurrent average monthly temperature, suggesting a lag effect. Although fertility followed this inverse pattern (Table 1), the correlation coefficient of −0.002 between PBI levels and fertility was insignificant. This probably should have been expected since only high quality semen was used for artificial insemination purposes.

From these results it appears that the high environmental temperatures during the summer and early fall months in Louisiana depress thyroidal activity, semen production, and fertility of dairy bulls. However, more work is needed to establish any cause and effect relationships among these factors and to determine recommended feeding and management practices.

—Cecil Branton, J. E. Johnston, and W. S. Griffith

The Effects of Air Movement, Air Movement Plus Sprinkling, and Air Conditioning on Semen Production and Physiological Responses of Dairy Bulls under Southern Conditions

Twenty-two mature dairy bulls selected on the basis of semen production and fertility (9 Jerseys, 8 Holsteins, and 5 Guernseys) were used in this study. The bulls were randomly placed into four groups, each consisting of 2 Jerseys, 2 Holsteins, and 1 Guernsey, except for group 1, which had 2 Guernseys, and group 3, which had 3 Jerseys. Groups 1, 2, and 4 were housed in a large barn divided into sections while group 3 was housed in a temperature control chamber. Animals in groups 1 and 2 were cooled by the use of large electric fans; in addition group 1 was exposed to a fine mist water spray during alternate hours between 10 A.M. and 5 P.M. Group 3 was cooled by an air conditioning system. The animals in group 4 served as a control in the study.

Two or three semen samples were collected from each bull weekly from March 1 through November 30, 1955. The volume, per cent motile sperm, per cent morphological abnormal sperm, concentration, and whether or not the sample met all the requirements for routine shipment were recorded for each sample collected. Three times a week from May through September, body temperature, respiration rate, flank skin temperature, and scrotal skin temperature were recorded. The semen data collected before the animals were placed under the experimental conditions on May 1 were used as a basis for correction in an analysis of covariance.

Body temperature showed no statistical significance; the mean
body temperature was 101.1. There was, however, a significant difference among groups in respiration rates. The mean respiration rates were 33, 42, 39, 51 for groups 1 through 4 respectively. There were also significant differences among groups in flank skin temperature. The means were as follows: 90.1, 91.4, 89.9, and 92.6 for the 4 groups. The scrotal skin temperature differences were significant, with means of 90.3, 90.8, 89.3, 90.9 for groups 1-4 respectively. The analysis showed that no significant differences were present among groups for per cent motility or per cent shippable ejaculates. The per cent of change from the base period can be seen in the following table.

<table>
<thead>
<tr>
<th>Fan Plus Spray Group</th>
<th>Fan Group</th>
<th>Air Condition Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VOLUME</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Period</td>
<td>5.1</td>
<td>5.1</td>
<td>4.7</td>
</tr>
<tr>
<td>Experimental</td>
<td>4.4</td>
<td>5.4</td>
<td>5.0</td>
</tr>
<tr>
<td>Per Cent Change</td>
<td>86</td>
<td>106</td>
<td>106</td>
</tr>
</tbody>
</table>

| **PER CENT MOTILITY**|           |                     |               |
| Base Period          | 48        | 49                  | 46            | 53            |
| Experimental         | 48        | 50                  | 43            | 51            |
| Per Cent Change      | 100       | 102                 | 93            | 96            |

| **PER CENT ABNORMAL**|           |                     |               |
| Base Period          | 13        | 12                  | 18            | 12            |
| Experimental         | 12        | 11                  | 18            | 12            |
| Per Cent Change      | 92        | 92                  | 100           | 100           |

| **PER CENT SHIPPABLE EJACULATES** |           |                     |               |
| Base Period            | 60        | 74                  | 60            | 72            |
| Experimental          | 59        | 75                  | 49            | 70            |
| Per Cent Change       | 98        | 101                 | 82            | 97            |

Two apparent factors present may explain why no differences were obtained in the semen data. First, the summer was very mild for this area and, second, some of the bulls in the air conditioned chamber and the group cooled by fans plus spray showed a serious decrease in semen production early in the experiment. Probably these individual decreases were due to something other than the experimental treatments.

—James W. Smith, T. E. Patrick, J. E. Johnston, G. F. D'Arenbourg, Cecil Branton, and H. C. Kellgren

Cost of Raising Dairy Herd Replacements

Sixteen dairy heifers (8 Jerseys and 8 Holsteins) were used in a study to determine the cost of raising replacements from birth to 12 months of age. The animals were fed hay free choice and grain at the rate of 4 pounds per day in large group pens. All ex-
penditures such as feed consumed, veterinary care, housing, and labor were recorded. The total cost of the various requirements as shown below was found to be $105.58 and $117.15 for the Jersey and Holstein animals respectively on the basis of the current prices.

### Itemized Requirements of Raising Replacements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Amount Per Animal</th>
<th>Jersey</th>
<th>Holstein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain</td>
<td>1124 lbs.</td>
<td>1,206 lbs.</td>
<td></td>
</tr>
<tr>
<td>Hay</td>
<td>1,789 lbs.</td>
<td>2,185 lbs.</td>
<td></td>
</tr>
<tr>
<td>Colostrum</td>
<td>20 lbs.</td>
<td>27 lbs.</td>
<td></td>
</tr>
<tr>
<td>Whole Milk</td>
<td>288 lbs.</td>
<td>257 lbs.</td>
<td></td>
</tr>
<tr>
<td>Skimmilk Powder</td>
<td>78 lbs.</td>
<td>89 lbs.</td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>16 hrs.</td>
<td>16 hrs.</td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>$3.00</td>
<td>$3.00</td>
<td></td>
</tr>
<tr>
<td>Veterinary Cost</td>
<td>$5.00</td>
<td>$5.00</td>
<td></td>
</tr>
</tbody>
</table>

—J. B. Frye, Jr., and D. L. Hays

### Fundamental Causes of Bloat in Ruminants

The study of the causes of bloat started in 1955 is to be continued. In 1955, 10 non-lactating dairy cows (5 Holsteins and 5 Jerseys) were studied during April and May under a pasture environment. The pasture herbage consisted primarily of white Dutch clover with some Persian and bur clover. The pasture was divided into six one-acre plots, and the cows were permitted to graze from 1 to 2 days on each plot, depending upon the abundance of growth, before rotating to another plot.

An attempt was made to produce bloat by drenching cows with juice pressed from forage. Juice from herbage which was cut and pressed early in the morning was given to the cows at the rate of approximately 1 ounce to 5 pounds of body weight in 15 attempts to produce bloat experimentally. The cows were drenched in the morning after they appeared to be full from grazing. Only two cases of bloat after drenching with the forage juice occurred during the period of observation. One case of bloat occurred under normal grazing conditions. These cases were considered slight and the animals recovered spontaneously in a short period of time. The almost complete absence of bloat during this trial may have been due to the dryness of weather and the rather advanced stage of growth of the pasture plants.

The nitrate-nitrogen content of the forage and the soil in the pasture where the animals grazed during part of the bloat season was determined at various intervals. The nitrate-nitrogen content of the forage varied from 70.9 to 141.9 p.p.m. and the nitrate-nitrogen content of the soil varied from 1.0 to 1.6 p.p.m. The two cases of
bloat caused by drenching occurred on the same day that the nitrate-nitrogen content was the highest for both the soil and plants.


**A Comparison of Permanent vs. Seedbed Pastures for Winter Milk Production**

A comparison of native with cereal grain pastures was made during the 1954-55 winter and spring grazing seasons. This study involved 343 acres of pasture land and the entire LSU milking herd. Complete records were kept on pasture costs (land preparation, seed, fertilizer), grazing and herd management and also weather conditions. Pasture returns are expressed in terms of standard cow days2 and net returns.

The best pastures in terms of yield of TDN and net income were those seeded to oats and wheat. The relative value of oats versus wheat was not studied. It is interesting to note that the period covered by this study was not considered a good clover year. Oats and wheat produced about three times as much grazing as did the permanent pastures. The seedbed pastures supported 60 standard cow days grazing per acre while permanent pastures gave only 22 standard cow days grazing. Extreme variation in daily carrying capacity was obtained. The poorest permanent pasture had a daily carrying capacity of 1.45 cows per acre per day but was grazed only 13 days and gave a net return of $42.71 per acre. The best seedbed had a daily carrying capacity of 0.92 cows per acre per day but was grazed 130 days with a net return of $377.36 per acre. Pastures contributed from 34.5 to 55.7 per cent (mean 45.1 per cent) of the TDN required by the cows for maintenance and production. This figure is controlled by the level of grain and supplemental roughage feeding. The percentage of TDN from all sources of roughage ranged from 52.1 to 72.0 per cent. The lower value was for the highest producing cows which received the most concentrates.

—E. J. Stone, J. J. Vizinat, and J. B. Frye, Jr.

**Comparative Value of Soiling Crop, Alfalfa Hay, Grass Silage, and Grazing Temporary Pasture for Summer Milk Production**

A study to compare various roughages in the ration of lactating cows was conducted during July and August, 1955. A 4x4 latin square design was utilized to minimize effects of period vari-

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1 Agronomist, Agronomy Department.
2 Standard cow day is equal to the amount of TDN required by a 1,000-pound cow producing 25.3 pounds of 4 per cent FCM.
ations in quality of forage and weather conditions. The design was repeated 4 times including 16 cows. Milk production, forage intake, and weather data were collected concommittantly.

It was observed that daily intake of chopped millet fed in fresh green state (soiling crop) varied from an average of 140 pounds per animal per day during Period I to 72 pounds per day during Period IV. At the same time daily dry matter intake increased from 21.4 to 23.4 pounds per cow per day for Periods I and IV respectively, thus denoting loss in moisture of the crop between the periods. With the increase in dry matter intake, an increase from 12.8 to 14.3 pounds of TDN* occurred simultaneously, as might be expected. Hay and silage intake varied little among periods when dry matter was considered. Analysis of variance of milk production for the study shows no significant differences among the various sources of roughages. This would indicate that under the particular conditions of this study silage was equal to purchased alfalfa hay, and grazing of temporary pasture was not significantly better than chopping the crop and hauling it to the cow.

An interrelated effect of treatment and period was highly significant. However, this indicated the possibility that weather conditions had a suppressing effect on the milk production of the animals as the hot weather progressed, since this occurred without significant decrease in TDN intake in the form of roughage.

<table>
<thead>
<tr>
<th>Average Daily Milk Production Per Cow (Pounds 4 Per Cent FCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Forage</td>
</tr>
<tr>
<td>Hay</td>
</tr>
<tr>
<td>Silage</td>
</tr>
<tr>
<td>Pasture</td>
</tr>
</tbody>
</table>

*TDN—total digestible nutrients.


The Influence of Season of Freshening on Milk Production of Jersey and Holstein Cows in Louisiana

The influence of season of freshening on the 305-day production of 4 per cent fat corrected milk (FCM) was studied for a 10-year period in the LSU Jersey and Holstein herds. All records were based on, or converted to, 2 times a day milking. Pertinent information on number of records and mean production by season of freshening is shown in Table 1.
### Table 1.—Mean* 305-Day Production of 4 Per Cent FCM by Season of Freshening

<table>
<thead>
<tr>
<th>Breed</th>
<th>No. Cows</th>
<th>Jan.-Mar. Mean Production n (lb.)</th>
<th>April-June Mean Production n (lb.)</th>
<th>July-Sept. Mean Production n (lb.)</th>
<th>Oct.-Dec. Mean Production n (lb.)</th>
<th>All Seasons Mean Production N (lb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holstein</td>
<td>168</td>
<td>144 9478</td>
<td>44 9384</td>
<td>142 9520</td>
<td>194 9409</td>
<td>524 9448</td>
</tr>
<tr>
<td>Jersey</td>
<td>120</td>
<td>77 8339</td>
<td>69 7563</td>
<td>114 7444</td>
<td>93 7723</td>
<td>353 7736</td>
</tr>
</tbody>
</table>

* Production records of Jersey cows based on unweighted means. Holstein records based on weighted means due to season-year interaction.

The seasonal differences in the Jersey breed were statistically highly significant (P<.01) as were the year to year differences. However, there was no evidence of a change in seasonal response from one year to another. Therefore it would appear that Jersey cows make the best production records when they freshen during the period January-March and the poorest records when they freshen in July-September. Early spring freshening resulted in 12 per cent more milk than summer freshening.

In the Holstein herd a highly significant (P<.01) season-year interaction was present, indicating that seasonal influences varied among years. As a result of this interaction it was necessary to weight mean production by years and no seasonal differences could be shown. This is obvious from observation of the mean values shown in Table 1. The difference in response to season of freshening of cows of the Jersey and Holstein breeds is difficult to explain unless we assume that the environmental conditions were such that the Holstein cows were never able to attain their maximum potential production regardless of season of freshening. This is possible since we recognize that the large Holstein cows are more seriously affected by hot summer conditions and lack of adequate forage during dry fall months than are the smaller Jerseys. However, it should be pointed out that Holsteins produced more 4 per cent FCM than the Jerseys regardless of when they freshened.

—Clyde Lewis, J. E. Johnston, E. J. Stone, and Cecil Branton

**Composition of Cows' Milk Not Affected During Summer Months**

A definite decrease in milk production during the summer months is experienced by dairy farmers in Louisiana. The high environmental temperatures and humidity, along with a lower plane of nutrition, particularly due to poor pastures and a limited roughage program during the season, are probably the main factors involved.
Since it has been suggested that the high environmental temperatures in Louisiana might also affect the physical and chemical composition of cows' milk, research was initiated in the summer of 1948 to investigate this. For 3 consecutive summers lactating Holstein and Jersey cows were cooled either by shade or by sprinkling with water and the composition of their milk analyzed and compared to milk from animals under natural environmental conditions.

Thirty-two lactating cows (16 Holsteins and 16 Jerseys) were used the first summer (average maximum temperatures were 82.3-92°F.), 12 lactating cows (6 Holsteins and 6 Jerseys) the next summer (average maximum temperatures were 86.4-89.1°F.), and 24 cows (12 Holsteins and 12 Jerseys) the third summer (average maximum temperatures were 87.5-89.2°F.). Chemical and physical analyses of the milks were made daily. Regardless of the type of treatment there were no important differences in the average values obtained for the composition of milk of the Holsteins or Jerseys. The average physical and chemical values of the milk of Holsteins and Jerseys for the 3-year summer period are presented in the following table.

<table>
<thead>
<tr>
<th>Composition of Milk During Summer Months (3-year average)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Fat (%)</td>
</tr>
<tr>
<td>Total Solids (%)</td>
</tr>
<tr>
<td>Solids-not-fat (%)</td>
</tr>
<tr>
<td>Total Protein (%)</td>
</tr>
<tr>
<td>Casein (%)</td>
</tr>
<tr>
<td>Albumin (%)</td>
</tr>
<tr>
<td>Globulin (%)</td>
</tr>
<tr>
<td>Lactose (%)</td>
</tr>
<tr>
<td>Ash (%)</td>
</tr>
<tr>
<td>Calcium mg/100 ml.</td>
</tr>
<tr>
<td>Phosphorus mg/100 ml.</td>
</tr>
<tr>
<td>Specific Gravity</td>
</tr>
<tr>
<td>Titratable Acidity (%)</td>
</tr>
<tr>
<td>pH</td>
</tr>
</tbody>
</table>


Milk Production Records of Red Sindhi-Holstein (F₁) Cows as Compared to Production of Dams and Holstein Controls

Fourteen Red Sindhi-Holstein (F₁) crossbreds have completed one or more lactation records in the LSU herd. Of this group, 11 have completed only two records, and 5 three records. Production of the crosses ranged from a low of 212 pounds FCM for a 17-day
lactation period to a high of 9,519 pounds FCM for 305 days. Seven of the crosses made fairly good records while the other 7 did very poorly. A brief summary of the production data is as follows:

<table>
<thead>
<tr>
<th>Breeding</th>
<th>Pounds</th>
<th>Fat</th>
<th>Corrected Milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>First No. Lactation</td>
<td>Second No. Lactation</td>
<td>Third No. Lactation</td>
<td></td>
</tr>
<tr>
<td>1/2 Sindhi—1/2 Holstein</td>
<td>14</td>
<td>11</td>
<td>6296</td>
</tr>
<tr>
<td>1/2 Sindhi—1/2 Holstein</td>
<td>10</td>
<td>9</td>
<td>7453</td>
</tr>
<tr>
<td>(Lactations 120 days or more)</td>
<td></td>
<td></td>
<td>6535</td>
</tr>
<tr>
<td>Holstein Controls</td>
<td>14</td>
<td>11</td>
<td>7080</td>
</tr>
<tr>
<td>Holstein Dams</td>
<td>14</td>
<td>11</td>
<td>7586</td>
</tr>
<tr>
<td>Maternal one-half Sibs</td>
<td>7</td>
<td>3</td>
<td>6428</td>
</tr>
</tbody>
</table>

It is obvious from this summary that the main difficulty with the crosses that made poor records was the lack of persistency. Most of the low producing animals ceased to milk within the first five months. Since these data represent all crosses that have freshened in the LSU herd, no selection has been practiced. Plans are being made to cull the low producing animals and retain the higher producing animals for further study.

—J. B. Frye, Jr., G. D. Miller, J. E. Johnston, and E. J. Stone

**Blood Studies of Red Sindhi-Brown Swiss Crosses**

Variation in level of certain blood constituents has been suggested as a possible measure of heat tolerance in cattle.

Eight purebred Brown Swiss, seven Red Sindhi—Brown Swiss (F₁) crossbreds, nine 1/4 Red Sindhi—3/4 Brown Swiss, and two 3/4 Red Sindhi—1/4 Brown Swiss animals were included in this study. Jugular blood samples were collected monthly and analyzed for hematocrit, hemoglobin, plasma calcium, and plasma phosphorus.

Analysis of variance for hemoglobin showed highly significant differences (P<.01) among age, breed, and animal within breed and significant differences (P<.05) among seasons.

A definite trend was obtained for hematocrit values. The percentage of packed red blood cells was highest in cold months and lowest in hot months. The Brown Swiss had the lowest levels while the F₁ crossbreds had the highest. The same general picture was true for calcium values for the purebred Brown Swiss and the F₁’s. The same seasonal variation was obtained for calcium as for hematocrit.

Seasonal differences for phosphorus were highly significant. Phosphorus values were highest in winter and lowest in summer.

Heat Production of Non-Lactating Jersey, Holstein, and Red Sindhi-Holstein (F₁) Cows

The hourly heat production of 4 Jersey, 4 Holstein, and 4 Red Sindhi-Holstein crossbred cows was estimated by means of indirect calorimetry while the animals were adapted to hot weather conditions. The apparatus consisted of a respiratory volume machine equipped so that the volume of air expired could be accurately measured. Samples of expired air were analyzed for content of oxygen, carbon dioxide, methane, and nitrogen by standard laboratory methods. Heat production was estimated using a constant caloric value per liter of oxygen consumed (4.825 K. Cal.). Animals were fasted for 12 hours prior to trials to reduce rumen carbon dioxide and methane production. Surface area and body weight at the time of the trial were determined on all animals. All animals were maintained under the same environmental and feeding conditions.

The values obtained for each breed group are shown in Table 1.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Body Weight (kilograms)</th>
<th>Surface Area (sq. meters)</th>
<th>M²/₁₀₀ Kg.</th>
<th>Heat Production (Kilo Cal./hr)</th>
<th>Cal./₁₀₀ Kg.</th>
<th>Cal./M²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jersey</td>
<td>406</td>
<td>3.81</td>
<td>0.94</td>
<td>284</td>
<td>70.3</td>
<td>75.0</td>
</tr>
<tr>
<td>Holstein</td>
<td>582</td>
<td>4.82</td>
<td>0.84</td>
<td>482</td>
<td>83.8</td>
<td>99.7</td>
</tr>
<tr>
<td>RS—H</td>
<td>534</td>
<td>4.67</td>
<td>0.88</td>
<td>266</td>
<td>49.6</td>
<td>57.0</td>
</tr>
</tbody>
</table>

The heat load per unit of surface area or per unit of body weight was much lower for the Red Sindhi-Holstein crossbreds than for animals of the European breeds. This lower basal heat load would appear to explain the fact that such Zebu crossbreds have consistently demonstrated greater resistance to hot conditions than have the European breeds in prior studies. Further studies must be carried out to determine the influence of milk production and gestation on heat production to determine whether the Zebu crosses maintain their advantage under these conditions.


Effect of Chlortetracycline (Aureomycin) on Young Dairy Calves in a New Environment

It has been reported that antibiotics are of no value for poultry and animals raised in a new "uncontaminated" environment. This experiment was conducted in a newly constructed calf barn. Ani-

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*Iberia Livestock Experiment Station, Jeanerette.*
mals were kept in individual pens on a cement floor covered with fresh shavings. Thirty newborn Jersey and Holstein male calves were fed colostrum for the first 3 days of life and then transferred to the new barn. They were divided into three groups at random according to breed. Group I served as the control, Group II received 50 mg. chlortetracycline daily, and Group III was administered intramuscularly 400 mg. chlortetracycline in sesame oil weekly. All calves were fed whole milk up to 30 days of age. Good quality hay and a plant protein calf starter were fed at 7 days of age. The calf starter for Group II was supplemented with $\frac{1}{2}$ per cent Aurofac 2A.

Scours occurred mainly in the calves in the control group and to a very limited extent in the calves receiving parenterally administered chlortetracycline. At the end of 12 weeks of age the antibiotic-supplemented Jersey and Holstein calves showed an increase in weight over the controls of approximately 25 per cent and 15 per cent respectively. These values were found to be statistically significant ($P < .05$). Increased feed efficiency was also found for the antibiotic groups of calves. Leucocyte counts of the blood of antibiotic and control calves showed no significant differences.

—L. L. Rusoff, F. T. Landagara, and R. M. Crown*

Continuous Feeding of Chlortetracycline (Aureomycin) to Heifers through Eight Months of Age

Thirty-two heifers were used in this trial. Eight Holsteins and 7 Jerseys served as the control group, while 8 Holsteins and 9 Jerseys comprised the antibiotic group. The latter group received aureomycin from 4 days of age to 32 weeks of age. All calves were fed colostrum for the first 3 days, whole milk for 3 weeks, and skim milk for an additional 5 weeks. A plant protein calf starter and hay were fed at 1 week of age. The antibiotic group was fed the calf starter supplemented with $\frac{1}{2}$ per cent Aurofac 2A (3.6 g. chlortetracycline per lb.). All calves were limited to 4 pounds of grain daily and allowed hay “ad lib.” The calves were placed in individual pens at 4 days of age and then grouped in larger pens at 4 months of age.

At 4 months of age the antibiotic group outgained the control group by 18 per cent and at 8 months of age the increased growth was 9 per cent. No differences were found in height at withers and heart girth measurements between the groups. Feed efficiency was in favor of the antibiotic-fed group.—L. L. Rusoff, A. H. Cummings, E. J. Stone, and J. E. Johnston

* Animal Industry Department.
Effect of Aureomycin on Carcass Yields, Including Physical and Chemical Composition, of 16-Week-Old Calves

Studies on carcass yield and finish of antibiotic-administered and control calves were conducted on 27 male calves (15 Jerseys and 12 Holsteins). At 3 days of age these calves were divided at random into 3 comparable groups. Group I served as a control, Group II received orally 50 mg. of aureomycin per calf daily, and Group III was administered parenterally (intramuscular) 400 mg. of aureomycin per calf weekly. All groups consisted of 4 Holstein and 5 Jersey calves each. Feeding and management practices were similar for all groups.

The calves in all groups were slaughtered at 16 weeks of age. Physical measurements and weights of all carcasses were obtained 24 hours after slaughter. Chemical analyses for percentages of moisture, ether extract and dry fat-free lean were made on the meat of the 12th rib.

At 16 weeks of age a significant increase in body weight gain (25 per cent) and feed utilization efficiency (15 per cent) in favor of the antibiotic groups was obtained.

Increased yield of carcass and increase of primal cuts (including leg and rib) in greatest demand were obtained in the antibiotic groups. Also, these groups attained a higher dressing percentage as compared to the control group: Jerseys, 43.50, 45.00, and 49.40 per cent, and Holsteins, 48.85, 52.45, and 51.80 per cent for Groups I, II, and III respectively.

—L. L. Rusoff, F. T. Landagora, Barney Harris, Jr., R. N. Crown,¹ and J. E. Bertrand¹

Effect of Post-Natal Administration of High Level Aureomycin on Dairy Calves

A total of 64 Holstein and Jersey heifer and bull calves were used in a management study to determine if post-natal administration of high levels of aureomycin (1) had an effect as a prophylactic in controlling deaths resulting from virulent scour² in newborn calves and (2) had a carry-over effect resulting in accelerated growth. In an attempt to establish a minimum effective prophylactic dosage, calves were fed aureomycin for the first three days of life at the following levels: no aureomycin, 250 mg., 500 mg., and 1,000 mg. The animals within these groups were randomly sub-grouped after three days into (1) those receiving Aurofac 2A and (2) those receiving none (control group).

¹ Animal Industry Department.
² Etiology unknown.
Fourteen calves died prior to 8 weeks of age. Most of the calfhood losses (79 per cent) occurred in the groups receiving no Aurofac and in the group that received no aureomycin at any time. The results indicate an apparent beneficial effect of three-day high level antibiotic feeding.

—E. J. Stone, A. H. Cummings, J. E. Johnston, and L. L. Rusoff

Progress Report on Attempts to Isolate the "Stimulating Factor" in Ammoniated Molasses

Research at this station has demonstrated that ammoniated molasses (16-38 per cent protein equivalent) can be satisfactorily fed to ruminants at a level of 10-15 per cent in a grain ration in replacing an equivalent amount of protein in cottonseed meal. Above this level, stimulation or excitability results within a few days.

Studies were initiated to isolate the "stimulating factor" in ammoniated molasses if such a factor is present. Various adsorbents were used such as Darco 60 (activated carbon), Elguanite (clarifying agent), and fuller's earth at different pHs and temperatures. After such treatment the molasses still caused stimulation at 20-25 per cent level. This indicates that no adsorbable compounds or impurities are present in the ammoniated molasses. It is suggested that high levels of ammoniated molasses react or combine with certain compounds in the rumen or intestines to produce a specific chemical compound which might cause stimulation.

—L. L. Rusoff, Barney Harris, A. H. Cummings, and J. B. Frye, Jr.

Feeding Rice Hulls to Cattle

It is generally believed that rice hulls will cause harmful irritation of the gastro-intestinal tract because of their high content of silica. To check this assumption four lots of eight-month-old Jersey steers were fed rations containing no rice hulls (control), 10 per cent rice hulls, 20 per cent rice hulls, and 30 per cent rice hulls. The basal ration consisted of corn and cottonseed meal. The rice hulls were substituted for corn in the other rations. The rice hulls used were ground but not finely enough to destroy the structure of the hulls. Because of a severe winter little pasture was available, but the steers had access to low quality native grass hay.

The experiment was conducted for eight weeks. All animals were in good physical condition and the feces were normal. All animals gained weight at the end of eight weeks but not as much
as the control animals. The more rice hulls in the ration, the less the gain in weight. The animals receiving the ration containing 30 per cent rice hulls gained only one-half as much as those on the control ration.

One animal from each group was further fed for an additional four weeks, at which time they were slaughtered. Examination of the gastro-intestinal tracts of these animals showed no signs of irritation or other abnormality.

It is concluded that “finely-ground” rice hulls are safe to use in cattle feeds but are of very low feeding value.

—L. L. Rusoff, J. B. Frye, Jr., and E. A. Epps, Jr.*

Retention of Antibiotic (Chlortetracycline) by Certain Constituents of Milk

Antibiotics are now being used extensively in the treatment of mastitis. Although successful in the treatment of mastitis, many antibiotics inhibit or destroy the microorganisms like Streptococcus lactis and Leuconostoc citrovorus, which are so important in the production of cheese, cultured milk, ripened cream butter, etc. It is therefore desirable to know the distribution and rate of elimination of the antibiotic in milk after treatment for mastitis.

This work concerns both “in vitro” and “in vivo” studies and is a preliminary report. Aureomycin was added to milk and the various components of milk separated and tested for the antibiotic by a standard microassay technique. It was found that a large percentage of aureomycin was held by the casein, little or none by the albumin, and a large percentage by the filtrate remaining after the precipitation of the casein and albumin. Pure butterfat did not retain any antibiotic. Pasteurization or boiling of milk containing aureomycin failed to cause appreciable destruction of the aureomycin.

Milk samples from a mastitis cow treated with aureomycin showed a large concentration of antibiotic in the milk 32 hours (third milking) after treatment. After 10 days only traces of the antibiotic were found in the milk. This amount was not sufficient to inhibit production of lactic acid in milk inoculated with lactic cultures.—L. L. Rusoff, A. J. Gelpi, Jr., and E. J. Stone

Solids-Not-Fat Variation in Louisiana Dairy Herds

An attempt to determine some of the factors contributing to the causes of solids-not-fat variations in Louisiana milk is being

* Feed and Fertilizer Laboratory.
undertaken. From time to time dairymen in the state are accused of watering milk. These accusations are based on the state legal requirements of 8.5 per cent minimum standards for solids-not-fat in normal cows milk. It is known that such factors as season of the year, breed, stage of lactation period, feed, etc., will affect the solids-not-fat content of milk one way or another. Results of the present study might possibly reveal some factors of a local nature which might furnish enough evidence to justify a change in the state legal standards. Although it is too early to make any definite predictions, the limited amount of data thus far obtained would indicate that the solids-not-fat content of milk of herds observed so far is in line with national averages. These averages, however, do not include the Deep South. During the course of this survey it is planned to include herds from all sections of the state for 12 consecutive months or longer.—A. J. Gelpi, Jr.

Shelf-Life of Cottage and Cream Cheeses

Complaints are frequently made by food store customers of spoiled cottage cheese and related products. This spoilage is due largely to contaminating molds and bacteria. *Oospora lactis* is a common contaminating mold forming an off-white coating on the surface of the product. Other molds and slime producing bacteria often contribute to spoilage also. Trials with varying concentrations of proprionic acid have been found to delay certain types of spoilage. Concentrations of 0.5 per cent when sprayed on the surface of packaged cheese (at time of packaging) have been found to increase the shelf-life of this product and Creole cream cheese from 5 to 7 days. The shelf-life of these products, regardless of treatment after packaging, depends largely on the sanitary conditions under which these products are made and also the conditions under which they are handled at the retail stores. Sodium, calcium, and other proprionates are also being considered as shelf-life improvers.—A. J. Gelpi, Jr.
Entomology

Sugar Cane Insect Research

Sugar Cane Borer Control with Chemicals, Parasites and Cultural Practices

Losses from the sugar cane borer were perhaps greater in 1955 than in any other year since 1949. Late development of the second generation accounted for a let-up in the use of chemical control, which appeared to be the principal contributing factor. Because the upper joints of the cane stalks were not badly bored, it appeared that cane yields were not affected as much as sucrose and purity.

Chemical Control—Preliminary data on the possibilities of using undiluted ryania at lower dosage rates were obtained in an airplane and a handgun test. The comparative effectiveness of 40 per cent ryania at 12 pounds per acre per application and 100 per cent ryania at the rate of about 7 pounds per acre for control of third generation borers was studied in an airplane experiment. In this large-plot test, comprising five varieties of cane, the two materials were equally effective, reducing borer infestation to 25 and 24 per cent of the joints bored as compared to 46 per cent in the untreated checks. Differences in yields cannot be measured in large-plot tests, because of the influence of many factors other than borers. In view of the borer control obtained, it appears that the undiluted material at lower dosage rates shows promise of use, but considerable testing would be required to determine whether under practical field dusting, with more unfavorable weather conditions and a variety of plane operators and equipment, it would be possible to obtain proper coverage with such low rates of application. There were no significant differences in yield increases from the two materials in handgun tests where lower dosage rates are not as important. Data available are not sufficient to warrant a recommendation of 100 per cent ryania at the low dosage rate.

The possible use of some of the organic insecticides for borer control in the Bunkie area, where their application is widespread on cotton, has been a question for some time. Additional data were obtained in a small-plot test to ascertain which of the organic materials should be included in proposed tests in this area with dust and granular materials. Endrin and toxaphene were superior to the other organics as well as ryania in this test for second and for second and third generation borer control.

—A. L. Dugas and E. J. Concienne

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Biological Control. *Trichogramma Egg Parasites*—After three years of research and development on mass production of Trichogramma, much has been learned as to what is needed and how it should be done, and it is apparent that the available facilities are inadequate to supply present parasite demands. Since this is now a matter of commercial production of parasites and far greater facilities are needed, the University has decided to discontinue the laboratory except on an experimental basis.

—A. L. Dugas and L. M. Sibley

Larval Parasites—Releases of both Cuban flies, *Lixophaga diatraeae*, and Amazon flies, *Metagonistylum minense*, were again made to determine the possibilities of their establishment and overwintering. As in 1954, establishment varied immensely from farm to farm and even on the same place. Average parasitism at harvest for individual fields on the different places ranged from 0 to 27 per cent. On Island Plantation at Plaquemine, parasitism averaged 19.2 per cent as compared to 29.5 per cent in 1954. The possible use of larval parasites appears to be limited by difficulties involved in gaining establishment, which appears to be principally affected by habitat and host population density.—*A. L. Dugas, G. C. Miller, and E. J. Concienne*

Cultural Control.—Results of reducing overwintering borer populations through the use of a top shredding device and the value of following with chopping of middles of rows, wrapping of middles, with or without shaving of the top of rows, was presented in last year’s progress report. In the spring, it was evident that nearly complete decomposition of the shredded tops occurred and because of better scraping of fields following the shredding, the amount of cane stalk residue was far less in the shredded fields. Since burning of shredded tops was not necessary following harvesting, considerable organic matter was returned to the soil.

—*A. L. Dugas and E. J. Concienne*

Varietal Resistance.—Canes showing borer resistance are being taken from a cooperative borer resistance planting now on the Houma Station, and are being used as parents in the breeding program at Canal Point, Florida. Several canes included in the replicated-plot planting and the single-plot planting showed borer resistance equal to that of C. P. 34/120, as revealed by infestation and yield determinations in the fall of 1954.

—*A. L. Dugas, E. J. Concienne, and Ralph Mathes*

Nematode Studies on Sugar Cane

Results of two nematocide tests on sugar cane on Westfield Plantation, at Paincourtville, Louisiana, showed very good control

* Houma Experiment Station.
of the root-knot nematode, *Meloidogyne incognita acrita* Chitwood 1949, as well as members of the genera *Pratylenchus*, *Tylenchorhynchus*, and *Trichodorus*. In some plots populations of all these parasitic nematodes remained at comparatively low levels from the date of planting seed pieces until harvest of the plant cane. At harvest time, root systems produced in nematocide-treated plots were white and showed little evidence of root rot, whereas those roots produced in unfumigated plots were darkened and showed evidence of root rot. Even with the very good nematode control, and the better appearance of the root system due to fumigation, the fumigated plots did not show an increase over the untreated plots in tons of cane per acre, per cent sucrose, per cent purity, pounds of sugar per ton of cane, or pounds of sugar per acre.

—A. L. Dugas, W. J. Martin,* and E. J. Concienne

**Soil Insecticides for Control of Small Insects and Soil Animals in Heavy Black Land**

**Soil Insects and Small Animals**—A single application of chlordane has shown an average increase in yield of plant cane of 2.9 tons per acre in 33 tests conducted by the Louisiana Agricultural Experiment Station and the Houma Station during eight years of study. Yield of first year stubble was increased 3.2 tons in eight tests designed to study the carry-over effect of chlordane into the stubble crop.

Available data fairly well establish dosage rates for chlordane, endrin, isodrin, heptachlor, and toxaphene.

Before-planting applications of soil insecticides for control of these small soil insects and animals are not as effective as after-planting applications. Spray mixtures derived from eight pounds per gallon chlordane emulsifiable concentrate, containing less oil base, gave somewhat better cane and sugar yield increases than those made from four pounds per gallon.

In combination soil insecticide and fungicide tests, it appears that the insecticidal treatments result in greater yield increase than the fungicidal treatments. A combination of the two produces increases in excess of either alone but not significantly so. Puratized dips have given superior results over the sprays.

—A. L. Dugas, Rene J. Steib,*
E. J. Concienne, and Ralph Mathes

*Department of Plant Pathology.
Pink Bollworm Research*

Seasonal History of the Pink Bollworm in the College Station, Texas, Area in 1955

The pink bollworm was considered a serious pest of cotton in the College Station, Texas, area for the first time in 1955. Until 1954 only a few larvae were found in gin trash each year. Heavy rains in the latter part of July of 1954 resulted in uncut cotton stalks making heavy second crops of cotton bolls, extending the cotton season into October. The untreated fields became heavily infested during this period and a large population of long cycle larvae was carried over to the spring of 1955.

In the spring of 1955 heavy populations of pink bollworm were found as cotton started blooming. Infestation records and records of insecticide applications were kept on one irrigated and four non-irrigated fields during the season. Infestations for the four non-irrigated fields at time of harvest in early August ranged from 2 to 13 per cent of the bolls. These fields had been treated with dieldrin-DDT at weekly intervals. The field of irrigated cotton was planted late and, because of the irrigation, the growing season was extended into October. This resulted in the cotton being exposed to very heavy population pressure as the other cotton nearby was being harvested. The field was treated with dieldrin-DDT at the recommended rate for boll weevil control. The infestation increased from 3 per cent infested bolls August 6 to 48 per cent on October 5. No damage to yield and grade of the cotton was apparent from this level of infestation.

These results indicate that normal boll weevil-bollworm control measures continued until the time cotton is defoliated will hold the pink bollworm infestation to a level that will not affect the yield and grade of cotton in the College Station, Texas, area.

—J. R. Brazzel

Effect of Pink Bollworm Infestation on Yield and Quality of Cotton

During 1955 a project was initiated to evaluate the damage to cotton quality and yield by various levels of pink bollworm infestation. Plots of 1/200 acre were covered with screen cages to eliminate other insect pests. Three infestation levels were obtained by releasing 6, 18 and 45 adults into each cage of the light, median, and heavy infestation respectively.

Results of the test show that infestation levels of over six larvae per boll caused large reductions in quality and grade of cotton. The grade of lint varied from below grade in the heavy and intermediate levels to strict good ordinary extra white in the check.

* In cooperation with Department of Entomology, Texas A & M College.
Analyses of differences in lint quality including fiber strength, fiber fineness, uniformity index, and fiber maturity indicated infestation had adversely affected these characters. Seed quality was significantly lowered for all tests. Each level of infestation caused an increase in dirt and trash, free fatty acids and lint left on the seed and a decrease in oil, ammonia, and protein.

Effect of pink bollworm infestation on yield and quality of cotton. Left: severely damaged; right; undamaged.

At the light and intermediate levels of infestation most of the loss in value was caused by reduced quality. Extremely heavy infestations of approximately 13 larvae per boll caused greater reduction in yield. The pink bollworm infestation levels in this experiment are extremely heavy. Infestation levels in the field approaching that of the lightest level in this test were rarely found during the year and then only after insecticide treatments had been stopped. Also, this test was conducted under dry weather conditions, which may have minimized the pink bollworm damage to the cotton.—J. R. Brazzel

A Study of Pink Bollworm Oviposition Habits

The pink bollworm adult does not normally oviposit on cotton squares. Bolls become attractive for oviposition when they are approximately one week old. However, infested cotton blooms are found in the field from the time blooming begins. During 1955 a
study was made of the site of oviposition on the cotton plant from the 6-leaf seedling stage until mature bolls had developed. Beginning May 28 and at weekly intervals thereafter through July 28, cotton plants were caged with 10 pink bollworm moths. Five days later the plants were examined and the number of eggs and site of oviposition recorded.

Before bolls were present terminal growth was preferred for oviposition. The number of eggs found per moth introduced was approximately 10 until June 23, after which it ranged from 30.5 to 59.8 for the remainder of the period of the test. More eggs were found per moth after bolls were available for oviposition. After bolls were present in sufficient numbers and the terminals ceased to grow, the fruit was preferred for oviposition.

These results indicate that predators and parasites may be of great importance in holding down early season pink bollworm populations since the eggs are placed in an unprotected spot and the larvae must migrate in search of fruit.—J. R. Brazzel

A Study of Factors Affecting Diapause in Pink Bollworms

The pink bollworm survives the winter as diapausing, or long cycle, larvae. Factors responsible for the development of these long cycle larvae are not understood. Low temperatures are considered to be at least partially responsible. It is known that moisture is necessary to break diapause so that larval development can be resumed. Factors responsible for the induction and breaking of diapause must be more completely understood in order to develop more effective control measures.

From August 1 through October 31 samples of pink bollworm infested cotton bolls were collected at weekly intervals from fields in the vicinity of College Station, Texas. The proportion of long cycle to short cycle larvae was determined for each sample. Beginning September 5 additional samples were collected and chilled at 60 degrees F. for 2 days, 1 week, and 2 weeks. Approximately 10 per cent of the larvae collected during August were long cycle but this percentage increased to 36 during September.

Exposing infested cotton to 60 degrees F. for 2 days almost doubled the proportion of long cycle larvae, and chilling for 2 weeks nearly tripled the number. These results emphasize the importance of temperature in the development of long cycle larvae but they also indicate it is not the sole factor influencing diapause.

In preliminary studies of the effect of soil moisture on diapausing larvae it was found that less than 1 per cent survived in soil maintained at the saturation point for one month compared to about 10 per cent in soil moistened periodically during this time.
Respiratory rates of long and short cycle larvae were compared. Important differences were apparent, but no practical technique has been developed to utilize these differences as a criterion of diapause.—J. R. Brazzel

Pink Bollworm Adult Toxicity Studies

The effect of several common insecticides on the adult pink bollworm was determined during 1955. Insecticides used in the tests include DDT as a standard, Bayer 17147, toxaphene, dieldrin, endrin, malathion, parathion, aldrin, BHC, heptachlor, toxaphene-DDT (2-1), dieldrin-DDT (1-2), and Bayer 17147-DDT (1-3). Individual cotton plants were treated in the field and 10 adults caged on each. Five days after the moths were released on the treated plants, mortality records were taken. The plants were then examined and the number of pink bollworm eggs recorded.

Results showed LD 50 values for less than 1 pound of technical material for Bayer 17147, endrin, parathion, malathion, and Bayer 17147-DDT (1-3), approximately 1 pound for DDT, dieldrin and dieldrin-DDT (1-2), and 2 to 4 pounds for the other materials. Effect on egg deposition gives a clearer picture of the effect of the insecticide on the insect. The number of eggs produced per moth was as follows: Untreated, 21.1; DDT at 1 pound, 3.9; Bayer 17147 at ½ pound, 0.13; toxaphene at 2 pounds, 6.39; dieldrin at ½ pound, 9.18; endrin at ¼ pound, 2.9; malathion at ¾ pound, 5.83; parathion at ¼ pound, 7.31; aldrin at ½ pound, 12.59; BHC at ½ pound, 12.21; heptachlor at 1 pound, 18.11; toxaphene-DDT (2-1) at 2 pounds, 5.45; dieldrin-DDT (1-2) at 2 pounds, 1.39; and Bayer 17147-DDT (1-3) at 1 pound, 0.72. The phosphorus compounds generally reduced egg deposition more than the chlorinated hydrocarbons.

The results of this test indicate that these insecticides are quite effective for killing the adult pink bollworm. The most marked effect of the chemicals on the insect, however, seemed to be in the reduction of the number of eggs laid by the adults on the treated plants.—J. R. Brazzel and R. K. Williams*

Resistance to the Chlorinated Hydrocarbon Insecticides in the Boll Weevil

The boll weevil became difficult to control in some areas of Louisiana during the late summer of 1954. Adverse climatic conditions including high temperatures, high wind velocities, and low humidities were considered responsible for the poor control obtained.

Under entirely different climatic conditions in 1955 even more

* Graduate student, Department of Entomology, Texas A & M College.
difficulty was experienced in obtaining control. Again, adverse weather conditions and improper application techniques were no doubt responsible for some failures. However, in many situations these factors may no longer be accepted as entirely responsible for inadequate control. Work conducted in the laboratory, plus supporting work in the field, shows that a high degree of resistance to the chlorinated hydrocarbon insecticides has developed in the boll weevil population in some areas of Louisiana.

Boll weevils reared from squares collected in the field from these areas were compared with a culture of boll weevils taken from an area where they were readily controlled with the chlorinated hydrocarbon insecticides. Laboratory cage toxicity tests revealed that increased mortality in the resistant cultures was very slight as the poundage of chlorinated hydrocarbon insecticides was increased from 20 to 40 pounds per acre. Even at 40 pounds per acre, the mortality was not sufficient to give adequate control. In the susceptible culture, it was not necessary to use dosages greater than 20 pounds per acre to obtain a high per cent mortality. Comparable control of both susceptible and resistant cultures was obtained with calcium arsenate and Shell Chemical Company's 2046, an experimental phosphate compound.

Topical applications of insecticides to the boll weevil showed approximately 140-fold resistance to endrin, whereas the mortality ratios of resistant to susceptible cultures was 2-1 for Bayer's 17147. This increase in tolerance of the resistant cultures to an effective insecticide apparently indicates the selection of a more vigorous race of boll weevils in the affected area.

Adverse weather conditions prevailed at all localities where field tests were conducted. However, under these conditions, calcium arsenate and Bayer's 17147 gave excellent control where the chlorinated hydrocarbon insecticides failed to control boll weevils. Where resistance had not developed, Bayer's 17147, endrin, toxaphene, and dieldrin were equally effective for boll weevil control. The results of these tests indicate that failure to obtain effective weevil control with the chlorinated hydrocarbon insecticides in some areas during 1955 was caused by the development of a high order of resistance to these materials by the boll weevil.

—J. S. Roussel, D. F. Clower, and R. V. Bielarski

**Granular Insecticide Formulations for Boll Weevil Control**

The use of granular insecticide formulations, applied directly to the soil as a wide band on either side of the cotton plant, timed to kill the first generation of boll weevil would have many advantages over conventional methods of dust or spray applications. The
most important of these would be decreasing the number of applications and minimizing the effect of adverse weather conditions.

In one of three tests in which this approach for boll weevil control was used, two applications of a 2.5 per cent granular heptachlor formulation controlled boll weevil as well as did 7 foliar applications of dieldrin. The first application was made just prior to appearance of first bloom and a second 10 days later. One application of dieldrin (2 per cent granular) and heptachlor (2.5 per cent granular) were equally effective but did not give effective control.

Applications of granular insecticides to the soil after emergence of the first generation failed to control the boll weevil.

Thimet (an organic phosphorous insecticide formerly American Cyanamid Company 3911) failed to control the boll weevil when applied as a sidedressing at the rate of one pound per acre prior to emergence of the first generation.—J. S. Roussel and D. F. Clower

New Insecticides Tested for Cotton Insect Control in 1955

Each year new insecticides are evaluated for their effectiveness against cotton insects. Of the chemicals tested this past season, an organic phosphate, Bayer Compound 17147, was the most promising.

It effectively controlled the boll weevil, the cotton aphid, and spider mites, and was moderately effective against the bollworm.

Thimet (an organic phosphate systemic insecticide) applied as a seed treatment controlled thrips and aphids for three to four weeks after emergence of the cotton seedling. When applied as a 2 per cent granular material directly under the seed prior to planting, it gave satisfactory thrips and aphid control. Applied at the rate of 1 pound per acre as a sidedressing to fruiting cotton it controlled aphids in one of four tests. There were no indications of the material being absorbed and translocated, as determined by failure to control aphids, in three tests.

DDVP (an organic phosphate chemical) failed to control all major cotton insects.

Malathion at the rate of 0.5 pound per acre in a spray controlled the cotton aphid.—Dan F. Clower, J. S. Roussel, and W. M. Scott

The Effect of Thrips Control on Mechanization

The possible value of thrips control as a means of expediting mechanization was investigated during 1955.

Total time required for chopping cotton was not affected.
There was no difference in the time required to cultivate the plots where the thrips had been controlled and those where they had not. Cultivators used were equipped with rotary weederers which acted as shields in protecting the small cotton.

Thrips control gave an increase in height and total leaf area early in the season. However, these differences disappeared later in the season as conditions became more favorable for growth and development of the cotton. Neither earliness nor total yield was influenced by thrips control.

Infection by Rhizoctonia was not affected.

Plans to determine the effects upon the efficiency of a mechanical cotton picker had to be abandoned because the rank growing condition of the cotton and the large number of immature bolls present at the time of first picking prevented use of the machine.

—D. F. Clower and J. S. Roussel

Summary of Investigations upon Cotton Spider Mites, 1955

There are at least 7 species of spider mites which attack cotton, all of them individually capable of damaging the plant. These are: *Tetranychus telarius* (L.) (the only green species, all the others are red), *T. tumidus* Banks, *T. cinnabarinus* (Bois.), *T. desertorum* Banks, *T. ludeni* Zacher, *T. gloveri* Banks, and a new species which is being described under the name of *T. lobosus*. *Tetranychus cinnabarinus*, *lobosus*, *desertorum*, and *tumidus* are the most widely distributed species in Louisiana. The other species seem to be of local importance only on cotton: *telarius* at Baton Rouge, *gloveri* in the vicinity of New Roads, and *ludeni* in central Louisiana. *Tumidus* has not been found in the northern one-third of the state. *Gloveri* was first recognized only this year since it was described from Baton Rouge in 1900.

A study of the effect of relative humidity in the atmosphere upon the egg-laying, hatching, and survival of nymphs was conducted upon six of the seven species (*T. ludeni* was not studied). A very dry atmosphere around the mites results in much greater egg production, longer egg-production period, and much better survival of the newly hatched young than does an extremely moist atmosphere in the species *cinnabarinus*, *telarius*, *lobosus*, and *desertorum*. Extremely wet or dry atmospheres prevented egg-laying in *gloveri*. The results obtained with *tumidus* suggest that extreme dryness is slightly more favorable than extreme moisture, but that the optimum condition is intermediate. There seemed to be very little difference in the rate of hatching under the extreme conditions. These experiments confirm the old idea that spider mites in general become more numerous in dry weather, and that one of
the contributing factors is the low relative humidity of the atmosphere.

Another experiment indicated that under room temperatures the amount of light has little effect upon rate of reproduction when the food supply is ample. Experiments are in progress to study the genetics of certain features of some of the species.

—H. Bruce Boudreaux

Nematocides for Control of the Reniform Nematode-Wilt Complex of Cotton

Fumigation, three weeks before planting, with DD mixture at 13 gallons, ethylene dibromide W-85 at 4 gallons, nemagon (1, 2 dibromo-3-chloropropane) at 0.5 and at 1.0 gallon per acre respectively, gave good control of the reniform nematode-wilt complex of cotton. Each of these treatments increased yield by about one-half bale per acre.

Nemagon applied at 2 gallons per acre prior to planting and at 1 gallon per acre as a post-emergence treatment when plants were in the four-leaf stage caused severe stunting and depressed yield.

—L. D. Newsom and J. E. Jones*

Stored Grain Insect Studies

The loss caused by insects to corn stored on the farm in Louisiana is great. The actual loss is not known. Efforts are now underway to determine this figure. Normally, corn that is kept in the crib later than May or June breaks down so rapidly as a result of insect damage that by the end of June the corn is commonly classed as “pig-feed.” Actual damage or loss counts made in a limited number of cribs at this time of the year have shown as much as 50 per cent or more of the kernels damaged or destroyed.

The insects of most importance to stored corn in Louisiana are the rice weevil, the Angoumois grain moth, the confused flour beetle, the sawtooth grain beetle, the square neck grain beetle, the Indian meal moth, and the pink corn worm. The greatest amount of damage is caused by the rice weevil in corn stored with the shucks on. The changing method of harvesting corn through the use of mechanical pickers results in a high percentage of the ears free of the shuck or nearly so. This opens up the ear for additional damage by the Angoumois grain moth and perhaps other species.

Corn samples were obtained at harvest time in 1955 and examined for infestation by stored grain insects, the shuck condition, and earworm damage. These samples were obtained from all sec-

* Department of Agronomy.
tions of the state. This examination showed damage at this time (coming from the field) was caused by the rice weevil, pink corn worm, square neck grain beetle, sawtooth grain beetle, confused flour beetle, and the Angoumois grain moth. The area of the state most heavily damaged was southwest Louisiana, where the grain as it was harvested from the field averaged 27 per cent damaged. The area of lowest damage was the Ouachita Valley, which averaged less than 1 per cent damage. The Florida Parishes area ranked second with 13 per cent damage, and the Mississippi Valley south of Baton Rouge third with 9 per cent damage. The Red River Valley, the Upper Mississippi Valley, and the hill country of North Louisiana were approximately equal, the infestation averaging between 3 and 5 per cent.

**Control Experiments**—In order to protect corn from stored grain insect damage in Louisiana under our methods of storage, it is necessary that the treatment be one of a continual protective nature. A treatment such as fumigation or some other insecticidal treatment used at the beginning of storage would be helpful if complete kill of the insects could be effected. However, under our conditions of storage, fumigation is practically worthless.

In view of the above, in efforts to develop a control measure for farm stored corn the continuous type of protectant has been sought. Previous tests (1953-54 Report) have shown that lindane at low concentrations absorbed on sawdust and distributed throughout the corn mass gave practically 100 per cent protection from harvest to harvest.

Tests in the 1954-55 storage season concerned the use of lindane treated sawdust used at various dosage levels on shelled, shucked, and snapped corn in both laboratory tests and in farmer cribs located at widely separated points in the state.

Results of the laboratory tests reveal that the insect which is most important to our stored corn, the rice weevil, is the one most readily controlled by this treatment. The confused flour beetle is little affected by the treatment.

A dosage rate between 0.5 and 1.0 ppm in shelled grain gave complete protection for 12 months. Four ppm failed to protect shucked corn in small tests. Ten ppm gave complete protection to shucked corn in large-bin storage. A dosage of one ppm on snapped corn gave complete protection for 12 months in 2-bushel-size tests.

Tests conducted to determine if the immature stages of the insects inside the kernels are killed showed that at dosages of 5 ppm and less they are not affected; at 10 ppm the immature stages are affected (rice weevil and Angoumois grain moth).

Results of crib tests conducted with farmers showed that the
corn in all the cribs in tests was completely protected from insect damage from the time of harvest until the following harvest. The corn in these treated cribs remained in practically the same condition of damage as when each was stored. The first live weevil observed in any treated crib was on September 1. The check corn for these same cribs in tests averaged 44 per cent damage after 12 months storage.

To date the use of this insecticide for treating grain which will enter into interstate shipment is not permitted by the Food and Drug Administration. Residue studies, etc., are now in progress.

A study to determine the first date during the growing season the rice weevil enters the field revealed that in 1955 an infestation was found on June 21 in corn that was in the hard dough stage. This represents the earliest recorded date for Louisiana.

Corn after 12 months' storage. Left to right: treated shucked corn; untreated shucked corn; treated snapped corn; untreated snapped corn. (Photograph by E. C. Tims.)

Additional studies in cooperation with the USDA concerning the use of insecticides applied to the silking ear in relationship to earworm control and subsequent infestation by stored grain insects showed that only endrin at 0.6 pound per acre compared to DDT, dieldrin and lower dosages of endrin offered any protective value in this respect. There was no difference in earworm control between any of the treatments. A supplementary test showed a direct
relationship between bird damage to ears in the field and subsequent damage by stored grain insects.

—E. H. Floyd and L. D. Newsom

Control of Soil Insects Affecting Corn and Corn Seedlings by Seed Treatment and Soil Insecticides

Major efforts for specific control of insect species responsible for reduction in stands and yields of corn in Louisiana were directed primarily against the southern corn rootworm, seed-corn maggot, wireworms, and the sugar cane beetle.

Tests embodying the recommended dieldrin-thiram-methocel seed treatment (Louisiana Pest Control Service Leaflet No. 36, Feb. 16, 1955) gave good results, as did this treatment plus additional applications of soil insecticides to the drill row. Damage during 1955 resulted mainly from southern corn rootworms and sugar cane beetles.

Methods of application, dosages and formulations were employed in application of aldrin, dieldrin, and heptachlor to the drill row at 1 pound per acre rates. Applications of these chemicals in granular form versus spray applications in a band over the drill row were compared. Both types of formulations were chopped into the soil immediately after application.

Corn seedling stands were doubled by using five ounces of a dieldrin-thiram-methocel mixture similar to the recommendation per 100 pounds of seed treated. Additional 10 to 15 per cent increases were obtained by application of insecticides to the drill row.

Yield per acre for untreated seed was 36.7 bushels. For the recommended seed treatment it increased to 72.4 bushels. Plots where the seed treatment plus additional insecticides were applied to the drill row gave acre yields ranging from 68.2 bushels for 2 per cent dieldrin granules, to an 83-84 bushel range for heptachlor granules and heptachlor and dieldrin spray treatments respectively.

—E. J. Kantack, R. S. Woodward, and E. H. Floyd

Timing and Number of Spray Applications in Control of Corn Earworm in Sweet Corn

An intensive study on control of corn earworm was made in 1955 in cooperation with the National Corn Earworm Experiment Program on a field test plot of Aristogold Bantam Evergreen sweet corn. Effects of timing and number of applications of DDT-mineral oil emulsion sprays were evaluated.
Each spray application included 2 pounds of emulsifiable DDT and 1 gallon of mineral oil in 24 gallons of water spray per acre. This formulation was sprayed on the ears and central stalk portions of the corn plant with a 1-nozzle hand sprayer in timed intervals after first silks.

One day after first silks 4 sprays at 3-day intervals, 5 sprays at 2-day intervals, 5 sprays at 3-day intervals, and 6 sprays at 2-day intervals were applied. Two days after first silks 4 sprays at 3-day intervals were applied and 6 sprays at 2-day intervals.

Data on control was somewhat limited in that apparently the silk stage took place between corn earworm generations, thus resulting in a mild infestation as indicated by untreated controls. Under these conditions all of the DDT-mineral oil emulsion sprays gave excellent control. There were, however, some differences in the severity of leaf and shuck burning, and some differences in injury to pollination among the spray treatments. Differences appeared to result from the time intervals of the spray treatments rather than from number of spray applications, with the 3-day intervals being the least severe. Degree of all types of injury was light under the high temperature-low humidity conditions which prevailed in Louisiana during June.—E. J. Kantack and E. H. Floyd

**Insecticide Treated Litter Controls Body Lice on Poultry**

Experiments were begun in 1953 in which poultry house litter was impregnated with lindane and used as the means of control and prevention of the body louse infesting poultry flocks. Results were very promising in the early tests in that heavily infested flocks were freed of lice after two to five days exposure.

In order to test the treatment in more detail and to determine if treated re-baled litter could be stored over a period of one year and retain its killing power, and to determine the minimum dosage required to effect satisfactory control with a residual effect of at least six months after spreading, the following tests were conducted in 1955.

Sugar cane bagasse poultry litter treated and re-baled in 1953 and stored for 16 months before use was tested against individual birds heavily infested with body lice. The tests were so arranged as to determine both the degree of kill, the time required to effect this kill, and the length of time the spread litter retained its killing power under actual use. The litter in this test was impregnated with 36 grams of lindane per 100-pound bale.

The results from the above test revealed that the treated litter stored 16 months before use still retained its killing power, and that complete kill of lice was obtained over a period of approximately six months, after which the chemical began to break down.
This six months control represented actual residual action of the chemical against the lice and not merely the result of an initial cleanup.

Other tests were conducted in the same manner where various dosages of the insecticide in the litter were tested to determine the minimum dosage necessary to effect control. These tests revealed that a dosage of 0.5 gram per bale produced approximately 50 per cent control after a 10-day exposure; 4.5 grams per bale gave 90 per cent control, and the 36 grams per bale dosage was 100 per cent effective. An indication from this part of the test suggests that a dosage of approximately 10 grams per bale will be required to produce the desired results.


Studies on Vector Relationships to Internal Cork of Sweet Potatoes

Internal cork of sweet potatoes was first observed in Louisiana in 1946. Since then its incidence in this crop has steadily increased. A higher incidence of disease was present in the 1955 crop than in any previous crop. The disease reached severe proportions in some of the sweet potato growing areas of the state. Some growers did not harvest the 1955 crop because of the severity of the disease at harvest.

Work was continued through 1955 to establish an intensive research program so that any possible arthropod vector responsible for transmission of this disease may be found. Transmission studies were continued by feeding possible insect vectors on infected plants, then placing them on caged, disease-free sweet potato plants. Insecticidal dust and spray tests for control of foliage feeding insects were initiated.

Field observations were made to determine biological aspects of plant-insect relationships which may have some connection with transmission of the disease in the field. Sweeps were made of foliage feeding insects in the major sweet potato growing areas to identify insect species present, and to determine their abundance and possible relationship to transmission. Records of species and their abundance were taken on sweet potatoes at various locations.

—E. J. Kantack, L. D. Newson, and W. J. Martin*

Soil Insecticides Effective in Control of Soil Insects and Sweet Potato Weevil

Control of soil insects which damage the roots of sweet potatoes was continued in seven field experiments during 1955 in the

* Department of Plant Pathology.
major sweet potato growing areas of Louisiana. Tests on methods of application, dosages, formulations, and residual studies of soil insecticides were made. Field observations on sweet potato roots indicated that the major portion of injury by soil fauna in untreated fields during the growing season resulted from white grubs, banded cucumber beetle larvae, and flea beetle larvae. Wireworms appeared not to be a serious problem on sweet potato roots during 1955.

Sweet potato weevil control studies were continued in St. Landry Parish and at the Essen Lane Experimental Farm at Baton Rouge, Louisiana. In these areas of weevil infestation additional data on its control were obtained from soil insecticide tests designed primarily for control of soil insects. Soil insecticides applied to the partially prepared rows just prior to planting have been demonstrated in previous years to also control sweet potato weevil when infestations are light. Data obtained from sweet potato weevil tests were limited as a result of low weevil infestation in the test areas during 1955.

Treatments of aldrin and of heptachlor were applied at rates of two pounds per acre in three methods of application. These methods were: 5 per cent aldrin granules or 2½ per cent heptachlor granules applied to partially prepared rows, then chopped into the soil; aldrin or heptachlor in fertilizer mixtures applied 4-6 inches deep in a narrow band in the center of the planting row; aldrin or heptachlor water-spray formulations applied to the prepared planting row, then chopped into the soil.

Granular and spray application gave the better results, with the spray method being somewhat superior. Insecticide-fertilizer treatments gave less than 50 per cent control when infestations in the check were near 100 per cent. Under these same conditions soil insect control for granular aldrin was 80 per cent, granular heptachlor 93.7 per cent, aldrin spray 93.2 per cent, and heptachlor spray 95.7 per cent.

From these data it appears that formulation and method of application are important factors in successful control of soil insects which affect sweet potatoes in Louisiana.

—E. J. Kantack, E. H. Floyd, and L. D. Newsom

Biological Notes on Lobiopa insularis, a Nitidulid Attacking Ripe Strawberries

A comparative newcomer to the list of strawberry insects of economic concern is Lobiopa insularis Castelnou, a nitidulid which was first observed in the strawberry belt during 1949. Since that time it has become a major pest in the strawberry growing areas
of Louisiana. Larval and adult stages damage the ripe berries used in the late season, cold-pack industry.

Previous literature shows *Lobiopa insularis* as first described by Castelnou in 1860. Further description of this nitidulid is made

The strawberry sap beetle. 1, Eggs under calyx of fruit. 2, Larvae. 3, Pupa in pupal cell. 4, Fruit showing injury. 5, Adult. 6, Predatory mites feeding on eggs. (Photographs by J. H. Roberts.)
by Parsons in 1943. It has also been reported from Panama on bananas. No other biological data appears available on this beetle.

Laboratory studies begun in the spring of 1955 show that eggs deposited singly or in loose clusters under the calyx of the strawberry hatch in 3 to 5 days, depending upon the temperature. The larvae feed in the ripe berries. There appears to be four larval instars. Feeding ceases in 10 to 12 days, and the larvae enter the soil to pupate in cells excavated in the top inch of moist soil. Approximately 12 days are required to complete the pupal period. Adults emerge from the soil to feed and oviposit on ripe strawberries.

Egg deposition in laboratory studies at room temperature ranged from 1 to 13 per day per female, with an average of approximately 8 to 9. Egg laying discontinued when the beetles were kept at a temperature of $57^\circ$ F. Eggs also failed to hatch at this temperature.

Surveys made during the summer months of 1955 showed Lobiope insularis to be widespread within Louisiana, with the northernmost ecological boundary somewhat coincident with the Louisiana-Arkansas border. Hosts from which this nitidulid was taken, other than strawberries, include watermelons, tomatoes, pears, plums, figs, and mandarins, when these fruits were in a partial state of decay.

Various chemicals and methods of application were tested in attempts to control this pest in strawberry fields. Good results were obtained in attracting and killing large numbers of the adult beetles with halved oranges placed cut side down on headlands and the ground immediately around the oranges sprayed with dieldrin. Slow migratory progression of the infestations appeared to come from headlands, etc., as seasonal generations increased.

Two pounds of granular heptachlor per acre uniformly mixed with soil in duplicated laboratory experiments prevented adult emergence after pupation. When these adult beetles were manually extricated from the soil they died shortly after liberation, presumably because of a weakened condition.

Further study on control of the pest by using heptachlor as a soil insecticide is being made.

—E. J. Kantack, L. D. Newsom, and E. H. Floyd

Ornamental Pest Control with Insecticides

Camellia: The tea scale (Fiorinia theae Green) is one of the most serious pests of camellia in Louisiana. An infestation once established rapidly spreads over the entire plant and to other plants in the yard.
Tests conducted in 1955 to evaluate insecticides for control of tea scale showed that oil emulsion, the standard control measure, and parathion effectively controlled this scale. Three applications of malathion at monthly intervals did not give satisfactory control.

Azalea: The southern red mite (Paratetranychus ilicis McG.) is a cool weather pest of azalea reaching a peak population during January or February. The mite causes bronzing and peppery appearance of azalea leaves. Ovotran at the rate of one pound or demeton (Systox(R)) at 4 ounces per 100 gallons of water gave effective control and prevented the annual population increase of the southern red mite.

The azalea mealybug (Eriococcus azaleae Comst.) may occasionally become a serious pest causing defoliation and even death of infested plants. In addition, the infested plant is covered with a sooty mold which seriously reduces its sale value. Good control of this pest was obtained with one application of parathion (2 pounds 15 per cent w.p.), demeton (4 ounces per 100 gallons of water), and a 2 per cent oil emulsion. A single application of malathion did not give satisfactory control. The insecticide should be applied in May when the mealybug is in the crawler stage.

Chrysanthemums: Results of a study made over a three-year period to determine if emulsifiable concentrates can be used on chrysanthemums after the blooms show color indicated that malathion (0.5 pound per 100 gallons), chlorthion (0.5 pound per 100 gallons), and mixtures of DDT-demeton (0.5 pound DDT and 0.25 pound demeton per 100 gallons) or dieldrin-demeton (0.15 pound dieldrin and 0.25 pound demeton per 100 gallons) were effective for both thrips and aphid control and resulted in no injury to the flowers.—R. C. Carlton and J. S. Roussel

Economic Insect Survey in Louisiana for 1955

Weekly insect surveys were made for each of the major crops during the year. Insects found during 1955 that have never been reported in Louisiana before were:

1. Southwestern corn stalk borer, Diatraea grandiosella.
2. Elm leaf beetle, Galerucella xanthomelaena.
3. Spotted alfalfa aphid, Pterocallidium sp.

Insects found in 1955 and reported in this state previously but not widely established were:

1. Yellow clover aphid, Pterocallidium trifolii.
3. Pink bollworm, Pectinophora gossypiella.

—Abe D. Oliver
**Feed and Fertilizer Laboratory**

**Activities of the Laboratory**

The director of the Agricultural Experiment Station is ex-officio State Chemist and is thus responsible for making analysis of feeds, fertilizers, and pesticides for regulatory purposes. During the year 1954-55 official samples analyzed were as follows: feeds, 2631; fertilizers, 963; pesticides, 396.

In addition to official work the staff made 841 analyses of samples of agricultural materials such as feeds, silage, water, limestone, etc. for farmers of the state and to assist other departments of the Station in their research programs.

Various members of the staff participated in check sample programs and in collaborative work with the A.O.A.C.

—E.A. Epps
Forestry

Effect of Geographic Source of Seed on Planted Southern Pine

Geographic seed source is thought to have some influence on growth, quality, and possibly pest resistance of planted southern pines. In a Washington Parish test of this hypothesis, four sources of seed are represented in a plantation of loblolly pine (*Pinus taeda* L.) now two years old. The seed sources are Ashley County, Arkansas; and Washington, Rapides, and Livingston parishes, Louisiana.

At the end of the second growing season no significant differences among the sources have been found with respect to survival, height growth, and susceptibility to tipmoth damage (*Rhyacionia frustrana* (Comst.).

Survival for all sources is 75 per cent, ranging from 83 per cent for the Arkansas source to 69 per cent for Rapides. Average total height is remarkably similar: for Livingston, 30.7 inches; Rapides, 30.0 inches; Washington, 29.9 inches; and Arkansas, 28.6 inches.

Tipmoth damage has become severe, with 50 per cent of the entire plantation affected as compared with 10 per cent a year ago. However, no source is significantly worse or better off than the others at this time.

The study will be continued to test further the influence of geographic seed source on these and other factors, but it can be suggested now that in the early years no effects can be seen of using loblolly pine seed collected within Louisiana and an immediately adjoining Arkansas county.—A. B. Crow

Natural Exterior Wood Finishes

L. S. U. Forestry Note No. 6, September, 1955, reported the results of one year's exposure of eight recommended finishes on three species of wood frequently used for outside finishing in this locality, in an effort to find a finish that would retain and protect the natural appearance of these woods. Two of the finishes were reported as giving satisfactory results in this test. The test was continued and the two finishes reported in Forestry Note No. 6 were still good, although the boards on which the new “fortified” log oil C-6917 was used showed considerable darkening but no mildew, leaving only one finish still satisfactory.
The second set of tests, using ten additional finishes, was established on May 28, 1955. A thorough inspection was made early in December, 1955. At this time, three of the finishes were promising, so far as retaining good finish and natural appearance was concerned.—Ralph W. Hayes

Pre-Commercial Thinnings in Loblolly Pine Stands

In view of the tremendous increase in planted Southern pine during recent years, some of the pulp and paper companies have initiated research designed to study the optimum spacing for pine plantations. Investigation has, however, uncovered no similar research in natural stands of pine.

In August 1953, a series of sample plots were laid out in the Baywood area of East Baton Rouge Parish for the purpose of studying the effect of various arbitrary spacings on natural stands of loblolly and shortleaf pure mixtures. The area chosen contained fully stocked stands of 4-year-old reproduction on a site which has been estimated preliminarily as 90 feet for loblolly pine. Spacing was confined to 6 x 6 feet, 8½ x 8½ feet, and 12 x 12 feet.

Thinning was accomplished by means of a bicycle-type power saw, and the seedlings chosen were screened as far as possible for optimum vigor. The first remeasurements, made during the summer of 1955, show increases in diameter growth roughly from 0.44 inch on the unthinned plots to 1.05 inches on the 12 x 12 spacing. Height growth in one year ranged from an average low of 2.7 feet on the unthinned plots to 4.4 feet on the 12 x 12 spacing.

—Robert W. McDermid

Management of Loblolly Pine in East Baton Rouge Parish

During the summer of 1951, sixteen permanent sample plots were established on the East Baton Rouge Parish School Board section near Indian Mound. Four plots, each one-half acre in size, were established in each of four different method-of-cutting areas. The purpose was to investigate the variable factors which influence growth, height to first live limb, and number of logs per tree. Basal areas and volumes were computed. After three years, the plots were remeasured and the results were tabulated.

Several facts concerning these plots are at once noticeable:

1. Average height growth of the pine on the control areas is greater by approximately 3 feet per tree than that on the areas cut by various methods.

2. Average height growth of hardwood trees is zero on control areas as compared with an average increase of 18 inches per tree on the cut areas.
3. Average number of pine trees per acre is lower on cut as well as uncut areas as a result of three-year mortality.

4. Diameter of the average pine tree has increased an average of 0.9 inch in three years on cut areas as compared with 1.0 inch in three years on uncut plots.

5. Cubic volume of pine has decreased on the cut plots and increased slightly on the uncut plots.

6. Cubic volume of hardwood has increased on the selectively-cut plots and decreased on the other plots.

Net growth has dropped because of the heavy volume losses through mortality. Examination into the cause of death indicates a high incidence of mortality from barkbeetle attack, notably by pine engraver beetles (*Ips calligraphius*). Mortality was much more severe in recently cut areas than in adjacent areas undisturbed by cutting.—Robert W. McDermid

Deer Food Studies and Farm Crop Damage by Deer and Raccoon

The study of deer feeding habits was continued through 1955. One of the five farms studied in Madison Parish during 1954 was dropped and another included. Also, one farm in Tensas Parish was visited regularly.

A large field of late soybeans that was damaged severely in 1954 was planted to soybeans early in 1955. The 1955 crop, which was heavy, escaped noticeable damage. Deer visited the field regularly at harvest time, but there was no concentrated damage. On another farm early soybeans interplanted with corn were only slightly damaged, even though the field contained only about 10 acres and was completely surrounded by woodlands.

Cotton was not damaged in fields studied in Madison Parish. However, the farm in Tensas Parish suffered heavy damage, and a portion of the crop had to be replanted. On selected farms visited, both soybeans and cotton adjoining the forest were heavily browsed.

Corn was not damaged severely by either raccoon or deer, although there was some damage by both. Raccoon are most destructive during the roasting ear stage; however, in a field where the corn had been blown over and was in contact with the soil, a family of raccoon was seen feeding in September.

In most places, field weeds showed more browse sign than the crops. This was especially noticeable in fields of cotton and young corn.

Two areas were selected for a study of pasture plants grazed by deer. In each, three degrees of use were provided: (1) open
grazing by cattle and deer; (2) exclusion of cattle but not deer; and (3) exclusion of both cattle and deer. Forage on these plots was clipped and weighed in April 1955.—Bryant A. Bateman

Ecological Studies in Coastal Marshes

Since the fall of 1954, ecological research has been conducted in the marshes of southwest Louisiana.

Ecology of Impoundments

Approximately 18,400 acres were impounded in ten reservoirs by the Louisiana Wild Life and Fisheries Commission in Cameron and Vermilion parishes. Selected reservoirs were chosen for detailed ecological studies of water depth, salinity, pH, O₂, evaporation rate, animal use, and plant changes. Since this study is in its first year, progress has been limited to gathering data of conditions as they existed at the time of impoundment.

Nutria

The food habits, growth, movement, and reproduction of nutria are being studied. About 350 animals were tagged in the summer of 1955. Thirty-six tags were recorded during the 1955-56 trapping season. Although most of them were recovered in the marsh where they were tagged, two were recovered about 18 miles from the tagging site. Reproductive tracts from female nutria were collected from Cameron, Iberia, and Plaquemines parishes. There were great differences in (1) percentage of pregnant animals, (2) size of pelts, and (3) quality of pelt, among nutria taken from different marshes. Studies of the suitability of nutria meat for human food showed that a large majority of people who sampled it rated the meat, prepared in various ways, as both attractive and delicious.

Plantings

Experimental plantings of common Bermuda, St. Augustine, salt marsh, and dogtooth grass were made on three different levees in 1954. Checks made in the fall of 1955 revealed that common Bermuda had sodded over about 80 per cent of the area, dogtooth about 50 per cent, St. Augustine about 35 per cent, and salt marsh grass about 25 per cent of the area planted.

Barnyard millet, smartweed, and common Bermuda grass seed were sown on the levees of impoundments. Smartweed and Bermuda grass plantings were a failure, while barnyard millet germinated and produced a limited amount of seed. Seed production is, however, not an indication of its value as a food since much of it was eaten as forage by birds and mammals. Banana waterlily
failed in the impoundments, while wigeon grass survived and spread.

**Deer Investigation**

A deer "die off" occurred in the summer and fall of 1954. Autop- sies failed to reveal the presence of any disease. Since the symp- toms of malnutrition were very obvious and since the range was in a very poor condition, it is probable that the deer died of star- vation. Burns which were followed by succulent vegetative growth and later by rain improved food conditions on the deer range. Following the production of sufficient food, the surviving deer re- gained a healthy condition. No further "die offs" have been re- ported.—*Leslie L. Glasgow*

**The Ecology and Management of Woodcock in Louisiana**

Much information has been obtained on the habits, distribution, abundance, and factors which affect the welfare of woodcock in Louisiana. A total of 4,806 woodcock have been banded from which 72 bands were returned from 20 states and three Canadian Pro- vinces. Additional bands can be expected to be returned for a period of five years after the original banding. About 45 woodcock bands which were retaken in Louisiana yielded data on local movement. About 58 per cent were males.

Because of early cold weather in the fall of 1955 in the Northern and Midwestern states, large numbers of woodcock arrived in Louisiana about the time the first migrants normally appear. Since summer and fall rains were above normal, excellent vegetative and moisture conditions existed on the study areas from late November to the latter part of December. A drouth from January 1 to January 18 seriously reduced the moisture in the study areas and it is probable that many birds deserted this region of the state. An additional 1,200 birds were banded.—*Leslie L. Glasgow*

**Fish Pond Management**

A new method of applying fertilizer to ponds was used and appeared to be satisfactory. Inorganic fertilizer was placed in burlap bags, one hundred pounds per bag, and each sack was placed on a specially built platform. The platforms were designed so that fertilizer sacks would be wholly under water. Wave action carried the dissolved fertilizer over several acres.

Temporary shelters were constructed and placed in ponds to determine if they would concentrate fish, thereby making fishing
more fruitful. Scrap lumber was picked up at a sawmill, and six-foot square pens were constructed, using scrub oak corner posts. Posts were cut about twice as long as the depth of water into which they were to be placed. The large ends of the posts were at the top, thereby giving sufficient weight to keep the pens in place. The mill scrap, mostly edgings and thin slabs, was nailed on the post similar to a fence; boards were also nailed diagonally across the six-foot square. Although permanent structures that allow small fish to escape predation are not recommended, these temporary movable structures did increase fishing success.—Bryant A. Bateman
Metabolic Studies with Preadolescent Girls

Work in this field has been continued and enlarged as a co-operative part in the Southern Regional Research Project S-28. Analyses have been completed and reports prepared on: (1) the calcium balances from the 1952 study, (2) the energy balances, (3) the blood serum vitamin A and carotene concentrations and (4) basal metabolic rates of the subjects on the 1954 metabolic balance studies. In addition detailed plans and dietary calculations for the four different diets to be used in the 1956 studies have been completed.

Calcium Utilization

Calcium intake, excretion, and retention were determined for the six subjects. The daily mean intake of calcium was 0.85 gm. The source of calcium was calcium lactate or nonfat dry milk solids. On this level of calcium intake five of the six subjects were in negative balance.

The calcium excretions were higher when calcium was provided by calcium lactate than when it was provided by nonfat dry milk solids. The daily mean urinary calcium excretion of the individual ranged from 0.078 to 1.163 gm. and accounted for 9.2 to 19.2 per cent of the intake. The urinary excretion was relatively constant for each subject. The daily mean fecal calcium excretion of the individual ranged from 0.726 to 0.848 gm., representing from 85.8 to 99.9 per cent of the intake. This resulted in a daily mean calcium loss of 0.068 gm. for five of the subjects, with losses ranging from 0.110 to 0.033 gm. One 11-year-old subject maintained a positive retention of 0.020 gm.

The calcium retention of all the subjects appeared to increase when nonfat dry milk solids were added to the diet. This addition also increased the calculated phosphorus intake from a mean of 0.49 gm. to 1.12. The increase in the phosphorus intake to a 1/1 ratio with calcium undoubtedly was the main factor in the apparent improvement in calcium retention.

—Mina Glidden, Ruth Morrison, and Dorothy Moschette

Energy Utilization

The caloric content of the food intake as well as the fecal and urinary excretions of each of the five subjects participating in the 1954 study were determined to obtain energy balance data. Food, feces, and urine were dried to a constant weight and burned in an
Emerson fuel calorimeter. A correction for loss in the dried urine was made by calculation from the nitrogen analyses of fresh and dried urine.

The average daily intake for the five subjects for 64 days was 1,998 calories, which was within 5 per cent of the calculated figure. The mean fecal loss was 86.9 calories or 4.3 per cent of the intake. Urinary loss was 68.9 calories or 3.4 per cent of the daily intake. There was some variation between individuals in the amount lost in the feces, but the urinary loss was nearly the same for all subjects.

The mean caloric absorption was 95.6 per cent of the intake, and 92.2 per cent of the intake was utilized. The percentages absorption and utilization of the caloric intake were similar for all subjects. The 2,000 calories appeared adequate for the 8-year-old girls to promote normal weight gains, though one subject who was overweight lost some weight on this intake. There was a direct relationship between intake per kilogram, as was shown by a correlation coefficient of 0.998. Differences in basal metabolism and in weight or height had no statistical significance on caloric utilization.

—Dorothy Moschette, Ruth Morrison, Mina Glidden, Laureame McBryde, and Ruby Whitehead

Blood Serum Vitamin A and Carotene Concentrations

The serum vitamin A and carotene concentrations were determined for 11 preadolescent girls on a controlled dietary regime for 64 days, in which the same diet was repeated every four days. During the experiment seven of the subjects had slight illnesses, with five having body temperature above normal. The controlled diet met the National Research Council recommended allowances for all nutrients. Two-thirds of the vitamin A intake was derived from animal sources. Blood samples were collected at four-day intervals and analyzed for serum carotene and vitamin A.

Mean serum vitamin A and carotene concentrations of 49 mcg. % and 124 mcg. % were found for the entire study. Mean serum vitamin A and carotene concentrations of 53 mcg. % and 130 mcg. % were found for samples collected after period five when the children were free of infections and/or fever. No correlation was found to exist between the serum vitamin A and carotene concentrations.

An increase was noted in the serum vitamin A concentrations through the fifth period, after which an analysis of variance revealed no significant change in the serum levels. No increase in the serum carotene values was observed after the first period and this absence of change was verified by an analysis of variance for periods eight through sixteen.
A decrease in serum vitamin A and carotene concentrations was noted when the subjects were ill. Increases in serum carotene concentrations were noted with the administration of antibiotics to five of the subjects.

"Excellent" serum vitamin A concentrations were found for the subjects who had received 3,850 I.U. of vitamin A daily for 64 days. The serum carotene concentrations were lowered by the illness of the children, but the values obtained when the children were well rated "good."

—Janet Blanchard, Ruth Morrison, and Dorothy Moschette

**Basal Metabolic Rates**

The basal metabolic rates of five preadolescent girls who were participating in the dietary study were determined. Triplicate tests were done on each subject in November and again in December, 1954, during the diet study. Four of the subjects were available for further tests during February, March, April and May, 1955. During these months the subjects were given duplicate basal metabolism tests on two consecutive week-end mornings. A total of 58 tests were given.

The average basal metabolic rate for the five subjects during the six months was 39.9 calories per square meter per hour. This is 9 to 17 per cent lower than the standards predicted by five other investigations. The individual basal metabolic rates of these girls were lower by 10 per cent or more than the proposed standards with two exceptions. One subject had a normal basal metabolic rate during the December test though her November test was 20 per cent below the standards. Another subject had a rate averaging 33 per cent below the standards in November, 15 per cent below in December, 5 per cent below in February and March, and 15 per cent above in April and May. The other subjects remained 12 to 22 per cent below the predicted rates for the six months.

The individual average rate per centimeter of heights for the five girls were: 6.5, 7.0, 7.7, 8.7, and 8.8 calories per centimeter for 24 hours, or a group average of 7.8 calories per centimeter. The average found by other investigators was 8.2 calories per centimeter for 24 hours.

There was no definite seasonal variation though there seemed to be a tendency for higher rates during December to March than in November, April and May, except the one subject who showed a steady increase for the six months.—Ruth Morrison

**Methods for Determination of Vitamin A and Carotene in Food and Feces**

An investigation of methods of analyses for vitamin A and carotene in food mixtures and in feces has been started. Present meth-
ods have been used for the analyses of a single food but when these methods are applied to food mixtures inaccurate results are obtained. An experiment measuring the vitamin A and carotene intake and excretion of subjects is impossible because of the difficulty in determining intakes. This difficulty is caused by substances in food combinations which interfere with the analyses. Various methods have been tried and compared. It is hoped that several of these methods can be combined and a new method developed to remove interfering substances and to determine the actual vitamin A and carotene content of food composites and of fecal material.

—Ruth Morrison and Marie Skellenger

**Relationship Developed between Parents and Children and the Behavior of the Children when Certain Patterns of Child Guidance Are Consistently Used by Parents**

The study of the parent-child relationship in punishment and frustration, begun last year under Federal Research Project S-20, was continued and expanded this year with funds provided by the Agricultural Experiment Station. Last year's study with the Highland Elementary School children and their mothers was written up and submitted for possible future publication to "Child Development Publications" under the title: "The Direction of Aggression in the Mother-Child Punishment Situation." Thirty-two children from the L.S.U. Laboratory School and their mothers were administered the Rosenzweig Picture Frustration Form and the Punishment-Situations Index (PSI), a set of 10 projective-type cartoons depicting typical punishment situations. Inquiries were conducted with the 64 subjects concerning the PSI. The data are currently being analyzed with regard to the mother's self-concept and her concept of the child and the child's self-concept and his concept of the mother in punishment and frustration. The data from the Laboratory School will be submitted in June 1956 as a Master's Thesis in psychology at Louisiana State University under the title: "A Technique for Investigating Punishment in the Parent-Child Relationship." The data from the two schools will then be combined and a new scoring system and tentative norms devised for the PSI.

—Patricia K. Morgan

**To Study Those Factors Which Affect Cotton Fiber Quality**

L. S. Project No. 895 was approved in late December 1955 and has not yet reached the stage of actual fiber testing, since procurement of equipment and preparation of a testing room have been the first necessary steps to preparing for the work. The project
proposes to measure fiber length, length uniformity, fineness, and strength of varieties and advanced strains as affected by different harvesting methods and the effect of infestation by certain insects, including boll weevil, pink bollworm, cotton aphid, spider mites, and root knot nematode.

—Lucille Finley and Anne Blanchard Bergeron

Factors Influencing Consumers' Choice of Beef

This project was not started until February 1956. The aim of the project is to determine the expenditure patterns of consumers in Louisiana and to uncover factors that motivate the consumer in the purchase of cuts of beef.

Immediate plans include:

1. The composition of trial forms suitable for keeping records which will show expenditure patterns of Louisiana consumers.

2. The preparation of a series of tests and other methods adapted to projective testing in the study of consumer preference in the choice of cuts of beef.

3. Pre-testing by choosing a small group of individuals to try out the forms and the tests in order to obtain the best possible approach to the complete study.

—Lavon A. McCollough and Sally W. Babin
Thirty-one varieties and breeding lines were studied in cooperation with the U.S. Vegetable Breeding Laboratory. Ten entries were planted in the replicated trial, and their yields in bushels per acre were as follows: Asgrow Black Valentine, 192.4; Contender, 231.1; Seminole, 188.3; Tendergreen, 110.3; Tenderlong #15, 156.5; New Improved Tendergreen, 242.3; Wade, 267.3; B-2567-1, 284.1; B-3077, 230.1; B-2194, 287.7. After considering earliness, shape, straightness, length, color, roughness, uniformity, pod size, pod elevation, height of plant, stand, quality, and yield, B-2194, B-2567-1, Contender, and Wade were selected as the most outstanding.

Twenty-one entries were planted in the observational trial, and the three most outstanding were (1) Improved Wade, (2) B-2456, and (3) B-2720-4.1.

One hundred and thirty-two plant introductions were observed, and five were selected to be used in our breeding program. These are P.I. Nos. 204716A, 205210, 206002, 206984, and 206986.

—James F. Fontenot and Julian C. Miller

Pole snap beans are important in Louisiana from the standpoint that they are grown for fresh market, canning, freezing, and home consumption in Louisiana.

Different localities in the state demand different type pole beans. In the Hammond-Springfield area, where the beans are shipped to northern markets, a long, flat-type bean is desired. In the area below New Orleans, where the beans are sold to the local market, and in southwest Louisiana, where many beans are sold to the canners, a round, straight, green type is desired.

To conform with these requirements our breeding program has been established to develop these two distinct types and also incorporate such characters as earliness, disease and insect resistance, quality, yield, heat resistance, size, straightness, color, smoothness, and adaptability to mechanization.

In 1955 the following number of selections were made: 14 Canfreezer selections, 1 Green Savage selection, 16 No. 6 x Kentucky Wonder selections, 2 F.M. 191 selections, and 2 Green Savage x St. Louis Perfection selections.
Certain processors (particularly baby food processors) prefer a white-seeded bean; therefore, Canfreezer was crossed with Blue Lake. We now have three selections of this cross and are now pure lining them.—James F. Fontenot and Julian C. Miller

Lima Bean Breeding

Fifty lines of bush Lima beans representing selections from a cross of the Fordhook and Sieva were planted in a replicated field trial. Throughout the season these beans were rated for the following characters: plant vigor, disease resistance, bush type, earliness of set, yield, number of beans per pod, size of beans, and quality of beans. On the basis of the data gathered 15 lines were selected for further purification and testing.

As Lima beans are not completely self-fertilized when grown in the presence of insects, a small screened house is being constructed for this project. This will facilitate the purification of desirable lines.

Twenty-five lines of pole Lima beans representing selections from a cross of the Fordhook and Sieva were planted in a replicated test with the Carolina Sieva. These beans were rated throughout the growing season, as were the bush Limas. The ten top ranking lines were selected for further purification.

In the Lima bean variety trial planted in cooperation with the National Lima Bean Nursery Trials for 1955 the outstanding lines for the Fordhook type were U.S. 551 and Fordhook 242, with yields of 7,438 pounds and 6,675 pounds per acre respectively. The highest yielding lines of the Baby Lima type were U.S. 253, Allgreen, and Limagreen, with yields of 6,365 pounds, 6,115 pounds, and 5,900 pounds per acre respectively.

—Donald Y. Perkins and Julian C. Miller

Breeding of Brassica Crops and Variety Trials

Cabbage

As a result of the selection and purification program followed for the past several years, the Allyear variety is commercially pure and should be planted for the fall crop. Lines of this variety which would be suitable for the spring crop are still segregating too much for commercial use. Data on the variety trials indicate that Glory of Enkhuizen, Allyear, Copenhagen Market, Medium Copenhagen, and Round Dutch performed the best.

Cauliflower

Thirteen varieties and strains of cauliflower were tested. Snowball A and Snowdrift were the best varieties in the early maturing
group. In the medium group, Snowball M and Stella Nova were superior. Snowball Y performed the best in the late maturing varieties.

**Broccoli**

Twelve commercial varieties of broccoli were grown in a yield trial. Texas 107 and DeCicco varieties performed best under Louisiana conditions. Texas 107 gave a slightly higher tonnage because of the many side sprouts produced. Broccoli-collard crosses have been made in an attempt to increase cold hardiness in broccoli. These lines have been back-crossed to broccoli in order to pick up the broccoli characteristics. This material is still segregating; however, some lines look promising.

—John J. Mikell, Julian C. Miller, and James F. Fontenot

**Sweet Corn Breeding**

The 287 inbred lines were further selected and inbred another generation. The best 150 lines were selected to continue the project. Those lines that were already homozygous and that show promise will be crossed with another group of inbred lines and with the tropical variety Pajimaca in order to determine general combining ability and for the purpose of obtaining a topcross hybrid that may be used to fulfill the requirements of the market until a definite variety is developed.

Twelve standard sweet corn varieties were tested for yield, adaptability, and quality under Louisiana conditions. Aristogold Bantam Evergreen, Sweetangold, and Huron proved to be the varieties best adapted.

—Carlos G. del Valle, Donald Y. Perkins, and Julian C. Miller

**Pop Corn Breeding**

The object of this project is to develop a pop corn variety that is adapted to Louisiana conditions. Fifteen hybrids and varieties were studied in a replicated field trial in order to determine their agronomic characteristics. At maturity, expansion tests were used as an indication of the market value of the different varieties. In general, the best pop corn hybrids of the country did not retain their maximum popability when grown under our conditions. The local variety, Creole, did not have the agronomic character required for economic production. Further work will have to be done in order to develop a good pop corn variety for Louisiana.

—Carlos G. del Valle, Donald Y. Perkins, and Julian C. Miller

**Okra Breeding**

The experimental work dealing with breeding improved varieties of okra was continued during the past year. Emphasis is
presently being placed on the selection of certain pod types to suit the different commercial purposes for which okra is being grown in Louisiana, that is, rather short, round, dark-green pod types are being selected and purified genetically for future use as varieties for freezing, while long, round, dark-green pods are being selected for the fresh market or for canning. Selection as to plant type is the same in all cases, since it is recognized that a dwarf plant type with a cut leaf would be preferable to any other type regardless of the use to which the pods were put.

Several of our most promising seedlings are being grown by certain selected growers so that an evaluation of these lines under the okra growers' conditions can be obtained along with opinions by the growers as to the potential value of these lines. One of our best seedlings, which has a Louisiana Green Velvet pod type along with a dwarf plant type and a cut leaf, is now being purified and increased so that it will be ready to release to growers in the near future.

A few of our lines are being maintained primarily with a view toward their use in the production of dry okra seed for its edible oil content. These lines have characteristics which make them suitable for this purpose. Samples of dry seeds are taken annually for oil assay from each of the lines which are maintained. Thus, a record of the oil production by any given line is being established. This will serve as a guide to growers in the future who might produce okra for its edible oil content.

—L. G. Jones, J. C. Miller, W. A. Sistrunk, and J. F. Fontenot

Onion Investigations

Breeding

The primary objective of the onion breeding program in Louisiana is the improvement of the Creole variety. This variety, although well adapted to our conditions in many respects, splits badly, bolts freely, and segregates for color. A number of inbred lines have been developed in an attempt to eliminate or reduce these faults. These lines are being closely selected, and inbreeding and crossing will be continued until the objectives of the program are reached.

Variety Trials

Variety trials are conducted in order to compare our better breeding lines or hybrids with the standard varieties and with the better hybrids from other areas. At present two such variety trials including 16 varieties and hybrids are being grown at Diamond and Baton Rouge.
Cultural

Much valuable field space is wasted of necessity by present Louisiana methods of land preparation. This is because we must plant on a raised row or bed so as to allow for adequate drainage. It was felt that, if two rows could be planted on each bed, more efficient land use would result. One year's experimentation indicates highest onion yields where the transplants are set in two rows on top of each bed with the plants spaced 2 inches apart in the row. This experimental work is being continued.

—Donald Y. Perkins and E. C. Tims

English Peas

During 1953, 1954 and 1955, our selection, D-3-43-3-1, was compared to Thomas Laxton. The three-year average yield shows that D-3-43-3-1 produced 2,957.2 pounds per acre as compared to 2,547.2 pounds for Thomas Laxton. In analysis, D-3-43-3-1 ran 20.57 per cent dry matter, while Thomas Laxton ran 20.17; ascorbic acid (mg/100 g fresh weight) for D-3-43-3-1, 52.10 and for Thomas Laxton, 38.47; total sugars (g/100 g fresh weight), D-3-43-3-1 ran 8.29 and Thomas Laxton, 7.12.

D-3-43-3-1 is slightly earlier and has as much vigor as Thomas Laxton. A taste panel evaluation showed that both are very good when frozen, but the general acceptance of D-3-43-3-1 was higher than for Thomas Laxton.

Five selections and five introductions are now being studied for their possibility as a home-garden or processing pea in Louisiana.

—James F. Fontenot and Julian C. Miller

Pecan Variety Test

The eight-year-old pecan variety test located on the Ben Hur farm produced its second crop of nuts in 1955. It is of interest to note that, although these trees are young and growing rapidly, good crops of pecans were produced on the following varieties: Desirable, Curtis, Farley, and Elliott. The kernels of these higher yielding varieties were classified as good.—P. L. Hawthorne

Irish Potatoes

Breeding

Late spring frosts in Louisiana this year (1955) severely cut back the potato plantings at Baton Rouge; however, the breeding material finally began flowering late in April—nearly a month late.
Crossing, therefore, was limited by the small amount of flowering. Fifty-five parental combinations were made among the 60-odd varieties and selections in the breeding plot. Only nine of these produced pollen strong enough, and in sufficient quantity, for pollinations. Two of these produced no seed balls in crosses.

Around 5,000 seedlings from 11 parental combinations and 16 selves were grown in the greenhouse, together with a similar number of seedlings grown in relation to disease resistance potentialities, late in 1954. From these seedlings, 400 individual tubers were selected for planting in South Dakota in May of this year.

Two late frosts (about two weeks apart) damaged our test plots seriously. Many of the potatoes were so badly hit as to not recover. It was interesting to note, however, that the LaSoda variety made a faster and more complete recovery than did most of the other varieties and seedlings in the trials. Of the seven plantings in Louisiana, only one approached normal. That was at the Plaquemines Parish Experiment Station, where the frost damage was least.

The seven plantings in Louisiana, together with the 116 selections in observational, preliminary, and advanced trials at Clark, South Dakota, constituted the 1955 spring Irish potato field trials designated principally for a study of yield and tuber foliage characteristics.

Certain young seedlings (such as 42-54, 42-56, and 32-23) are coming under closer observation. These newer selections will be subjected to more extensive tests when they are later in the "advanced" selection category in the program.

None of the older red seedlings thus far equals LaSoda and Red LaSoda in yield or other qualities. The two most promising seedlings are 82-94 and 12-92. These have been retained for further careful study and final disposition.

Two white seedlings, 91-258 and 91-143, continue to hold a great deal of promise. Seedling 91-258, which was mentioned more fully in our 1955 report, is an oblong russet potato having very desirable baking quality. The other promising white-skinned seedling is 91-143. Its parentage is B61-3 x Cherokee. It has performed rather consistently in both the northern and southern areas and shows a high degree of scab resistance. It has high solids and excellent cooking qualities. It is equal to Katahdin or Sebago in yielding ability.

Pollination and Pollen Handling

Basic studies have continued on the handling of pollens, particularly in relation to the use of potato pollens for pollination. Stress, thus far, has been laid on pollen storage and longevity and
on the reaction of pollen to both artificial environments and culture media.

Field studies during the unusually hot weather of the 1955 spring potato breeding season showed that, contrary to previous potato breeding practices, good seed-ball set can be expected from pollinations made as late as mid-morning and as early as mid-afternoon (provided, of course, that other factors involved are conducive to seed ball development) and that protection of emasculated flowers from the sun by bags is beneficial on hot, bright days.

The average set of seed balls from all pollinations made with 1954 (one-year-old) stored pollens was over four times higher than the average set from pollinations made from fresh (1955) pollens.

The collection of pollen from flowers of horticultural crops from which pollen is difficult to abstract has been aided by the development of a simple, cheap, vacuum-type collector.

Quality Studies

The specific gravity was much higher for the varieties and seedlings which were grown at Plaquemines Parish Experiment Station than for those grown at Baton Rouge, because of the late frost which shortened the growing period at the latter location. The chipping quality of the potatoes grown at Baton Rouge was inferior, of course, due to their lower specific gravity.

Results from storage tests indicate that the specific gravity remains fairly constant in most varieties up to five months of storage. The values are slightly higher at 40° F. than at 60° F. or common storage in most instances. The reducing sugar values correlated rather closely with the chipping quality of the varieties. A reducing sugar value above 0.2 per cent produced a poor quality chip in all instances. The maximum chip quality rating of these samples, however, was only "fair" to "good" because of the low specific gravity.

There appeared to be no effect of the various nitrogen fertilizer levels on specific gravity, reducing sugar values, or chipping quality, either in freshly harvested or stored potatoes.

The specific gravity and chip quality were somewhat higher for all of the South Dakota grown potatoes because of better growing conditions and longer growing season. Several seedlings and varieties rated excellent for chipping, namely, 91-143, 91-78, 12-91, 21-382, 32-92, 21-367, LaSalle, and DeSoto.

Storage Tests

Two types of storage tests were conducted during the past year. The first was concerned with the natural length of the rest period of standard varieties and some of our most promising
seedlings. These potatoes were stored at 55° F. The information gained from this study has been added to that already obtained on the subject; and when sufficient knowledge is gained as to the natural length of the rest period of each variety, it will serve as a valuable guide to Louisiana potato growers as to their most profitable source of seed.

The other type of storage test dealt with the effect of maleic hydrazide applied as a foliar spray in prolonging the storage life of potato tubers. These potatoes were held at 60° F. Two varieties (LaSoda and Katahdin) were used in this test. The results on sprout control and tuber quality were comparable to those obtained last year with this chemical. That is, the treated samples did not sprout appreciably or show any great changes in tuber quality, while those in the control samples were sprouting profusely and were of very poor quality after six months of storage.

It was intended that a study be made of the effects of foliar applications of maleic hydrazide to both varieties, LaSoda and Katahdin, on the yield of tubers; but the extremely inclement weather that prevailed shortly after emergence of the plants prevented the carrying out of a good yield test. Yields were reduced by maleic hydrazide applications in the field year before last.

In the storage experiments mentioned above, another chemical in addition to maleic hydrazide was tested as to its effectiveness in prolonging the storage life of potato tubers. This chemical is Iso-propyl N—(3 Chloro-phenyl) carbamate (Chloro-IPC). It appeared to have an ability equal or superior to that of maleic hydrazide in preventing sprouting of the tubers, and no major changes in tuber quality were attributable to its use. This material was applied as a tuber dip at harvest time; it therefore had an advantage over maleic hydrazide in that it could not affect the yield of tubers.

Fertilizer Tests

Rather elaborate fertilizer tests were put out last spring (1955). However, the plants were so severely damaged by the heavy spring frost that the yield data obtained from these tests are not considered sufficiently accurate to merit reporting.

Preliminary Tests

Preliminary tests were conducted last year on the following phases of the potato research program: (1) the efficiency of certain chemicals used as vine-killers and their effects on tuber quality and (2) the influence of soaking the seed-pieces in certain antibiotic solutions on the amount of seed-piece decay after planting and the growth rate of the plants. It was impossible to obtain satisfactory yield data from these tests because of the inclement
weather, but tuber samples were obtained at harvest time for purposes of certain quality measurements and storage tests.

—J. R. King, L. G. Jones, W. A. Sistrunk, J. J. Mikell, and Julian C. Miller

**Sweet Potatoes**

Experimental work on sweet potatoes in Louisiana includes that conducted at Baton Rouge, the Sweet Potato Research Center at Chase, three substations, and at eight outfield areas. All of the work is tied in closely with the staff and laboratories at the main station in Baton Rouge. Each year new phases of research are initiated in an attempt to develop a well-balanced program. Regional tests are conducted in collaboration with the United States Department of Agriculture and other state Experiment Stations that are conducting research work on sweet potatoes.

**Foundation Seed**

There will be approximately 2,000 bushels of foundation seed available to the sweet potato growers in Louisiana. All of this seed is apparently free of cork and is of the best quality, both in skin and flesh color. Emphasis was placed on the production of Unit I Porto Rico and Copper Skin Goldrush.

A technique for growing and keeping the foundation seed free of cork and of high quality has been in practice since 1953. This procedure includes the selection of high yielding and good quality hill selections. These hills are stored at a high temperature until the early spring, at which time they are diced and checked for skin and flesh color and the possible incidence of cork. The proximal ends are treated in Semesan Bel and these seed pieces are bedded in the greenhouse. An early planting is made from the plants grown from these seed pieces and subsequent plantings are made from vine cuttings. An additional step in this program was used in 1955 by carrying over a reserve stock of foundation seed to plant from the previous year’s stock.

**Breeding**

Additional breeding lines were added to the nursery last year. Some proved satisfactory, while others will be removed because of low flower production and low fertility levels. The process of adding new lines to the nursery each year is a continuous one and is a means of adding new germ plasma, such as resistance to internal cork. As a result of this procedure, the breeding nursery now consists of nine lines which are resistant to fusarium wilt, have good skin and flesh color, and produce flowers in great numbers. There are three lines that are resistant to soil rot, two resistant to black rot, one resistant to fusarium wilt and black rot, and one line in
which no internal cork has been found. The last mentioned seedling, while it has many undesirable characteristics, flowers profusely, and many crosses have been made between it and good commercial varieties.

Approximately 15,000 sweet potato seeds were planted in the greenhouse in 1955. Those having the desirable characteristics were transplanted to the field. A total of 120 seedlings were saved in 1955 for further testing in 1956. Also, 14 1951 seedlings, 22 1953 seedlings, and 43 1954 seedlings were saved for more advance testing. Of the 1953 seedlings, 3-7, 3-64, 3-77, 3-79, 3-83, 3-93, and 3-101 looked especially good.

**Yield Trials**

The early test at Arnaudville was harvested 89 days after planting. Earlyport continued to produce well in this area. Allgold and 1-231 produced very high yields, but they were both too irregular in shape for commercial production. L 1-13 outyielded Unit I Porto Rico by over 100 bushels of number one grade. This seedling looked very promising in that the shape and skin color were outstanding. Unit I Porto Rico showed up well at Breaux Bridge; 3-7 is late but the potatoes produced were smooth, well shaped, and of very good skin color.

Five varieties and 15 seedlings were planted at Sunset. Outstanding entries were Unit I, Porto Rico 2-1, Copper Skin Goldrush, 3-7, 1-13, and 1-80.

Results show that Earlyport outyielded all entries at Scott, Grand Prairie, and Church Point. Copper Skin Goldrush and L 1-13 show definite promise in the Church Point area.

Unit I Porto Rico performed best at Hessmer with 3-7 showing much promise.

Copper Skin Goldrush performed better than other varieties at St. Francisville.

**Fertilizer Experiments**

Soil tests have shown consistently that Richland silt loam at Chase, Louisiana, is very low in phosphorus and medium in potash. For a four-year period, 1950 to 1954, there has been a response to phosphorus both in plant growth and yield. There has been very little response to nitrogen and potash during the same four-year period. In 1955 in a rate of application of N-P-K at ratios of 5-10-5, 5-10-10, and 5-15-10, it was found that the rate of 600 pounds per acre gave the best yield under irrigated and non-irrigated conditions. The response to the fertilizer treatments is more apparent under irrigated conditions. Fertilizer burn resulted when the heavier rates were applied in a drill on the row at a six-inch depth.
Effect of Different Starter Solutions on the Yield of Sweet Potatoes

The tests dealing with the effect of dissolving a small amount of certain fertilizer salts in the transplanting water on the yield of roots were continued during the past year. The salts used were nitrogen, phosphorus, and potassium carriers combined in various ways so as to give an indication as to the nutritive element or elements causing the greatest effect. The results of this work so far are summarized in the table below.

<table>
<thead>
<tr>
<th>Location**</th>
<th>Arnaudville</th>
<th>Hessmer</th>
<th>Grand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>81.5</td>
<td>155.3</td>
<td>94.1</td>
</tr>
<tr>
<td>H.0</td>
<td>76.3</td>
<td>166.3</td>
<td>208.9</td>
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<td>121.1</td>
<td>146.1</td>
<td>268.3</td>
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<td>21-54-0</td>
<td>127.4</td>
<td>166.3</td>
<td>270.3</td>
</tr>
<tr>
<td>0-52-34</td>
<td>103.3</td>
<td>153.1</td>
<td>195.0</td>
</tr>
<tr>
<td>10-52-17</td>
<td>117.5</td>
<td>173.4</td>
<td>214.8</td>
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<tr>
<td>L.S.D. 5%</td>
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</tr>
<tr>
<td>L.S.D. 1%</td>
<td>61.1</td>
<td>28.2</td>
<td>87.1</td>
</tr>
</tbody>
</table>

* Expressed as bushels of No. 1 roots per acre.
** Varieties: Arnaudville—Earlyport; Hessmer—Unit I Porto Rico.

These data indicate that beneficial results were obtained from the use of starter solutions, especially those containing nitrogen and phosphorus, or nitrogen, phosphorus, and potassium.

Irrigation Studies

The 1955 growing season was very wet from the middle of June through the middle of August. Soil moisture samples showed that most of July was around 75 per cent of field capacity or above and at certain periods the soil was completely saturated. In the sweet potato tests in 1955 it was found that in most cases the sweet potato roots began to set around the middle of August regardless of date of planting, except for April plantings, in which some seedlings and varieties had set their roots before the prolonged rainy spell that kept the soil saturated. Comparative yields for May 15 and June 15 plantings were about the same. In 1955, sweet potatoes transplanted in May made heavy vine growth at the expense of the root crop. These same plants began setting roots around August 15, after which the roots made rapid growth.

It was necessary to irrigate the test plots on August 19 and September 8, 1955, using 2 surface inches of water at each irrigation to keep the soil above 50 per cent field capacity. An average increase of 68.8 bushels per acre resulted from using two irrigations as needed.

It is suggested that, whenever possible, one should irrigate during the last half of July and during the months of August and Sep-
tember, applying 1 acre inch weekly or as needed to keep soil moisture above 50 per cent of field capacity. The rapid fluctuation of soil moisture in the top soil from a high level to low levels induces veining in some varieties and under some conditions may cause cracking.

**Weed Control**

New chemicals are continuously being screened for controlling weeds and, at the same time, to see if they are injurious to the potatoes. CIPC at 4 and 8 pounds per acre caused no apparent injury to the sweet potatoes. Weed control was erratic, and counts in all of the test plots were low. Karmex as a pre-planting spray in machine-planted sweet potatoes has never given any injury; however, in hand-planted and post-spray treatments, it has been toxic to the plants. Dalapon gave some injury as both a pre-planting and post-planting spray. A new chemical under the code of 3Y9 has shown considerable toxicity to weed seeds at 8 and 16 pounds per acre. It was slightly toxic to the plants at 8 pounds per acre, but subsequent sweet potato yield on these same plots was very high.

**Vine Killer Test**

In addition to the vine-killing effects, it was felt necessary to study the influence of the various chemicals on the quality and storage ability of the roots under prolonged storage. Accordingly, storage samples were taken in duplicate at harvest time, one set of samples being held in common storage at Chase, Louisiana, and another set being held at 55°F. storage at Baton Rouge. At the Chase station only minor differences were noted in the storage ability of the treated samples, with the notable exception of the 2,4-D treated potatoes in which case most of the roots decayed rapidly soon after harvest. This effect was likewise noted for this treatment at the Baton Rouge station. No great differences were noted in the dry matter, carotene, or total sugar contents of the roots at any time during storage, indicating that the vine-killer chemicals did not affect the quality or storage ability of the roots. At the end of the storage period (after approximately 9 months), the roots in all samples appeared to be still in fairly good condition except those from the 2,4-D treatments, which already had been discarded because of excessive decay.

Since the treatment with dinitro-secondary-butyl-phenol appeared the most promising the first year, this material was applied in another test this year at the Chase station. The Dow General Weed Killer formulation (55 per cent active dinitro-secondary-butyl-phenol) was used in this test at the rate of 4 pounds in 50 gallons of diesel fuel per acre. At harvest time, which was 10 days after application of the chemical, approximately 95 per cent of the

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1 In cooperation with W. D. Poole, Agricultural Engineer.
foliage and vines were completely dead and were beginning to disintegrate. Thus, the harvesting operation was facilitated considerably.

Soil Insect Studies

Soil insect damage to sweet potatoes has been severe in this area for the past six years. This has been true especially in sod land that was planted with sweet potatoes. In a test at Chase, Louisiana, in 1955, it was found that the check plots had 40.8 per cent of the roots damaged by soil insects. However, good insect control was obtained with aldrin and heptachlor with different methods of applications. In these test plots only 2.3 per cent to 6.5 per cent of the roots were damaged as compared to 40.8 per cent for the check plots.

Because most farmers water their plants when transplanting and since there is a possibility of using nutritive starter solutions at the time of transplanting, the question arose regarding the feasibility of including insecticides in the solution to control soil insects. As a result an experiment was conducted at Baton Rouge to determine the effectiveness of insecticides applied in this manner. Data from this year's results indicate that insecticides may be included in starter solutions with effective results.

Disease Studies

(a) Fusarium Wilt—All seedlings saved in 1955 will be tested in the greenhouse for their reaction to fusarium wilt. The practice of greenhouse and field testing is being continued with all the seedlings produced in the breeding program. Some 1953 seedlings, which were resistant to wilt, were discarded for other reasons. Those which have shown consistent resistance for two years are 3-86, 3-93, 3-128, and 3-147.

(b) Soil Rot—Soil rot affects the feeding roots of the plants, causing rottng of the smaller ones. On the larger roots and also on the potatoes rather typical scabby lesions are formed. This disease causes heavy losses to Louisiana farmers annually.

The development of a soil rot resistant variety would mean much to the sweet potato industry. Therefore all seedlings that are saved for further evaluation are planted in a field known to be thoroughly infested with the organism. To determine the degree of resistance in each seedling, notes are taken during the growing season on vine growth and rootlet rot. After harvest all roots are examined and notes taken on number and depth of lesions on each root.

Five varieties, 41 seedlings, and 6 introductions were planted

1 Cooperative test with E. J. Kantack and L. D. Newsom.
in this field plot. Notes were taken as to vine growth, and the following showed very good growth: Heartogold, 0-58, 1-13, 3-7, 3-47B, 3-151, 208792, and 208805. Seedlings and introductions having good vine growth were 3-2, 3-3, 3-26, 3-27, 3-32, 3-42, 3-45, 3-49, 3-77, 3-86, 3-93, 3-99, 3-101, 3-114, 3-128, 3-131, 3-147, 208314, and 208796. Seedlings 1-13 and 3-7 were outstanding in that they produced many roots that had few and shallow lesions. Both of these seedlings have Porto Rico type skin and good shape.

(c) Internal Cork—The practice of testing all parental lines and the most promising seedlings for resistance to internal cork is being continued. Re-evaluation of certain lines is being made. Seedlings from certain parental combinations are receiving emphasis as well as certain introductions. Much of this material has not been examined as yet.

Storage Studies

(a) Temperature and Varieties—The experimental work concerned with the ability of 4 varieties (Unit I, Goldrush, Earlyport, and Heartogold) to withstand prolonged storage at different temperatures was continued during 1954-55. The storage temperatures were 55° F., 60° F., and those of common storage. No control was exercised over the relative humidity in the storage rooms.

(1) Shrinkage—Five small-crate samples of each of the 4 varieties listed above were placed in each of the 55° F., 60° F., and common storage rooms and weighed at monthly intervals in order to determine their shrinkage rates. With each variety the shrinkage was much greater in common storage than in the 55° F. or 60° F. storage rooms. Such losses would be of considerable economic importance in a commercial sweet potato storage operation. It was noted that all samples shrank appreciably during curing, then tended to lose rather steadily during the middle of the storage period (December-May), and increased again in shrinkage rate toward the end of the storage period.

(2) Changes in the Components of the Roots—The effects of 55°F., 60°F., and common storage temperatures on the dry matter, B-carotene, total sugar, and ascorbic acid contents of the roots of the 4 varieties were also studied. The dry matter content of all varieties at each temperature tended to gradually decline after the first part of the storage period. Unit I was observed to maintain the highest dry matter content throughout the storage period. The other three varieties were somewhat inconsistent in dry matter content, with no clear cut indication as to which was highest for any significant length of time. The total sugar content increased in all varieties during the curing process and tended to continue to increase slowly in all varieties stored at 55°F. This trend was less noticeable for samples stored at 60°F., and those stored in com-

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mon storage remained fairly constant in sugar content throughout the test. No great differences were noted in the sugar contents of any of the varieties at a given temperature at any time. The carotene content of the Goldrash variety was highest in all cases, with the Heartogold variety ranking second. The storage temperature appeared to have little effect on the carotene content of any of the varieties. The carotene content tended to increase slightly early in the storage period at all temperatures in all varieties and to gradually decline thereafter to the end of the test. All of the varieties were about equal in ascorbic acid content at harvest time, but it appeared to decrease more rapidly during storage in the Earlyport and Heartogold varieties than in Unit I or Goldrash. All varieties gradually decreased in ascorbic acid content, however, regardless of storage temperature, but Unit I seemed to maintain its ascorbic acid level better than the other varieties. There seemed to be only minor differences in ascorbic acid content attributable to different storage temperatures.

After 8 months of storage all samples appeared to be still in fairly good condition; however, those from 55°F and 60°F storage were apparently in better condition than those from common storage.

(b) Fertilizer and Irrigation—In conjunction with a study dealing with the effects of irrigation and fertilizers on yield (reported last year) it was felt advisable to conduct storage tests on samples of the roots in order to determine the influence which the fertilizer-irrigation treatments might have on the keeping quality or nutritive components of the roots. Thus, samples were collected from the fertilizer-irrigation test at harvest time and analyzed for dry matter, carotene, and total sugar contents. Additional samples were cured and stored for 9 months at 55°F for analyses periodically during the storage period.

The different fertilizer treatments appeared to have little bearing on the dry matter content of the roots at any time during storage. However, the roots from the irrigated plots appeared to be slightly lower in dry matter in most cases than those from the non-irrigated plots. At harvest, the average dry matter content of roots from all fertilizer treatments receiving irrigation water was 21.72 per cent, while that from non-irrigated plots was 24.45 per cent. At the end of the storage period 9 months later, the irrigated potatoes had an average of 17.45 per cent dry matter, while those from the non-irrigated plots had 18.10 per cent.

The carotene content of the roots apparently was not affected by the fertilizer treatments. On the other hand, the carotene content was slightly lower in every case in the samples from the irrigated plots than in those from the non-irrigated plots. In most cases
a trend was evident for carotene to increase slightly early in the storage period and to gradually decline thereafter.

The total sugar content of the roots apparently was not affected either by the fertilizer or irrigation treatments. All samples tended to increase in sugar content early in the storage period and to maintain that level throughout the storage period.

**Culinary and Processing Studies**

(a) **Baking Test**—Baking tests were conducted on 4 varieties and 74 seedlings, 37 of which were 1954 seedlings. The factors evaluated were color, flavor, firmness, and fibrousness. These components were rated separately by a panel of tasters. A scoring system of 0 to 6 was used for each factor and then the evaluations were consolidated to obtain a final average rating. Seedlings 3-64, 3-77, 3-79, 3-93, 1-80, 4-72, and 4-93 were superior to the varieties Porto Rico and Goldrush, and several others were equal to these varieties in quality.

(b) **Pre-peeled and Packaged Sweet Potatoes**—Further work has been conducted on the problems involved in pre-peeling and packaging sweet potatoes and some of the questions have been answered. Commercial packers are becoming more and more interested in this product and small operators are packing pre-peeled sweet potatoes for institutional use.

(c) **Sweet Potato Chips**—This work is concerned primarily with methods of preparation and methods of storage of the chips. More specifically, the effects of different frying temperatures and lengths of frying time on chip quality are being studied, along with the effects of the use of different frying fats. Another factor under investigation is the influence of different curing and storage conditions of the roots upon the quality of the chips. The effects of preheating the roots prior to frying in order to increase their sugar content and improve chip texture are also important phases of this study, as well as the importance of the use of certain varieties for making sweet potato chips.

(d) **Frozen Sweet Potatoes**—The increasing demand for a high quality processed candied sweet potato that can be prepared for the table in a minimum amount of time has been partially met with frozen yams. Increasing interest by commercial packers in this phase of processing has resulted in more of our local packers going into freezing and consequently more interest in freezing the No. 2 sweet potatoes. Further work is in progress on the best method of freezing sweet potatoes.

Shallot Investigations

Breeding

The shallot breeding program is centered around a cross between the Nebuka onion and the true shallot. The Nebuka onion carries resistance to pink root and yellow dwarf, while the true shallot carries the desired plant type. A number of crosses have been made and attempts are now being made to backcross the hybrid to the true shallot in order to improve plant type. Progress in this program is being hampered by the fact that the hybrid shows a high degree of sterility.

As a great deal of emphasis is placed on pink root resistance in the shallot breeding program, a pink root infected plot is being established on the Ben Hur farm. When this plot is completely established, all new shallot seedlings will be tested for resistance to this disease.

Growers who have grown the two new varieties, Bayou Pearl and Wintergreen, report favorably on the Bayou Pearl. Although the Wintergreen is well adapted to the Baton Rouge area, it has not met with favor in other parts of the state.

Weed Control

Lately, there has been increasing interest in the possibility of using chemicals for weed control in shallots. In order to study this problem, a series of experiments was set up in various parts of the state. A number of chemicals were used, including those that have shown promise for weed control in onion fields in other parts of the country. Although several of these chemicals are quite effective in controlling the weeds present in Louisiana shallot fields, none of them can be safely recommended at the present time because of reduced shallot yields.—Donald Y. Perkins and E. C. Tims

Strawberry Investigations

Breeding

A spore suspension spray of the organisms that cause leaf scorch, Diplocarpon earliana, and leaf spot, Mycosphaerella fragariae, was applied to all strawberry seedlings in 1955. A uniform infection made it possible to discard all but 1,652 of 13,572 seedlings grown. This number was further reduced to 1,265 in the nursery row, as seedling clones that produced a small number of runner plants were discarded.

Preliminary yield data were taken on 82 selections from the previous year’s work and 15 selections and varieties were planted to a replicated yield trial. A number of selections produced a higher yield of marketable fruit than the named varieties. Selections 2-610, 3-378, 0-188, L 27, and 0-242 were among the high yielding selections.
Storage, shipping, organeoleptic, and freezing tests have shown that these selections merit further trials.

Selections L 27, 0-188, and 0-242 are in expanded grower-cooperation tests at various locations throughout the strawberry area. These expanded grower tests will determine grower and market acceptability and will determine if any of these selections should be named and introduced.

**Starter Solution Tests**

Experiments have been conducted for the past two years toward determining the feasibility of applying a starter solution to strawberry plants during the transplanting operation. These materials were composed of nitrogen, phosphorus, and potassium salts dissolved in water. The results from these tests have indicated consistently that the solution containing either nitrogen and phosphorus, or nitrogen, phosphorus, and potassium gave the greatest response in terms of increased early plant growth and increased yield of marketable fruit. It appears that strawberries, as well as several other crops commonly transplanted in Louisiana, might benefit from having a portion of their fertilizer requirement applied in the transplanting water.

**Quality Studies**

The quality studies consisted of analysis of standard varieties and promising seedlings for per cent dry matter, per cent soluble solids and total acidity, as well as freezing tests.

It was noted that several of the 1952 seedlings containing high soluble solids in previous tests were among the best selections this year. The 1953 seedlings showed higher soluble solids, higher brix-acid ratio, and other desirable characteristics than the average for previous years. This was probably due to the use of more desirable parental lines in the breeding program. It is apparent that this quality is consistent since two years' data show rather uniform readings throughout the harvesting season.

Several of the 1952 and 1953 selections were included in the freezing studies. It is worth noting that seedlings 2-163, 3-378, 3-302, and 3-1065 ranked higher in the organeoleptic tests than either the standard varieties or seedling 0-188. Seedling 0-242 looked very good in the freezing test this year, being slightly better than 0-188; however, both of these seedlings have ranked higher in quality than the standard varieties for four successive years. Seedling L 27 still appears to be too dark in color to be a high-ranking frozen strawberry.

—P. L. Hawthorne, L. G. Jones, W. A. Sistrunk, W. F. Wilson, Jr., N. L. Horn,* and Julian C. Miller

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*N. L. Horn, Department of Plant Pathology.
Tomato Breeding and Variety Trials

The breeding program consists of obtaining lines that are adaptable to southern conditions, produce high yield of globe-shaped red fruit, and are resistant to certain diseases. Emphasis is being placed on varieties resistant to fusarium wilt, gray leaf spot, and fruit cracking. Most of the material is still segregating for these characteristics; however, five lines showed no cracking and ten lines appeared to be resistant to wilt.

In cooperation with the U.S. Regional Vegetable Breeding Laboratory, 9 lines were included in a yield test and 28 lines in an observation test. Four of the lines tested performed well under Louisiana conditions.

Variety trials were conducted at several locations in the state. Those which performed well are Van Cross, Moreton’s Hybrid, Rutgers, and Jefferson. Van Cross is an early, high yielding, red-fruited variety. Jefferson is a late variety and good for home gardens. It also has some resistance to fusarium wilt.

—John J. Mikell, James F. Fontenot, and E. C. Tims*

Camellia Investigations

Depth of Planting Experiment

It has been generally believed that depth of planting camellia plants will have a great deal to do with whether they will live or not. On heavy soils where drainage is not good, plants are often set on top of the ground and soil mounded up around them. To get information on depth of planting, the following treatments were used: plant set on surface and mounded around, ½ of ball above the surface, top of the ball at surface level, one inch below the surface, two inches below the surface, and four inches below. Two varieties, Pink Perfection and Debutante, were used. Three replications were used with one plant of each variety and each treatment per replication. Plants were set two feet apart on a slightly ridged 10-foot row. The area was well drained. Under the conditions of this experiment the plants grew well regardless of depth of planting. This means that where there is good drainage the depth of planting is not as important a factor as it has often been thought to be. Deeper planting where unfavorable drainage conditions exist probably makes the plant more susceptible to root rot.

Soil pH Studies

Camellia plants are in general believed to thrive better on relatively acid soil. To get additional information on this subject and to determine the effects of several acidifying materials, an experi-

* E. C. Tims, Department of Plant Pathology.
ment was set up using small plots in the lath house. The following materials were used: aluminum sulphate, ammonium sulphate, zinc sulphate, phosphoric acid, and lime. The materials were applied at two rates, with the larger one being considered a very heavy rate. Over a period of four years there was a soil pH range of 3.1 on plots receiving ½ pound sulphur per square yard to 7.8 on plots receiving ½ pound of hydrated lime per square yard. Soil pH on check plots varied from 6.0 to 6.6. Good growth was obtained on all plots with the exception of those that received 1 pound of ammonium sulphate per square yard, where plants were killed or badly injured. There was no damage to plants on plots that received 1 pound of aluminum sulphate per square yard. Plants on the check plot made good growth. The results obtained show that when the plants got sufficient nutrients from the soil to make good growth the soil pH was of itself of no great importance. These results were published in the 1955 Proceedings of the American Society for Horticultural Science, Volume 55.

Mulch Experiment

The mulch experiment, conducted for five years, has been discontinued. All of the mulch materials, with the exception of vermiculite, proved satisfactory. Mulches that tend to pack, such as peat moss and the sawdusts, are not as satisfactory as looser type mulch materials, because where they are used plant roots tend to grow above the surface of the soil and water may even be shed from the surface of the mulch. It is believed that pine straw is the best mulch material if it is available.

Roses

The rose occupies a unique place in the ornamental field, retaining first place in popularity over other ornamental plants year after year.

During the past seven years over 100 hybrid tea varieties have been tested at the Experiment Station, several floribunda varieties, and a few grandiflora types. Recommended varieties can be found in Bulletin No. 451, revised in June 1955. Golden Masterpiece and Buccaneer are two relatively new yellow varieties that are doing exceptionally well.

Fertilizer tests are still being conducted, and plants growing in manure plots are still producing well. Plants growing in the check plots have been showing a nitrogen deficiency for some time.

In a propagation trial testing own-rooted versus plants budded on different rootstocks, the following varieties have done well for four years on their own roots: Peace, Mirandy, Nocturne, Charlotte Armstrong, Red Radiance, Eclipse, Countess Vandal, Etoile de Hol-
lande, and Crimson Glory. No real difference has been noted in the budded plants no matter which rootstock was used.

**Gladiolus Investigations**

**Breeding**

The breeding work with gladiolus has been continued. Each year more crosses are made and new seedlings grown. Many promising seedlings have been produced. Great difficulty is still being encountered in trying to increase selected seedlings because of diseases. For the past two years plantings have been made at the DeRidder Experiment Station, but that did not solve the problem. It may be that selected seedlings will have to be increased in some commercial corm growing area.

**Fertilizer**

For the past two years a fertilizer experiment has been conducted with gladiolus. Two varieties were used each year. Under the conditions of this experiment very little benefit has been obtained from the fertilizer applied. No. 1 corms were used and water relations seemed more important than fertilizer. On poor soil different results would likely be obtained.

**Variety Test**

A variety test to determine the adaptability, especially of new kinds, to this area has been continued. Each year several new varieties are included in the trials. In general early and medium early varieties have been more successful than later ones. Varieties of gladiolus come and go rather rapidly because of susceptibility to diseases, especially fusarium. The following varieties that were not listed when the last report on gladiolus was made seem promising: Ace of Spades, Ben J. Britton, Dark David, Friendship, Fort Knox, LaValle, Lief Ericsson, Mother Fisher, New York, Pink Chiffon, Snow Clad, and The Rajah. When varieties are first introduced, they are quite high in price, but if they are any good and propagate easily, the price falls rapidly.

—W. D. Kimbrough, R. H. Hanchey, and LeMoyne Hogan

**Figs**

Viable seeds were obtained from 14 crosses made in the 1955 blooming season. Varieties used included Celeste, Swann Celeste, Hunt, Florentine, Green Ischia, and Smyrna x Mission as female parents. Three male parents were used; pollen was obtained from one Capri fig tree in the LSU orchard and was imported from California in two cases. The F₁ seedlings are being grown in the
greenhouse during the winter and will be planted in field rows this spring. Some should fruit during 1956.

A nursery was established in the spring of 1955 for increase of the main local varieties for outfield planting. Several thousand plants of seven varieties are now available for transplanting into experimental orchards.

Preliminary tests of several materials were made in attempts to prolong storage life of fresh fig fruits. Samples of treated fruit were canned for later quality testing. Several materials show promise and will be tested further.

—E. N. O'Rourke, Jr., Julian C. Miller, and William A. Sistrunk

**Pears**

Approximately 500 plants including 70 varieties and species of pears were grown during 1955 for planting in orchards as a source of parental material for the breeding program. These varieties represent a collection of types with inherent resistance to fire blight.

Crosses made during 1955 in the orchard at LSU resulted in viable seed from 15 combinations. These will be grown in beds and inoculated with fire blight for determination of inherent resistance. The resistant seedlings will be planted in the field for further study.—E. N. O'Rourke, Jr., and Julian C. Miller

**Tung**

Low temperatures in April 1954 greatly reduced the crop in the experimental tung planting at Franklinton, Louisiana. Estimates of the crop indicated varietal differences in resistance to crop loss due to spring freezes. Seedling trees of the clones F 554 and L 128 showed apparent resistance and appear worthy of further observation in this regard. In general, seedling trees appeared more resistant to such injury than did budded trees, this being probably due to later blooming of seedling trees.

Ratings of cold injury to branches of trees in the planting showed varietal differences in degree of damage suffered. This injury appears to be partly due to the stage of growth at the time low temperatures occur, and partly due to inherent hardiness of the tissues.

—E. N. O'Rourke, Jr., L. G. Jones, H. D. Ellzey, Jr., and S. G. Merrill (U.S.D.A.)
Plant Pathology

Chemical Weed Control in Sugar Cane

The effects of several chemicals and combinations of chemicals on weed and grass control and yields of plant and stubble cane were studied in 1955. The new materials studied were Dalapon, amino triazole, American Cyanamid’s 6249, and different formulations of 2, 4, 5-T-proprionic acid. All of the chemicals, combinations of chemicals, and different rates per acre showed some promise of either grass control or increased yields of sugar cane. None of the treatments were superior to the T. C. A. and 2, 4-D combinations, the recommendations for the past five years, in both weed control and yields of sugar cane in plant and stubble cane.

A survey was made to determine the acreage of sugar cane in Louisiana treated with chemicals for weed and grass control during 1955. This survey was conducted with the cooperation of the county agents in the 18 sugar cane-producing parishes of Louisiana. The results of the survey showed that on 45.8 per cent of the total acreage a complete (recommendations of L.S.U. Agricultural Experiment Station) chemical grass and weed control program was carried out and 28 per cent of the acreage was sprayed with 2, 4-D alone for weed control. A total of 73.8 per cent of the sugar cane acreage was sprayed with chemicals as herbicides for weed and grass control in 1955.—Ernest R. Stamper

Reaction of Some Sugar Cane Seedlings to Mosaic Inoculations

In the fall of 1955 about 42,139 young sugar cane seedlings from Grand Isle, Louisiana, and Canal Point, Florida, were inoculated with sugar cane mosaic. During the season they were examined to determine amount of infection. Of the 110 crosses tested in this way there was an infection ranging from 1.6 to 78.9 per cent, averaging 27.3 and 31.9 per cent for Louisiana and Florida seedlings respectively.

—P. J. Mills, P. J. Dunckelman, and S. J. P. Chilton

Reaction of Some Sugar Cane Varieties to Red Rot

During the past season a number of sugar cane seedlings were tested for resistance to red rot. The stalks were inoculated with the red rot fungus, planted in the field, and taken up at intervals during the winter to determine the amount of injury. Of the 38
Flowering and Production of Seed of Sugar Cane at Baton Rouge

The controlled flowering of sugar cane was successful at Baton Rouge, Louisiana, in 1953 and 1954. In further work in 1955, 41 varieties were induced to set flowers by controlling the photoperiod. This makes a total of 48 varieties which have been induced to set flowers in the last three years. There seems little doubt that the flowering of many sugar cane varieties is due to the response to photoperiod.

Seed for approximately 40,000 seedlings was produced at Baton Rouge, Louisiana, from the above flowers.

S. J. P. Chilton, E. D. Paliatseas, and E. R. Barrett

Control of the Ratoon Stunting Disease of Sugar Cane by the Use of Heat Treatment

Studies have been made during the past two years to determine the temperature and length of time necessary to treat sugar cane seed pieces to effectively control the stunting disease and yet not seriously reduce germination in the spring. Preliminary studies conducted in the greenhouse and in the field in 1953 indicated that a hot-air treatment of 54° C. for 8 hours would be safe to use.

Several experiments conducted in 1955 were designed to study how effective different heat treatments are in eliminating the virus from the stalk. In one test, variety C. P. 44-101 known to be 100 per cent diseased received hot-air treatments of 50° C. for 8 hours, 52° C. for 8 hours, and 54° C. for 4, 6, and 8 hours. The air temperature used for any particular treatment, except the treatments 54°C. for 4 and 6 hours, was set so as to give the desired temperature in the cane stalk for at least the last two hours of the run. After the various treatments were completed the cane was planted for comparison with cane free of the disease, cane free of the disease but inoculated with juice from diseased cane, and diseased cane. Weights taken of the various treatments in the plant cane showed that all heat treatments gave a significant increase in yield over the diseased check. Increases in yield varied from 9.3 tons for cane treated at 54° C. for 4 hours, to 17.6 tons for cane treated at 50° C. for 8 hours.

Results of heat treatment studies completed in 1955 indicate that a hot-air treatment is still the safest to use in controlling the stunting disease of sugar cane in Louisiana. It was also found that
the treatment now being used (54° C. for 8 hours) will not completely eliminate the virus from the stalk if the cane to be treated is 100 per cent diseased. However, because an improvement in yield and a reduction in the amount of infection may be expected from this treatment, it might be advisable to continue using the treatment and retreat the same cane for a few years until complete control of the disease is realized.

—R. J. Steib, L. Farrar, and S. J. P. Chilton

Chemical Weed Control in Cotton

In 1955 several new experimental chemicals were evaluated as possible herbicides for cotton. Greenhouse and field screenings indicated one new chemical, Geigy 444 (2-chloro-4,6-bis(dielhylamino)-S-Triazine) may be of value as a pre-emergence herbicide. This chemical compared very favorably with CIPC both in terms of weed control and length of residual action.

Extensive field studies were conducted during the year to determine the value of CIPC and Karmex DL as practical cultural tools. The results of these studies show that when environmental conditions are present which result in minimum weed populations, the use of presently available chemicals does not result in any substantial saving of hand labor. However, under conditions that result in moderate to heavy weed infestations the chemicals greatly reduce hand labor. Similarly, over quite a wide range of rates of chemicals, the hand labor requirements are independent of the rates. Thus, the use of chemicals appears to stabilize the hand labor requirements from year to year.

Studies were also carried out to determine if post lay-by sprays for weed control would be of practical value. Both Dalapon and Karmex DL significantly reduced the number of late season weeds; however, they did not cause an appreciable reduction in trash content of machine harvested cotton. Studies of this type will be continued.


Cotton Defoliation

Several new classes of chemical compounds were field tested as defoliants during 1955; however, none was superior to the commercially available ones. Amino triazole was evaluated as a second growth inhibitor on both average and rank cotton. On average size cotton it caused from 65 to 85 per cent reduction in regrowth for a period of one month. On the other hand, in rank cotton regrowth was suppressed for only about two weeks. This chemical was also
effective as a defoliant, causing about as much leaf shed as the recommended defoliants.

Studies were also conducted on bottom defoliation. In moderately rank cotton good removal of lower leaves was obtained; however, on very rank cotton it was not possible to properly apply the defoliants. It appeared that the defoliation machine caused as much damage to rank cotton as was caused by boll rot.

—W. K. Porter, Jr., and C. H. Thomas

Weed Control in Rice

Of the 15 chemicals tested in 1955 as pre-emergence treatments for the control of grasses, only CIPC gave satisfactory results. This chemical has consistently given excellent grass control during the last three years; however, in several tests this year there was considerable rice injury. This injury seemed to be associated with a leaching of the CIPC down into the zone where the rice was germinating. In greenhouse studies it was found that this injury could be avoided by deeper planting, about 1½ inches. In fields where the stand was not reduced too greatly there were yield increases ranging from 23 to 83 per cent depending upon the grass infestation in the checks. Continued studies will be made on this chemical in 1956.

Only 3 of the 11 chemicals tested as post-emergence treatments for grass control showed any promise. CIPC, TCA, and 6249 showed some promise as a post-emergence treatment if applied when the grass was very young (about 10 days old) but on older grass they gave insufficient control.

Much of this work was conducted with the cooperation of the staff of the Rice Experiment Station.—John B. Baker

Studies on the Control of Nutgrass (Cyperus Rotundus)

For several years experiments have been conducted in Louisiana on nutgrass control (Cyperus rotundus). Field data and observations have shown that plowing in summer 4 to 6 times at three-week intervals breaks the nutgrass tubers apart and aligns them in position for germination. After the tubers germinate following the last plowing, 2,4-D at 3 pounds acid per acre has given a high level of control of the germinated tubers. Tubers that were not germinated at the time of the 2,4-D application were not affected.

Studies were made in 1955 on the number of tubers in heavily infested soil. These studies showed an average of 3 million tubers per acre, with a total weight of 1.5 tons per acre in the top three inches of soil. There was no difference in counts made in cultivated and non-cultivated areas.
Sprouting of whole tubers, apical halves, and basal halves was compared. There was a significant difference in the germination of basal halves when compared to whole tubers. There was no significant difference between the germination of basal halves and apical halves, nor between whole tubers and apical halves. Tubers cut into quarters germinated but the resulting growth was weakened. Tubers cut into pieces smaller than 1/4 did not germinate.

These studies showed that when the moisture content of tubers is reduced, germination is also reduced. If the moisture content of the tubers is dropped below 20 per cent very few of the tubers germinate.

Several chemicals and combinations of chemicals were used with and without plowing after application. These studies indicate that amino triazole (3-Amino-1,2,4-triazole) has promise of controlling a high percentage of nutgrass tubers when sprayed on the foliage of nutgrass and certain cultivation practices are followed.  

—Ernest R. Stamper and Garland Melville

**Varietal Reaction of Sweet Potatoes to Soil Rot**

Sweet potato seedlings and varieties have been observed in soil rot infested soil in different varietal comparison tests over a period of years. In 1955 the following were planted in a carefully controlled experiment in soil rot infested soil in the Sunset community, for the purpose of comparing varietal reaction to the disease: Unit 1 Porto Rico, Goldrush, Earlyport, Allgold, Heartgold, and seedling La-1-13. Vine growth of Allgold, Heartgold, and La-1-13 was superior to that of the other varieties. Yields in bushels per acre of U.S. No. 1 potatoes for the above varieties were: 11, 23, 22, 19, 73, and 53 respectively. Total yields including culls were 75, 169, 93, 161, 236, and 195 respectively. Severe soil rot lesions were found on certain roots of all varieties. In spite of this, Heartgold and La-1-13 produced significantly greater yields of U.S. No. 1 roots than the other varieties. However, the yield of U.S. No. 1 roots was far below normal for those 2 varieties in disease-free soil. 

—W. J. Martin, J. J. Mikell,* and James Fontenot*

**New Sweet Potato Mother "Seed" Treatment**

For many years sweet potato growers have wanted a seed treatment chemical with the fungicidal effectiveness of the mercurials against the black rot fungus, but without the high toxicity of the mercurials to human beings and farm animals. Results of several years' work at L.S.U. and in cooperation with several

*Department of Horticulture.

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growers, have yielded the desired fungicide, Vancide 51 (a water solution of the sodium salts of dimethyl dithiocarbamic acid and 2-mercaptobenzothiazole). Recommendations for treating sweet potatoes follow: Carefully remove all defective roots and dip the selected seed potatoes in a 2 per cent water solution of Vancide 51 (1 gallon of Vancide 51 made up to 50 gallons with water). Keep the roots in the solution long enough to wet them thoroughly. Allow roots to dry or bed them immediately after dipping. When
about ½ of the original solution has been used, discard it. Make a
new solution for treating other potatoes.—W. J. Martin

Internal Cork of Sweet Potatoes

Internal cork has increased to the point of causing serious losses
to sweet potato growers in the commercial-growing areas of south-
west Louisiana.

The recommended control measure is the planting of cork-free
seed potatoes. The disease spreads rapidly, by yet unknown means,
when infected plants and cork-free plants are grown side by side,
but spread is lessened as the distance increases between cork-free
and cork-infected plants. Cork-free plants grown only 300 feet
distant from heavily diseased plants became only slightly infected
in 1955.

Attempts to eliminate the internal cork virus from infected
sweet potatoes by heat treatment, tip cuttings, etc. have not been
successful to date.

At least one breeding line, HM-15 (developed at the U.S.D.A.
Horticultural Field Station at Meridian, Mississippi), seems to be
highly resistant to the virus. HM-15 did not become infected even
when grafted on virus-infected plants.

Promising seedlings from the L.S.U. breeding project are
being tested annually for their reaction to internal cork by graft-
 inoculation.—W. J. Martin

Control of Sclerotial Blight, Nematodes, and Weeds
in Sweet Potato Plant Beds

Sweet potato plants grown in hot-water-heated or electrically-
heated beds often are heavily damaged by Sclerotial blight, caused
by the soil-borne fungus Sclerotium rolfsii, as well as by root-knot
nematodes and weeds. Experiments made since 1952 indicate that
very effective control of these pests can be obtained by fumigating
the entire bed and bedding soil with Dowfume MC-2 under gas-
proof covers, and then bedding disease-free and nematode-free
sweet potatoes in this treated soil. In attempts to obtain other con-
control methods which might be more attractive to growers, a new
chemical, called Vapam (formerly Stauffer N-869), was used in
two experiments in 1954. Applied at the rate of 2 quarts per 100
square feet, sprayed in the beds five weeks before bedding, Vapam
gave excellent control of nematodes and Bermuda grass. Effectiv-
ness of the treatment on Sclerotial blight was not determined defi-
nitely. Large-scale experiments comparing Vapam with Dowfume
MC-2 are under way in 1956.—W. J. Martin
Differences in Varietal Reaction to White Rust in Sweet Potatoes

The early part of the 1955 growing season in southwest Louisiana was exceptionally wet and favored development of white rust (caused by the fungus *Albugo ipomoeae-panduranae* (Schw.) Sw.), usually considered a minor disease of sweet potatoes. In August 1955 rather severe defoliation due to white rust was noted on seedlings La-1-13 and other seedlings in two field experiments planted at Grand Coteau and Sunset for comparing varieties and seedlings as to yield and other characteristics. Notes were made on each plot in these four-replicated experiments, using a scale ranging from 0, indicating no disease, to 4, indicating severe disease. Highly significant differences in reaction to white rust were found among varieties and seedlings in these experiments. Average ratings for Unit 1 Porto Rico, Goldrush, Earlyport, and Allgold were: 1.75, 2.00, 2.75, and 1.75 respectively. Average ratings of 4.00 were given the following Louisiana seedlings: 1-13, 1-86, 1-183, 1-234, 3-36. Average ratings for Louisiana seedlings 1-28, 1-57, 1-80, 1-231, and 3-7 were: 3.75, 3.25, 2.75, 2.00, and 2.00 respectively. As
far as the writer knows, this is the first record of such great differences in varietal reaction to white rust in sweet potatoes.

—W. J. Martin

**Methyl Bromide Fumigation of Bell Pepper Seedbeds for Controlling Damping-Off**

Damping-off, caused principally by *Rhizoctonia solani* Kühn, may be very destructive in bell pepper seedbeds in south Louisiana in January-February. Experiments made since 1952 have shown that very effective control of damping-off in seedbeds can be obtained by fumigating the entire bed and covering soil with Dowfume MC-2 under gas-proof covers. One pound of MC-2 per 100 square feet has resulted in striking control of weeds, as well as damping-off.—W. J. Martin, N. L. Horn, and John A. Cox

**Onion Pink Root on Some Other Plants in Louisiana**

Pink root is known to occur on onion, shallot, and garlic in Louisiana. A fungus similar to the one causing this disease has been found on the roots of a number of other plants in the state, including sugar cane, cotton, corn, and rice. But no tests have been reported to determine whether the fungus from these hosts will attack onion or shallot. Beginning in 1953 efforts were made to isolate this fungus from the roots of a number of plants commonly found in shallot and onion fields. The pink root fungus was isolated from roots of several weeds and grasses, as well as corn, soybean, and tomato, growing in soils known to be infested with the disease. There was no pink discoloration or other typical lesion on the roots of these plants. The cultures of the pink root fungus, *Pyrenocheata terrestris*, obtained from roots of corn, soybean, tomato, pigweed (*Amaranthus retroflexus*), crab grass (*Digitaria sanguinalis*), crow-foot grass (*Eleusine indica*), and jungle rice (*Echinochloa colona*) were typical of those isolated from onion and shallot. Texas grano onion seedlings were inoculated with one or more cultures from each of the above mentioned kinds of plants. In all the tests typical pink root symptoms were observed, similar in every respect to those obtained with pink root cultures from onion and shallot. These results indicate that a number of crop plants as well as some grasses and weeds may serve as hosts for the pink root fungus in the absence of cultivated Alliums.—E. C. Tims

**Fungicides for Control of Camellia Dieback**

Previous studies had shown (1) that dieback and canker of camellias is caused by *Glomerella cingulata* and (2) that infection
occurs primarily through the scars of naturally abscising leaves. These findings suggested the possibility of control by spraying with a suitable fungicide just before and during the relatively short period of leaf fall in late winter and early spring.

In laboratory screening tests, Ferbam and Captan inhibited spore germination completely at as low a concentration as 1 p.p.m. Bordeaux mixture also inhibited spore germination but at a much higher concentration than the organic fungicides.

Bordeaux, 4-4-50, and Captan, 3 lb./100, were tested on camellia plants. In one series of tests, the leaves subtending lateral shoots were removed, the fungicide applied and allowed to dry, then the plants were inoculated with a conidial suspension. The per cent infection (ave. of several replications on 4 varieties) was 81.9, 47.3, and 28.5 for check, Captan, and Bordeaux respectively. In another series, the fungicides were first applied and allowed to dry, then the leaves were removed and the plants were inoculated. The per cent infection (ave. of several replications) was 69.3, 34.5, and 16.2 for the check, Captan, and Bordeaux respectively. In both cases the plants were kept moist by subjecting them to natural or artificial rain for several days following inoculation. In all tests on plants, better protection was obtained with Bordeaux than with Captan.

—Louis Anzalone and A. G. Plakidas

The Use of Fungicides in Camellia Grafting

Tests on the use of fungicides in grafting operations were started in 1954. In that year, Captan and Ferbam, both at the rate of 3 lb./100 gallons of water, were used to dip the scions and grafting tools and to wet the rootstock stump. The object of these tests was to determine whether or not the fungicides would prevent the dieback of scions and thus increase the per cent of successful grafts. Striking differences in favor of the fungicide treated grafts were obtained (See La. Agr. Exp. Sta. Ann. Rept. for 1953-54: p. 140. 1955). In the 1954 tests, potted plants in a greenhouse were used.

The same two organic fungicides, Captan and Ferbam, and also 4-4-50 Bordeaux mixture, were used in the 1955 tests. Two camellia varieties, Adolphe Audusson and Donckelari, were used as scions, and both were grafted on Texas Star sasanqua rootstock outdoors in a commercial nursery. In the 1955 tests, the “take” for Audusson was: check, 82.0 per cent; Ferbam, 63.9 per cent; Captan, 92.1 per cent; Bordeaux, 50.0 per cent; and for Donckelari: check, 80.0 per cent; Ferbam, 97.1 per cent; Captan, 83.8 per cent; Bordeaux, 50.0 per cent. Bordeaux toxicity is indicated.

—Louis Anzalone and L. W. Baxter

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Anthracnose of Azalea

An apparently new disease appeared in epidemic form in several nurseries in southeast Louisiana in the summer of 1954 and again in 1955. The disease is characterized by numerous brown spots on the foliage of both the Indian and Kurume types of azalea. Affected leaves abscise, resulting in severe defoliation. Defoliated plants are not salable. Some of the affected nurseries suffered severe losses.

Our studies have shown that this disease is caused by a Colletotrichum. The fungus has been repeatedly isolated from the leaf lesions of both Indian and Kurume azaleas, and the disease in its typical form has been reproduced by inoculations with pure cultures of this fungus.

The only reference to Colletotrichum on azalea is a note by Ellis and Everhart ("New species of fungi," Bul. Tor. Bot. Club XXII: 434-440. 1895) listing C. azaleae among their collections from Florida. The factor responsible for the sudden and severe outbreak of this disease in Louisiana has not been ascertained. It is possible that a race of the fungus particularly pathogenic to azaleas has appeared. It has not been determined whether or not the Louisiana fungus is identical with that briefly described by Ellis and Everhart. Fungicidal sprays, both copper and organic, have given satisfactory control.—P. D. Stathis and A. G. Plakidas

Pathogenicity Studies with Various Colletotrichums from Lilies

This is a summary of three years’ study on the pathogenicity (ability to cause typical “black scale” symptoms on lily bulbs) of various Colletotrichums isolated from lilies. The following isolates were used in these tests:

1. Colletotrichum lilii Plak., isolated from Easter lily bulbs with typical symptoms of black scale, from Louisiana.

2. C. liliacearum (Schw.), from dead leaves of Iris, from Washington, D. C.
3. Isolates presumably of *C. liliacearum* (Schw.) isolated from dead flower stocks of daylily, from two separate localities, Bethlehem, Pa., and Hammond, La.

4. Two separate isolates of a *Colletotrichum* associated with anthracnose of Croft lilies in Oregon.

5. Several isolates of *Colletotrichums* isolated from imported oriental lily bulbs intercepted by the Federal quarantine inspectors. These were isolated from 7 different species of *Lilium*.

**Results**

Of all the isolates tested only *C. lilii* Plak. proved pathogenic. It caused typical black scale symptoms on bulbs of the Creole, Croft, Estate, and Georgia varieties of Easter lily (*L. longiflorum*), *L. umbellatum*, *L. pumilum*, *L. martagon* var. *album*, and *L. dauricum* var. *sanguenium*.

The following species proved non-susceptible to infection by *C. lilii* Plak.: *L. speciosum* var. *rubrum*, *L. speciosum* var. *album*, *L. concolor*, *L. amabile*, *L. candidum*, *L. regale*, *L. henryi*, *L. callosum*, *L. cernuum*, *L. davidii*, and *L. formosanum*.

All the lily *Colletotrichums* studied appear alike. It was found impossible to separate them on morphological characters such as shape or size of conidia. There were some cultural differences. In general, the growth rate of the colonies of the non-pathogenic isolates was greater than that of the pathogenic ones.

—E. K. Sobers and A. G. Plakidas

**Studies on the Purple Stain Disease of Soybean**

The purple stain disease of soybean incited by *Cercospora kikuchii* produces, as the common name suggests, a purple discoloration of infected seed. Experiments were conducted to determine whether or not this criterion could be used to detect the amount of diseased seed in a given seedlot. The soybean varieties Lee, Roanoke, Ogden, S-100, and Dorman were obtained from five stations throughout the soybean growing areas of the South. The data obtained from 1954 seed indicated that there was no correlation between the incidence of purple stain on the seed and that of disease development. The seed crop for 1955 will also be tested. The results of this study indicate that seed free of purple discoloration are not necessarily free of the fungus.

The causal fungus of the purple stain disease was readily recovered when infected seed were plated on suitable culture media and infection was readily established in the resulting seedlings. Where the per cent of infection was high in plated seedlings of a given seedlot, less than 1 per cent was observed in plants grown
in the greenhouse from the same lot of seed. Tests are now in progress to determine to what extent humidity is the factor responsible for the differences observed.

—M. M. Kulik and G. D. Lindberg

Studies on the Kernel Smut of Rice Caused by Neovossia Horrida

The importance of the kernel smut of rice in Louisiana has paralleled the development and increased use of long grain rice varieties. To meet the threat of this disease, studies of the causal fungus and the host-fungus relationships are underway.

The genetics of the fungus are being studied by isolating individually the primary sporidia that develop from germinating chlamydomospores. Excellent germination of primary sporidia has been accomplished and the individual isolates have been paired in all possible combinations to determine compatibility lines. A more satisfactory method of artificially infecting rice is being studied in order to determine compatible lines as well as to screen rice varieties for resistance.

Laboratory phases of this investigation include a critical study of the nutrition of the fungus in culture. Preliminary results indicate that the fungus has been induced to complete its life cycle in culture, a phenomenon relatively uncommon with this group of fungi.—Dorothy Harper and G. D. Lindberg

Strawberry Fungicide Tests

During a three-year period about 140 different chemicals were screened in the laboratory for possible effectiveness against the gray mold (Botrytis cinerea) rot of strawberries. The materials included organic and inorganic fungicides and also some of the antibiotics. Greater prevention of fruit rot resulted from the use of some of the organic mercury compounds, such as N-phenylmercuriethylenediamine and phenylmercurydithiocarbamate. Captan was considerably less effective than the mercury compounds. However, less than 45 per cent of the Captan treated berries rotted compared to nearly 100 per cent of the inoculated control berries. It is appreciated that the organic mercurials are poisonous and unsafe to use close to harvesting, but it is believed that they can be used early in the season, prior to fruiting, to keep down inoculum build-up. Captan, which is non-poisonous, could then be used just prior to, and even during, the harvesting.—N. L. Horn
Strawberry Nematode Studies

Field tests comparing the yields of strawberry plants grown in ethylene dibromide treated soils with those of plants grown in untreated soils were made during the past three years. Yields were significantly higher in the treated soils where the root-knot nematode was controlled. Soils infested with a variety of other plant parasitic forms, exclusive of root-knot, failed to show yield responses by the fumigation even though the plant parasitic forms were greatly reduced or eliminated by the treatment. Control of all the plant parasitic nematodes concerned was obtained by fumigation with 2 gallons of Dowfume W-85 per acre in the row. With our present information, in Louisiana soil fumigation in strawberry soils should be recommended only when root-knot is a problem.

—N. L. Horn, W. J. Martin, W. F. Wilson, Jr., and M. J. Giamalva

New Nematocide Effective in Controlling Wilt-Nematode Damage in Cotton

Nemagon (1, 2 dibromo-3-chloropropane), a new nematocide previously tested as Shell OS-1897, gave good control of the cotton wilt-nematode disease in several field tests in 1954 and 1955. One-half to 1 gallon per acre applied in the row 2-4 weeks before planting gave control comparable to that obtained by recommended rates of DD-mixture and ethylene dibromide. In limited tests one-half gallon per acre applied 9 inches deep in the row at planting time was effective. A toxic reaction, resulting in stunted plants, was evident when 2 gallons per acre were applied in the row at planting time. A granular formulation applied at about 20 pounds of active chemical per acre also gave good control.

—W. J. Martin and L. D. Newsom*

Cultural Studies on Plant Nematodes

It is difficult to measure the damage which certain nematodes cause to crop plants because large numbers of nematodes cannot be obtained at any given time for experimental studies. The reason is that nematodes cannot be grown in the laboratory as can many other microbes which cause plant diseases. For the first time, one species of an important group of plant nematodes—the so-called spear nematodes—has been maintained in the laboratory. It reproduces rapidly in glass containers by feeding on a filamentous fungus. Since large numbers of this nematode can be obtained at will,

* Department of Entomology.
it will be a useful laboratory animal for additional studies on the significance of plant nematodes in Louisiana agriculture.

—John P. Hollis and Max J. Fielding

Responses of Corn and Rice to Soil Fumigation for Control of Parasitic Nematodes

Field plots of important crop plants were established in different areas of Louisiana to ascertain the effects of soil fumigation for control of parasitic nematodes. Those plots planted to corn and rice are reported on here. The fumigants used were Shell D-D, ethylene dibromide (Dowfume W-85), Nemagon, and methyl bromide (Dowfume MC-2). At Homer corn yielded an average of 68 bushels per acre in the fumigated plots as compared with 25 bushels in the untreated check. In a similar experiment carried out at Curtis, corn yields from the fumigated plots averaged 88 bushels per acre, while those from the untreated checks were 68 bushels. There were marked differences in stover weights at Homer but none at Curtis.

The experiments on rice conducted at Ragley and Crowley, La., gave inconclusive results. In both cases the plants in the fumigated plots were much greener, the stands were denser, and the height was greater than in the check plots. At harvest time straw yields were twice as great in the fumigated plots as in the untreated checks. No significant difference, however, was found in the actual grain produced on the treated and untreated plots.

—M. J. Fielding and John P. Hollis

New Records of Plant Parasitic Nematodes in Louisiana

Since 1950 members of the Department of Plant Pathology have listed the new plant parasitic nematodes found in Louisiana each year in the Annual Report, Louisiana Agricultural Experiment Station, where additional information can be found on parasitic and suspected parasitic nematodes found in Louisiana. During 1955 the following parasitic nematodes not previously reported were found in Louisiana:

*Meloidogyne incognita acrita* Chitwood 1949\(^1\) from sugar cane roots, Paincourtville, Louisiana.

*Heterodera* sp. from soil about the roots of white Dutch clover, Robson, La.

*Pratylenchus scribneri* Steiner 1943 from the roots of cotton, Nat-

\(^1\) A new host record for Louisiana.
chitoches, La., and soil about the roots of sweet potatoes, St. Francisville, La.

*Dolichodorus heterocephalus* Cobb 1914 from soil about the roots of pecans, Grand Isle, Louisiana.

*Xiphinema index* Thorne and Allen 1950 from soil about the roots of figs, Grand Isle, Louisiana.

*Pratylenchus penetrans* Cobb 1917 from about the roots of bell pepper, Hester, Louisiana.

—*Max J. Fielding, John P. Hollis and W. J. Martin*

**Studies on the Population Dynamics of Plant Nematodes**

The build-up of nematode populations on crop plants is controlled primarily by the rate of reproduction of the nematodes. It is well known that some nematodes reproduce rapidly while others reproduce slowly. By measuring the length of the ovary in 240 different species of plant nematodes it was found they could be separated into three groups based on the ovary lengths. Nematodes with long ovaries were found to reproduce rapidly and those with short ovaries slowly. Those with intermediate ovary lengths fell between the two extreme groups in rate of reproduction. Nematode populations in soil can be determined both experimentally and theoretically. The theoretical number of nematodes increasing on an individual plant was obtained by expansion of the binomial formula \((a + x)^n\), where \(a\) = initial number of nematodes, \(x\) = number of eggs laid per generation and \(n\) = number of generations. When numbers obtained from this formula are compared with numbers obtained experimentally by actual counts, it is possible to derive an *Environmental Resistance Factor*. By comparing this factor with different stages of plant growth under experimental conditions, one can determine when the plant is most susceptible to the action of the nematodes. Such studies enable us to understand better the ways in which nematodes attack crop plants.

—*John P. Hollis and Max J. Fielding*

**The Effect of Chemicals Used in Agriculture Upon the Microflora of the Soil**

A continuation of the study of the effect of some herbicides upon members of the beneficial nitrogen-fixing bacteria, *Azotobacter*, has been made. The action of the herbicide was gauged by a measurement of the respiration (oxygen uptake) of the organisms in the presence of different concentrations of the agents. The following table gives the minimum concentration of the herbicides which produced the maximum inhibition of respiration of the species studied. It will be noted that all levels of any herbicide...
which proved toxic to the three species of *Azotobacter* are exceedingly higher than the levels used in field applications.

### The Minimum Concentration of Herbicide Which Produced the Maximum Inhibition of Respiration of *Azotobacter*

<table>
<thead>
<tr>
<th>Herbicides</th>
<th>A. agile (ppm)</th>
<th>A. virelandii (ppm)</th>
<th>A. chroococcum (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2, 4-D amine</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>2, 4-D ether</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>2, 4-D ester</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>2,4,5-T amine</td>
<td>2,000</td>
<td>1,500-2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>TCA</td>
<td>15,000</td>
<td>15,000-20,000</td>
<td>3,000</td>
</tr>
<tr>
<td>NaClO₃</td>
<td>2,500</td>
<td>2,500</td>
<td>2,000</td>
</tr>
<tr>
<td>Delapon</td>
<td>7,000</td>
<td>5,000-10,000</td>
<td>7,000</td>
</tr>
<tr>
<td>DNOSBP</td>
<td>1,500</td>
<td>1,500</td>
<td>700</td>
</tr>
</tbody>
</table>

—— = not toxic at any concentration tested.

—Lyman A. Magee and Arthur R. Colmer
Poultry

Broiler Trials under Commercial Conditions

One test was run testing the use of high-level antibiotics in commercial broiler production. In this case "aureomycin" was used at the rate of 100 grams per ton of feed. Three houses, each containing 6,000 birds, were involved in the test. One house was used as a control and received no aureomycin. House number two received high-level aureomycin feed the first, fourth, and eighth weeks. The third house was fed high-level aureomycin feed continuously throughout the test. The birds were marketed at nine weeks.

The birds fed no aureomycin averaged 2.76 pounds at time of market and consumed 2.79 pounds of feed per pound of gain. Total cost per pound of broiler at time of market was 19.88 cents. Livability was 93.8 per cent.

Those fed aureomycin intermittently averaged 2.85 pounds in weight and had a feed conversion of 2.52 pounds of feed per pound of gain. Total cost per pound of broiler was 18.93 cents and livability was 96.56 per cent.

Those fed aureomycin continually averaged 2.94 pounds at market and had a conversion of 2.53 pounds of feed per pound of gain. Total cost per pound was 20.45 cents and livability was 96.56 per cent.

Even though those birds fed aureomycin continually were heavier at market, the added gain was not sufficient to offset the increased feed cost due to the cost of the aureomycin. Therefore, on the basis of these results it seems possible to profitably add aureomycin to broiler feed but the level should be moderate.

In another test broilers were grown (sexes separate) in an effort to determine if such a procedure can be used by the producer to increase his margin of profit.

Two houses, belonging to one producer, were used. Each had a capacity of 5,500 birds and allowed one square foot per bird. The females were marketed at 8 weeks and 6 days and the males at 9 weeks.

The producer marketed 5,420 males, giving a livability of 98.5 per cent. The males averaged 3.40 pounds and produced a feed efficiency of 2.54 pounds of feed per pound of gain. Their yield in pounds of meat per 100 pounds of feed was 29.3. Market price
was 22 cents per pound. Cost per pound was 19.6 cents, giving a labor income of $79.66 per thousand birds sold.

The producer marketed 5,273 females, giving a livability of 95.8 per cent. Average weight was 2.78 pounds and the feed efficiency was 2.77 pounds of feed per pound of gain. The cost per pound was 22.3 cents. A major cause for this high cost of production was that just prior to marketing a number of the birds smothered due to a scare. The end result, as far as labor income is concerned, was a loss of $43.24.

From a comparison of the feed conversion values it can be seen that males are more efficient in utilizing feed than are the females. In our future tests we plan to determine at what age each sex ceases to convert feed at an economical rate, taking into consideration the demands of the market as to size.

—B. Hall Davis and A. B. Watts

Insecticide-Impregnated Litter for Control of the Chicken Body Louse (Eomenacanthus Stramineus Nitz.) on Poultry

Dried, ground sugar cane bagasse was treated with lindane, baled, and placed in storage. After 16 months the bales were opened and used as a poultry house litter as a means for the control of body lice on poultry. After an exposure period of 10 days, birds that had been heavily infested with body lice were almost completely freed of infestation. After 5½ months of continuous use this treated litter was still effective in control of the body louse. Residual studies are still in progress. However, there is an indication that the treated litter was beginning to lose some of its effectiveness after 165 days in use. Various dosage rates at 10-day exposure periods gave the following results: 36 grams per bale, 100 per cent control; 4½ grams, 90 per cent control; 0.5 gram, 50 per cent. Results to date indicate that a dosage rate of 10 grams of technical lindane per 100-pound bale of bagasse should provide optimum lice control at minimum cost.

—E. H. Floyd and B. A. Tower

Effect of Season on Egg Quality and Certain Blood Constituents

Studies were conducted on the effect of the season of the year and the age of birds on egg specific gravity, interior quality, plasma specific gravity and blood levels of calcium and total acid soluble phosphorus for a nine-month period. The experiment involved two groups of pullets, a spring hatched and a fall hatched group. These experimental periods started November 1, 1953, and June 1, 1954, respectively. During one week each month eggs were collected
each hour and necessary measurements made. On the third day of the same week each month blood samples were taken by heart puncture from the same group of hens.

Per cent shell and specific gravity of the whole egg were found to follow a similar trend. Spring hatched pullets came into production with high shell quality and continued producing eggs with high quality shells until February, after which the shell quality decreased. Fall hatched pullets began producing eggs with low shell quality and continued to do so until December, which was a month after environmental temperatures had dropped below an average high of 70° F.

The interior quality (as measured by Haugh units) of the egg from both groups of pullets decreased each succeeding month throughout the experimental period.

Correlation analyses of several of the observables and egg specific gravity did not demonstrate any appreciable degree of association between these factors.—C. W. Pope and A. B. Watts

Melanic Pigment in Broilers

Some concern of a condition called "blue belly" in broilers is being shown by processors. This condition is characterized by the presence of black pigment in the abdominal facia of chickens, giving the fat of this area an unpleasant appearance. A study was undertaken at Louisiana State University to determine if this condition was inherited and if so how it was inherited. The plan was to separate two pure lines, one pigment and one non-pigment, cross these, and study the F2. Much difficulty was experienced in separating these two lines and after five generations of inbreeding and selection the non-pigment line gave 7 per cent pigment male offspring and 33 per cent pigment female offspring. The pigment line was lost. Examination of the F2 generation gave the following results: 75 per cent of the male offspring and 17 per cent of the female offspring were non-pigment. When the F2 data of last year's results and this year's were combined, the following was found: 52 per cent of male offspring and 13 per cent of female offspring were non-pigment. This indicates that sex is influencing the occurrence of this characteristic. Penetrance may be another limiting factor in the occurrence of this pigment.—W. A. Johnson

The Most Economical Length of Fasting Time Prior to Processing Chickens

Five replications involving a total of 250 male and 250 female broilers have been completed in an experiment designed to study
the effect of various lengths of starvation period on the eviscerated yield of broilers. The birds were weighed live, placed in battery brooders and held for 24 hours with feed being removed at such intervals as to obtain the desired starvation period. The lengths of starvation period used were 24, 12, 6, 3, and 0 hours. Eviscerated yield was calculated as a per cent of initial live weight.

Both males and females starved for 24 hours or for 12 hours yielded significantly lower eviscerated weights than did the other groups. No significant differences were noted between the eviscerated yields of the other groups studied. Eviscerated yields, as a per cent of live weight, of males and females respectively were as follows: 24 hours—66.2 and 66.3; 12 hours—69.0 and 69.6; 6 hours—70.8 and 70.5; 3 hours—70.6 and 70.6; and 0 hour—69.9 and 70.9. There were no real differences between sexes.

Feed consumption records were kept for the 24-hour period prior to slaughter. Feed consumed per bird, in pounds, for each of the groups was as follows: 24 hours—0.00; 12 hours—0.120; 6 hours—0.161; 3 hours—0.175; and 0 hour—0.196.

—K. N. May and C. C. Brunson

Energy Studies with Broilers

Two experiments were run to determine the effects of fiber in a practical broiler ration. The effect of fiber, fat, bulk density, and calorie/protein ratio on gain and feed efficiency were determined. Common statistical procedures were used to analyze the data.

For the first experiment 360 sexed, day-old, broiler-strain White Plymouth Rock chicks were allotted at random in groups of ten males and ten females per deck into four starting batteries. Individual lot feed records were kept. At nine weeks the experiment was terminated and gain and feed efficiency determined.

The basal ration was a standard corn ration. In the other eight rations 3, 6, 9, and 12 per cent rice hulls were added at the expense of corn with and without equal additions of cottonseed oil. Two replications were run on each ration. The data showed no significant difference in gain and a highly significant difference in feed efficiency.

In the second experiment 760 sexed, week-old, broiler-strain, crossbred chicks were allotted in the same manner as previously. The rations were a corn basal with and without 6 and 12 per cent added fat, plus rations containing 6 and 12 per cent rice hulls, 18 and 36 per cent ground oats, 21 and 42 per cent rice bran and wheat bran. In eight other rations the same levels of fibrous feeds were used but to the low level was added 6 per cent fat and to the higher
level of fibrous feed was added 12 per cent fat. Two replications of each ration were run.

The first experiment showed the rice hulls acted as a low value energy diluent; that rice hulls significantly depressed feed efficiency; that rice hulls had no significant effect on broiler gains to nine weeks; that equal parts of cottonseed oil neutralized the energy diluting effect of rice hulls. There was a highly significant correlation between feed efficiency and calorie/protein ratio.

In the second experiment it was found that there was a highly significant effect on gain and feed efficiency between levels of bulk, among sources of bulk, and between levels of fat. Males and females did not react alike to these factors. The fibrous feeds used may be ranked in the following manner for maintaining feed efficiency when fed at the levels used in the experiment: (1) corn, (2) oats, (3) rice hulls, (4) rice bran, (5) wheat bran.

A highly significant positive correlation between ration bulk density and feed efficiency indicates that a high percentage of the depression of feed efficiency may be due to decreasing this factor. Bulk density and calorie/protein ratio do not explain all the differences between the fibrous feeds.

A very large, highly significant, negative correlation coefficient between calorie/protein ratio and feed efficiency in the two experiments indicates that in this protein range (22 to 23 per cent) 78 to 84 per cent of the variance in feed efficiency may be due to the variance of this factor. These experiments indicate that in this protein range a calorie/protein ratio of 41.5 to 42.5 will give optimum results.

The vegetable oils used in this study seemed to be adequately utilized by the chick as a source of energy to maintain growth and feed efficiency. The full effect of the oil cannot be fully explained by its productive energy content.

—C. E. Richardson, E. A. Epps and A. B. Watts

Testing the Relative Efficiency of Four Breeding Methods in Producing Superior Broiler Chickens

This project proposes to compare (1) convergent improvement, using the Cornish breed and an egg strain New Hampshire as recurring parents; (2) crossbreeding, using the Cornish as the male parent; (3) backcrossing, using the Cornish as the recurrent parent; and (4) family selection with the Cornish. This is the first year of this project and only preliminary observations have been made on hatchability, 8 weeks weight, brooder house mortality, and range mortality for purebred and crossbred progeny. The purebred Cornish was slightly superior to all other purebreds and
all crossbreds except the Cornish x Broiler New Hampshire, which was equal to it in 8 weeks body weight. The White Leghorn was superior to all purebreds and crosses in hatchability of all eggs set, and the purebred Cornish ranked second. There tended to be no difference in mortality. No backcrosses have been made, since this is the first year.—W. A. Johnson

Effect of pH During Processing on the Nutritional Value of Cottonseed Meals

The effect of pH during processing on the nutritional value of cottonseed meal was investigated in studies involving 2,960 chicks in 10 feeding trials. These tests involved feeding the cottonseed meals in rations containing both optimum and sub-optimum levels of protein. These meals were prepared over a wide range of pH values, and extensive tests were conducted using rations of sub-optimum protein level to establish the relationship between the pH of the prepared meal and its nutritive value.

From the results of these low level protein quality evaluations, sets of conditions were selected and larger samples of meals were prepared for testing under practical ration conditions. Two feeding experiments were conducted in which cottonseed meal and soybean meal supplied the major portion of the protein in practical broiler rations. It was found that meals prepared at pH's between 6.4 and 8.4 were equal or only slightly inferior to soybean meal. The results indicated that factors other than pH during processing appeared to affect the nutritive value of cottonseed meals. Nitrogen solubility did not appear to be correlated with nutritive value in cottonseed meals containing 80 per cent or more soluble nitrogen. Rations containing equal parts of soybean meal protein and cottonseed meal protein proved to be equal to or superior to rations containing these meals as the sole source of supplementary protein. A cottonseed meal prepared at pH 8.2 proved to be slightly superior to two excellent commercially prepared cottonseed meals. This particular meal was equal to soybean meal as a source of supplementary protein in practical broiler rations.—L. J. Conly and A. B. Watts

Performance Tests with Certain Experimental and Commercial Broiler Strains

Broiler tests were undertaken to compare two Cornish stocks and two Cornish crosses with three commercial broiler stocks grown generally in the Louisiana broiler areas. The experimental broiler stocks were two Cornish, Cornish x New Hampshire, Cornish x White Plymouth Rock, Nichol's New Hampshire, Silver
Broad x Arbor Acre White Plymouth Rock, and Vantress Cross. The tests were divided into two parts, production or growing period up to 9 weeks and processing yields.

Variables studied from the growing period were mortality, 9 weeks weight, and feed efficiency.

Variables studied for the second phase were percentage New York dressed weight of live weight, percentage eviscerated weight of live weight, and percentage of breast, legs, and breast and legs combined.

The non-Cornish (Nichol’s New Hampshire) males were superior to other breeds studied in broiler weights at 9 weeks of age. In comparing the non-Cornish (Nichol’s New Hampshire) to Cornish (Cornish 201 and Cornish 300), the single non-Cornish strain was superior to other breeds tested in 9 weeks live weight and equal to other breeds tested in all other variables studied when breast and legs were considered together.

The full-Cornish (Cornish 201 and Cornish 300) gave a higher eviscerated dressing percentage than did the part-Cornish (Cornish x White Plymouth Rock, Cornish x New Hampshire, Vantress Cross, and Silver Broad x Arbor Acre White Rock). The full-Cornish (Cornish 201 and Cornish 300) gave a lesser percentage of leg yield than the part-Cornish (Silver Broad and Arbor Acre White Rock, Cornish x New Hampshire, Cornish x White Plymouth Rock, and Vantress Cross) and non-Cornish (Nichol’s New Hampshire). In comparing the full-Cornish (Cornish 201 and Cornish 300) to the part-Cornish (Cornish x New Hampshire, Silver Broad x Arbor Acre White Rocks, Vantress Cross, and Cornish x White Plymouth Rock), the full-Cornish was superior in percentage eviscerated weight and equal in all other respects when breast and leg yields were considered together.

The experimental stock (Cornish x White Plymouth Rock, Cornish 201, Cornish 300, and Cornish x New Hampshire) gave a higher eviscerated dressing percentage than the commercial stock (Silver Broad x Arbor Acre White Rock, Nichol’s New Hampshire, and Vantress Cross). In comparing the commercial stock (Silver Broad x Arbor Acre White Rock, Nichol’s New Hampshire, and Vantress Cross) to the experimental stock (Cornish 201, Cornish 300, Cornish x New Hampshire, and Cornish x White Plymouth Rock), the experimental stock was superior to the commercial stock in percentage eviscerated weight and equal in all other respects when breast and legs were considered together.

—G. J. Simoneaux and W. A. Johnson

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Factors Affecting the Chemical Composition of Broiler Carcasses

Early growth and development in chickens is characterized by the formation of bone, muscle, and associated tissues with little deposition of fat. After the early growth rate begins to plateau, fat is deposited more readily. The fat content of a chicken carcass is important in determining market quality. Flavor, tenderness, and juiciness of the meat are dependent upon an adequate amount of fat properly distributed throughout the carcass. This project was initiated to study some of the factors that affect the deposition of fat and other components of broiler carcases and to determine how these factors can be used to assure an adequate fat deposition.

The first phase of the experiment has been a preliminary study to determine the average percentages of fat, protein, water, and ash in 10-week-old broilers grown on a regular starter ration. Random samples of equal numbers of males and females were taken from lots of New Hampshire and White Plymouth Rock broilers. Birds in these samples were slaughtered, eviscerated, and one-half of each carcass was finely ground in a meat grinder. Aliquot portions of the ground meat were analyzed to determine the chemical composition. The resulting percentages for females and males respectively were as follows: fat, 8.16 and 7.28; protein, 18.41 and 18.92; water, 70.45 and 70.98; and ash, 3.25 and 3.20. The sums of the figures for both males and females slightly exceeded 100 per cent. This discrepancy could be due to the fact that all analyses could not be determined on the same sample; thus, different samples could have varied slightly in composition.

—C. C. Brunson, K. N. May, and A. B. Watts

The Effect of Adding Certain Feed Supplements to Practical Broiler Rations

This study, consisting of four trials and 6,000 chicks, was initiated to determine the effects of additions of dl-methionine, fish meal, dried whey, and Methionine Hydroxy Analogue to broiler rations in regard to growth rate and feed efficiency.

Two feeding experiments were conducted in which the plant protein of the rations was supplied by two kinds of cottonseed meals. It would appear that additions of dl-methionine and dried whey to cottonseed meal rations may have a growth stimulating effect, depending upon the nature of protein furnished by cottonseed meal. Rations containing equal parts of soybean meal protein and cottonseed meal protein proved to be equal to rations whose major source of plant protein was soybean meal.

The beneficial effects of adding dl-methionine to soybean meal...
rations appear to be dependent upon the nature of protein furnished by the soybean meal in the rations. The addition of 0.05 and 0.1 per cent of methionine and Methionine Hydroxy Analogue appeared to produce no beneficial effects to a soybean meal-fish meal ration.

Supplements of dried whey (Ribolac) gave no improvements in growth rate or beneficial improvements in feed efficiency when added to a soybean meal or soybean meal-fish meal ration.

The addition of menhaden fish meal to soybean meal rations did not appear to aid in the growth rate or feed efficiency, over that of the basal ration, in the diet of 8-week-old broilers.

—R. A. Teekell and A. B. Watts
Rural Sociology

Louisiana's Rural Population at Mid-Century

The analysis of the composition and characteristics of the rural population has been continued with special emphasis placed upon parish variations in educational status, sex composition, and age dependency ratios. Also, study has been made of the occupational and income status of rural people in the state. There is considerable variation in the educational attainment of farm people in the different parishes. (See Figure 1.) In 1950, the median number of school years completed by the farm population 25 years of age and over was 5.6. However, an analysis of parish differentials shows

that the farm residents of a group of parishes in the South Central Louisiana Mixed Farming Area and the Sugar Bowl Area are characterized by particularly low educational attainments. Also, farm people in the Mississippi Delta Area, the Red River Delta Area, and the Southwest Rice Area have comparatively little formal education. Relatively high educational levels on the part of farm people prevail in the West Central Cut-over Area, the North Central Cut-over Area, the North Louisiana Uplands, and the Florida Parishes Area. These differentials in educational attainment among farm people reflect to a considerable degree the racial and cultural make-up of the populations of the various parishes.

In most of the parishes, the farm population is characterized by an excess of males, which is the expected situation. Generally, the farm population contains a numerical excess of males. In 1950 in the farm population of the state as a whole there were 105.6

males for every 100 females. However, some areas have sex ratios of less than 100, which means that they are dominated numerically by females. (See Figure 2.) Jefferson, West Baton Rouge, Tensas, Red River, and DeSoto parishes had more women than men in their farm populations in 1950. On the other hand, the farm populations of Calcasieu, Cameron, Iberia, St. Charles, Plaquemines, and St. Bernard parishes had large relative excesses of males (112 men or over to each 100 women).

In our society, persons 65 years of age and over and those under 15 years of age are often considered as dependents. If you relate the number of persons in these ages to the number 15 to 65 years of age, i.e., in the productive years, an age dependency ratio is obtained. Figure 3 shows the variations by parish in the age dependency ratios of the farm population in 1950. In several parishes, the farm populations are characterized by age dependency.

ratios of less than 700. This means that each 1,000 persons in the
productive ages must care for less than 700 individuals in the de-
pendent ages. Parishes in this category are LaSalle, Calcasieu,
Cameron, Vermilion, Iberville, Jefferson, Plaquemines, and St.
Bernard. From the standpoint of the ratio of producers to depen-
dents, the farm people of these parishes have the least burden to
carry. However, among the farm dwellers in several other par-
ishes, age dependency ratios of 900 and over prevail. Parishes hav-
ing these high age dependency ratios include Madison, Tensas, East
Feliciano, West Feliciano, Livingston, and St. James. In these
areas, the farm population has the highest number of persons in
the dependent ages per 1,000 individuals in the productive years.

An analysis of the occupational status of the population of
Louisiana in 1950 shows that about one-sixth of the experienced
labor force was engaged in agriculture. Farmers and farm man-
gers made up 9.8 per cent of the experienced labor force and farm
laborers and foremen constituted 6.5 per cent. However, if the
analysis is made according to sex, the data reveal that a consider-
ably larger proportion of the experienced male labor force is en-
gaged in agricultural pursuits. In 1950, approximately one-fourth
of the experienced male labor force was in farm activities. A much
smaller proportion of the experienced female labor force is engaged
in these occupations.

Investigation of the income status of the rural people of Lou-
isiana at mid-century indicates that the farm population 14 years
of age and over with an income had a significantly lower median
figure per person than that for the corresponding residents of the
state as a whole. The median income for the farm population was
$809 as compared to $1,259 for the state generally. Therefore, the
median income among farm people was only about two-thirds that
received by individuals in the entire state. In the farm popula-
tion, white persons had median incomes almost double that of
Negroes. The figures were $1,037 and $566, respectively. The data
further show that farm men received median incomes approxi-
mately twice as large as farm women. This relationship holds true
for both whites and Negroes.

The study of composition and characteristics of the rural pop-
ulation of the state at mid-century is being completed and a manu-
script is being prepared for publication which will point up the
significant features of the rural people.

—Homer L. Hitt and Paul H. Price

Rural Social Areas and Cultural Islands in Louisiana

The work of locating and analyzing homogeneous rural social
areas and cultural islands within the state has been completed. In
connection with the former, 10 rural areas of Louisiana having socio-cultural homogeneity were delineated through use of a refined statistical methodology. A brief description of each is given below. Those persons interested in a more detailed description are referred to Louisiana Agricultural Experiment Station Bulletin No. 496 entitled *The Many Louisianas*.

Area I, the Red River Delta Area, includes Caddo, Bossier, DeSoto, Red River, Natchitoches, and Rapides parishes. This area is primarily devoted to the production of cotton and livestock and is characterized by a high proportion of Negroes, a high rate of tenancy, a relatively low average level of living, a high infant mortality rate, and a relatively high fertility ratio.

Area II, the North Louisiana Uplands Area, includes Webster, Claiborne, Union, Lincoln, Bienville, and Ouachita parishes. Although cotton is by far the most important crop in this area, agricultural production includes livestock, truck crops, poultry, dairying, and forest products. The level of living and educational attainment are relatively high in Area II, while the fertility ratio is relatively low. Social stratification is not pronounced in this region of family size farms.

Area III, the Mississippi Delta Area, includes Morehouse, West Carroll, East Carroll, Franklin, Madison, Richland, Catahoula, Tensas, Concordia, Pointe Coupee, East Feliciana, and West Feliciana parishes. Agricultural endeavor is characterized by the production of cotton and livestock on large holdings, although there are regions of family size and subsistence farms. Among the social characteristics of Area III are a high percentage of Negroes, a high proportion of rural-farm persons, a low density of population, an extremely low educational level, and a high fertility ratio.

Area IV, the North Central Louisiana Cut-over Area, includes Jackson, Union, Grant, Caldwell, and LaSalle parishes. The farmers of this area are largely classified as self-sufficing and part-time. In this regard, it is significant that a high proportion of rural residents do not farm. The Area is characterized by a low density of population, few Negroes, a low fertility ratio, a relatively high educational level, and a relatively high level of living.

Area V, the West Central Cut-over Area, includes Beauregard, Sabine, and Vernon parishes. This is also a relatively poor agricultural area with a concentration of self-sufficing farms. The level of living and level of education in the Area are slightly below the average for the state. The social characteristic of the Area which stands out is the extreme individualism of the rural residents, which affects their relations with outsiders.

Area VI, the Southwest Rice Area, includes Cameron, Calcasieu,
Allen, Jefferson Davis, Acadia, and Vermilion parishes. The French culture and rice are responsible in large part for the homogeneity of Area VI. It ranks high among the other areas in level of living, size of farm, and value of farm products sold, but low in proportion of Negroes and fertility ratio.

Area VII, the South Central Louisiana Mixed Farming Area, includes Evangeline, St. Landry, Avoyelles, and Lafayette parishes. This is an area of numerous small farms, populated by a hard-working class of Yeomen farmers, who are French and Catholic for the most part. The area is strategically located between the major rice, cotton, and sugar cane areas and all these are grown in quantity plus sweet potatoes and truck crops. This area does not include a great many Negroes and holds an intermediate position among the other Areas in level of living and education.

Area VIII, the Sugar Bowl Area, includes West Baton Rouge, Iberville, St. Martin, Iberia, Assumption, Ascension, St. James, St. John the Baptist, Lafourche, and Terrebonne parishes. In this French-Catholic area, sugar, livestock, fur, and fish are produced in quantity. The fertility ratio is high, as is the percentage of Negroes in the population. Education and level of living are relatively low, however.

Area IX, the Florida Parishes Area, includes St. Helena, East Baton Rouge, Livingston, Tangipahoa, and Washington parishes. This is more of a dairy area than anything else, although considerable acreage is devoted to strawberries and vegetable crops and there is some cotton and livestock. The educational level is relatively high, as is population density. Several ethnic groups are found in this area.

Area X, the New Orleans Truck and Fruit Area, includes St. Tammany, St. Bernard, Plaquemines, Jefferson, and St. Charles parishes. The number of rural-farm persons is low in this area, giving evidence of the influence of the metropolis of New Orleans. Vegetables, nursery products, and citrus crops are the chief agricultural enterprises in Area X. The major social characteristic which stands out is its high level of living.

The second part of the present study was concerned with locating and describing the more important cultural islands of the state. This was considered a long overdue research endeavor in view of the several racial and ethnic elements in the rural population not yet assimilated. In this connection, the task of mapping the dividing lines between the two major cultural areas of the state, French and Anglo-Saxon Louisiana, was first undertaken. Once this was done, the major cultural islands listed below were located and studied: The Spanish Americans of Delacroix Island, the Hungarian Americans in Livingston Parish, the various Italian-American communi-

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ties, the Slavonian-Dalmation Americans of Plaquemines Parish, the Koasati Indians of Southwest Louisiana, the Endogamous Inhabitants of Southwest Louisiana, the Sabines of Terrebonne and Lafourche Parishes, and the several minor Indian, ethnic, and racial hybrid groups in various parts of the state. Detailed descriptions of each of the above appear in The Many Louisianas.

—Alvin L. Bertrand

The Use and Potential of Television in Farm and Home Education

The study of the use and potential of television by Louisiana farmers and homemakers was begun in the fall of 1955. To date, all of the television stations in the state have been contacted and information obtained on their areas of primary and secondary coverage. In addition, data on the number of television sets owned by farm people have been obtained. The above information is being used in the preparation of maps to facilitate the field work and analysis. In connection with the former, a comprehensive schedule is in process of preparation. This schedule will be used in interviewing a carefully selected sample population of farmers and homemakers in the summer of 1956.

It is anticipated that the information sought will be of great use to Agricultural Extension agents and others who must decide how best to get their ideas and facts to farm people. In this regard, it is known that television has been well received in rural areas. Up to now, however, very little factual knowledge has been available with respect to the viewing habits of farm folk. It is hoped the present study will be a contribution in terms of factual knowledge regarding the proportion of the rural population owning or planning to buy television sets and the program and time preferences of farmers and homemakers.—Alvin L. Bertrand
Sugar Cane

Varieties

Under the three-way agreement of the Louisiana State University, the United States Department of Agriculture, and the American Sugar Cane League of the U.S.A., two new sugar cane varieties were released for commercial cultivation in the fall of 1955.

C.P. 48-103 is considered to be the earliest maturing sugar cane ever released for commercial cultivation in Louisiana. It is recommended for planting only on the most fertile well-drained soils of the sugar district. It is believed that this variety will fill a great need in our varietal program, insuring good sugar recoveries during the very early portion of the harvesting season, which is not always possible with present commercial varieties.

C.P. 47-193 is a good yielder, relative to present commercial varieties, on heavier soil types, though it is not competitive on the most fertile soils because there it does not outyield standard commercial varieties C.P. 44-101 and C.P. 36-105. The variety is earlier in maturity than the present commercial varieties grown on the heavier soil types, which is a decided advantage as this allows relatively early harvesting of these fields. It is believed that C.P. 47-193 will strengthen the varietal program by increasing sugar production per acre on these heavier soil types.—E. C. Simon

Outfield Sugars

Sugar Cane Variety Test Fields

During the 1955 milling season 22 experiments* were harvested and analyzed in order to obtain additional information as to the relative commercial value of various sugar cane varieties when grown under different environmental conditions existing in the Louisiana sugar cane region. These experiments were conducted in cooperation with producers and county agents at seven locations. Six important soil types were represented. Varieties previously released for commercial production as well as some experimental varieties were compared in each experiment. Each variety in every experiment was grown in a large single plot. The actual weight of the cane from the entire plot was used in comparing yields, while

* Plant cane tests were planted in 1954 by D. S. Byrnsde, Jr., Department of Agronomy, and C. B. Gouaux, Agronomist Emeritus, Retired. All stubble tests were planted by C. B. Gouaux in 1952 and 1953.
a ten-stalk sample from each plot was taken at random for juice analyses.

A relatively dry spring and a late March freeze retarded early growth of the cane, but recovery was rapid and good stands were obtained as the season progressed. Rainfall during the warmer months was relatively heavy and, in general, good yields of cane were obtained. In spite of ample moisture, yields were low in the Shirley test field, where sugar cane borer and Johnson grass infestations were extremely heavy. Relatively high temperatures in late summer and early fall delayed maturity of the cane somewhat. Sugar cane borer damage appeared to be relatively slight in early summer but became more serious as the season advanced. Greatest borer damage was apparent on plant cane in most experiments and on all cane in the Shirley test field. Johnson grass was a serious pest in all experiments at the Shirley test field and in the stubble cane in the Cinclare heavy soil test field.

Plantation cultural and harvesting methods were used in all experiments. Nitrogen was applied to all experiments according to plantation practice, and at one location phosphorus and potash were applied to stubble cane in addition to the nitrogen. The TCA chemical weed control program was followed in all experiments in the Mississippi River-Bayou Lafourche area. In all other experiments weeds were controlled primarily by mechanical means. Chemical and biological programs for control of borers were employed at most test fields. The cane was cut by hand at the Billeaud and Youngsville test fields. Mechanical harvesters were used at all other test fields for cutting the cane. Where weather permitted, the leaves were burned and the cane was hauled and weighed as soon after cutting as possible.

Variety Evaluations

Based on results for 1955 and prior years, C.P. 44-101 appears to be the most valuable variety for general planting in all areas on all soils in the Louisiana sugar belt. C.P. 36-105, which is grown to a considerable extent at the present, has yielded slightly less than C.P. 44-101 on light soils in the Mississippi River-Bayou Lafourche area and considerably less than C.P. 44-101 on light soils in the Bayou Teche-Lafayette area. C.P. 44-101 has also been superior to C.P. 36-105 on Sharkey clay in the Mississippi River area. Although the data at present are inconclusive, N. Co. 310 has been superior to C.P. 44-101 in most tests. N. Co. 310 is subject to lodging, matures relatively late in the season, and is susceptible to mosaic, however.

Although C.P. 44-101 has been best for general planting, other varieties have proved to be suitable for certain purposes. Some varieties mature earlier than C.P. 44-101 and may be planted for
early harvesting. In test fields located in the Bayou Teche-Lafayette area C.P. 36-13 and C.P. 44-155 have been valuable varieties in this respect. According to present information, C.P. 44-155 and C.P. 43-47 can be satisfactorily used for early harvesting in the Mississippi River-Bayou Lafourche area. These varieties have not produced as well as C.P. 44-101 and are not as generally adapted, however. The most promising early maturing variety is C.P. 48-103. This variety has been higher in sugar per ton of cane than any of the previously mentioned varieties in all tests. In average yields of sugar per acre C.P. 48-103 has been superior to C.P. 44-101. The data are inconclusive, however. In preliminary trials C.P. 47-193 has been superior to C.P. 44-101 on Sharkey clay in the Mississippi River area and on light soils of the Red River area. In all light soil tests average yields of sugar per acre for C.P. 47-193 and C.P. 44-101 have been similar. C.P. 47-193 has been higher in sucrose content, however.

Co. 290, C.P. 29-116, and C.P. 44-154 are still being grown to a limited extent in the western portion of the sugar belt. Although these varieties have given good yields of cane they have the disadvantage of being low in sugar content and are subject to lodging.

The most promising unreleased varieties in the test fields during 1955 were C.P. 48-117 and C.P. 50-40. Although no yield data have been obtained both varieties appeared to be vigorous and to have growth types suitable for mechanical harvesting. An average of three juice analyses in 1955 indicated that C.P. 50-40 was slightly superior to C.P. 44-101 in sucrose. C.P. 48-117 is probably too low in sucrose to be used as a major sugar variety but offers possibilities as a variety for sirup production.

1955 Plantings

In the past, variety trials similar to the ones previously described have been conducted independently by the United States Department of Agriculture Sugarcane Field Station, Houma, Louisiana. After several conferences with personnel from the U.S.D.A., L.S.U., and the American Sugar Cane League in attendance, it was decided that, beginning with the 1955 plantings, all outfield variety trials will be conducted jointly. Thus, some duplication of effort will be avoided, more efficient use of equipment and personnel will be possible, a better geographic distribution of test fields can be made, and uniform experimental methods, which make possible a combination of the information, can be employed. In accordance with this agreement all experiments were planted in a randomized complete block experimental design with 4 replications.

Eight promising unreleased varieties were introduced to the test fields this fall and planted on a small-plot increase basis. In
addition, 12 released varieties were planted in a similar manner. Seed cane of these 20 varieties had been heat treated for control of the stunting disease and furnished by the L.S.U. Sugar Experiment Station. Enough disease free seed should be available for variety trials in 1956.

In cooperation with the L.S.U. Department of Agricultural Engineering and Shirley Plantation, Bunkie, La., an experiment designed to study the yields of four varieties of cane when grown on rows of two different widths was planted in 1955.

—T. J. Stafford and C. B. Gouaux
Veterinary Science

Gastro-Intestinal Parasites of Cattle

The studies on gastro-intestinal parasites of cattle have dealt with *Cooperia punctata*, one of the small nematodes or round worms found in the small intestine. Experiments have been directed along the following lines:

A. Low level feeding of phenothiazine as a control measure. There were no effects produced upon the eggs, either in appearance or numbers when phenothiazine was fed at the rate of 1½ and 3 grams per day. However, there is a definite reduction in number of infective larvae recovered from the calves when these amounts are fed daily. The reduction is so great that it is close to 100 per cent. These observations show that something happens to the eggs which is not visible but which keeps them from hatching into infective larvae. Thus, if phenothiazine is constantly fed in a manner which insures each animal obtaining the required amount regularly, protection from further infections will be afforded against *Cooperia punctata*. Former experiments have demonstrated protection against nodular worms, hook worms, and the large stomach worms.

B. Results during the past year when phenothiazine was offered free choice in a simple mineral mixture, indicate that animals do not consume the mixture in sufficient quantities to get the required amount of the drug. The simple mineral mixture consisted of 2 parts bone meal, 2 parts oyster shell, and 1 part salt, and for each 10 parts of the mineral, 1 part of phenothiazine was added.

C. Phenothiazine given in the anthelmintic (therapeutic) dose, does not eliminate the adult worm when given in doses of 10, 20, 30, and 50 grams per 100 pounds body weight. When administered in larger doses there was a temporary reduction in egg count.

D. Observations on the life cycle of *Cooperia punctata* show that it requires approximately two weeks for mature worms to develop after the calf has been given infective larvae. Diarrhea develops in the calf during the second week following administration of the larvae.

E. Resistance or immunity to reinfection has developed in five animals. These calves were originally subjected to pure infections of *Cooperia punctata* and later given additional doses for the purpose of attempting to re-establish infection.

—Roy L. Mayhew and Betty J. Torbert

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Anaplasmosis

Anaplasmosis research has been divided into three phases. One is to study the possibility of developing a product that will immunize the anaplasmosis susceptible animal. The second is to conduct experiments (filtration) which will determine the true nature of the causative agent. The third is to find a medicinal or combination of medicinals which will, with one treatment, eliminate the carrier state of the recovered animal.

Fifteen products have been prepared and tested for anaplasmosis immunizing properties. None of these gave promise of possessing the desired properties. Five additional products are currently on experiment. Calves inoculated with these agents will be challenged with virulent anaplasmosis blood to determine whether any of these products have immunizing qualities.

Several filtration experiments have been conducted. The results are inconclusive. Observations at this Station indicate that the causative agent of anaplasmosis is either a virus or a Rickettsia and not a protozoan. These studies will be continued.

Various medicinals have been used in an attempt to find one or a combination of drugs that will economically eliminate the carrier state of anaplasmosis in the recovered animal. Aureomycin, achromycin, and terramycin (broad spectrum antibiotics) are the only medicinals now proven to have the ability to eliminate the carrier state of anaplasmosis. It is necessary to administer very large amounts of these drugs in repeated doses in order to accomplish this. Such a procedure is costly and in most instances prohibitive.

Calves to be used in the experiment are purchased at three to seven days of age. It is evident that the majority of calves procured during the past year were carriers of eperythrozoonosis at time of purchase. Because this disease interferes with anaplasmosis research, it is necessary that a medicinal or combination of medicinals be found which will eliminate this infection from experimental calves. The very widespread occurrence of eperythrozoonosis in Louisiana is a major obstacle in anaplasmosis research.

The most important point to be realized and constantly remembered by the farmer in anaplasmosis areas is that early diagnosis is imperative if maximum benefits are to be derived from treatment. Early diagnosis, treatment with an effective specific antibiotic, and supportive treatment as prescribed by the veterinarian, followed by careful nursing, are the most effective means of combating clinical anaplasmosis. The effective drugs are aureomycin, terramycin, and achromycin, but they must be used judiciously. An additional point of primary concern to the veterinarian and one which the farmer must realize is that often the clinical case of anaplasmosis when
first seen is beyond the point of specific therapy and only good supportive treatment and care can help.
―Lon E. Foote, Helen E. Levy, and Betty J. Torbert

Breeding Disorders of Cattle

A continuation of the observations on the reproductive efficiency of three herds of dairy cattle has been carried on during the year. The incidence of various conditions which have resulted in pregnancies not occurring on schedule, together with the effectiveness of different therapeutic measures, have been recorded. This information, when enough cases of each type have occurred to be significant, will be very valuable in evaluating the efficiency of the various treatments employed.

It is rather interesting to note that clinical anestrus, or failure of the cow to show outward signs of heat, continues to be one of the major causes of delayed breeding in these three well managed Louisiana dairy herds. The possibility that a hypothyroidism (a condition of lowered thyroid activity) might be a motivating factor in this condition was explored in one of the three herds. Data obtained suggest that the thyroid gland might be involved. Work is continuing along this line and it is hoped enough data will be obtained in the coming year to make an evaluation possible.—R. B. Lank
Substations

Fruit and Truck Station, Hammond

W. F. Wilson, Jr., Superintendent
Henry G. Barwood, Assistant Horticulturist
Mike J. Giamalva, Assistant Horticulturist

Strawberry Studies

Variety Test

Five varieties were used in the variety test. The following varieties were grown in replicated plots: Klonmore, L-27, Marion Bell, Tuzzolino Bell, and Tuzzolino Beauty. The highest yielding variety was L-27, which produced 149 crates per acre compared to 90 crates per acre from Klonmore, the recommended and most widely grown variety. L-27 has consistently been the highest yielding variety, but it is a very shy plant producer under normal conditions.

Chemical Weed Control

This test is a continuation of the program testing various herbicides in comparison to the recommended treatment of 2,4-D at the rate of 2 pounds per acre. The treatments included: 2,4-D at the rate of 2 pounds per acre, C. M. U. at 1 pound per acre, Sesin at 3 pounds per acre, Chloro IPC at 6 pounds per acre, Craig at 3 pounds per acre, and C. M. U. at ½ pound per acre. These materials were applied to the top of the rows with a knapsack sprayer after the fertilizer had been applied and 15 days before setting. All treatments except Sesin resulted in fewer numbers of weeds and grasses than the 2,4-D check.

Tung Meal Test

Tung meal was compared to cottonseed meal, soybean meal, nitrate of soda, and urea as a source of nitrogen. All materials were significantly higher than nitrate of soda. These materials were used in combination with superphosphate and muriate of potash to provide 4 per cent nitrogen in a 4-12-4 fertilizer. Tung meal proved to be as good a source of nitrogen as cottonseed meal for the production of fruit. It is much cheaper per pound of nitrogen.

Sidedressing Test

This test included variations of methods of application of the recommended rate of 1,500 pounds of 4-12-4 fertilizer per acre. The
split application of 750 pounds applied before setting and 750 pounds applied as a sidedressing at the time of scraping and mulching gave the highest yields.

**Green Manure Test**

Significant increases in yield were obtained when a cover crop was used between crops of strawberries. This test has been conducted over an extended period with significant increases each year from the plots where a cover crop was turned under.

**Spacing Test**

The spacing test included variations in spacing from 8 to 22 inches, double and single, on a 3½-foot row. The highest yield per acre was obtained from spacing plants 8 inches double. Highest yields per plant were from the wider spacings.

**Nematode Test**

This test was conducted in cooperation with Dr. N. L. Horn to determine if nematodes were suppressing strawberry yields. Large populations of several species of nematodes had been found at a number of locations in the Louisiana strawberry area. Large numbers were found in the test block. Three varieties—Klonmore, Marion Bell, and L-27—were used in the test. The soil treatments consisted of seven gallons of D.W. 85 per acre, and no treatment.

Treated plots produced an average yield of 236.6 crates per acre compared to 151.4 crates per acre from the untreated plots. Klonmore plants taken from treated soil produced 176.1 crates per acre compared to 111.1 crates per acre from plants grown in nematode infected soil.

**Cucumber Studies**

**Spring Variety Test**

Five varieties from the regional variety trials were planted in the standard replicated test. All of the new varieties showed resistance to mildew and produced higher yields than Marketer. These varieties are Stono, which has been grown as S.C. 10-3; Ashley, grown as S.C. 15 B-3; and Palomar, which was entered by Ferry-Morse as 2088.

**Fall Variety Test**

Six varieties were grown in the regional variety trials. The new introductions showed high resistance to mildew and some resistance to anthracnose. All varieties had to be dusted for insect control. Since it is economical to apply a fungicide in the same operation, Marketer remains the recommended variety because of its more desirable fruit shape and color.
Fall Variety Trial—Observation

Seven new cucumber lines from South Carolina were grown in an observation test. Total yields were very high, but the percentages of No. 1 cucumbers were low. Several of these show some promise but must be further selected and pure lined.

Fall Fertilizer Test

Nine variations were used in the rate of application of the three major elements. Yields from all treatments were good, with very little difference between treatments.

Fall Fertilizer Rate Test

In this test, 4-12-4 was applied at 400, 800, 1,200, and 1,600 pounds per acre. Highest yields were obtained from the highest fertilizer rate.

Okra Studies

Fertilizer Test

Fifteen fertilizer treatments were used in a randomized block design, varying nitrogen from 24 to 96 pounds, phosphorus from 32 to 96 pounds, and potassium from 16 to 64 pounds. Greatest response was obtained from the increase of potassium to 32 pounds. Nitrogen and phosphorus were held constant at 24 and 72 pounds. There was an increase in yield from 6,551 pounds where 16 pounds of potassium was used to 9,314 pounds of okra where 24 pounds was used. There were also slight increases in yield from increases of nitrogen over 24 pounds and increases of phosphorus over 64 pounds which were not significant.

Variety Test

Six of the standard varieties of okra were grown in a production test. Yields were recorded in number of pods and tons produced per acre. The planting was harvested four times each week from July 20 to October 19.

Highest yields were produced by Louisiana Velvet and Emerald. Lowest yields were recorded from New Orleans Market. Louisiana Green Velvet produced 4.45 tons; Emerald, 4.45 tons; Dwarf Green, an angled variety, 4.0 tons; Dwarf Green Velvet, 3.76 tons; Louisiana Market, 2.72 tons; and New Orleans Market, 1.54 tons.

Sweet Corn Studies

Ten varieties were grown in a replicated test. Yields of 1,880 dozen ears per acre were obtained from Cheddar Cross, the highest yielding variety. Aristogold Bantam Evergreen, Sweetangold, and Paymaster produced yields of 1,400 dozen ears per acre.
Irish Potato Studies

Spring Variety Test

LaSoda was the highest yielding variety. It produced yields of 134 bushels of marketable potatoes per acre compared with 125 bushels for Red LaSoda and 84 bushels for Triumph.

Fall Variety Test

LaSoda produced the highest yields of Irish potatoes in the fall test. It produced 134 bushels of marketable potatoes per acre compared with 121 bushels for Triumph and 114 bushels for Red LaSoda.

Broccoli Studies

Six varieties of broccoli were tested for early and total yields. Early Green Sprouting and Decicco were the earliest and highest yielding varieties, producing yields of 4,603 and 4,315 pounds per acre respectively, with 51 per cent and 33 per cent of the crop harvested early. Freezer's Green Sprouting, Medium Green Sprouting, and Grant Central produced 3,928, 3,512, and 2,966 pounds respectively.

Container Culture

Manure, compost, peat, and krillium were tested as soil conditioners in growing container-produced plants of Pfitzer Juniper, Common Box, Japanese Roundleaf Holly, and Chinese Photina.

Manure as a soil conditioner gave significant increases in the growth of Pfitzer Juniper, Common Box, and Japanese Roundleaf Holly over compost, peat, or krillium as soil conditioners in container potting soils. Either manure or compost as a soil conditioner for container-produced Chinese Photina significantly increased growth.

The use of peat as a drainage in containers produced a significant increase in the growth of Common Box and Pfitzer Juniper. There was no difference in the growth of Japanese Roundleaf Holly when peat was used as a drainage or no drainage was used. Either practice produced significant increases in the growth of the plants over plants that had gravel, sawdust, or tung hulls as a drainage material. Tung hulls as a drainage material for container-grown Chinese Photina were significantly better than the omission of a drainage material or the use of sawdust, gravel, or peat.

Mayhaw

Seed

Production of mayhaw seedlings was carried on during 1955.
Seed cleaned immediately after harvest and planted were best. Seed size had no effect upon the number of seedlings produced.

**Seedling as Rootstock**

Mayhaw and pear scions were grafted to mayhaw seedlings. All whip-grafted mayhaw scions grew. Eighty-four per cent of the cleft-grafted mayhaws grew. Ninety-six per cent of the whip-grafted pears grew. Further investigations of the value of the mayhaw as an understock for apples, crabapples, and other haws are being carried on.

**Magnolia Seed Harvest**

Three years’ results show that early harvested magnolia pods produce the most good seed. Good seed from any part of the harvesting period germinate equally.

Seeds removed from closed ripe pods either by hand or by allowing the pods to open in the shade produced more good seeds than pods that were allowed to open on the tree. Pods are ripe when the ground color changes to yellow. Ripe pods will open in the shade in five to eight days.

**Blackberry and Dewberry Breeding**

A varietal collection has been established for observation and for use as parent material in the breeding program.

Approximately 5,000 seedlings from open-pollinated Megna and Youngberry stock with plants from controlled crosses set to the field the previous fall were severely injured by the late freeze this year. These seedlings will be in production this season.

**Blueberry Breeding**

A large number of seedlings of both open-pollinated and controlled crosses were grown under the lath house this year and have been recently set to the field.

Seedlings set to the field the previous year failed to fruit because of the severe late freeze in March. Many of these seedlings of this planting had failed to survive the hot dry summer months.

**Farm Woodlands Managed for Both Timber and Pine Straw**

In the strawberry-growing region of Louisiana, timber owners need to know the proper way to manage pine stands for both merchantable timber and pine needle straw. Several plots with varying
densities of timber were laid out in 1947 in a young pine stand at the Fruit and Truck Experiment Station, near Hammond.

Measurements of average annual growth over the last 3-year period showed that growth in basal area was greatest in the most open stand and least in the densest stand. Mortality from wind and ice storms caused a significant reduction in growth. Many trees on the densest plot died and could have been used for fence posts or pulpwood if harvested before they decayed.

Straw yields in 1955 were heaviest on dense plots, averaging 4,400 pounds per acre on unthinned plots compared with 3,000 pounds per acre on the most open plot.

Control of brush with sprayed herbicides is an incidental part of the main experiment. It was found that red oak was only partially killed by a 2 per cent solution of 2,4,5-T. Smilax and yaupon were resistant to a one-pound-per-gallon solution of Ammate. Kerosene and Varsol as 2,4,5-T carriers were only slightly more effective than water.—Bryant A. Bateman and W. F. Wilson, Jr.

North Louisiana Experiment Station, Calhoun

RALPH S. WOODWARD, Superintendent
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Agronomy

Corn Irrigation

Results of this experiment for 1955 were not so outstanding as in 1954 although the yields were excellent. The check plot produced 74.0 bushels per acre in 1955 as compared to a yield of only 28.7 bushels from the best treatment (furrow irrigation) in 1954. This is partly explained by the amount of rainfall, which in 1954 was only 15.38 inches during the growing season of March through August as compared to 25.04 inches for the same period in 1955. However, it appears that the total amount of water does not always determine the final results, because in 1954 the rainfall plus the irrigation water applied totaled 26.88 inches on the irrigated plots and in 1955 the same plots had a total of 27.79 inches of rain and irrigation, or a difference in total water of only .91 inch.

Furrow irrigation was the best yielding treatment both years, with 1954 producing 28.7 bushels per acre as compared to 93.1
bushels per acre in 1955. It is improbable that the difference of .91 inch of total water received could cause the extreme difference in yield; some other factors associated with the frequent rains of 1955 must have had a very important role in determining yields. In all probability these were (1) lower temperature during the growing season of 1955, and (2) reduced transpiration and evaporation losses of available water. The trend was the same in all treatments receiving irrigation water. Using plant wilting as an index or indication of drought it required a total of 11.5 inches of irrigation in 1954 and only 2.75 inches in 1955. The crop response to irrigation method was about the same both years but with much less difference between the non-irrigated and irrigated plots in 1955. Subsoiling in 1955 produced excellent yields as compared to 1954 and proved to be of some value over no treatment, increasing the yield 7.1 bushels per acre. There was only .7 bushel difference between sprinkler and furrow irrigation in favor of the latter method, but in combination with subsoiling furrow irrigation produced 9.0 bushels more than the sprinkler method.

Cotton Irrigation

This experiment, a companion of the one above, responded in an entirely different manner. The yields from all treatments increased but not so much as did those in the corn. Highest yield recorded was from the check plot with a yield of 2,007.8 pounds of seed cotton per acre. Sprinkler irrigated plus subsoiling was second with 1,999.1 pounds, followed by furrow irrigated plus subsoiling, 1,929.3 pounds, and subsoiling alone, 1,916.2 pounds. Irrigation alone, furrow and sprinkled, was in last place. The cotton plots received the same amount of irrigation as did the corn but in all cases the application of extra water reduced the yield. The cotton made an extremely large stalk and the control of insects was a difficult problem late in the season. One interesting factor noted in harvesting this test was the high yields from the outer guard rows. These rows made yields of 3,500 pounds seed cotton, which may indicate that irrigated cotton should have wider row spacing to offset the increased growth of the plants.—Ralph S. Woodward

Cotton and Corn Variety Experiments

The yields of cotton were exceptional in spite of heavy weevil infestation and an outbreak of aphids late in the season. The top five varieties in order were (1) La. DS 518-12, 1,144 pounds lint per acre; (2) Louisiana 33x14, 1,068 pounds; (3) Fox, 1,060 pounds; (4) Empire, 1,047 pounds; and (5) La. DS 524-9, 1,039 pounds. However the yields of the other varieties were also good, with very little difference between any of them.

Corn yields were excellent in all cases, with the old, open-pollinated varieties equaling the past yields of hybrids. The five
top varieties in 1955 were (1) La. 521, 98.7 bushels per acre; (2) La. 2129, 97.3 bushels; (3) La. 2203, 95.2 bushels; (4) Dixie 18, 92.7 bushels; and (5) Dixie 22, 92.0 bushels per acre.

For the past three years the following were the five leading varieties: (1) Dixie 22, 46.7 bushels per acre; (2) La. 2130, 46.3 bushels; (3) La. 2129, 46.1 bushels; (4) N.C. 27, 45.2 bushels; and (5) Funk's G-779W, 45.1 bushels. The effects of adequate rain and moderate weather are clearly shown in a comparison of the 1955 yields with the three-year average.

—Ralph S. Woodward, F. W. Self, and Lee Mason

Insect Control Experiments

Two new trials were begun in 1955, one designed to control stand destroying insects of corn and the other to study the effect of early control of boll weevils on the yield of hill land cotton.

In the cotton experiment attention was directed towards the usual seasonal growth of cotton in the hill area in which most of the crop is set by mid-July, with very few squares being set later in the season owing to the extremely hot, dry weather. Dusting for control of weevils when they first appear in the late spring, 5 per cent infestation rate, is compared with dusting begun at 20 per cent infestation, 40 per cent infestation, and with no dusting at all. Results in 1955, although it was not a typical year, were not significant. However, the early control plots, 5 per cent infestation, produced 2,328 pounds seed cotton per acre, 20 per cent infestation produced 2,242 pounds, 40 per cent infestation produced 2,173 pounds, and the undusted plots produced 1,806 pounds.

In the corn insect control test the results were very favorable, with seed treatment alone producing 35.7 bushels more than the untreated seed. Several insecticides were used at different concentrations and under different methods of application, and all of them resulted in increased yields over the untreated check plots.

These experiments will be continued.


Beef

The beef herd is in its second year of a crossbreeding program between the Devon and Hereford breeds. There are now 18 registered Devon and 17 registered Hereford cows in the breeding program using both Devon and Hereford bulls.

Seven Hereford-Devon crossbred and 8 purebred Devon calves were raised in 1955. Fourteen of these calves were placed on a grazing and feeding program, using oat pasture for winter grazing
and at the same time feeding enough grain to cause the calves to fatten. At birth the Devon calves averaged 69 pounds of body weight and the Devon-Hereford cross 56 pounds. At 180 days the Devon calves weighed an average of 561 pounds and the crossbreds weighed 458 pounds. After 4 weeks on the grazing and feeding program the Devon calves weighed an average of 635 pounds and the crossbred calves 550 pounds.

Seven Devon cows were bred to a Hereford bull and 9 Hereford and 8 Devon cows were bred to a Devon bull for the 1956 season. 

—Arthur V. Davis and Ralph S. Woodward

Dairy

In 1955 an average of 19.3 cows were milked and produced an average of 7,237 pounds of 4 per cent FCM. The average cost of feed was $133.56 per head and the gross profit per cow over feed cost was $249.28. For the first six months of the year the herd was fed two rations on a comparison trial, and for the next six months they were fed a 16 per cent commercial dairy ration. Grass hay produced on the Station was fed and pasture was allowed at all times. The herd presently consists of 44 registered Jerseys, consisting of 25 cows, 13 heifers, and 6 calves. All breeding is done by artificial insemination through the Louisiana Artificial Breeders Association at Baton Rouge, Louisiana.

Comparison of Wheat and Oats for Winter Grazing

After the introduction into this area of Atlas 66 wheat as a winter grazing crop, a study was made to compare its value with oats. In 1952, four acres were planted to Atlas 66 wheat and four acres were planted to Nortex 107 oats. Both crops received the same treatment. During the 1952-53 winter grazing period the oats furnished approximately 76 per cent more grazing and 14 per cent more hay than did the wheat.

During the next two years a more comprehensive study was made of the two grazing crops. On September 25, 1953, eight acres were planted to Atlas 66 wheat and eight acres to Nortex 107 oats. Both pastures received the same treatments and management throughout the growing season. Grazing began on November 10 and continued through December 29, after which the crop was allowed to recover. On February 1, grazing began and continued through March 31. The oats furnished 117 cow days grazing per acre and the wheat furnished 110 cow days grazing per acre. The cows while grazing oats produced 2,665 pounds of 4 per cent FCM valued at $159.90 and gained a total of 500 pounds in body weight, while the cows grazing the wheat produced 2,411 pounds of 4 per cent FCM valued at $144.66 per acre and gained a total of 1,029 pounds.
pounds of body weight. The oats produced 1,268 pounds of TDN and the wheat produced 1,423 pounds of TDN per acre. The oats furnished 79.25 and the wheat furnished 88.94 standard cow days grazing per acre. Hay was cut from both pastures and each produced 1.75 tons per acre.

This comparison was again made in the 1954-55 grazing season. The oats furnished 86 cow days grazing and produced 2,584 pounds of 4 per cent FCM valued at $147.28 per acre. Cows on the oats lost a total of 222 pounds of body weight. The wheat furnished 69 cow days grazing and produced 2,015 pounds of 4 per cent FCM valued at $114.85 per acre. Cows on wheat lost a total of 86 pounds of body weight. The oats produced 639 pounds of TDN and furnished 39.9 standard cow days grazing per acre, while the wheat produced 505 pounds of TDN and furnished 31.6 standard cow days grazing per acre. The oats made 2.32 tons of hay per acre and the wheat made 1.94 tons of hay per acre.

For each of the three years in which the comparisons were made it was observed and recorded that the oats furnished a significantly greater early forage than did the wheat and that this early grazing came at a time when there was little else available for pasture.

Comparison of Two Dairy Rations

A feeding trial begun in July 1953 was conducted to check the economy of a commercial dairy ration as compared to a home-grown, homemade ration. The commercial ration used was a medium quality 16 per cent protein dairy ration and was priced at $3.70 per hundred pounds. The homemade ration was made of corn grown on the Station and cottonseed meal mixed in proportions to give approximately the same protein percentage as found in the commercial ration. Six different feed analyses were made of each ration, and the commercial ration averaged 17 per cent protein, 2.7 per cent fat, and 8.3 per cent crude fiber. The homemade ration averaged 16.8 per cent protein, 2.5 per cent fat, and 10.3 per cent crude fiber. The homemade ration was valued at $2.50 per hundred pounds. All cows in the herd were divided into two equal groups and used in this trial. At the end of the first year the cows were regrouped and the trial continued for another year.

For the two years the cows getting the commercial ration produced an average of 23.16 pounds of 4 per cent FCM valued at $1.313 per day and ate an average of 6.06 pounds of feed that cost $.224 per day. The value of milk above feed cost per cow per day was $1.089.

The cows receiving the homemade ration produced an average of 22.88 pounds of 4 per cent FCM valued at $1.292 and ate an average of 5.96 pounds of feed that cost $.148 per day. The value of milk above feed cost per cow per day was $1.144. There is a
difference of $.055 per cow per day in favor of the cows getting the home ration.

Calf Raising

A calf raising program is being conducted where the cost of raising dairy calves and the performances of these calves are being studied. To date three different systems have been initiated. In the first system used, calves are kept in individual pens for at least 12 weeks and fed whole milk for 8 weeks. At one week of age a home-mixed calf starter ration and alfalfa hay is fed. The starter is fed free choice until 4 pounds a day is being consumed and continues until the calves are six months of age. At this time they are changed to the herd ration at 4 pounds per day and continue on it until they come into production. Alfalfa hay is fed free choice at all times. To date on this system 16 calves at 12 weeks of age weighed an average of 130 pounds and cost $25.33. Sixteen calves at 6 months of age weighed an average of 255 pounds and cost $45.58. At 12 months of age 16 calves weighed an average of 478 pounds and cost $83.82, and at 18 months of age 12 calves averaged 663 pounds and cost $137.66 per head. Nine calves have freshened at an average of 23.4 months of age, weighed an average of 843 pounds, and cost $172.19 per head. Three of these calves have finished a first lactation. They produced an average of 7,280 pounds of 4 per cent FCM valued at $362.63. The cost of feed for production was $122.42 and the value of production above feed cost was $240.22 per head.

In the second system to be used the calves are treated the same as those in the first system except that they are fed a commercial milk replacement ration in place of whole milk. At six months of age they are put on pasture and fed grass hay free choice, and are fed two pounds of a commercial dairy ration per day until they come into production. At six months of age 4 calves weighed an average of 245 pounds and cost $35.61 and at 12 months of age 4 calves weighed an average of 389 pounds and cost $62.87 per head.

The calves in the third system are fed the same as those in the second system until they are six months old. At that time they are put on pasture and fed grass hay free choice. They get no more grain after six months of age except during the winter when pasture is short. To date in this system 3 calves at six months of age weighed an average of 258 pounds and cost $34.59, and at 12 months of age 3 calves weighed an average of 348 pounds and cost $54.98 per head.

Horticulture

Peach Orchard Management Studies

The peach crop was 100 per cent destroyed by March freezes in
1955. All cultural and fertilizer practices were continued as usual. Growth measurements of the trunk circumference were taken in February and it was found that the average circumference of trees from the treatment which received an intertilled crop during the spring months of the first three growing seasons measured 16.40 inches as compared to 20.59 inches where clean tillage was the practice. These trees are six years of age and even though this treatment has been clean tilled during the summer months and received a cover crop during the winter for the past three years the trees have not recovered any of the growth which they failed to make the first three years.

Peach Varieties

All varieties had the fruit destroyed by the late freezes, but the blossoming dates and leaf emergence notes were taken along with the percentage of bud kill during the first killing freeze in March. All cultural practices were performed as usual.

Sweet Corn Irrigation and Subsoiling

This test received only two irrigations of 1 inch of water each, May 5 and May 17. The increases in yield from the different methods of irrigation alone and in combination with subsoiling ranged from 18 dozen to 60 dozen ears per acre over that of the check plots. Sprinkler irrigation in combination with subsoiling produced the highest yield of any irrigated plots. However, subsoiling without irrigation produced the highest yield in the test, with a production of 1,000 dozen ears per acre as compared to 932 dozen from the check plot.

Sweet Corn Varieties

Twelve of the better varieties of sweet corn were grown in replicated yield trials. The corn was harvested, shucked, weighed, and graded in the usual manner. The Tempo variety produced the greatest number of high quality ears with a yield of 20,682 per acre. However, the average weight per ear from this variety was only .342 pound, which is too small for our market. The recommended variety, Aristogold Bantam Evergreen, ranked fourth in this test with a yield of 17,146 ears per acre with an average weight per ear of .404 pound.

Tomato Irrigation and Subsoiling

The results of this work in 1954 when the crop received 9 inches of its water from irrigation were quite different from those of 1955 when only 2.75 inches of water were supplied by irrigation. Highest
yields were obtained from irrigation in combination with subsoiling during the 1954 season, and there was a reduction in yield from subsoiling without irrigation. However, best yields were obtained from irrigation alone, both sprinkler and furrow, and there was also a considerable increase in yield from subsoiling without irrigation in 1955. The 1954 crop received only 14.62 inches of natural rainfall as compared to 29.37 inches in 1955.

**Watermelon Breeding**

Several additional crosses were made involving varieties which have not been used in the program heretofore. The anthracnose disease became a major problem in this area during the 1955 season, and in the future every effort must be made to try to include resistance to this disease in our breeding program. A new seedling from a cross of Calhoun Sweet with Charleston Gray looked very good from the standpoint of resistance to both anthracnose and fusarium wilt and possessed excellent quality, yield, and fruit size. One of the more advanced seedlings, a cross of Calhoun Sweet and Black Diamond, is now being carried under the number L-1 and will be tested extensively throughout the watermelon areas during the 1956 season.

**Watermelon Fertilization**

Results from four years’ studies indicate that 600 to 800 pounds of a 6-8-8 or 8-8-8 plus a sidedressing of approximately 25 pounds of available nitrogen should be used for best production of the watermelon in north Louisiana. The seedling L-1 was used in the 1955 test, and the best yield was obtained from an application of 600 pounds of 6-8-8 plus a sidedressing of 150 pounds of nitrate of soda. The yield was 1,436 melons per acre, actual count, and 1,482 per acre on corrected stand, with an average weight of 27.13 pounds per melon. Only those melons weighing 20 pounds or more were counted.

**Watermelon Irrigation and Subsoiling**

In 1955 the best yields were obtained, as in 1954, from furrow irrigation in combination with subsoiling. The yield was 811 melons per acre with an average weight of 26.7 pounds per melon as compared to a yield of 483 melons per acre weighing 25.9 pounds each from the check plots. Only those melons weighing 20 pounds or more were counted in this test. There was an increase of 207 melons per acre from the subsoiled plots during the 1955 season as compared to a reduction in yield from these plots in 1954. The 1954 crop received only 2.37 inches of natural rainfall and 10.00 inches of irrigation as compared to 9.18 inches of natural rainfall and
Field Pea Breeding

The spring season of 1955 was very near ideal for field pea production and because of the high yields it was possible to do a very good job of seedling selection. A large number of rather advanced lines were discarded, a number of selections from later crosses were obtained, and a few new crosses were made. One seedling, a cross of Calhoun Crowder and Texas Cream 40, looked very promising in the spring planting, especially from the standpoint of yield and earliness. However, in the fall planting it was found that there was considerable pod splitting as well as cracking of the seed pericarp in this seedling even while it was in the green stage. A single plant selection was obtained from this planting which did not show any of these undesirable characters.

Peach Breeding

A great number of crosses were made during the early portion of the blossoming season and a large percentage of these were well toward development when the late March freezes came. Seven times during the month of March the temperature dropped to or below freezing, with a low of 23° on March 27. This destroyed 100 per cent of the peach blossoms in north Louisiana. Growing on the Station at present are some 400 seedlings ranging from three to six years of age, all of which should fruit in 1956 providing the season is favorable. There are also approximately 200 one- and two-year-old seedlings on hand.

Strawberry Variety and Seedling Observations

Seedling 0-242 continued to produce well, along with L-27 and Konvoy. The March freezes cut production considerably and several seedlings produced practically no fruit. The Konvoy variety is recommended for north Louisiana as well as L-27 when plants can be obtained.

Sweet Potato Varieties and Seedlings

Nineteen varieties and seedlings were grown in replicated plots. Yields were very good, with the percentage of culls being rather low. Seedling 1-231 again produced the highest yields of both number 1 and total marketable roots—308 bushels of number 1 and 374 bushels of total marketable roots per acre. Dark Skin Goldrush was second in yield with 297 and 357 bushels per acre as compared to 211 and 291 bushels for Porto Rico Unit 1. Recommended varieties for north Louisiana are Dark Skin Goldrush and Porto Rico Unit 1.

—John C. Taylor and Ralph S. Woodward

—John C. Taylor, P. L. Hawthorne, and Ralph S. Woodward

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Sweet Potato Wilt Studies

Vine cuttings from 82 varieties and advanced seedlings were dipped into a spore suspension of the wilt organism and planted to the field. Several weeks later the plants were lifted, examined, and indexed according to the extent of disease. An indexing system in which zero represented no infestation and 100 represented dead plants was used. Eight varieties and seedlings had a reading of 10 or less as compared to a reading of 85 for the Porto Rico Unit 1 variety.

—John C. Taylor, Teme P. Hernandez, Travis P. Hernandez, Julian C. Miller, John J. Mikell, James F. Fontenot, and Ralph S. Woodward

Watermelon Variety Observations

Twelve varieties and advanced lines were grown and observed on wilt infested soils, in cooperation with the Southern Regional Trials. There was a very heavy infestation of wilt present in the susceptible varieties. Three of the advanced lines showed no resistance and all plants were destroyed by the disease. Of the nine remaining varieties the Chris Cross variety looked best from the standpoint of disease resistance, yield, and quality. The White Hope variety ranked highest in yield but the fruits were rather small for local commercial purposes. Recommended varieties for north Louisiana are Charleston Gray for commercial purposes when grown on wilt soils, Black Diamond when grown on wilt free soils, and Calhoun Sweet for local market.

Field Pea Variety Observations

In cooperation with the Southern Regional Trials 16 varieties and advanced lines were grown and observed under field conditions. The Louisiana Purchase variety ranked first in yield of green peas in the pod and was third highest in shelling percentage with 65 per cent peas and 35 per cent hulls while in the mature green stage. The Dixie Lee variety ranked second in total yield with a shelling percentage of 49 per cent. Recommended varieties for field pea production in north Louisiana are Louisiana Purchase, Running Purplehull, Bunch Purplehull, and Dixie Lee.

—John C. Taylor and Ralph S. Woodward

Poultry

Laying Flock Research

A study of the effect of feed restriction as compared to full feed on the feed consumption, production, and egg size of young pullets was begun in 1954. In the first year of comparing restricted-
fed pullets with full-fed pullets, 300 Arbor Acre White Plymouth Rocks were selected from the broiler house in July and placed in range shelters at 10 weeks of age. The pullets remained on range until they started in production, at which time they were culled and 100 birds from each flock were placed in separate pens in range shelters. Nests for the birds were added to each pen. The culls were sold from the two flocks and each group was given credit in the tabulation of net returns. The restricted feed group received about 3/4 of the amount of feed consumed by the full feed group. This rate of feed was continued until both flocks started in production, at which time both flocks were put on full feed for the remainder of the test. The cost of growing pullets to laying age, including culls and hens sold, was 77 cents per bird for the full feed birds and 50 cents per bird for the restricted feed group. The total feed and replacement cost was $4.30 for full feed group and $3.93 for restricted feed group.

During the laying period the full feed group produced 10,985 eggs for an average production of 113.67 eggs per hen, or 39.25 per cent, while the restricted feed group produced 11,114 eggs for an average of 113.59 eggs, or 39.69 per cent. The eggs in both groups were sold as fresh eggs and the net gain over chick, feed and replacement cost was 43 cents profit per bird for the full feed group and 80 cents per bird for the restricted feed birds. The average egg weights were 23.9 ounces per dozen for the full feed group and 25.13 ounces per dozen for the restricted feed group.

Current Laying Flock Research

The program now in effect is a study of the following: (1) the effect of feed restriction of pullets on pasture during the growing period; (2) the performance of birds grown in complete confinement as compared with that of birds grown on native pasture; and (3) the performance of hens in confinement as compared with the performance of those having access to range. This program was started July 1955 and has not progressed enough for a report at this time.

Broiler Production, Feed Comparison

The program of broiler research under way at the present time is the testing of a simple home-mixed ration and a concentrate yellow corn mixture with a standard commercial ration. The feed comparison was started with the summer trial in 1954, and five complete trials were completed with the summer trial of 1955. Arbor Acre White Plymouth Rocks were used in all five trials.

The results of five trials comparing feeds show the livability was 96.2 per cent in home-mixed ration as compared to 95.9 per
cent for concentrate-corn mixture and 96.8 per cent for the commercial feed. Feed efficiency was good in all three groups, but the commercial feed group utilized feed better than the other two groups, with 2.71 pounds feed required to produce 1 pound meat as compared to 2.89 pounds for the concentrate-corn ration and 3.17 pounds for the home-mixed ration. In the five trials completed the average weight per bird was 2.59 pounds for home-mixed ration; 3.14 pounds for concentrate and corn meal, and 3.29 pounds for commercial feed. The average feed cost per 100 pounds was $4.41 for home-mixed ration, $5.15 for concentrate and corn meal, and $5.55 for commercial feed. The average net income above all cost except labor for the five trials was $472.46 for home-mixed feed as compared to $661.68 for concentrate and corn meal and $745.95 for commercial feed.

Comparing All Mash and All Crumbles

In the first trial of comparing a mash type commercial feed and a crumble type commercial feed 308 chicks were divided into lots of 154 each and housed in separate small colony-type brooder houses. The livability was 99.4 per cent for birds on crumbles as compared to 95.5 per cent on mash. The feed consumed was 8.03 pounds per bird for crumbles and 8.97 pounds for mash. The average weight when sold was 3.20 pounds for crumbles as compared to 3.15 pounds for mash. The average feed cost per 100 pounds was $5.57 for crumbles and $5.25 for mash. The average net income above all cost except for brooding, lights, and labor was $22.73 for crumbles and $15.50 for mash.

Summary of Broiler Performance

Since July 1951, 17 groups of experimental broilers have been produced and sold under commercial type conditions. A total of 48,857 broilers were sold for a net return of $5,840.95, not including labor, which gave an average labor income of $115.66 per month from a 3,000 capacity broiler operation. This was based on 4 groups per year placed in the house, irrespective of market conditions, on the following approximate dates: mid-July, September, January, and April. All of the groups did not show a profit, some barely breaking even and some losing up to $500. The baby chicks, feed, and other cost items were bought on the open market with very little, if any, discount allowed other than that allowed for cash purchases. The finished broilers were sold through regular channels.

—J. L. Heath, Jr., Burl Watts, Charles W. Upp, and Ralph S. Woodward

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Agronomy

The Nematocidal Effect of Soil Fumigation on Corn Production
—Control of parasitic nematodes by soil fumigation increased corn plant growth throughout the growing season. Stover and grain yields were more than doubled by soil fumigation.

Chemical composition of the whole plant at the tasseling stage, of the mature stover, and of the grain revealed no differences in contents of N, P, K, Ca, Mg, and Na between the non-fumigated and the fumigated treatments.

Analysis of soil samples of the top six inches, collected after the corn was harvested, revealed no differences in available nutrients between the fumigated and non-fumigated plots.

—G. E. Wilcox, M. J. Fielding, J. P. Hollis, and D. M. Johns

Cotton Yield Response to Magnesium Fertilization on Ruston Fine Sand—A positive linear yield response to increasing rates of magnesium fertilization was obtained in 1950, the first year of the experiment. Similar yield increases were obtained from the cotton on magnesium treated plots in the succeeding years of the experiment, but the increases were not significant. Although significant yield responses were obtained only in 1950, visual observations of growth in subsequent years indicated that magnesium was exerting a positive influence.

—D. M. Johns, G. E. Wilcox, and D. A. Russel

Oat Production and Fertilization under Various Management Practices—The importance of early planting for winter grazing was brought out in this test. Oats planted September 15 produced about

* Appointed October 17, 1955.
** Appointed August 1, 1955.
*** Appointed April 25, 1955.
900 pounds oven-dry forage by January 15, while oats planted October 15 did not produce any harvestable forage.

—G. E. Wilcox, D. A. Russel, and D. M. Johns

**Coastal vs. Common Bermuda**—In 1955, Coastal Bermuda produced 13,471 pounds air-dry forage per acre compared with 6,384 pounds for common Bermuda.

—G. E. Wilcox and D. M. Johns

**Sorgo Variety Test**—Three early maturing varieties of sorgo yielded in tons per acre as follows: Tracy, 9.6; Red Top, 9.8; Honey, 13.3.

Three late maturing varieties of sorgo yielded in tons per acre as follows: Mer. 52-1, 14.0; MN1056, 15.6; Sart, 16.0.

—D. M. Johns, G. E. Wilcox, and K. Freeman

**Nematode Control in Oat and Sorgo Production**—The control of parasitic nematodes by soil fumigation did not affect oat and sorgo yields in 1955.

—G. E. Wilcox, D. M. Johns, M. J. Fielding, and J. P. Hollis

**Common Bermuda Response to Treatments with Three Sources of Nitrogen with and without Phosphorus and Potassium**—In 1955, the application of 60 pounds of nitrogen April 1 and 60 pounds of nitrogen May 18 was the most effective method of application of ammonium nitrate for utilization by common Bermuda. One hundred twenty pounds of Urea applied April 1 resulted in the production of more forage than a 60-60 split application on April 1 and May 18. The use of anhydrous ammonia depressed yields in direct relation to the number of treatments required to apply a given amount of nitrogen. The application of phosphorus and potassium resulted in more efficient use of the nitrogen applied.

—G. E. Wilcox and D. M. Johns

**Coastal Bermuda Yield Response to Fertilization**—The greatest increases in production due to nitrogen fertilization were between the 0- to 200- and 200- to 400-pound rates. The addition of an extra 100 pounds of K₂O and 100 pounds of MgO per acre to the 200-200-200 treatment also increased the yields significantly. One year's production removes all the effect of the application of 200 pounds P₂O₅ and 200 pounds K₂O per acre.

—G. E. Wilcox and D. M. Johns

**Corn Fertilizer Test**—Some important lessons were learned in the fertilizer test work with the 1955 corn crop.

(1) **Possible Yields**—When rainfall is plentiful, as in 1955, yields of over 70 bushels per acre are easily obtained through the use of proper fertilization, adapted corn varieties, and selection of the proper land site.
(2) Sufficient Fertilization Necessary for High Yields—The first two 50-pound increments of nitrogen applied to good corn land increased the yield by 24.5 bushels per acre per increment. The third 50-pound increment increased the yield 12 bushels per acre, or an increase in yield of approximately 60 bushels per acre from the use of 150 pounds of nitrogen per acre.

(3) Selection of Site Important—Fumigation for control of parasitic nematodes in a soil that had been previously grown to corn more than doubled the yield of corn. Corn grown on soil not previously in corn yielded nearly as much as the fumigated soil.

(4) Plant Population Necessary for High Yields—Plant population tests indicate that 8,000 to 10,000 plants per acre is an adequate number of plants for maximum corn yields under the weather conditions that prevail in north Louisiana.

—G. E. Wilcox and D. M. Johns

Sudan and Millet Variety Test—Three millet and ten Sudan varieties were tested for yield. The millet varieties produced over four times as much forage as the Sudan varieties.

—D. M. Johns, G. E. Wilcox, and C. L. Mondart

Cotton Response to Fertilization and Soil Fumigation—Cotton yields on nematode infested soils were significantly increased and the incidence of fusarium wilt of cotton plants was reduced by soil fumigation.

Fumigation with methyl bromide gave excellent control of Meloidogyne spp. but not of the Trichodorus spp.

The addition of a high amount of potassium created a nutrient unbalance in the soil which resulted in the development of severe magnesium deficiency symptoms on cotton growing on non-fumigated soils. The cotton grown on fumigated soil that received the same potassium treatment did not develop the visual magnesium deficiency symptoms.

—G. E. Wilcox, L. D. Newsom, and D. M. Johns

Corn Hybrid Yield Test—Two tests of ten corn hybrids each were conducted in 1955. Coker 811, Dixie 18, Dixie 11, La. 2129, Funk’s G-714B, and Funk’s G-710 produced the highest yields.

—G. E. Wilcox, D. M. Johns and Lee Mason

The Effect of Additions of Lime, Sulfur, and Minor Elements on Cotton Grown on Shubuta Fine Sandy Loam—This experiment was initiated for the purposes of relating sulfur needs of cotton to the amount of sulfur brought down in the rainfall and the effect of the residual supply of sulfur in the soil on cotton yields and to determine the period of time required for sulfur deficiency to develop under the continued use of sulfur free fertilizers.

About six pounds of sulfur is added each year in rainfall.

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The use of 600 pounds per acre of a sulfur free 8-8-8 fertilizer prepared from ammonium nitrate, treble superphosphate, and muriate of potash, supplemented with 44 pounds of sulfur resulted in a yield increase of 273 pounds of seed cotton over a comparable mixture containing no sulfur.

The yield increases may have been due to the sulfur alone, and also to the effect of sulfur on the availability and absorption of other nutrient elements. The plants growing on soils to which sulfur was not applied were retarded and light green in color during the early part of the growing season, but seemed to partially overcome this as the season progressed and their root systems became more developed. In general, the addition of dolomitic lime-stone did not improve the vegetative growth of the plants and did not increase yield.

Although sulfur deficiency symptoms have developed each of the four years of the experiment, they were the most severe in 1955 both as visual symptoms and as depressed yields.

—G. E. Wilcox and D. M. Johns

Interrelationship of Yield, Plant Composition, Fertilizer Treatment, and Available Soil Nutrients in Cotton Production—A four-year experiment was conducted on a Ruston fine sand to determine the interrelationship of yield, plant composition, fertilizer treatment, and available soil nutrients in cotton production. The experiment was laid out in a randomized block design with four replications. Sixteen treatments, varying in sources of N, Mg, and Na and in rates of P, K, Mg, and Na, were used. The plot locations were maintained for the entire period of the experiment.

In a comparison of two sources of N, NH₄NO₃ increased the yields of seed cotton more than did NaNO₃ when the total yield of the four-year period was considered. When this same comparison was evaluated by individual years, there was no difference in yields for the N sources in 1952, a difference in favor of NaNO₃ in 1954, and a difference in favor of NH₄NO₃ in the other two years.

A positive linear yield response to 0, 24, and 48 pounds of P₂O₅ per acre was obtained for both sources of N. However, most of the yield response with NH₄NO₃ was between the 0- and 24-pound rates of P₂O₅, while most of the yield response with NaNO₃ was between the 24- and 48-pound rates of P₂O₅.

Potassium effectively increased the yield of cotton in this experiment only when applied with NaNO₃ as the source of N. An attempt was made to evaluate the substitution of Na for K but no conclusions could be drawn from the data collected.

Cotton leaf samples were collected at the first-blossom (July 14) and mature (Sept. 1) stages in 1954 and chemically analyzed
for N, P, K, Ca, Mg, and Na. In a comparison of the effect of NaNO₃ vs. NH₄NO₃ as sources of N, it was found that: the Ca content in the first-blossom stage of growth and the N content at the mature stage were higher with NH₄NO₃ as the source of N; the Na content of leaves at both stages was higher with NaNO₃; and the Mg, K, and P contents were the same for both sources of N.

From soil samples collected at the termination of the experiment, it was found that the pH of the soil from plots treated with NaNO₃ was higher than that from plots treated with NH₄NO₃.

The adsorbed P content of soils that received NH₄NO₃ as the source of N was not changed by the addition of 24 or 48 pounds of P₂O₅ per acre annually. However, with NaNO₃ as the source of N, the adsorbed P in the soil was increased, but only with the 48-pound rate of P₂O₅.

Exchangeable K was higher for soils that received N from the NaNO₃ source than from the NH₄NO₃. The application of 48 pounds of K₂O per acre annually increased the K content of the soil, regardless of the source of N.

Exchangeable Ca was higher for soils from plots that received NaNO₃ than for soils from plots treated with NH₄NO₃. Soils that received annual applications of 48 pounds of P₂O₅ per acre, in conjunction with NaNO₃ as the source of N, were higher in Ca than soils that received 0 or 24 pounds of P₂O₅ per acre. There was no difference in Ca content due to P₂O₅ treatment when NH₄NO₃ was used as the N source. Potassium applied at the rate of 48 pounds of K₂O per acre, with NaNO₃ as the source of N, increased the Ca level of the soil, but 48 pounds of K₂O per acre, with NH₄NO₃ as the N source, did not affect the Ca level.

Exchangeable Mg was higher in soils treated with NaNO₃ than in soils treated with NH₄NO₃. Neither P₂O₅ nor K₂O had an effect on the Mg content of the soil. The application of 48 pounds of MgO per acre in the form of dolomitic limestone resulted in an increased Mg content of the soil with both NaNO₃ and NH₄NO₃ as sources of N; 24 pounds of MgO, applied as Sul-Po-Mag, had no effect on soil Mg in this experiment.

The Na content of the soil was higher for plots treated with NaNO₃ than for plots treated with NH₄NO₃. No other fertilizer treatment had an effect on the exchangeable Na in the soil.

—D. A. Russel, G. E. Wilcox, and D. M. Johns

Dairying

The year 1955 brought no marked changes in general management. Feeding of home grown roughages was again emphasized. Pastures were excellent through the spring and early summer.
months, but were curtailed by a drought in late summer and fall. A new self-feeding, above-ground, horizontal silo was built and placed in service.

Breeding Plans for Developing Strains of Dairy Cattle Adapted for the South—Brown Swiss, crosses of Red Sindhi and Brown Swiss, and backcrosses of Brown Swiss on Red Sindhi-Brown Swiss crosses are maintained at the North Louisiana Hill Farm Experiment Station. The year-end inventory showed 50 Brown Swiss, 19 crossbred, 22 first backcross to Brown Swiss, 8 second backcross to Brown Swiss, and 2 first backcross to Sindhi female animals in the herd.

Twenty-six crossbred cows have completed first lactation records with an average of 3,245 pounds milk, 158 pounds fat. These records represented decreases of 1,642 pounds milk and 38 pounds fat below their dams’ records. Five purebred daughters of Clemson Lucky Baron have completed first lactation records averaging 7,627 pounds milk, 325 pounds fat, an increase over the dam of 3,421 pounds of milk, 149 pounds fat. Five first backcross daughters of the same sire have completed first lactation records averaging 5,371 pounds milk, 238 pounds fat, an increase over the crossbred dams of 3,407 pounds milk, 142 pounds fat.

A third Brown Swiss bull, Alfalfa Knoll Claiborne Pride, was placed in service. Three backcross bull calves have been retained as tentative herd sires for a program of inter-se matings among the backcross animals.

Field Studies of Heat Tolerance in Brown Swiss and Backcrosses of Brown Swiss on Red Sindhi-Brown Swiss Crossbred Cattle—Observations of rectal temperatures and respiration rates were made on six Brown Swiss and six backcross heifers aged 20 to 23 months. The heifers were confined to individual 0.1 acre paddocks with water, but without shade on native Bermuda grass sod. Four observations were made on each heifer on 19 different days. Observation periods began at 9:00 A.M., 11:00 A.M., 1:00 P.M., and 3:00 P.M. Physiological responses were correlated with climatological observations. Dry bulb temperatures ranged from 78.2 to 92.8°F., vapor pressures from .580 to .950 in. Hg., and unshaded black globe temperatures from 89.2 to 124.9°F. during the experimental period.

Rectal temperatures of the Swiss averaged 0.3°F. higher than the temperatures of the backcrosses, a difference which was not statistically significant. Respiration rates of the Swiss averaged 15 counts per minute higher than the rates of the backcrosses, a highly significant difference. Rectal temperatures and respiration rates were both higher in the afternoon than in the morning. The differences among times of observation were highly significant for
both rectal temperatures and respiration rates. Highly significant differences were found between correlations for the different breeds for rectal temperature with dry bulb temperature, rectal temperature with black globe temperature, rectal temperature with respiration rate, and respiration rate with dry bulb temperature. No significant differences were found between correlations for different breeds for rectal temperature with vapor pressure, respiration rate with vapor pressure, and respiration rate with black globe temperature. Within animal correlations of rectal temperature with: respiration rate, dry bulb temperature, vapor pressure, and black globe temperature were .553, .559, .138, and .353 respectively. Within animal correlations of respiration rate with: dry bulb temperature, vapor pressure, and black globe temperature were .661, .331, and .488 respectively. All within animal correlations were highly significant.

It was concluded that Swiss backcrosses on Sindhi-Swiss crosses tolerate higher ambient temperatures than do Brown Swiss before increased pulmonary ventilation is required to alleviate increasing body temperatures. Vapor pressures were less important than dry bulb or black globe temperatures in determining physiological responses within the climatological patterns prevailing during the experiment.—F. N. Baker*

Forestry

Spacing Study of Loblolly Pine—Growth and survival data were collected from the different spacings included in the experiment. Satisfactory growth has been made by the plants of all spacings, which range from 4 x 4 feet to 10 x 10 feet, and the difference in growth amongst spacings has not been significant. Greater tip moth damage was noted on the wider spacings, especially at the 10 x 10 feet.—T. Hansbrough

Control Burned and Growth Comparison Study of Slash and Loblolly Pine—The rate of growth in both height and diameter continued to be equal for 1950 plantings in both pure and mixed stands of slash and loblolly pine. The percentage survival was higher for the loblolly species in this experiment.

—T. Hansbrough

Effect of Hardwood Brush on the Survival and Growth of Pine Plantations—Records taken in 1955 on slash and loblolly plantings

*The author wishes to acknowledge the contributions of Mr. M. H. Fohrman, Agricultural Research Service, USDA; Dr. J. B. Frye, Dairy Department, LSU; and Mr. D. M. Johns, North Louisiana Hill Farm Experiment Station, in establishing the RMS-3 project at Homer. He also wishes to acknowledge the contributions of his several predecessors and of staff members of the Dairy Department in maintaining the herd and collecting data which were used in preparing this report.
made in 1950 showed that heavy stands of resprouting hardwood species reduced both survival and rate of growth of the pine species approximately 50 per cent. Hence, the total pine growth in such plantings may be no more than 25 per cent of that of pines planted in areas free of hardwood competition.—T. Hansbrough

Soil Fumigation for the Control of Nematodes and the Effect of Nematodes on the Survival, Growth, and Development of Loblolly Pine Seedlings—An experiment was initiated in the fall of 1955 encompassing the objectives indicated in the title. In preparation for the 1956 phases of the study, complete nursery facilities were established and four soil fumigants were applied in December 1955.—T. Hansbrough

Methods of Improving Reproduction in Low Quality, Old-Field, Pine Stands—The economic value of different methods of improving reproduction in low quality, old-field, pine stands is being studied in an experiment established in 1955. The methods being studied include that of seed tree cutting, four different types of seedbed preparation which may facilitate natural reproduction, and clear cutting, followed by hand planting of seedlings. Data have been collected on the labor and other requirements incident to these various methods of improving stands, and records will be kept on the stands obtained, growth, and value of products harvested from the areas under the different management systems.

—T. Hansbrough

Direct Seeding of Loblolly Pine—A study was initiated in the fall of 1955 to determine the value of direct seeding at different rates and dates as a means of obtaining satisfactory stands on the following type seedbeds: (1) no seedbed preparation; (2) vegetation and debris removed by burning; and (3) seedbed preparation by disk ing. Unstratified seeds were sown in the December 1955 planting of the experiment, and stratified seeds will be used for the March 1956 plantings.—T. Hansbrough

Effects of Pruning on Old-Field Shortleaf Pine—An old-field area, medium stocked with pole size shortleaf pine, was used as the site in the fall of 1955 for the establishment of an experiment to study the effects of pruning on such stands. The following treatments were included: (1) no treatment—stand composition unchanged; (2) thinned and unpruned—stand composition changed by removal of all trees competing with the selected crop trees; and (3) thinned and pruned—stand composition changed by removal of all trees competing with selected crop trees, plus the pruning of crop trees. The treatments in which the stand composition was altered involved thinning to a stand ranging between 100 and 150 crop trees per acre. The diameter of the selected trees varied from 3 inches to 10 inches DBH and the branches were removed from
the pruned trees to a height of approximately 17 feet (one sawlog length). The average pruning time per pruned tree was nine minutes.—T. Hansbrough

The Effects of Pruning and Thinning on Loblolly Pine Plantations—A six-year-old, ten-acre, loblolly pine plantation was used in November 1955 to establish an experiment to determine the value of pruning and thinning as a means of accelerating the production of high quality sawlogs. In each treatment, in which thinning was involved, the stand was reduced to 300 to 400 crop trees per acre. The experiment includes the following treatments: (1) no treatment—stand composition unchanged; (2) thinned and unpruned; (3) unthinned and pruned; and (4) thinned and pruned.

—T. Hansbrough

Undesirable Hardwood Eradication with Urea Herbicidal Poisons—Three Urea herbicides were applied as ground sprays at three different rates in an experiment initiated in August 1955 to determine the value of these materials for eliminating trees and brush of various species in preparation for planting pine seedlings. Data were collected on the sensitivity of the various species to the different materials used. The residual toxic effects of these materials on the pine seedlings to be planted in February of 1956 will be recorded in terms of stand survival and growth rate.

—T. Hansbrough

Farm Fish Pond Management

A three-acre pond was fertilized with six applications of 11-8-4 fertilizer at the rate of 100 pounds per acre, at intervals necessary to maintain a good growth of algae. Records were kept on the numbers and sizes of fish caught during the last half of 1955. Six hundred forty-one bream and 120 bass were taken. It was estimated that 168 pounds of bream and 57 pounds of bass were harvested.

Of 225 attempts reported, 117 were successful. The fishing time for successful trips averaged 2 hours 18 minutes. The time spent on unsuccessful trips averaged 1 hour 3 minutes. On the average, one fish was caught for each 29 minutes spent fishing, with an average of 6.5 fish per successful trip.

Weights and measurements were taken on 58 bream and 24 bass. Prediction equations for estimating weight from length measurements were:

Weight (oz.) = .2811 (1.468)^x for bream, and

Weight (oz.) = .3785 (1.323)^x for bass where

x equals the length in inches.

—T. Hansbrough, F. N. Baker, and G. E. Wilcox

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**Horticulture**

**Fertilizer Studies with Dixigem Peach Trees**—No peaches from the orchard of Dixigem peach trees established in 1949 were harvested in 1955 owing to a freeze at blossoming time. However, growth, defoliation, and survival data were collected.

Growth of the trees, as indicated by the diameter of the trunk, was influenced by the rate of fertilizer application, the largest tree diameters being associated with the highest rate of fertilizer application. The growth, however, could not be associated with any single fertilizer element (nitrogen, phosphorus, or potassium).

With increasing rates of nitrogen application, regardless of the phosphorus and potassium applied, there was a decreasing rate of defoliation of the trees at the onset of fall and winter dormancy. Neither phosphorus nor potassium had any apparent effect on the defoliation of the trees.

The percentage survival of the original stand of Dixigem trees was dependent solely upon whether or not the trees had been fertilized. No one of the 13 fertilizer treatments used was better than any other fertilizer treatment, but all fertilizer treatments were better than the no-fertilizer treatment.

—D. A. Russel and D. M. Johns

**Mobile Soil Testing Program**

During the past year the soil testing program has been shifting from working on a community basis to working more with the individual farmer. This has meant that the mobile laboratory has been used more at the Station to do the actual testing and the personnel have gone into the field in working with the individual farmers.

This method of working has the advantage of allowing the farmer and Station personnel a better opportunity to discuss more fully the problems involved, in arriving at a liming and fertilizing program which fits the individual needs.

In addition to work of this nature, some time was spent in visiting farms on which some testing work has been done. There were indications that the farmers were following the fertilizer recommendations to some extent. The lime recommendations in most cases were not followed, except in the cases of pasture programs and a few cotton fields. The problem of distribution of lime is one of the main causes for this, especially in regard to row crops.

With more emphasis on working with the individual farmer, the total number of samples was less than in 1954—1,175 compared
to 1,688—and the number of individuals worked with decreased to 451 compared with 637 in 1954.—J. L. Keogh

**Soil Testing Procedures**—In the past year the testing procedures have been modified to make use of a photolometer. This was done to improve the accuracy of the determinations.

Work is continuing on the study of various procedures to find the one which will give the best results utilizing the type of equipment that can be adapted to use in the mobile lab. With these results a study of their relationship to crop response and nutrient uptake by the plants will be made.—J. L. Keogh

**Lime**—In 1954, an experiment was set up to study rates of liming. The lime was worked into the soil, and millet and Louisiana S-1 clover were grown. Soil samples taken periodically have been checked for pH. They have shown a consistent increase in pH, which indicates that the lime has not come into equilibrium with the soil.

The yields on the clover were taken during the past year. There was no significant difference in yields due to rates of lime. To investigate the cause of this lack of response, soil and plant samples will be analyzed.

To further investigate this liming problem, a number of outfield experiments have been set up to study the rates of liming on the various soil types of this area. These experiments were laid out in the fall of 1955 and the first crops on them will be cotton and corn in 1956.—J. L. Keogh

**Watermelon Fertilizer Test**—Two outfield tests were established on growers' farms in the Saline area. They were set up using two levels of nitrogen, phosphate, and potash, which gave nine treatments including a check. Each field had four replicates. The yields gave no consistent response to any of the nutrients, as anthracnose killed many of the plants during the ripening period, and the melons did not mature.—J. L. Keogh

**Poultry**

**Comparative Egg Production of Caged and Floor Managed Groups of S. C. White Leghorns**—In August 1953 an experiment was initiated to study the practicability of caged housed hens for producing market eggs as compared to the conventional method of floor managed hens.

The floor group for 1953-54 (August-July) gave a net profit of $588.60 more than the caged group, although the floor birds produced only 24 dozen more eggs. The difference in profit was primarily attributed to the cost of producing replacement pullets for
the cage operation. For the laying year 1954-55, the caged flock gave a net profit of $150.77 more than the floor group and produced 116 dozen more eggs. In the first five months (August through December) of the third laying year (1955-56) the floor birds were more profitable than those in cages. However, the floor managed flock probably reached their peak in egg production during these five months, whereas the cage birds should hold more constant production throughout the laying year. The total eggs produced and the net profit for the two years and five months of the experiment have been 10,042 and 9,363 dozen eggs and $1,791.05 and $1,187.49 from the floor managed and caged flocks respectively.

—C. O. Briles*

Northeast Louisiana Experiment Station, St. Joseph

John A. Hendrix, Superintendent
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Chemical Weed Control

Corn

Studies on the use of chemical herbicides have been conducted during the past several years, and the degree of weed control obtained has been measured in terms of mechanical harvesting efficiency. In general, pre-emergence herbicides have not proved satisfactory; however, dinitro at rates of 4 to 6 pounds, Kuron and MCP at rates of 1, 1½, and 2 pounds per acre appear worthy of further testing. The amine salt of 2,4-D at rates of ½ to ¼ pound per acre post-emergence has given consistently good weed control. Preliminary experiments indicate that emergence or very early post-emergence applications of dinitro at 2 pounds per acre, MCP or M-213 at rates of ½ to 1 pound per acre may be of value.

Soybeans

During the 1954-55 seasons several pre- and post-emergence chemicals were screened as potential herbicides for use in soybeans. No significant yield increases were obtained on plots

* Prior to October 15, 1955, the data included in this report were collected by A. C. Goodling and others of the North Louisiana Hill Farm Experiment Station and C. W. Upp and associates of the Poultry Industry Department, L.S.U.
treated with any pre- or post-emergence herbicides; however, other factors such as combine efficiency or reductions in overall weed populations were not evaluated. Future studies will include the above factors.

Alfalfa

The results of a one-year study on the use of 2 pounds of di-nitro applied in 20 gallons of water per acre for the control of henbit (*Lamium amplexicaule*) in alfalfa appear promising.

Pasture

The amine salt of 2,4-D at a rate of $\frac{3}{4}$ pound per acre gave good control of dock and other broad-leaved plants growing in pastures. The above rate of 2,4-D caused little, if any, damage to white clover.—*L. F. Curtis*

**Mechanical Harvesting of Corn**

Several commercial corn hybrids and 2 Louisiana strains were compared in a mechanical harvesting test. Harvester efficiency was calculated by comparing the amount of corn picked mechanically to the amount picked by hand (hand picking representing 100 per cent). Dixie 22 and Funk's G-710 were the leading hybrids in terms of harvesting efficiency, and their efficiency ratings were 96.8 and 96.5 per cent respectively. Other hybrids which showed good harvesting efficiency were as follows: Coker 911 (92.4 per cent), Funk's G-740 (93.9 per cent), Funk's G-7856 (93.4 per cent), and Louisiana 468 (84.2 per cent).—*L. F. Curtis*

**Animal Industry**

Pastures

Pasture work consists of grazing experiments to compare various summer and winter grasses in relation to days of grazing and beef production per acre. All plots are 4 acres in size. Winter grazing plots received 212 pounds N and summer plots 251 pounds N per acre. All pasture plots are replicated twice.

*Winter Grazing*—Fescue and Harding grass are the two grasses used for winter grazing. They were seeded in the fall of 1951 and 1953 respectively. Each furnished grazing from November 1954 to August 1955. The fescue furnished 252 days of grazing and made 316 pounds of beef per acre and the Harding grass 246 days of grazing and 559 pounds of beef per acre in 1955. Average beef production is as follows: Harding grass, 377 pounds per acre (2-year average); fescue, 293 pounds per acre (3-year average).
Summer Grazing—Dallis-Bermuda combinations and Coastal Bermuda are the three grasses used for summer grazing. The Dallis-Bermuda plots furnished 228 days of grazing and produced 490 pounds of beef per acre. The Coastal Bermuda plots furnished 180 days of grazing and made 448 pounds of beef per acre. The Coastal Bermuda plots carried more animals per acre through the summer than did the Dallis-Bermuda combination. The 2-year average is as follows: Dallis-Bermuda, 397 pounds beef per acre; Coastal Bermuda, 314 pounds beef per acre. Good grade Hereford and Angus steers were used in the above grazing work.

—John C. Carpenter, Jr.

Lamb Grazing Project

A grazing project was started in 1954 in which lambs were used to graze small grains and clovers and to clean Johnson grass and soybeans out of corn to be harvested mechanically. Two groups were to be purchased each year, one in November and one in July. The gains were as follows: November group, .2 lb. per head per day; July group, .08 lb. per head per day. The July group did not fatten fast enough to top the market in November, so only one group of lambs will be purchased next year.

One-half of the July group this year was clipped and they gained one-third more through the summer and fall than the group left in the wool.—John C. Carpenter, Jr.

Dry Lot Feeding

One group of steers was taken off fescue and one group off Harding grass and fed in dry lot for 98 days to compare gain and selling price of steers wintered on different grasses. The fescue fed steers did not carry as much flesh as the Harding grass steers. Because of this, the fescue fed steers gained more in the feed lot and brought less per pound when sold. The fescue fed steers, however, netted $2.00 per head more when sold than the Harding grass fed steers.—John C. Carpenter, Jr.

Commercial Cereal Grains

Several adapted varieties have been tested for the Delta region. Leading varieties and a six-year average yield in bushels per acre are: Early group—Fulgrain, 56.3, and Victorgrain 48-93, 64.5; late group—Alber, 55.5, Camellia, 45.1, and Nortex 107, 57.9.

Four wheat varieties were tested in 1955. Their yields in bushels per acre were as follows: Atlas 66, 26.4; Coker's Coastal, 24.5; Chancellor, 21.8; and Coker's 54-1, 16.2 (with an LSD at .05 of 8.4 bushels).—L. W. Sloane

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Cotton Variety Test

The three phases of cotton variety testing being conducted annually at this Station are commercial, new strains, and progeny evaluations. The 5-year averages of lint cotton per acre produced by 9 of the leading adapted varieties for northeast Louisiana are DPL 15—1,089; Stoneville 5A—1,085; Delfos 9169—1,039; Plains—1,062; Fox—986; Bobshaw lA—957; Coker lOOWR—927; Stoneville 2B—910; and Empire—900.

Heavy rainfall in July and August 1955 prevented optimum insect control, yet these varieties produced from 827 to 1,106 pounds of lint cotton per acre. Probably cultural practices and an early boll set contributed to the high production although yields in 1955 were slightly below the average for the last four years.

These tests were usually planted from the middle of April to mid-May. Sixty to 80 pounds of nitrogen were applied in deep furrow and bedded on just prior to seedbed preparation.

—L. W. Sloane

Cotton Fertilization

Results from 3 years' testing of two sources of nitrogen (solid and liquid) at 60 to 120 pounds, P₂O₅ at 48 to 60 pounds, and K₂O at 60 pounds indicate that nitrogen at the rate of 80 pounds per acre in either form produces as much seed cotton as higher rates.

The addition of P₂O₅ and/or K₂O to sandy loam delta soils provided no economical response in amount of cotton produced.

One year's testing of two sources of N at 60, 90, and 120 pounds applied in the fall as compared to spring applications on blackland-buckshot soils indicated no significant difference in amount of seed cotton between application dates. It appeared that the more firmly settled seedbed of the “fall” portion produced a better stand. Usually fall culture of blackland soils is possible, whereas winter and spring rains may render early spring management impossible. Therefore, fall working is desirable, and no appreciable leaching of fertilizer occurs.—L. W. Sloane

Cotton Following Winter Cover Crops

Twenty-six years of cover crops testing have indicated that a good tonnage of green legumes turned under is approximately equivalent to 35-40 pounds of nitrogen. Less grass and a better seedling emergence exist following legumes. These crops are usually planted in mid-November and turned under the first part of April. However, during dry years cotton following cover crops turned under tends to be more drought-stressed than where only
commercial fertilizers have been applied, probably because of competition for water between the deteriorating legume and the cotton plant.

The check plot in this test had no cover crop or fertilizer for 26 years and still produced \(1/2\) bale of lint cotton, indicating the tremendously high inherent soil fertility present. Also, the plots receiving 40 pounds of commercial nitrogen maintained a seed cotton yield about as high as the legume plots.

No significant response resulted from the addition of dolomitic limestone, available \(\text{P}_2\text{O}_5\) or \(\text{K}_2\text{O}\), to crimson clover or vetch when applied either in the fall or spring.—L. W. Sloane

**Corn Fertilization**

A slight response from the addition of 56 pounds of available \(\text{P}_2\text{O}_5\) to 100 pounds of nitrogen under corn indicated the possibility of economical gains from phosphate on sandy loam delta soils.

The previous 5 years' average in bushels per acre is as follows: check—47.1; 60 pounds N—78.3; 80 pounds N—82.6; 100 pounds N, 48 \(\text{P}_2\text{O}_5\)—86.1; and 120 pounds N—85.4. In 1955 the yields were 53.1, 72.8, 61.3, 86.7, and 68.8 respectively. Available \(\text{K}_2\text{O}\) resulted in no increase.

In 1955 a source of nitrogen (solid and liquid) at 60, 90, and 120 pounds per acre, fall applied as compared to spring application, test was instituted on blackland-buckshot soil. No significant differences occurred among rates from fall application. However, there were significant differences among rates from the spring application. Data from this test indicated no significant difference between the dates of application.—L. W. Sloane

**Corn Variety Test**

One commercial corn variety test at two dates of planting and two Louisiana hybrid tests were planted on Commerce sandy loam in 1955. Seventy-five pounds of nitrogen were applied in deep furrow and bedded on just prior to planting. A sidedressing of 32 pounds was made May 12.

Several of the leading adapted varieties and a 3-year average yield in bushels per acre are: Dixie 11—106.8; La. 468—103.9; Dixie 22—103.9; La. 521—103.3; Coker's 811—101.5; N. C. 27—100.3; Dixie 18—97.0; Funk's G-779W—94.9; and White Tuxpan—91.6.

Yields of some Louisiana experimental strains indicate the possibility of commercial availability if field testing proves them superior.—L. W. Sloane
Vegetable Crops

Bush Beans

Nine bush bean varieties were planted in replicated and 21 in observational trials at the Station this spring as part of the Southern Regional trials to further study the adaptability of these varieties to the growing conditions of this area.

The purpose was to obtain a more productive fresh market bean with a vigorous bush, concentrated early production, resistance to certain diseases such as root-rot, mosaic, etc., and storage qualities of Stringless Black Valentine and good freezing and canning qualities.

In the spring trials, Contender, New Improved Tendergreen, and Wade were the most productive, producing 283, 234, and 227 bushels of snap beans per acre respectively. Tenderlong 15 and B2567-1 were close behind with yields of 203 and 196 bushels per acre. Stringless Black Valentine produced 181 bushels per acre.

Contender, B2567-1, and Stringless Black Valentine were the only varieties which could be considered good shipping varieties since the others wilted badly in storage. B2567-1 has shown considerable promise as a shipping bean in tests at this Station for the past two seasons. It is an early, oval, straight, dark green bean with a fairly vigorous bush. When released it should be tried in areas where Stringless Black Valentine and Contender are grown.

In the fall trials New Improved Tendergreen, Tenderlong 15, and B2567-1 gave the highest yields, producing 425, 377, and 370 bushels of fresh beans per acre. Wade produced 356 and Contender 303, as compared with 263 for Stringless Black Valentine. Tenderlong 15 was considered a little too short and New Improved Tendergreen too rough for a shipping bean.—R. T. Brown, J. Hoffman, and J. C. Miller

Tomato Variety Trials

Fifteen varieties and breeding lines of tomatoes were planted in a replicated planting and 37 varieties in observational plots to determine the adaptability of these varieties to our growing conditions and to find a large, early, heavy producing variety with good shipping quality and resistance to wilt.
A sudden drop in temperature two weeks after transplanting resulted in considerable injury to most of the early maturing types, such as Moreton Hybrid, Vancross, Grothen Globe, and Break O'Day. Early Giant Hybrid, Early Prolific, Bigboy, Manalucie, and Rutgers and several of the breeding lines were injured only slightly.

Early Giant Hybrid, Manalucie, Step 218, Step 198, and Step 193 gave the highest early marketable yield, producing 10,888, 10,289, 10,235, 10,180, and 9,636 pounds respectively for the period from May 3 through June 6, 1955.

Early Giant Hybrid also produced the second highest total yield of number 1 tomatoes, being surpassed only by Step 193.

In total marketable yield, Bigboy, Step 218, Early Giant Hybrid, Early Prolific, and Grothen Globe were the leading varieties with yields of 29,561, 28,254, 28,037, 26,458, and 25,043 pounds of marketable tomatoes per acre respectively. Early Giant Hybrid ripened a little softer than Grothen Globe, but its ability to withstand cold winds and fusarium wilt and its large red fruits of good quality make it a very promising variety.

Of the 37 varieties in the observational plots, Queens, Step 190, and Ohio Wilt Resistant Brookston gave the highest early yield, 21,558, 15,243, and 12,467 pounds of marketable fruit per acre for the period from May 3 through June 6 respectively.

The highest yields of marketable fruit were produced by Ohio Wilt Resistant Brookston, Queens, and Step 190 with yields of 40,776, 40,449, and 39,850 pounds per acre. Ohio Wilt Resistant Brookston had the highest yield of number 1 fruit, followed by Queens.—R. T. Brown and J. J. Mikell

** Shallots  

Five varieties of shallots were planted in replicated plantings in the fall of 1955 to further study the adaptability of these varieties to early fall planting in this area.

A57 and A58 were again outstanding in the plantings made in early August and show good possibilities as early fall shallots.

On November 4, 1955, when the shallots were harvested, A57 produced 5,757 and A58 5,356 dozen bunches per acre as compared with 4,777 for Bayou Pearl and 4,287 for Homer Red, two that are widely planted at present.

Little bulbing was observed in Homer Red and none in A57 and A58; however, considerable bulbing was observed in Bayou Pearl. A57 and A58 have a tendency to get coarse if left too long. Since the two are so much alike, A57 only has been given to farmers for evaluation studies.—Don Perkins and R. T. Brown
Cucumber Varieties

Twelve varieties of slicer cucumbers were planted in a replicated planting as part of the Southern Regional Trials, to obtain a disease resistant, early, dark green, productive slicer type.

Ashley produced the highest yield of marketable cucumbers per acre, 413 bushels, followed closely by Marketer and Stono with yields of 406 and 364 bushels per acre, respectively.

Ashley held its color slightly better than Marketer and much better than Stono and has considerable resistance to downy mildew.

Palomar was the longest, dark green cucumber but had a tendency to be crooked. It produced 388 bushels of marketable cucumbers per acre as compared with 225 for Palmetto.—R. T. Brown

Irish Potatoes

Fall trials started in 1953 to determine the feasibility of producing fall potatoes in this area were continued. The seedling 92-23, a breeding line developed by Dr. Miller and his staff at L.S.U., shows promise for fall planting, since it has consistently outproduced the other varieties. Although the shape has been irregular in the spring trials, its appearance has been excellent in fall plantings. It has produced an average of 159 bushels of number 1 potatoes free of scab, cracks, and other defects, as compared with 103 for LaSoda, another good red potato.—J. King, J. C. Miller, and R. T. Brown

Effect of Irrigation on Yield of Cauliflower

Studies were started in 1955 to determine the effect of irrigation on yield of cauliflower at the Plaquemines Parish Experiment Station, since many failures have resulted from insufficient moisture in the fall.

The yield of marketable trimmed heads was not affected significantly by the application of two inches of water on October 20. However, this does not mean that irrigation would not result in increased yields in most years.

We probably had the best distribution of rainfall this fall that we have had for the past six years. The distribution was as follows: September 15, 1.2 inches; September 21, 1.3 inches; September 23, 2 inches; October 6, 2 inches; October 13, 1.2 inches; October 20, 2 inches applied as irrigation; November 2, 1.4 inches; and November 19, .55 inch.

Mr. Butler of the Agricultural Engineering Department, who is cooperating in this work, is checking the feasibility of using tensiometers and irrometers as a means of determining soil moisture in irrigation work.
Although the yield of trimmed heads of the ten varieties used was not affected significantly by irrigation, there was a significant difference between the varieties.

Snowball A and Master produced the highest yields in the early maturing group. Snowball A produced 18,891 pounds of marketable trimmed heads where irrigated as compared with 19,108 with no irrigation. Master produced 18,510 pounds where irrigated as compared with 20,306 where no irrigation was applied.

Snowball M gave the highest yield in the medium early maturing group, producing 17,448 pounds of trimmed heads where irrigated as compared with 19,462 where no irrigation was applied.

Helios produced 21,667 pounds where irrigated as compared with 20,279 pounds of trimmed heads where no irrigation was applied. Helios is very late maturing. A difference of 2,604 pounds is required for significance.

Supersnowball was probably the poorest flower in the test, producing an irregularly shaped head with long flower stem and poor wrapper leaves.

The yield of Snowball Y was low because it was injured to a greater extent by “black leg” than any of the other varieties.

—R. T. Brown, J. C. Miller, and H. E. Butler

Sweet Corn Variety Trials

Aristogold Bantam Evergreen was again one of the best varieties in the test, producing 773 dozen marketable ears weighing an average of .71 pound per ear. Sweetangold was slightly larger and was more concentrated in harvest but a couple of days later. It produced 788 dozen marketable ears which weighed .74 pound per ear. Experimental Golden was also outstanding, producing 897 dozen ears weighing .73 pound per ear. The other varieties were too small.

Market Corn Varieties

Since many growers were interested in field types which could also be used for the fresh market a small planting was made to evaluate certain field corn types.

Texas #11 produced an average of 10,585 marketable ears per acre, weighing .90 pound per ear. It was harvested on May 30, 1955. The second best yield was obtained with 521 Hybrid, which produced 9,888 marketable ears per acre weighing .96 pound per ear. It was harvested on June 4, and the stalk was the weakest in the test. Of the white varieties 512W was the earliest and produced the largest ear, but the yield was only 7,971 marketable ears per acre. They averaged 1.02 pounds per ear.—R. T. Brown and J. C. Miller
Effect of “Yellows” on Yield of Certain Varieties of Cabbage

In the fall of 1954 and 1955 plants were observed dying from a disease which was identified as “yellows” by Dr. Weston Martin and Dr. E. C. Tims of the L.S.U. Plant Pathology Department.

A test was set up in cooperation with Dr. Tims in 1954 and continued in 1955 to compare the resistance of some of the leading commercial varieties and breeding lines collected from Ferry-Morse Seed Company, Reuter Seed Company, Dr. Mikell of L.S.U., and other cabbage breeders.

The following varieties showed the greatest freedom from this disorder: New Badger Market, Yellows Resistant Charleston Wakefield, Wisconsin Ballhead, Jersey Queen, Medium Copenhagen, Resistant Golden Acre, Resistant Glory, Wisconsin All Season, Globe, Resistant Round Dutch, and a breeding line listed as 1060 Y.R. by Ferry-Morse Seed Company. Medium Copenhagen, Resistant Glory, Ferry-Morse 1060 Y.R., Globe, and Marian Market were the best sacking types in 1954 and 1955, producing 19,598, 18,958, 18,346, 17,821, and 14,603 pounds per acre respectively with an average weight of 3.2, 3.2, 3.1, 3.4, and 2.9 pounds per head respectively.

Medium Copenhagen was the earliest and most concentrated in heading of the round green types. Globe and Marian Market showed more black-rot than the other varieties. Ferry-Morse 1060 Y.R. is a dark green, round, compact, late maturing type like Resistant Round Dutch but is much more concentrated in heading.


Garlic: Size of Seed Piece

The Creole garlic (from common storage) were divided into three distinct sizes; large (40 cloves averaged 181.2 gms.); medium (40 cloves averaged 98 gms.); and small (40 cloves averaged 33 gms.).

These three treatments were planted in four replications in the field. Yields as recorded in pounds per plot were: large, 6.7; medium, 5.3; small, 3.45.

It would not be practical to use all large cloves for seed, as a head will only give 2 or 3 large sized cloves. However, the majority of the cloves are in the medium sized class and these cloves (with the large) should be used for seed pieces exclusively.—F. B. Schmitz

Pole Snap Bean Trial

A pole bean trial is planted each year to screen new varieties as compared in performance with the standard varieties.

The beans are planted on 5-foot rows, plants spaced 12 inches apart and trained on bamboo canes leaning on a wire stretched be-
between two posts. Yields calculated in bushels per acre were as follows: Blue Lake Strain #1, 392; Blue Lake Strain #4, 453; Canfreezer, 428; Green Savage, 443; Canfreezer 4-1, 480; Green Savage #8, 477; Canfreezer #4, 470.

The improved strains of Canfreezer and Green Savage germinate better, are more vigorous in growth, and are better climbers than the other strains tested.—F. B. Schmitz and J. F. Fontenot

Pumpkin and Winter Squash Trial

Pumpkin and winter squash varieties were grown and examined for fresh use, winter storage, and Halloween use. Average yields per vine were as follows: pumpkin—Longfellow, 4.6 fruit; Dickinson, 2.7; Sugar or Pie, 2.0; Kentucky Field, 2.0; Large Cheese, 3.5; Halloween, 2.0; winter squash—Improved Hubbard, 2.0; Golden Acorn, 7.0.

The Longfellow pumpkin was the best for fresh use. Longfellow, Kentucky Field, and Dickinson (the latter two buff-colored) kept well in storage. The only orange-colored pumpkin grown, Halloween, failed to hold well in storage but has the ideal color and shape for Halloween use.

The Golden Acorn squash has the erect, bush type of growth and is well suited to the home garden. This squash stores well and is preferred for baking.—F. B. Schmitz

Citrus

Citrus Fertilization

Replicated tests were started with both young and bearing Satsuma trees in 1950 to study the effect of various ratios of nitrogen, phosphorus, and potassium on growth, yield, and quality of fruit.

In the test at the Station the highest average yield for the period 1953 through 1955 has been obtained where one pound of 8-8-8 or 12-8-8 has been applied per year of age in the spring. The average in pounds per tree was 147.8 and 145.1 respectively as compared with 131.5 and 121.4 pounds where this same amount of nitrogen was applied alone. The check plots have produced an average of 121.0 pounds per tree for this period. No consistent difference has been noted in quality.

With bearing trees at Mr. Elston's, nitrogen has been the most important element as far as yield is concerned. The highest yield for the five-year period has been where the equivalent of 1 pound of nitrate of soda has been applied per year of age, with ¾ being applied in early spring and ¼ in June. The plots receiving 8-12-8 are close behind. Those plots receiving 12-0-0 were in a favored
position and therefore were not injured as severely in 1951 as those receiving the 8-12-8, which produced 305.9 pounds per tree in 1955 as compared with 304.5 for the one receiving 12-0-0. There was a tendency for earlier maturity and better quality in those plots receiving the 8-12-8.

In an experiment with young Washington Navel trees at the Station, which was started in 1952, the highest average yield for 1954 and 1955 has been from the 12-12-8, 8-0-0, and 4-12-8, with yields of 54.9, 53.0, and 49.6 pounds per tree as compared with 42.1 where a 12-0-0 was used. The check plots have produced an average of 48.8 pounds per tree. It seems from these results that over-fertilization with nitrogen might actually cause an increase in vegetative growth at the expense of fruiting, for the most growth has been made where 12-0-0 was used, yet the yield is less than that obtained in the check plot.

—R. T. Brown, J. C. Miller, Walter Peevy, and Wm. Sistrunk

Effect of Source of Budwood and Rootstock on Incidence of “Scaley Butt”

In 1951 studies were started in cooperation with Mr. Schexnayder of the Plant Pathology Department at L.S.U. to determine the cause of “scaley butt” or “exocortus,” since at that time little work had been published on this disease.

Buds were taken from diseased and healthy trees budded on trifoliata stock, since this is the stock which was affected with this disorder. The buds were placed on various rootstocks. The seed of these rootstocks were furnished by Dr. Gardner of the U.S. Subtropical Field Station at Orlando, Florida, with the exception of trifoliata, which was secured locally, and Troyer Citrange, which was secured from Dr. Bitters of the Citrus Station in California.

The results to date indicate that Carrizo Citrange, Troyer Citrange, Uvaldi Citrange, Rusk Citrange, Norton Citrange, Cleopatra Mandarin, and Sweet Orange can be symptom-less carriers of this disease, since they have not shown any symptoms of this disease although the budwood was taken from diseased trees.

Trifoliata, Tangor 998, Lakeland Lime, Morton Citrange, Williams Tangelo, and Rangpur Lime have shown symptoms of this disease when budwood was taken from diseased trees, but to date have not shown any symptoms when the budwood was taken from healthy trees. This rules out the possibility that it might be an expression of rootstock scion incompatability.

This study has brought two things to light. First, the importance of selecting budwood from an old tree budded on the type of stock that you intend to put them on. Second, if this disease is in certain varieties from which you cannot find a virus free source
of budwood you can bud them on other stocks to get away from it. Cuttings have been taken from healthy and diseased trees to determine if this disease will show up when the trees are on their own roots. There is nothing to report at present, however.

—R. T. Brown, C. Schexnayder, J. C. Miller, F. Gardner

Citrus Rootstock Studies

Rootstock studies started in 1951 and 1952 to study the effect of various rootstocks on growth, yield, size of fruit, and quality under South Louisiana conditions, were continued.

This is only the second crop of fruit harvested from this test, so no conclusions can be drawn at present. However, considering cold hardiness, resistance to “scaley butt” and “quick decline,” vigor, yield, size of fruit, and ability of stock to produce seed, Carrizo Citrange appears to be a very promising new stock for trial in this area.

No quality determinations of the fruit have been run to date, so it is impossible to say which stock is most likely to produce the highest quality fruit.

The yields on the Carizzo Citrange in pounds per tree were as follows: Washington Navel, 27.3; Pineapple Sweet, 93.8; Owari Satsuma, 51.9; and Valencia, 21.4 as compared with 14.4, 87.9, 68.5, and 10.5 respectively where these same varieties were budded on trifoliata.—R. T. Brown, J. C. Miller, and F. Gardner

Miscellaneous Ornamental Work

The collection of Chinese hibiscus has been maintained and 21 seedlings from the University breeding program added.

Plots of Tifton 57 (Bermuda hybrid), Zoysia Matrella, Native St. Augustine, Texas and Farley’s St. Augustine, and Centipede lawn grasses were planted. The plot of Marion Blue grass failed to live over the summer.

A collection of hybrid Dutch Amaryllis has been growing outside in beds, without protection for several years.

The culture of Gerbera daisies has been studied while selections were being increased. A full southern exposure, well-drained, deep (18 inches) soil of near neutral pH, setting the crown of the plant 1½ inches above the surface of the soil and spacing 24 inches apart in the bed were factors which gave good results.

The greenhouse chrysanthemums Silver Sheen, Betsy Ross (white standard), Mrs. Kidder and Blazing Gold (yellow standard) will produce flowers for All Saint’s Day use, without shading, if planted around June 1. The plants are best pruned to two stems.
If grown outside, these varieties will require protection from the elements after the buds show color.

The Dots (yellow-bronze-pink pompons), Lillian Doty (light lavender pompom), Mrs. Dupont (coral buff, large decorative), Bonfire (bright red, decorative), Carnival (burnt orange, large pom-pom), Red Velvet (crimson, decorative) and White Popcorn (pom-pom) are garden varieties which produce flowers for October 31 use. These varieties should be cut back around July 10 and are best pruned to three clusters.—F. B. Schmitz and W. D. Kimbrough

Red River Valley Agricultural Experiment Station, Curtis

J. Y. Oakes, Superintendent
W. A. Nipper, Assistant Animal Husbandman
C. N. Bollich, Research Associate in Agronomy
D. R. Melville, Research Associate in Agronomy

The work at the Red River Valley Agricultural Experiment Station consists largely of fertilizer and variety studies on cotton, corn, soybeans, and forage crops, along with beef cattle production in relation to pastures. Considerable work is being carried on with grasses and legumes, particularly new strains, in an effort to find some that are better suited to our conditions and that will offer more forage and longer grazing.

Irrigation studies are being undertaken in an effort to determine the feasibility of this practice on pastures and row crops.

Corn Studies

Commercial Hybrid Corn

The year 1955 was ideal for corn in Northwest Louisiana. Good yields were obtained throughout the area on both alluvial and upland areas, with more corn and higher yields being produced than ever before. This of course was due in part to good moisture conditions, but other factors, such as better adapted hybrid varieties, good cultural practices, and adequate fertilizer, were also important. Several of the high producing hybrids continue to produce high yields, with the open-pollinated varieties and less adapted hybrids being one-fourth to one-half lower in production.

The leading hybrid varieties that continue to produce top yields are La. 468 and 521; Dixie 11, 18, and 22; N. C. 27; Coker’s 811 and 911; Funk’s 710, 711, 785W, 779W, and 714B.
New experimental hybrids that show promise are La. 2117, 2127, 2129, and 2130. These are now in the process of being field tested prior to being released.

—J. Y. Oakes, D. R. Melville, C. N. Bollich, and Lee Mason

**Early Hybrids**

Early hybrid varieties have a place in our corn program for early feed or for use in a hogging-off program. Early hybrids invariably produce about one-third less per acre than do the late maturing, adapted hybrids, making them susceptible to worm, bird, and weevil damage. In addition to this, if adverse weather prevails they are subject to further damage due to rotting.

Early hybrids that do satisfactorily are Funk's G-50 and G-76; Mo. 148, 313, and 804. Medium early maturing hybrids are U.S. 523W, Shannon 1300, and Tenn. 90—D. R. Melville and C. N. Bollich

**Mechanical Picker Studies With Corn**

The total percentage of any corn variety harvested with a mechanical picker depends on number of stalks standing, uniform stand, uniform height of ears on stalks, large ears, and minimum amount of vines, weeds, and grasses remaining in the fields. The mechanical picker should be working satisfactorily as well as operating at the proper speed. Leading varieties adapted to mechanical harvesting are Coker's 811 and 911; N. C. 27; Dixie 18; Funk's G-785W and 779, and Texas 15W, 17W, 30, and 32. The Texas hybrids usually have large ears, which aids in their mechanical harvesting.

—D. R. Melville, J. Y. Oakes, and C. N. Bollich

**Corn Fertilization**

Adequate rainfall occurred during the growing season, and good corn yields were obtained from all fertilizer treatments in 1955. The 96-pound rates of nitrogen gave highest yields but were only slightly higher than the 64-pound rates. The 128-pound rates produced about the same yields as the 64-pound rates of nitrogen. The yields from different sources of nitrogen did not differ significantly; apparently the total pounds of nitrogen is what counts.

Good seedbed preparation, adapted varieties, proper spacing, and good cultural practices play an important part in corn growing.

In 1954 the year was dry with yields lower than in 1955 and apparently all the fertilizer applied was not used, resulting in rather uniform yields from all fertilizer treatments in 1955.

—J. Y. Oakes, C. N. Bollich, and D. R. Melville

**Corn Spacing**

The optimum spacing of corn under conditions where variable amounts of rainfall occur through the growing season may vary
from year to year. As a result of this condition, several years’ data are necessary in order to establish about what would be satisfactory spacings. Results indicate that where lower amounts of fertilizer are applied, 60 to 80 pounds of nitrogen with one stalk 12 to 18 inches in the drill will give satisfactory yields. Where 80 to 100 pounds of nitrogen is used, one to two stalks spaced 12 to 18 inches will give best yields.—D. R. Melville and C. N. Bollich

Corn and Soybean Fertilization

Work has been under way since 1951 to determine the effects on corn yields from continuous corn, corn and soybeans interplanted, and corn and soybeans planted separately but alternated each year, with fixed amounts of nitrogen, phosphorus, and potassium applied.

Results indicate that where corn is planted continuously with no fertilizer, the yields will remain low, but where it is interplanted with soybeans year after year, corn yields will likely be lower the first year than where corn is planted alone but will show a gain the following years due to the residual effects. When corn and soybeans are planted in separate rows but alternated each year, further increases may be expected over continuous corn or corn and soybeans interplanted. Soybean yields will normally remain about constant without fertilization on the alternate rows.

—J. Y. Oakes, C. N. Bollich, and D. R. Melville

Soil Fumigation Work on Corn

Farmers for years have recognized the inability of some crops to grow off and do as well in parts of the field as the same crop does in adjoining areas or even the same field. In most cases wireworms, fertilizer deficiencies and in some crops, nematodes, were blamed for this lack of growth or crop failure. In recent years, it has become evident from experimental work that nematodes are causing serious damage in many crops. A preliminary survey in 1955 revealed several nematodes that are known plant pathogens and several that are suspected plant parasites. As a result of these studies, ethylene dibromide W-85, Shell DD, and methyl bromide MC-2 were used at 7 gallons per acre, 25 gallons per acre, and 2 pounds per 100 square feet respectively. The no-treatment or check plot produced 68.8 bushels of corn, with other treatments producing 84.2 bushels, 87.7 bushels, and 94 bushels per acre respectively.

—J. Y. Oakes, C. N. Bollich, D. R. Melville, M. J. Fielding, and J. P. Hollis

Cotton Studies

Cotton Fertilization

The use of mixed fertilizer in the production of cotton on average alluvial soils of the Red River Valley is still questionable. It is
known, however, that on extremely sandy areas where potash deficiencies and wilt occur, some benefits are derived from mixed fertilizers of about a 1-1-1 ratio at about 3 to 4 hundred pounds per acre.

Results for 6 years indicate that nitrogen is the most profitable single element when used at rates of 60 to 80 pounds per acre. The source of nitrogen makes little difference in the over-all yield per acre.

Yield data obtained on heavy clay soils indicate that mixed fertilizer does not pay but 40 to 60 pounds of nitrogen will give profitable yields.

The use of anhydrous ammonia as a source of nitrogen so far has indicated that little response has been obtained.

—J. Y. Oakes, D. R. Melville, and C. N. Bollich

Cotton Following Winter Cover Crops

The use of winter cover crops on sandy soils in a cotton program aids in maintaining the land in a high state of productivity and under normal conditions reduces the amount of nitrogen to be added.

During 1955 best results were obtained from 65 pounds of nitrogen, with lowest yields obtained from plots where wheat was grown with some vetch with 30 pounds of nitrogen applied at plowing time. Yields were low throughout the experiment as a result of excessive insect infestation. The excessive growth of the plants made insect control very difficult.

Under normal conditions where 3 or 4 tons of green matter is turned under from winter legumes, 30 to 40 pounds of nitrogen may need to be added for best results. Where greater tonnages are obtained, little or no nitrogen will have to be added.

—D. R. Melville and C. N. Bollich

Cotton Varieties and Mechanical Harvesting

Excessive amounts of rain fell during July and August and unusual stalk growth occurred, making insect control very difficult. A large percentage of the crop was made on the upper half of the plants, which resulted in more bolls being required per pound of cotton. Many of the bolls that were set late did not fully mature and they opened prematurely after the frost. The cotton had a tendency to fall out of the burs very badly. The variety of cotton grown within any area depends largely on its popularity as well as ginning facilities and whether seed is produced for resale. The D&PL variety is still the most popular within this area but several varieties produce good yields. Varieties that produce satisfactorily are Delfos 9169, Fox, Stonestile 2B, Empire, and Coker's 100WR. Stardel, a Louisiana variety released in February 1956 and previous-
ly known as Louisiana DS 524-9, shows great promise and produced high yields for the last three years.

Numerous factors influence the picking qualities of any variety with a mechanical picker. During 1955 there was little difference in the efficiency of a mechanical picker on varieties. Factors that affect mechanical picking are adequacy of defoliation, amount of cotton open, amount of grass and weeds present, state of mechanical repair of machine, and speed at which machine is operated.

—D. R. Melville, C. N. Bollich, J. Y. Oakes, and F. W. Self

Cotton Defoliation

Excessive plant growth occurred, making defoliation very difficult. Plants were large and still in the growing stage as a result of excessive moisture and difficulty in controlling insects. In many cases, leaves appeared to be mature enough to make defoliation ideal but results varied from field to field, depending on growth conditions, fertilizer treatment, and effectiveness of insect control measures.

Amino Trizole is a growth inhibitor and used to slow down or stop second growth which usually occurs following defoliation. In many cases, regrowth did not occur, which made mechanical picking easier and gave a better grade of cotton at the gin.

—D. R. Melville, C. N. Bollich, and J. Y. Oakes

Insect Control Studies on Cotton

General Insecticide Studies—Commercial insecticides are included in experiments at recommended rates to test their comparative value for controlling cotton insects. Spray materials and dust were used in this work. Infestation counts were made at weekly intervals throughout the poisoning season. Difficulty was encountered in applying the insecticides because of the excessive growth of the plants that resulted from large amounts of rainfall in August and September. This resulted in having to double the rates of application to get control, as it was very difficult to get plant coverage, plus possible resistance being built up by the boll weevils.

The toxaphene spray with DDT added apparently gave the best control in sprays and the 3-5-40 the best control with dusts.

—D. R. Melville, C. N. Bollich, and J. Y. Oakes

Rate and Interval of Applying Insecticides—Several insecticides including toxaphene, endrin, dieldrin and aldrin were applied at 5-, 7-, and 10-day intervals, with the total amount of technical material increased in proportion to interval increase, to check the effectiveness of each for controlling insects.

Results indicate that best control was obtained from the 5-day rate with 2 pounds of toxaphene and 1 pound of DDT. The 5-day in-
Interval applications in all cases gave better yields than the 7- or 10-day intervals.

Endrin was the only insecticide used at the 10-day interval and gave yields lower than the 5-day interval but slightly higher than the 7-day interval. This indicates that the 7- and 10-day intervals are too broad for effective control.

—D. R. Melville, C. N. Bollich, and J. Y. Oakes

Chemical Weed Control Studies in Cotton

For the last several years various herbicidal materials have been used in weed control work with cotton. The results obtained from the use of pre-merge herbicidals depend on rates used and rainfall following applications.

Karmex DL and CIPC were used at different rates during the spring of 1955. Good results were obtained from the use of both chemicals, with best weed control being obtained from .25 to .30 pound per acre of Karmex DL in a 14-inch band. The CIPC gave good control at rates of 1½ to 2 pounds per acre in 14-inch bands.

No post emergence herbicidal oils were used, as dry weather prevailed at that time and little grass or weeds occurred. The use of 1 or 2 applications of herbicidal oils is very effective in controlling grasses and weeds and reduces the hoe hand hours per acre.

—C. N. Bollich, D. R. Melville, and W. J. Porter

Soybeans

Commercial varieties of soybeans are tested each year to determine varieties best adapted to the area. In addition to this work cooperative studies are carried on with the U. S. Regional Soybean Laboratory for testing new strains for yielding ability, oil content, resistance to disease, lodging, and seed quality.

Good yields were obtained from most varieties during 1955 except the late maturing varieties. The use of calcium arsenate in relation to cotton insect control apparently caused a reduction in yield on these varieties.

The Lee variety gave excellent yields and is highly desirable because of its shatter resistance.

Varieties that have performed satisfactorily in the area are: for early use, S-100, Dorman, and Ogden; medium to late use, the Ogden, Lee, Jackson, Mamotan, Dortchsoy, Roanoke, and Improved Pelican.

—J. Y. Oakes, D. R. Melville, and C. N. Bollich

Forage Crop Studies

Small Grains

Oat Varieties—A comparison of commercial oat varieties is made each year to determine yield, lodging, ability to produce
forage, and resistance to disease and cold. Yields were reduced on all varieties owing to the freeze that occurred in late March. The stand on many of the varieties was reduced due to many of the plants being killed or injured severely. Varieties that do well for grazing and grain are Alber, Nortex, Ferguson, Arlington, Mustang, Victorgrain, and Fulgrain. As a general rule, good forage varieties do not produce the highest yield of grain.

—J. Y. Oakes and D. R. Melville

Wheat, Rye, and Barley—Several wheat varieties have been tried for grain and grazing use. The Atlas 66 and Chancellor wheat appear to be the outstanding varieties for grazing and grain.

Abruzzi and Balboa rye have been used in relation to grazing and both perform satisfactorily as they are very winter hardy. Cardovia and Colonial barley are both very winter hardy and provide excellent grazing during the winter and spring months. They are much more palatable during late spring than wheat and oats and will produce satisfactory grain yields if not grazed excessively.

—J. Y. Oakes and D. R. Melville

Sorgo for Silage

Sweet sorghums produce higher yields of silage per acre than do grain sorghums and make better quality silage. Several new strains and varieties have been under study for the second year in cooperation with the U. S. Sugar Plant Field Station, Meridian, Mississippi. Yield data and varieties are as follows: Sart, 41.3 tons; Honey, 36.5 tons; Red Top, 26.6 tons; Tracy, 24.6 tons; Mn. 1056, 35.9 tons; and Mer. 52-1, 34.3 tons per acre.

—J. Y. Oakes, D. R. Melville, and C. N. Bollich

Sudan and Millet Varieties

A comparative study of millets and Sudans was made on sandy and clay soils to determine adaptability of each. Tonnage yield data indicate that both are adapted to sandy soils and will produce about the same tonnage. The Sudan grasses are better adapted to clay or heavy soil types than the millets. Several years' results show that most of the millets produce far less tonnage of forage on clay soils than on sandy soils. The average yield of Sudan ranged from 5 to 10 tons per acre on both sandy and clay land, with yields for millet being equally good on sandy soils but only about 2 to 3 tons per acre on clay soils.—J. Y. Oakes, D. R. Melville, and C. N. Bollich

Alfalfa Varieties

Results from alfalfa variety studies indicate that some varieties produce better yields than others. Several years' results indicate that the Buffalo variety and the common strains such as Oklahoma, Kansas, and Southwestern consistently produce higher yields.
Several of the newer varieties such as Ranger, Atlantic, Du Puit and some of the Argentina strains produce high yields the first or second year but will only survive 2 or 3 years before going out completely. The Buffalo has proved very winter-hardy, has small stems, and produces high quality hay. The common strains are winter-hardy and will normally survive several years. The hay is usually coarser from them than from Buffalo.

—D. R. Melville and C. N. Bollich

Grasses

Summer Grasses

Coastal Bermuda grass continues to be superior to common Bermuda in both forage production and drought tolerance. Indiana 13 and Tift 127 are two additional Bermuda strains that produce higher yields than common. Midland, a newer strain, was added to the nursery this year.

Results from the Sudan and millet variety tests indicate that the Sudan grasses are far superior to the millets on clay soils. An exception to this is Hybrid No. 1 millet, which produced as well as any of the Sudans on the clay soils. On sandy soil, the millets and Sudans performed equally well.—D. R. Melville and J. Y. Oakes

Winter Grasses

Cereal grains are superior to all of the other grasses observed, such as tall fescues, brome grasses, rye grasses, and orchard grasses, for winter grazing.

Prairie brome, Texas 46 rescue, and commercial rescue are perennial grasses that show promise for early winter grazing. Several of the rye grasses are good for mid-winter grazing. The smooth bromes and orchard grasses are suitable for late winter and spring grazing. The tall fescues are adapted to heavy soils and produce over a longer period of time, but the total forage produced is about the same as with the other winter grasses.

—D. R. Melville and C. N. Bollich

White Clover

Louisiana S-1 white clover is superior to all others in total forage production, distribution of forage, and seed production.

Red Clover

Kenland, Pennscott, Midland, Port Gibson, Nolin’s Red Clover, and La. Strain No. 1 made excellent growth during early spring and summer. All strains and varieties of red clover appear to be well adapted to the valley area.
Crimson Clover

Crimson clover affords early grazing but dies out fairly early in the spring. Most all strains of crimson clover are adapted to the area, but the re-seeding varieties are most desirable, as they can be depended on for re-seeding. Common strains are likely to germinate all through the summer if adequate moisture prevails, resulting in inadequate seed remaining in the fall to produce a stand. A light scarification of areas where crimson clover has been grown is desirable in early fall to aid in getting a stand.

—D. R. Melville and C. N. Bollich

Subterranean Clover

Tallarook and Mt. Barker produced more than Bacchus Marsh. All made satisfactory growth and appear to be well adapted to the area but die out earlier than red or white clover and do not offer much from the standpoint of grazing.

—D. R. Melville and C. N. Bollich

Sesame

Sesame is an old crop and has been grown in South Louisiana for a number of years. Its use has been limited because the older varieties shattered so badly that it was impossible to save the seed without harvesting by hand.

In recent years considerable work has been done in Texas by the Renner Foundation and Texas Agricultural Experiment Station in developing varieties that are shatter-resistant.

In 1955 a small quantity of seed of the Renner Sesame variety was obtained from the Renner Foundation and planted as an observational plot. A poor stand was obtained. The plants grow upright with seed pods setting in a fairly upright position. The upright position of the pods apparently contributes to its shatter resistance, which aids in harvesting.

Yield data were obtained on a small area where stalks averaged 1 every 6 inches. Production was 1,115 pounds per acre.

—J. Y. Oakes

Animal Industry

Pastures

Pasture studies include both winter and summer grazing experiments to evaluate the various summer and winter grasses.

Winter Pastures—Winter pasture experiments have been conducted for 6 consecutive years. The pasture combination consisted of Atlas 66 wheat and Singletary peas, prairie brome grass and Singletary peas, fescue and Singletary peas, and fescue and white Dutch clover. All pastures were 5 acres in size and replicated twice.
The fescue and Singletary pea pastures were planted in 1951, fescue and white Dutch clover pastures in 1952, and other pastures were seeded in the fall of 1954. All pastures received 30 pounds of nitrogen in the fall.

The fescue and Singletary pea and fescue and white Dutch pastures were grazed from March 7 until June 30 and gave 247 and 267 pounds of beef per acre respectively. The prairie brome pastures were grazed from January 25 until June 30 and gave 432 pounds of beef per acre. The wheat pastures were grazed from January 25 until June 3 and gave 501 pounds of beef per acre.

Each of the above pastures was plowed up and planted to Sudan grass for summer grazing. The fescue and Singletary pea pastures gave an additional 95 pounds, the fescue and white Dutch gave 93 pounds, the prairie brome 127 pounds, and the wheat pastures 136 pounds of beef per acre.—W. A. Nipper and J. Y. Oakes

Summer Pastures—Three pastures, 4 acres in size and replicated twice, were started in the spring of 1951. Duplicate pastures of Coastal Bermuda, common Bermuda, and Dallis grass were included. Each pasture was seeded to 2 pounds of white Dutch clover. Rye grass was added in the fall at 25 pounds per acre for the purpose of providing spring grazing and to aid in reducing bloat. The clover also provided nitrogen for the grass.

In 1955 one pasture each of common Bermuda and Dallis grass was discontinued because of the poor stand that resulted from the extremely dry summer of 1954.

All pastures were grazed continuously from March 2 until November 7. Each pasture was fertilized with 90 pounds of nitrogen in 3 applications.

The Coastal Bermuda pastures produced 687 pounds of beef per acre, the common Bermuda 575 pounds, and the Dallis grass 565 pounds.

Additional work has been carried on in comparing steers on feed lot only, green pastures of wheat only, and one-half ration plus green wheat pastures for daily gains and profit from each method.

Feed lot steers gained 2.47 pounds, those on wheat alone 2.11 pounds, and those on wheat pastures and one half ration 2.30 pounds per day. Profit per animal was $16.93 from feed lot steers, $45.32 from those on green pastures of wheat, and $41.87 from those on green pastures of wheat and one half ration.

—W. A. Nipper and J. Y. Oakes

Hogging Off Corn and Soybeans

The marketing of corn through hogs has been a profitable enterprise at the Station for 6 consecutive years.
Five acres of corn and soybeans have been included each year. The area is divided into 2 plots and consists of early maturing hybrid corn with early maturing soybeans and late maturing hybrid corn with late maturing soybeans. Early hybrids consist of Funk's G-50, Mo. 148 or 313 corn with S-100 and Ogden soybeans, planted four rows of corn and one row each of the soybeans. Late maturing hybrid corn usually consists of any of the high yielding yellow hybrids with Ogden and Improved Pelican soybeans.

Feeder pigs were vaccinated, wormed, and fed mineral supplement prior to starting the work. Early hybrids were hogged off first followed by the late maturing hybrids.

In 1955, 371 pounds of corn with green beans produced 100 pounds of pork. In 1954, it required 356 pounds of corn and beans to produce 100 pounds of pork. The soybeans were defoliated by calcium arsenate, which probably accounted for more corn being required in 1955 than 1954. A greater net return was obtained in 1955 than in 1954 because of greater yields of corn and a cheaper purchase price on feeder pigs.

A net return of $108.39 per acre was realized, or $2.01 per bushel for corn utilized through hogging off.

Six years' results show a net profit of $161.01 per acre, or $3.24 per bushel of corn through hogging off.—W. A. Nipper

Rice Experiment Station, Crowley

RUFUS K. WALKER, Superintendent and Associate Agronomist
Nelson E. Jodon, Agronomist (U.S.D.A.)
Robert W. Helm, Entomologist (U.S.D.A.)
Richard P. Walker, Assistant Agricultural Engineer
Roy Jean Miears, Assistant Agronomist
David E. Black, Assistant Agronomist
Edwin E. Goodwin, Assistant Animal Husbandman
Austin T. Harrell, Research Associate in Agronomy
Earl A. Sonnier, Supervisor of Trainee Program

Experimental studies at the Rice Experiment Station during 1955 were in the general fields of agronomy, agricultural engineering, animal industry, entomology, and plant pathology.

The rice field insect project and the rice breeding and variety testing project are cooperative projects with the U.S.D.A. Entomology Research Branch and the U.S.D.A. Bureau of Plant Industry,
Soils and Agricultural Engineering, respectively. The rice drying and storage project is in cooperation with the L.S.U. Agricultural Engineering Department. The rice fertilization project is in cooperation with the L.S.U. Agronomy Department. The weed control and nematode studies are in cooperation with the L.S.U. Plant Pathology Department.

Major physical facilities added to the Station or under construction during 1955 were a residence for a staff member and a beef cattle experimental feeding barn. In addition, the contract was let for an addition to the office and laboratory building.

A grant was made to the Rice Experiment Station by the Rockefeller Foundation in the amount of $140,000 for a five-year period to support a trainee program in rice.

A brief summary of the work conducted at the Station during 1955 is presented below.

**Fertilization Studies**

**Rice**

*Rates and Ratios of N, P, and K*—Six identical randomized factorial designed experiments were established in Acadia, Jeff Davis, Vermilion, Allen, Evangeline, and Calcasieu parishes. Analysis of the data obtained during 1955 shows that an average yield of 16.7 barrels per acre was received from plots that received no fertilizer, while an average of 25.7 barrels per acre was received from the better fertilizer treatments. Nitrogen applications in the amounts of 40 to 80 pounds of N per acre resulted in high rice yield increases. Only two of the five experiments responded in yield to phosphorus application. Five of the six experiments responded in yield to the application of 20 to 40 pounds of potash per acre.

*Time of Application*—Results of this experiment substantiate the results obtained during 1953 and 1954 in that applications during the period from seeding to 20 days after emergence of the seedlings continued to produce the highest yields. This proved to be true when the materials were applied at a single application. Yields were increased when the materials were applied at later dates; however, there was some loss of efficiency of the fertilizer.

*Depth of Anhydrous Ammonia*—Anhydrous ammonia at three rates was applied at five different depths. As in 1954, results show that depth had no effect on the yield of rice. It appears that under optimum soil moisture conditions a 3- to 4-inch depth is sufficient for rice.

**Forage Crops**

*Pasture Fertilization*—A continuation of the studies of fertilizer
needs on a clover-grass pasture indicated that during the second year of establishment a good response was received from applications of both phosphorus and potash, with the 50-pound rate of P₂O₅ producing approximately the same yield as the 100-pound rate, and the 30-pound rate of K₂O yielding approximately the same as the 60-pound rate. There was little or no response to the application of nitrogen during 1955. There was no response to an additional application of dolomitic limestone in comparison to the initial application of 1,000 pounds per acre. For the second consecutive year the application of minor elements in the form of Es-Min-El had no effect on forage yield. Superphosphate continued to produce higher forage yields than rock phosphate.

**Rate of Nitrogen and Irrigation on Bermuda Grass**—Because of abnormally wet weather conditions during the summer and in one instance a long period of rainfall following an irrigation treatment which brought about a waterlogged condition, forage yield was reduced considerably. The results obtained during 1955 were contrary to results obtained during the two previous years in that very little response from nitrogen and irrigation was obtained.

—R. J. Miears, M. B. Sturgis, and R. K. Walker

**Pasture and Forage Studies**

**Pasture-Rice Rotations**

An experiment designed to determine the optimum number of years land should be devoted to pasture and rice in rotation was continued in 1955. Yields from improved pastures were relatively high as compared to previous years. Grazing on the improved pastures not planted to rice was continuous throughout the 12-month period and produced an average of 321 pounds of beef per acre. Yields from the rotation of one year rice and one year native pasture were 32.2 pounds of beef and 16.73 barrels of rice per acre, while yields from the rotation of two years improved pasture and one year of rice were 117 pounds of beef and 19.07 barrels of rice per acre. These studies continue to show the high value of improved pastures in rotation with rice.

**Date of Stubble-Planting Oats and Wheat**

This experiment, designed to determine the optimum date for planting oats and wheat in rice stubble without seedbed preparation, shows that November 1 is a satisfactory date for planting. This method of planting has three main advantages: (1) the elimination of seedbed preparation, (2) opportunity of planting regardless of weather or soil moisture conditions, (3) the relatively firm footing for grazing animals.
Other Cereal Grain Investigations

Two experiments of 54 entries of new strains and selections of oats were planted in nursery plots. Several of these strains showed some promise. In a yield test of commercial oat and wheat varieties, Victorgrain 48-93 produced the highest yield of grain.

A Study of Crop Diversification in Southwest Louisiana

Variety tests of three oil producing crops—soybeans, okra, and sesame—showed little promise of these crops being commercially feasible.

Corn Variety Test

Four varieties of hybrid corn produced from 22.1 to 32.1 bushels per acre even though they were adequately fertilized and suffered very little for moisture. Corn borer and earworm infestation was 100 per cent.

Sorghum Grain Test

Eight varieties of dwarf type sorghum produced from 17.1 to 50.1 bushels per acre, with sagrain being the highest producer. Since this yield is a little over three times the national average, this crop may become valuable as a grain crop in southwest Louisiana. A number of selections of more desirable types have been made for planting in 1956.

Silage Test

Ten entries of sorghum, millets, and Sudan grass were planted to determine their value for silage production. Sart sorghum produced 27.04 tons per acre, followed closely by Honey and Atlas sorghums with 24.32 and 21.58 tons respectively. The Sudan varieties produced the lowest tonnage.—D. E. Black and R. K. Walker

Pre-emergence Treatment for Control of Grass and Weeds in Sorghum and Soybeans

CIPC at 4, 6, and 8 pounds per acre and Alanap 3 at rates of 1, 2, and 3 gallons per acre caused severe reduction in sorghum stands; however, because of better grass control in treated plots the grain yield was not seriously affected.

The above treatments on Ogden soybeans produced serious damage by both chemicals at the highest rates; however, observations indicated that CIPC at 6 pounds per acre gave fair grass control. Seed yields were not taken because of crop failure.

—D. E. Black, John Baker, and R. K. Walker

Regional Sudan Grass and Millet Test

Thirteen varieties and selections of Sudan grass and millets were planted to determine their forage value. Syn. 4 Sudan grass
produced the highest yield, which was 6,771 pounds of green forage per acre. Most varieties were severely affected with a leaf disease which was not identified.

**Flax Variety Test**

Five varieties of flax were planted by broadcasting seed in rice stubble without seedbed preparation. Excellent stands and good growth were obtained on all varieties.

—D. E. Black and R. K. Walker

**Drying and Storage of Rough Rice**

**Drying Rice in Bins With Atmospheric Air**

Experimental work with atmospheric air as the drying medium was concentrated on determining the proper air flow rate. Air flow rates of 1.5, 2, 2.5, and 3 cubic feet of air per bushel of rice were used in drying. With the air flow rate of 3 cubic feet of air per bushel of rice and rather high relative humidity the rice was dried in 176 hours. Under the same relative humidity but using 1.5 cubic feet of air per bushel of rice, drying was accomplished in 385 hours. The rice was 8 feet deep in the bins and no spoilage occurred at any level.

**Bin Drying Equipment**

A new bin arrangement was set up on the Station to study air flow and temperature control characteristics of different equipment. Different types of air distribution systems exist in each bin. Tests to date indicate that increasing or decreasing the size of the fan outlet will decrease the manufacturer's rated efficiency for the fan. The decreased efficiency will in many instances be enough to lower the air flow rate to a dangerously low rate for drying.


**Effect of Subsoiling on Rice**

The area was subsoiled with a Ferguson subsoil-chisel at depths of 8 inches and 12 inches, with a space between chisels of 12 inches, 18 inches, and 24 inches. The automatic draft control feature of the tractor hitch and manual control of depth were both used under all of the above depths and spacings.

A slight increase in production was received in the subsoiled areas above that of the non-subsoiled areas. The information is not conclusive but does indicate yield effects that warrant continuation of this experiment.—R. P. Walker and R. K. Walker
Rice Breeding¹

Investigations at the Rice Experiment Station bearing on the development of improved varieties are conducted cooperatively with the Field Crops Research Branch, A.R.S., U.S. Department of Agriculture. The objectives are to develop and make available to growers superior medium and long-grain varieties of early, midseason, and late maturity. The work involves the making of crosses between varieties, the selection of strains appearing to embody improved characteristics or to incorporate a greater number of desirable qualities, the testing of better selections in various types of variety experiments, and the establishment of pure seed stocks of new varieties.

The new midseason long-grain variety Toro was released to growers in 1955. This variety is excellent in field characteristics and yield, and has exceptionally high milling quality. Toro and Sunbonnet, a 1953 release, are described in Louisiana Bulletin No. 499.

Nato, an early medium-grain selection from Rexoro-Purpleleaf × Magnolia, 44C507, was named and increased to be distributed in 1956. Compared to Magnolia and Zenith, Nato is: (1) more resistant to white tip and straighthead; (2) 2 to 4 inches shorter; (3) easier to thresh than Zenith; (4) free of irritating dust in combining and drying; (5) higher in head-rice yield than Zenith; and (6) it should dry better than Magnolia because of smaller grain.

Many short-season long-grain selections are being tested for yield and quality. The possibility of developing productive varieties considerably earlier than those now grown is being investigated. Selection is being carried on to obtain a high quality, long-grain variety maturing about two weeks earlier than Rexoro.

Numerous non-commercial varieties are maintained so as to have them available for use in crosses if any of their qualities are needed in the future to meet new requirements.

Acreages of varieties released by the Rice Experiment Station increased slightly in 1955 in relation to the total rice acreage. Rexoro was grown on approximately 13 per cent of the acreage, and Magnolia on 11 per cent. The acreage of Sunbonnet was not reported separately. These varieties were grown on more than 25 per cent of the Louisiana acreage.—N. E. Jodon²

Foundation Seed Production

Rice

One thousand five hundred thirty-five barrels of foundation rice seed of five varieties were released to 123 farmers during 1955

¹In cooperation with the Louisiana Agricultural Experiment Station.
from the 1954 crop. Six varieties of rice for foundation seed were grown in 1955. A new variety, Nato, will be released to seed growers in the spring of 1956.—A. T. Harrell and R. K. Walker

Louisiana S-1 Clover

Sixteen hundred pounds of foundation La. S-1 white clover seed were produced on 10 acres that were planted in the fall of 1953. This seed was distributed to farmers by the Louisiana Crop Improvement Association.—D. E. Black and R. K. Walker

Variety Repurification Program

Two thousand head rows of each of the six varieties of rice that are grown as foundation seed, were grown in 1955.

The rows were inspected individually and any row having “off-type” plants or showing any other type variation was discarded. The remaining rows were harvested and bulked for planting in increase blocks in 1956.—A. T. Harrell and R. K. Walker

Rice Field Insects

A survey was conducted in Louisiana during the winter of 1954-55 to determine the amount of damage caused by the rice stinkbug. The damage to the Zenith rice crop during 1954 was estimated at nearly $670,000. Although figures are not yet available for the 1955 season, preliminary observations indicate very light damage in most areas. A formula to express the loss caused by the rice stinkbug has been developed and utilized in the preparation of a table for estimating pecky rice losses. This table will help the grower determine under what conditions he can profitably treat his crop for control of this pest.

Experiments were conducted in 1955 to determine if heavy populations of rice water weevil larvae could cause losses of economic significance and if insecticides could be used effectively against the insect. The following insecticides, in emulsions, were applied to the soil at planting time: Dieldrin at \( \frac{1}{2} \) pound, heptachlor at 1 pound, and toxaphene at 3 pounds per acre. In addition, the following cultural treatments were tested: continuous maintenance of high and low flood water, and drainage of high and low flood water for 19 days at peak of larval infestation. The plots had excessively heavy larval populations. The conclusions reached as a result of this research are as follows:

1. Populations of rice water weevil larvae were reduced significantly by soil applications of dieldrin, heptachlor, or toxaphene.

\[ \text{In cooperation with the Louisiana Agricultural Experiment Station.} \]
2. The reduction in populations of weevil larvae, due to the insecticides, did not affect rice yields.

3. Heavy populations of weevil larvae did not reduce rice yields.

4. The dieldrin formulation used in these tests caused some stunting of the plants, hastened maturity, and reduced yields.

5. On the basis of these tests, control of the rice water weevil, even at high populations, would not be practical.

During the 1954 and 1955 seasons, shipments of parasitic wasps were received from Moorestown, New Jersey, and released in rice plots on the Rice Experiment Station at Crowley, in an effort to establish them with either the rice stalk borer or the sugar cane borer as host. The numbers of parasites released thus far are as follows: Apanteles angaleti, 20,192; Bracon brevicornis, 9,930; Chelonus sp. No. 1, 8,188; Chelonus heliopae, 3,322; and Stenobracon deesae, 257. No attempts have yet been made to recover progeny of these parasites.—Robert W. Helm

Animal Industry

Pastures

Nine 5-acre improved pastures were planted on the old Station in October for studying systems and practices of grazing and feeding beef cattle.

Fifty-eight acres of woodland were cleared on the new Station and seeded, in the fall of 1955, to rye grass and La. S-1 clover.

—D. E. Black, E. E. Goodwin, and R. K. Walker

Steer Feeding

A preliminary study was made of rough rice in rations for fattening 78 two-year-old steers that had been used in the pasture-rice rotation experiment. These steers were short-fed rations composed of either ground rough rice or a mixture of ground rough rice with oats and wheat, supplemented with cottonseed meal, molasses, and minerals. Feed consumption and rates of weight gain were satisfactory.

Foundation of Herd

Forty grade Hereford heifer calves were purchased December 16, 1955, for the foundation of a cow herd at the Station. These heifers are serving in current experimental studies.—E. E. Goodwin

Rockefeller Trainee Program

The Rockefeller Foundation Grant Trainee program was begun July 1, 1955, and from that date to December 31, 60 visitors repre-

1 Entomologist, Entomology Research Branch, Agricultural Research Service, U.S.D.A.
senting 19 foreign countries were received. A detailed training pro-
gram is being developed which will be in operation in 1956.
—E. A. Sonnier, J. N. Efferson, and R. K. Walker

Southeast Louisiana Dairy and Livestock
Experiment Station, Franklinton

H. Dewitt Ellzey, Jr., Associate Agronomist and Superintendent
Olen D. Curtis, Research Associate in Agronomy
Buck Green, Research Associate in Dairy Husbandry*

The Effect of Rate of Nitrogen and Increment of Application on
the Milk Production of a Dallis Grass-White Clover Pasture

Grazing commenced on all treatments May 9, 1955, and con-
tinued without interruption through October 11, 1955. As a result of insufficient shade in several pastures, grazing was limited to the period between evening and morning milking, a period of about 10 hours. During the day the animals were fed harvested roughage or were grazed on millet for 2-3 hour periods. Grain was uniformly fed on a production basis.

Moisture conditions were more favorable in 1954 and 1955 than in the previous three years of the trial. Production trends for these two years were the same, i.e., milk yields increased as the level of nitrogen increased, with the greatest increase increment being obtained from the first 64 pounds of nitrogen. A definite advantage was gained by splitting a given rate of nitrogen in two applications as opposed to applying all in one application. No advantage, how-
ever, was gained by splitting a given rate in more than two applic-
ations. Little response can be expected from nitrogen applied to a Dallis grass-clover pasture after mid-June inasmuch as favorable weather conditions do not usually exist in mid-summer. Later on in the season, when rainfall is more favorable, the growth stage shifts from vegetative to reproductive and again little response from nitrogen can be obtained. It is therefore recommended that the se-
lected rate of nitrogen fertilization be applied in two applications, the first half being applied in mid-April followed by the second half in late May. As much as 200 pounds of nitrogen (6 bags of am-
onium nitrate) can safely and economically be applied to a Dallis grass-white clover mixture. Higher rates can be economically used with more productive species.

* On Military Leave—effective June 18, 1955.

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The aim of this trial was to evaluate several systems of feeding harvested roughage with and without winter pasture. The effect on body weight, breeding efficiency, milk production, and return above cost were considerations in the evaluation. The hay used was Alyce clover, the silage was Sart sorghum, and the pasture was a mixture of oats-crimson clover.

The trial commenced November 27, 1954, and continued through April 25, 1955. The treatments studied were: Hay, silage, grain; silage, grain; hay, silage, pasture, grain; pasture, grain; hay, silage, pasture; hay, pasture, grain; silage, pasture, grain. During this entire period winter pasture was available to the animals assigned to treatment involving winter pasture. Silage and/or hay was fed to those animals assigned to treatments involving silage and/or hay. The so-called “continuous trial” experimental procedure was used, with Lucas’s method of equalized feeding being carried out insofar as grain feeding was concerned. The following are pertinent from the data:

1. Cows assigned to the hay, silage, pasture, and grain treatment produced the greatest amount of milk.
2. The greatest return above cost was obtained from the cows assigned to the pasture and grain treatment.
3. The hay, silage, pasture, no grain group was the second best money maker but only fifth best in milk production.
4. All pasture groups were considerably superior to the dry lot groups.
5. Hay and silage appeared to be equally good.
6. Hay and silage fed together were no better than either fed alone.
7. All silage-fed groups lost considerable live weight.
8. All pasture groups maintained body condition satisfactorily.
9. The breeding efficiency of all animals assigned to the pasture group was superior to that of the animals in the dry lot groups.
10. Levels of production for cows assigned to the pasture groups were considerably superior to that obtained by the dry lot groups.

Nitrogen Studies with Forage Crops

1. Effect of Rate of Nitrogen On the Forage Production of Dallis Grass, Coastal Bermuda, and Pearl Millet—Rates of nitrogen varying from 0 to 231 pounds per acre were applied at varying intervals of time in varying amounts in an effort to determine the optimum
increment of application as well as total amount. Each additional increase in nitrogen produced an increase in total dry matter yield. Millet, for any given rate of nitrogen, was more productive than either Coastal Bermuda or Dallis grass. Coastal Bermuda and Dallis grass were equally as productive per rate of nitrogen up to and including 198 pounds per acre. At higher rates, the Coastal Bermuda was increasingly more productive. Applying all of a given rate in one application, up to and including 165 pounds on Dallis grass, 198 pounds on Coastal Bermuda, and 231 pounds on millet, provided yields equal to or superior to those obtained from the same rate applied in more than one application. At higher rates, better yield distribution and total yield were obtained by splitting a given rate. No advantage, however, was gained at the high rates by applying same in more than two or three applications.

Because of the fact that it has become more apparent that Coastal Bermuda grass can utilize higher rates of nitrogen than most forage grasses, an experiment was set up in 1955 wherein rates of 0-800 pounds of nitrogen were applied to this grass in one, two and three applications during the season. Each increase in nitrogen up to and including the 600-pound rate resulted in an increase in forage yield. Yields leveled off at 700 pounds per acre and were reduced at the 800-pound level. For example, yields were 3,051, 11,459, 13,280, 13,334, and 11,668 pounds of dry forage per acre for 0, 500, 600, 700, and 800 pounds of nitrogen respectively. The total yield for the season for any given rate was not significantly affected by increment of application, but from a practical point of view better seasonal yield distribution was obtained as a result of splitting a given rate of nitrogen in two applications. Especially is this desirable at rates above 200 pounds of nitrogen per acre. In instances where all of the nitrogen was applied in one application at rates of 600 pounds or more, there was an accompanying reduction in yield at the time of first cutting which was never overcome in succeeding cuttings.

2. Effect of Rate of Nitrogen on the Forage Production of Oats, Rye Grass-Crimson Clover, and Tall Fescue-La. S-1 Clover—Treatments were the same as in (1) above. Total yield increased as the rate of nitrogen increased for all rates of nitrogen applied to oats and for all rates of nitrogen except the 33-pound rate applied to rye grass-crimson clover. Significant yield increases were obtained from each 33 pounds of nitrogen on oats alone. Sixty-six pounds of nitrogen were required to produce a significant yield increase with rye grass-crimson clover. There was no advantage gained as a result of applying a given rate in more than one application except at rates above 165 pounds per acre. At rates above 165 pounds per acre good yield distribution was obtained by splitting the rate in two applications.
Rye grass-crimson clover outyielded the oats at all nitrogen levels up to and including the 198-pound rate. It should also be pointed out that rye grass-crimson clover receiving no nitrogen produced yields equal to the 66-pound rate. One hundred thirty-two pounds of nitrogen were required by oats to equal the yield obtained from no nitrogen on rye grass-crimson clover. Nitrogen was, however, necessary to produce these differences and was doubtlessly provided by the clover grown in association with the rye grass. In defense of applied nitrogen, however, it should also be pointed out that earlier growth, a most important consideration, was obtained as a result of applying commercial nitrogen.

The yields obtained from tall fescue-La. S-1 clover increased as the rate of nitrogen increased. While this statement is true, the fact remains that all yields were so low as to preclude the use of this grass for winter grazing purposes in this area. It has been impossible to maintain a satisfactory stand of La. S-1 clover, an excellent white clover, in the mixture because of the dominating growth habit of tall fescue.

3. Effect of Rate of Nitrogen on the Forage Production of a Dallis Grass-White Clover Mixture—Yield trends continued as in (1) and (2) above, i.e., yields increased as the rate of nitrogen increased. In addition, single applications of a given rate provided as good yields as the same rate applied in two or three applications. In similar trials where a clover was not grown in association with the grass, better yield distribution, though no greater total yield, was obtained by splitting the application of rates at and above 165 pounds of nitrogen per acre. It should also be pointed out that yields obtained from lower rates of nitrogen are much greater where a clover is grown in association with the grass. For example, Dallis grass-clover produced 4,392 and 5,337 pounds of dry forage per acre at the no-nitrogen and 64-pound rates respectively. These same rates applied to Dallis grass alone produced only 2,071 and 4,014 pounds of dry forage. On the average, the white clover in the mixture either directly or indirectly produced 1,800 pounds of dry forage per acre.

Phosphate and Potash Studies with Winter Growing Forage Crops

These experiments were set up to determine how much phosphate and potash to apply to an annual and perennial winter growing combination at low and moderately high levels of nitrogen fertilization. Minor element treatments were also included to determine if there was a need for same above that already present in the soil or applied as a by-product in the already used fertilizer materials.

1. Tall Fescue-La. S-1 Clover—Unfortunately there are no desirable winter growing perennials available for the upland soils of
southeast Louisiana. This, however, had not been determined at the time this experiment was initiated. Maximum yields at all levels of fertilization were so low as to preclude the use of this combination or any other perennial winter growing combination. Especially was this true at the 60-pound level of nitrogen fertilization. In order that the reader might have information that may be used advisedly, 100 pounds of phosphate and 150 pounds of potash were necessary to obtain maximum yields at the 120-pound level of nitrogen fertilization. These "maximums" were slightly less than 3,000 pounds of dry forage per acre and totally inadequate.

2. Rye Grass-Crimson Clover—Maximum yields at the 60-pound level of nitrogen fertilization were obtained from the application of 20 pounds of phosphate. No response was obtained from the application of potash. At the 120-pound level of nitrogen fertilization, 60 pounds of phosphate and 100 pounds of potash were required for maximum production. Apparently there is a criterional yield level for the expression of a need for potash. There is little need for potash at yields of 5,000 pounds of forage per acre or less. If the yield is in excess of 6,000 pounds per acre, there appears to be a need for relatively large amounts of potash. This seems to hold true whether the forage is a grass alone or a grass-legume combination.

Lime Studies on Perennial Spring and Summer Growing Pasture Mixtures

The purpose of these experiments is to evaluate the relative effectiveness of calcium silicate slag, dolomitic limestone, and calcic limestone at rates varying from 3,000 to 9,000 pounds per acre. Other trials have been set up to determine the amount and frequency of application of maintenance liming material. In none of the four years the trial has been under study has a significant yield difference been exhibited between any treatments. This means that under the conditions of this experiment, 3,000 pounds of any source is capable of providing maximum yields and that no maintenance liming material is needed at this stage.

Phosphate Studies for Perennial Spring and Summer Growing Pasture Mixtures

The purpose of these trials is to determine the amount of phosphate needed and the most effective interval of application at so-called minimum and liberal initial rates. Sources and methods of
application are also a part of the over-all study. The following are pertinent findings after four years of study:

1. Sixty pounds applied initially is capable of providing maximum yields.

2. Annual applications are necessary if a consistently high level of production is to be obtained.

3. Twenty-forty pounds of phosphate applied annually is capable of providing maximum yields. This rate is vastly superior to larger rates applied biennially or triennially. In this connection it should be pointed out that the 20-40 pound rate is no better than the larger rate in years when the larger rate is applied but is considerably more productive in years skipped in the biennial or triennial plan. For example, 60 pounds of phosphate applied initially in the spring of 1952 with subsequent annual applications of 20 pounds of phosphate each January in 1953, 1954, and 1955 provided yields of 6,156, 7,110, and 5,935 pounds of forage respectively. One hundred pounds of phosphate applied in the spring of 1952 at planting, with no additional phosphate until January 1955, at which time 120 pounds of phosphate was applied, made yields of 5,315, 3,940, and 7,057 pounds for the same years respectively. Obviously the livestock man cannot operate from year to year with the apparent ups and downs of production obtained as a result of biennial or triennial application.

Superphosphate appears to be a more desirable source of phosphate than basic slag or raw rock phosphate.

Potash Studies for Spring and Summer Growing Pasture Mixtures

The purpose of this experiment is to determine the amount of potash to apply initially for the establishment of a Dallis grass-white clover pasture, the amount to apply annually thereafter for maintenance, and the relative desirability of applying the recommended amount in single or split application. The same trends have persisted for the three years the trial has been in progress, i.e., 50 pounds applied initially with annual applications of 25 pounds per acre has been capable of providing maximum yields. No advantage has been gained by applying any rate in split application.

Effect of Rate of Nitrogen on the Forage and Protein Production of Several Winter Growing Annuals

The oat-crimson clover mixture was superior in total forage and protein production. Rye grass alone was inferior in this respect. Oats alone and oats-crimson clover provided the most desirable
distribution of growth. Crimson clover alone provided the least desirable growth distribution.

Nitrogen significantly increased the forage and protein production of the mixtures and of the grasses grown in pure stands. Clover yields were not significantly increased by nitrogen. The percentage protein of the grasses was significantly increased by nitrogen, whereas percentage protein of the clover was not increased.

The clover present in the mixtures decreased as the rate of nitrogen increased.

These data indicated that grass-clover mixtures are superior to pure stands of either. Especially is this true in instances where less than 160 pounds of nitrogen per acre is to be applied.

Forage Crop Mixture, Variety, and Strain Yield Testing

Perennial Spring and Summer Growing Pasture Mixture Trial

All adapted perennial grasses and self-seeding clovers plus tall fescue, sericea lespedeza, and common lespedeza were grown in all logical combinations in an effort to determine the most desirable combination. After three years' trial the following facts are pertinent from the data.

1. Components of the mixtures rather than the complexity of the mixtures determined the relative production of same.

2. Mixtures predominated by Coastal Bermuda grass were more productive.

3. Mixtures containing Bahia grass were the second most productive, while Dallis grass mixtures were the least productive.

4. Bahia is the most aggressive grass and will crowd out both Coastal Bermuda and Dallis grass. It is likewise more difficult to maintain clovers in Bahia grass mixtures.

5. As a result of the varying degree of aggressiveness and the fact that no better yield distribution is obtained, there is no advantage in having more than one of Coastal Bermuda, Bahia, or Dallis grass.

6. Dallis grass is the least competitive of the three grasses and the percentage of same generally decreased as the season progressed, while the percentage of Bahia and Coastal Bermuda grass in the mixture increased as the season progressed.

7. Bahia and Coastal Bermuda grass were more productive during drouthy periods than Dallis grass. Dallis grass was generally affected more by wet or dry periods than Bahia grass or Coastal
Bermuda grass, thereby providing a less uniform level of production during the season.

8. Mixtures containing crimson clover were most productive at the time of first cutting. White clover mixtures were the second most productive at that time.

9. Little advantage was gained as a result of having both crimson and white clover in the mixture; choose one.

10. Alsike clover was not present in any mixture.

11. Red clover lengthened the clover season and therefore might be used in combination with white or crimson clover.

12. Both lespedeza and tall fescue were crowded out prior to the 1955 season.

Annual Winter Growing Mixture Trial

Oats, wheat, rye grass, little canary grass, crimson clover, red clover, and white clover were tried in various combinations in an effort to determine the most desirable annual winter growing mixture for use in southeast Louisiana. Combinations containing oats were superior to all other combinations from both a total production and yield distribution consideration. Of the combination involving oats, oats alone performed as well as oats with one or more clovers, another grass or rye grass and a clover. If a clover is desired, crimson clover appears to be the most desirable. Wheat combinations were the second most desirable mixtures.

Perennial Winter Growing Mixture Trials

This is the second year of a trial designed to evaluate several winter growing perennial and/or self-seeding species. Prairie brome grass, Palestine orchard grass, white clover, reseeding crimson clover, and red clover were tried in all logical combinations. While total yields might be considered as acceptable, the first cutting was not obtained until January 12, 1955, a time too late for the dairy farmer attempting to establish a winter base. It is possible that these grasses have a place in a grazing program but it is extremely doubtful if the practical livestock farmer can afford the luxury of having species that provide all of their production during seasons where no problem really exists.

Summer Growing Grasses

1. Dallis and Bahia Grasses—All Bahia grasses under trial continued to demonstrate their superiority over Dallis grass. Bahia grass yields were 9,000, 10,000, and 11,000 pounds of dry forage per acre as compared to 7,000 and 8,000 pounds of dry forage for the Dallis grasses. Bahia grass is an extremely aggressive grass com-
mencing growth earlier in the spring and continuing later in the fall than Dallis grass. It is likewise more drouth tolerant.

2. Millet and Sudan Grasses—In these trials all entries were clipped when they reached the grazing stage, the idea being to determine the best millet and Sudan grass for grazing purposes. All millets under trial were superior to the Sudan grasses. Hybrid 1, Starr, and common millet were the most productive, with yields of 11,503, 10,448, and 10,327 pounds of dry forage per acre. A second trial was conducted in order that the various millet and Sudan varieties might be evaluated for silage purposes and to compare the yield of stubble regrowth with that obtained from a new planting made at the time the first crop was harvested. In this trial all entries were harvested at the silage stage rather than the grazing stage. Stubble growth was equal to that obtained from a new planting, but it should be pointed out that weedy type grasses were of such proportions as to influence yield more than did the millet and/or Sudan. Because of the weed problem it was impossible to determine if some strains had better regrowth qualities than others.

3. Johnson Grass Sorghum Hybrids—These hybrids show considerable promise inasmuch as yields of 14,000-15,000 pounds of dry forage per acre were produced the first year from very poor stands.

Winter Growing Species

1. Cereal Grain Forage Yield Trial—In descending order of production oats was the most productive followed by wheat, barley, rye grass and rye. Camellia was the most desirable oats while Atlas and Coastal were the most productive varieties of wheat. Barley made very satisfactory yields early in the season but the quality was off later on in the season. Rye was generally inferior to all other cereal grains.

2. Rye Grass Strains—Florida rust resistant, with a yield of 6,614 pounds of forage per acre, was the superior rye grass. Domestic rye grass, with a per acre yield of 6,326 pounds of forage, was second best. In spite of the fact that rye grass provides little grazing prior to January in any given year, it has a place in most grazing programs because of its ability to grow at low temperatures and because of its sodding effect.

3. Tall Fescue Grass Strains—Alta 144 and Goar continued to be the most productive strains but yields were so low from all entries as to preclude the recommendation of any entry. In addition to being unproductive, little or no growth is made prior to January in any given year.

4. Rescue Grass Strains—This is the second year yields have been taken from the same planting. As has been true in the past,
yields obtained the first year following seeding are satisfactory even though the major portion of the growth occurs in the spring. In succeeding years, however, the yields of all varieties are generally unsatisfactory because of the fact that the grass does not survive the summer to the extent necessary to provide a stand the following fall. This, plus the fact that the rescue grasses do not volunteer satisfactorily from reseeding, requires that this grass be used as a winter growing annual, in which case it is inferior to oats.

5. Orchard Grass Strains—None of the orchard grasses can be recommended for southeast Louisiana because of low yields.

Winter and Spring Growing Clovers

1. White Clover Strains—Only adapted Louisiana white clovers were included in the trial, the unadapted ones having been previously eliminated. There were no significant differences in yields among any entries. It is important, however, to choose a Louisiana strain of white clover.

2. Crimson Clover Strains—The data continues to indicate that one reseeding crimson clover is as good as any other. This yield trend persists on second and third year cuttings following seeding as well as first year seedings. It should be pointed out, however, that common crimson clover will produce as much as any reseeding crimson clover if it is reseeded each year.

3. Red Clover Strains—Kenland, Nolin, Port Gibson, and La. Strain 1 are equally productive red clovers on these soils and can be added to a permanent pasture mixture to lengthen the clover season.

Alyce Clover Fertilization Studies

In this experiment nitrogen was varied from 0 to 60 pounds in 20-pound increments. Phosphate was varied from 0 pounds to 200 pounds in 40-pound increments and potash from 0 pounds to 160 pounds in 20-pound increments. No significant differences in yields were obtained in 1953, 1954, or 1955. The probable explanation for this is the fact that the site on which this experiment is located has been liberally fertilized with a complete fertilizer since 1949 and there was a sufficiently large accumulation of phosphate and potash to meet the plants’ needs. In preceding years maximum yields were obtained from the addition of 80 pounds of phosphate plus 40 pounds of potash. No advantage has been gained by applying nitrogen material.
Corn

Yield Testing

All commercially available hybrids and open-pollinated varieties that are generally adapted to this area are included in the test. Entries that have consistently been at the top for three or more years include La. 2130, La. 521, Funk's G 785W, Coker's 911, and Dixie 22.

Phosphate and Potash Rates With and Without Lime

Rates of phosphate and potash were each varied in 40-pound increments from 0-120 pounds per acre. A split plot design was used in which half of each replication was limed with 2,000 pounds of dolomitic limestone per acre. All plots received a uniform application of 120 pounds of nitrogen applied in the drill before planting. Forty pounds of phosphate and 40 pounds of potash were capable of providing maximum yields, which in this instance was about 50 bushels per acre. All treatments receiving lime consistently produced 2-3 bushels more corn than the same treatment without lime.

Nitrogen Study

Ammonium nitrate and nitrate of soda were used as the sources of nitrogen at rates varying from 60 to 180 pounds of nitrogen per acre. In addition, 350 pounds of dolomitic limestone per acre was applied to the sides and bottom of the water furrow and covered by bedding on with a middle burster. A uniform application of 80 pounds of phosphate and 60 pounds of potash along with the designated amount of nitrogen was applied in a band in the same water furrow before the bedding operation commenced.

While no significant differences existed between sources for a given rate, the ammonium nitrate, for any given rate, consistently produced more corn. It is possible that by applying all of the nitrogen at planting an advantage was gained by ammonium nitrate inasmuch as nitrate of soda, a more readily available source of nitrogen, quite possibly lost part of its nitrogen by leaching before the plant could use this nitrogen.

No significant differences were evident as a result of applying 350 pounds of lime to neutralize the acidifying effects of the ammonium nitrate.

It should be pointed out that this is the first year of the trial and no opportunity exists at this stage for any residual effects to be established.

Sorghum for Silage*

The highest yielding entries were Sart, MM 1056, and Honey. The syrup production, always a good measure of the feeding value

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*Test conducted in cooperation with the U.S. Sugar Field Plant Station, Meridian, Mississippi.
of a sorghum, was 369, 362, and 341 gallons per acre respectively for MM 1056, Honey, and Sart.

**Effect of Seed and Fertilizer Placement on the Forage Production of Millet**

The purpose of this study was to determine the effect of row spacing and seed and fertilizer placement on the forage yield of millet. The amount of fertilizer applied was uniform but the relationship of fertilizer placement to seed varied. The greatest yield was obtained from the treatment in which all of the fertilizer was applied in a band 2 inches to the side of the seed drill. The seed drills were on 36-inch centers. The next best yields were obtained from drilling the seed and fertilizer together on 10-inch or 20-inch centers. The poorest yields were obtained from broadcasting the seed and/or fertilizer.

**West Louisiana Experiment Station, DeRidder**

**Cecil B. Roark, Superintendent**

**Harold E. Harris, Research Associate in Agronomy**

**Archie H. McDaniels, Assistant Animal Husbandman**

During 1955 investigations were continued with native and improved pastures, measured by gains of beef cattle grazed; with adaptation of strains and varieties of forage crops; and in soil fertility, forestry, livestock, and floriculture. In cooperation with USDA, a new project was started in soil fumigation.

**Pasture Studies**

**Improved Pastures**

The number of pastures grazed was reduced as a result of an unusually favorable growing season during July, August, and September. During this three-month period the rainfall at the Station measured 23.2 inches, which is almost twice the normal precipitation during these months at this location. The increased growth of pasture vegetation was about in proportion to the increase in rainfall.

Cows and calves were sold from the Station prior to this rainy season, and the number remaining was insufficient to consume the unusually heavy forage growth. Consequently grazing was dis-

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1 On leave for further study.
continued on some pastures and the forage cut for hay or silage, while on others grazing was continued throughout the growing season.

Dallis grass, common Bermuda, white clover, and rye grass produced 393 pounds of beef per acre. A similar pasture which was sod seeded in the fall with oats produced 525 pounds of beef per acre.

A Coastal Bermuda and Singlelary pea pasture produced 451 pounds of beef per acre.

A pasture of common Bermuda grass and Singlelary peas broadcast to rye grass in the fall produced 378 pounds of beef per acre.

Native Range Pastures

A limed and fertilized range pasture that contained a scattering growth of pine trees produced 62 pounds of beef per acre. This is the fourth year of this test and scattered areas of voluntary white clover and Bermuda grass were evident. A similar unfertilized pasture produced 22 pounds of beef per acre. A third range pasture that is burned over every third year produced 10 pounds of beef per acre.

Temporary Winter Pasture

An oats pasture was plowed, prepared, and seeded to Southland oats October 1. Grazing started December 15 and extended through April. The yield was 442 pounds of beef per acre.

Another pasture prepared and treated similarly, but planted to Atlas 66 wheat, was grazed from December 15 through April. The yield was 356 pounds of beef per acre.

The oats pasture made better gains early and late in the season. Wheat made a higher gain per acre during February, the month of lowest average temperature during the 1954-55 winter season.

—H. E. Harris, A. H. McDaniel, and C. B. Roark

Livestock

Performance and Grazing Habits of Hereford and Aberdeen Angus Cattle Grazing Improved Pastures with Shade and Without Shade

Data for this study were collected from 81 groups, involving approximately 100 head per year, of Hereford and Angus cows with calves, over a 4-year period. Information on cattle grazing the pastures with shade came from 61 test groups, whereas 20 test groups comprised the source of information for cattle on pastures without shade. Test periods averaged 25 days in length, and the average number of cattle per test was approximately six head of cows with calves. Angus cows and calves comprised 40 per cent
of the cattle used. The treatments were typed as pastures with either: (1) abundant natural shade; (2) scanty natural shade; (3) artificial shade; or (4) no shade. Average daily gains were 1.29,** 1.00,* .84, and —.05 pounds for the cows and 1.85,** 1.64,* 1.78,* and 1.18 pounds for the calves from the 4 treatments respectively. The average 13-hour (6:00 A.M. to 7:00 P.M.) grazing habit breakdown for cows on the 4 treatments follows in respective order: grazing, 4:16, 4:13, 3:58, and 3:47; standing, 4:16,** 4:30,** 4:55,* and 6:04; and lying, 4:28,** 4:17,** 4:07,* and 3:09. The same information kept on the calves grazing the 4 treatments follows in the same order as above: grazing, 3:05, 2:45, 3:06, and 2:42; standing, 4:00,** 4:03,** 3:49,** and 5:06; and lying, 5:55* 6:12,** and 6:05,* and 5:12. The mean air temperature recorded for the 4 shade treatments follows in respective order: 90.67,** 93.45,** 92.97,** and 96.81° F. The mean 4-year maximum temperature during the testing periods was 90° F., and the mean relative humidity was 63 per cent.—Archie H. McDaniel and C. B. Roark

Sheep

A sheep project to study crossbred lambs on improved pasture was initiated in the summer of 1954. The lambing period for 1955 was from January 25 to March 26. The average lambing weight of the native-Corriedale cross was 8.2 pounds compared with an average birth weight of 9.1 pounds for the native-Hampshire cross. On May 14, the average age of the two groups of lambs was 90 days. The average weight for the two groups was 60 pounds.

—Archie H. McDaniel and C. B. Roark

Forage Crop Studies

White Clover

In the 1955 white clover test six strains of white clover were harvested once for forage yields. The yields obtained from the different strains, in pounds of air dry matter per acre, were: La. S-1, 4,987; La. Improved white, 4,778; Ladino (Western composite), 4,737; Ladino (Italian), 4,417; La. white, 4,181; and Pilgrim Ladino, 4,112. The difference required for significance at the 5 per cent level is 821.

A second year white clover test which includes five strains of white clover was harvested twice for forage yields. The yields, in pounds of air dry matter per acre, obtained from this test are as follows: La. S-5, 4,557; La. S-1, 4,244; La. Improved white 4,178; Ala-Lu., 3,924; and La. white, 3,702. The difference required for significance at the 5 per cent level is 387.

* Equals probability of 0.05.
** Equals probability of 0.01.
Red Clover

In the red clover test six strains were harvested March 19 and April 22, 1955, for forage yields. The strains produced the following pounds of air dry matter per acre: La. Strain 1, 6,647; Port Gibson, 6,486; Kenland, 6,432; Midland, 6,063; Nolins, 6,028; and Pennscott, 5,938.

Nolins Red and La. Strain 1 were the earliest of the strains tested. There were no significant differences in yield among the strains.

Crimson Clover

Four varieties of crimson clover were harvested once for forage yields. The varieties included in this test, with yields, are as follows: Mississippi Selection, 3,334; common, 3,177; Auburn, 2,990; and Autauga, 2,907.

There were no significant differences in yield.

Winter Grass Test

This test includes four strains of rescue grass, three strains of canary grass, and common rye grass. Three cuttings were made to obtain forage yields.

Common rye grass produced the highest yield in this test. Chapel Hill rescue and Phalaris tuberosa were superior to other strains of rescue grass and canary grass in this test.

Rye Grass

Five strains of annual rye grass and five strains of perennial rye grass were harvested three times for forage yields.

Yields obtained from the annual strains of rye grass were significantly higher than those obtained from the perennial strains.

Domestic rye grass and the rust resistant Florida strain gave the highest yields in this test, the rust resistant Florida strain being the earlier of the two.

—H. E. Harris, C. R. Owen, and C. L. Mondart, Jr.

Oat Variety Test

This test includes four commercial varieties of oats, one lot of feed oats, and one strain of wheat.

These plots were harvested four times from February to May.

The yields in pounds of dry weight per acre are as follows: Nortex, 3,688; Ferguson, 3,442; feed oats, 3,306; Southland, 3,265; Alber, 3,140; and Atlas 66 wheat, 2,393.

Atlas 66 wheat produced at a uniform rate throughout the season but is susceptible to stem rust.
The Southland oats is the earliest of the varieties tested. The difference required for significance at the 5 per cent level is 430.

**Rate of Oats Seeding**

This test was begun in the fall of 1954 to determine the most economical rate of seeding oats for forage yield.

All plots received 15 pounds of N, 60 pounds P₂O₅, and 60 pounds K₂O before seeding and were topdressed with 60 pounds N in two applications.

The seeding rates were 2, 3, 4, 5, 6, 7, and 8 bushels per acre. The seeds were sown broadcast, disced, and rolled.

The first year results show that there were no significant differences in forage yield among the different rates of seeding.

—*H. E. Harris and C. B. Roark*

**Dallis Grass—Bahia Grass**

Three strains of Dallis grass and five strains of Bahia grass were harvested twice for forage yields. The yield from Pensacola Bahia was significantly higher than the other strains of Dallis and Bahia grasses.

**Sudan and Millet**

Four strains of Sudan grass and three strains of millet were harvested once for forage yields.

All three strains of millet produced significantly higher yields than did the strains of Sudan grass.

—*H. E. Harris, C. R. Owen, and C. L. Mondart, Jr.*

**Soil Fertility Studies**

**Nitrogen**

Nitrogen levels of 0, 33.5, 67, 100, and 134 pounds per acre respectively were applied as a topdressing to a white clover-common rye grass mixture. The rates of nitrogen were applied in single and in split applications. There were no significant differences in forage yield between the single and split applications of nitrate.

The optimum rate of nitrogen required to produce a good clover-grass mixture in this area is approximately 65 pounds per acre, providing other fertilizer needs have been supplied.

**Anhydrous Ammonia vs. Ammonium Nitrate**

Sixty pounds of nitrogen per acre from anhydrous ammonia and ammonium nitrate were applied to an established stand of
oats. The anhydrous ammonia was applied at a depth of 6 inches in 20-inch rows. The ammonium nitrate was broadcast on the sod.

The application of ammonium nitrate gave an earlier growth response and a significantly higher yield than did the anhydrous ammonia.—H. E. Harris and C. B. Roark

**Sulphur**

This test was begun in 1952 to determine the effects of sulphur when added to different sources of phosphate on a white clover, Dallis grass, and rye grass mixture. In addition, two sources of lime (shell and dolomite) were used.

The sources of phosphate are superphosphate, treble superphosphate, calcium metaphosphate, fused rock phosphate, raw rock phosphate, and basic slag. Each source of phosphate is being used with and without sulphur.

In this year’s results there was no significant increase in yields from the addition of sulphur.

**Rates and Ratios**

This test was begun in the fall of 1952 to determine the most efficient rates of a complete fertilizer for a white clover, rye grass, and Dallis grass mixture on the West Louisiana Experiment Station.

All plots received two tons of lime per acre before seeding. The rates of the different fertilizer elements are as follows: N, 20, 40, 60; P$_2$O$_5$, 40, 80, 120; and K$_2$O, 20, 40, 60 pounds per acre. These rates of N, P$_2$O$_5$, and K$_2$O were used in all combinations.

A three-year average of forage yields shows that the greatest response was obtained from the addition of phosphate, and the least response was obtained from potassium. This could possibly be due to the fact that all the elements are applied at one time, and the cuttings are made over a period of eight or nine months.

**Residual Phosphorus**

A study of the residual effects of phosphate from different sources is being continued. All the plots being compared were treated with uniform rates of lime, nitrate, and potash. Superphosphate and triple superphosphate were applied at different levels in single and in split applications. Rock phosphate was applied at two levels in one application.

—H. E. Harris, M. B. Sturgis, and C. B. Roark

**Rates of Rock Phosphate**

This test was begun in 1952 to compare the effectiveness of raw rock phosphate at different rates, and raw rock phosphate supplemented with superphosphate. The rates of rock phosphate ranged
from 1,000 to 10,000 pounds per acre. The lower rates were supplemented with enough superphosphate to bring the available $P_2O_5$ to 100 pounds per acre. Uniform rates of lime, nitrate, and potash were applied to all plots.

There were no significant differences in forage yield among the different treatments.—H. E. Harris and C. B. Roark

**Forestry**

This Station is located in the longleaf pine area of West Louisiana. Several million seedlings of slash, loblolly, and longleaf are planted annually in the area and this move is gathering momentum as the early plantings show increasing promise.

**Species Tests of Planted Pine Seedlings**

Three species, slash, loblolly, and longleaf, were planted in the winter of 1951-52. At the end of three years there was still sufficient slash and loblolly for a satisfactory commercial stand while over 95 per cent of the longleaf had failed to survive.

All species were replanted in 1954-55. Replanted seedlings were placed in the center of areas two feet square scraped clean of vegetation.

After one year the stand including the original and replant was 97 per cent for loblolly, 95 per cent for slash, and more than 85 per cent for longleaf. The loblolly had a 100 per cent tip moth infestation.

The best survival and growth of all species was on well-drained but moist areas.

**Fertilized and Unfertilized Longleaf**

Beginning in March 1953 five plots of trees were limed and fertilized with a 60-60-60 fertilizer and fertilized annually thereafter. These plots were compared with five similar groups that were not fertilized.

During the three years the average annual diameter growth of the fertilized trees was 0.600 inches while the diameter growth of the non-fertilized plots has averaged 0.567 inches. The average annual height growth of the fertilized plots was 3.70 while that of the non-fertilized plots was 3.77 feet.

**Natural Longleaf Reproduction**

In October 1951 a 40-acre area was burned in preparation for longleaf pine seed-fall. The area was burned again on February 2, 1955.

At the beginning of the experiment, eight strips 4 links by 200
links were selected at random and permanently marked on the burned area, and eight on an adjoining similar area that was unburned.

In January 1956 the number of seedlings one year old or older on the burned area ranged from none to 4,750 per acre, averaging 1,360. The number on this area from the 1955 seed crop ranged from 250 to 2,875 per acre, averaging 1,109.

On the unburned area, January 1956 counts showed the number of seedlings one year old or older to range from 125 to 750 per acre, averaging 422. The number of young seedlings from the 1955 seed crop on this area ranged from 125 to 1,625 per acre, averaging 609.

On strips in the burned area the average number of seedlings of all ages since the beginning of the test was 2,469 per acre, compared with an average of 1,031 for the unburned area.

In studying the effect of land preparation on seed germination from natural seed-fall, strips were disked on burned and unburned sites October 22, 1955, adjacent to producing longleaf seed trees. A 10-foot-wide double disk was run over each strip twice.

On both burned and unburned areas, groups of four measured plots in strips of 2 feet by 50 feet were established on the disked area and four on the adjoining rough or undisked area.

In January 1956 counts were made on all areas of young seedlings germinating from the seed-fall following the time of disking in October.

On the burned area that was disked, there was an average of 5,227 new seedlings per acre and 6,098 on the adjoining undisturbed rough.

On the unburned area, the number of seedlings on the disked strips averaged 3,049 per acre while the adjoining rough averaged 2,439 per acre.—Bryant A. Bateman and C. B. Roark

Floriculture

Gladiolus

Sixty-nine varieties, strains, or crosses of gladiolus were planted March 4, 1955. Several strains showed promise, and selections were made for further testing at the Main Station at Baton Rouge.

Hibiscus

Twenty varieties or strains of hibiscus were planted in the spring of 1955. Most varieties made good growth with rather wide
variation in amount of blooms. Two of the better adapted varieties this season appeared to be Kona and Orange Giant.

Roses

Twenty-four varieties of roses were set in a test in January 1954. Most of the varieties planted grow well in this area.

The second year’s test indicated that some of the more thrifty varieties are Etoile de Holland, Mission Bells, Red or Pink Radiance, Forty-Niner, and Charlotte Armstrong. The Lowell Thomas and Show Girl varieties seem least adapted.

—R. H. Hanchey and C. B. Roark

Nematodes

A survey of nematodes in the soils of this Station was made in December 1954. Sixteen species were identified.

In 1955 two fumigation experiments were initiated, one in February in preparation for lespedeza and one in November for white clover.

The lespedeza experiment was abandoned after the second planting because heavy rains resulted in failures to get adequate stands.

In the lespedeza fumigation, the kill was complete where methyl bromide MC-2 was used. OS-1897 was the least effective, while ethylene dibромide and Shell D-D were between the two extremes.

In the white clover fumigation three treatments were used. MC-2, resulting in an almost complete kill, was most effective, OS-1897 least effective, and Shell D-D intermediate.

—Max J. Fielding, John P. Hollis, L. S. Whitlock, E. J. Wehunt, H. E. Harris, and C. B. Roark
Cotton Disease Investigations

During the past season studies were continued along the lines previously reported. The important cotton diseases in Louisiana such as bacterial blight, fusarium wilt, verticillium wilt, and seedling diseases are being investigated with emphasis centered upon the development of control measures.

Bacterial Blight—Breeding for Resistance

The breeding program to develop blight-resistant strains adapted for Louisiana was continued as previously reported. Progeny selections of the Louisiana cross, Stoneville 20 x Deltapine 14-312 (strain designation 2014), and selections of the F₃ backcross generation of this hybrid to the Deltapine parent, together with strain 1-11-11 developed by L. M. Blank in Texas remained free of infection following inoculation with races 1 and 2 of the blight organism in 1955 and are graded as blight-resistant lines. The fiber properties of these breeding stocks are to be evaluated as soon as time permits and the superior progenies increased for yield trials and studies of other desirable agronomic characters.

Fusarium Wilt—Breeding for Resistance

Emphasis has been centered on 3 strains, namely, Louisiana hybrid 3314, Auburn 56 x Deltapine 14-312, and Stoneville 2B-R, with respect to improvement of wilt resistance, staple length, lint per cent, productivity, and other desirable agronomic characters. Screening of progeny selections of these strains was continued as in former years and the more promising material again studied in plantings made in an area infested with fusarium wilt-reniform nematode complex. Because of excessive rainfall, the incidence of wilt was less than usual, but yields were good which afforded opportunity for better comparison of progeny rows and evaluation of plant selections for yield potential and fiber properties. Several selections of these strains were harvested in September and later ginned for subsequent studies.

Yield Trials with Louisiana Hybrid 3314

Reports given to the writer by associates here, Jack E. Jones and F. W. Self, agronomists with the Experiment Station, reveal

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1 In cooperation with the Louisiana Agricultural Experiment Station.
2 Field Crops Research Branch, Agricultural Research Service, Section of Cotton and other Fiber Crops, U. S. D. A., in cooperation with Louisiana Agricultural Experiment Station.
that in their commercial variety and new strain tests conducted in 1955, Louisiana hybrid 3314 is among the varieties in the top bracket for lint yield per acre at St. Joseph (1234 pounds), Calhoun (1068 pounds), and Baton Rouge (1018 pounds). Also, in a small increase block at Baton Rouge, comprising 0.265 acre, the lint yield per acre was 1443.7 pounds, or 2.9 bales, each 500-pound minimum. This strain was also used the past season by the agronomists at Baton Rouge in their fertilizer tests. Highest lint yields per acre were 969.1 and 935.2 pounds respectively, the first indicated being from an application of 600 pounds of an 0-8-8 fertilizer following 2 years of soybeans and the second from 600 pounds of dolomitic limestone plus 48 pounds of ammonium nitrate.

**Verticillium Wilt**

From the surveys the writer made the past season, it appears that this wilt is gradually increasing in prevalence. More infested fields have been located in the parishes previously reported, and an additional adjoining parish, Natchitoches, also may have the disease in one locality.

Since last year breeding work to develop lines that are tolerant to the disease and adapted to this region was continued. Seventy-eight F₃ progeny selections of the cross, Auburn 56 x Deltapine 14-312, which had been analyzed for staple length (range 1 1/16-1 1/32 inches) and lint per cent (range 38.0-40.0) were studied again at Baton Rouge. The better plants of these progenies were again selfed and a considerable quantity of both SP and OP seed saved under favorable conditions for future testing in verticillium-infested areas. The above line appears promising with regard to yield potential.

**Orthocide 75 as a Post-Emergence Drench for Control of Sore Shin**

In a preliminary test conducted the past season, Orthocide 75, containing Captan 75 per cent, applied as a post-emergence drench to seedlings 21 days old at concentrations of 2, 4, and 6 pounds per 100 gallons of water respectively arrested development of sore shin, *Rhizoctonia solani*, the important cotton seedling disease. Each concentration used was effective and no toxicity was apparent. Before drenching, examinations revealed that in all row sections selected for treatment, the disease was prevalent in about the same degree. Fourteen days after treatment, the percentage of healthy seedlings in the rows drenched was 90.8 (6 lbs./100), 97.2 (4 lbs./100), and 95.7 (2 lbs./100), while in the rows not drenched the percentage healthy was 70.7, 74.8, and 75.8.

**Seed Treatment**

Listed in the accompanying table are the fungicides which
have been found most effective in reducing seedling disease losses and in improving cotton stands in Louisiana, and the rates of application of these fungicides for reginned and acid delinted seed.

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<th>Acid delinted seed</th>
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<tr>
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Honey Production Records

Seven colonies of bees have been maintained on scales since 1942 in a typical white clover location near Baton Rouge. Average net gains per colony have varied from 98 pounds in 1955 to 300 pounds in 1950. Net losses in weight can be expected in all months except April, May, June, and July. Average net gains per colony during the 14-year period have been 50 pounds in April, 81 in May, 52 in June, and 34 in July. The figures show that: (1) a colony needs at least 50 pounds of honey for fall, winter, and spring use; (2) a colony must be strong in bees about April 1; (3) ample equipment must be available for brood rearing and honey storage. A detailed table of gains and losses may be obtained upon request.

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Iberia Livestock Experiment Farm, Jeanerette

Beef Cattle Research

Herd of Brahman-Angus and Africander-Angus crossbred cattle are maintained at the Iberia Livestock Experiment Farm. Purebred Brahman and Aberdeen-Angus herds are being established at the present time. The experimental program is designed to compare the performance of the various herds.

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1 Pathologist, Field Crops Research Branch, Agricultural Research Service, U. S. D. A.
2 In cooperation with Louisiana State University.
3 Entomology Research Branch, A.R.S., U.S.D.A., Beekeeping and Insect Pathology Laboratory.
4 In cooperation with the Louisiana Agricultural Experiment Station.
The Brahman-Angus crossbred herd is divided into six one-sire lines, the Africander-Angus into four one-sire lines. The crossbred herds usually are headed by two-year-old untested bulls although unusually promising one-year-old bulls may be used. Bulls which perform well the first year are used a second year; exceptional bulls may be used for longer periods.

Under the present program bull calves are left uncastrated until weaning time, when approximately one-fourth of each line, at least two in number, are put on a 154-day record-of-performance feedlot test. At the end of the test the best bull in each line is saved for future use. The remaining bull calves are castrated and put on record-of-performance test as steers. It is planned next season to rough the steer calves through the winter, placing them on feed the following fall and selling them at the age of approximately 18 months instead of as yearlings. Selection of sires is based on weight for age, average daily gain on feed, beef type, and on productivity of dam. Carcass data are obtained from the steers on slaughter.

All sound heifers are retained. They are fed largely on roughage with some protein supplement their first winter to gain an average of three-fourths to one pound daily, and grazed during their second summer. At the end of the grazing season heifers are carefully evaluated on the basis of six months weight, winter performance, beef type, performance of dams, and average performance of paternal half-sibs. Based on the above criteria one-third to one-half of the poor performers are culled, depending on numbers needed for replacement.

Cows are culled on the basis of performance especially on first and second calf crops. They are culled for unsoundness at any time. Cattle are tested annually in November or December for brucellosis and leptospirosis. They are tested for tuberculosis every three years. The whole herd is vaccinated for anthrax in March of each year. Spring calves are vaccinated for blackleg in March or April and again in September or October. Replacement calves are vaccinated for brucellosis at weaning. Calves are treated with phenothiazine at weaning and again in the spring. Hexachlorethane is given two weeks after the phenothiazine. Unthrifty cattle may be treated for internal parasites at any time. After treatment, cattle are placed on clean pastures. External parasites are controlled by “back scratchers” treated with chlordane or DDT.

Record-of-performance bulls and steers are fed a mixture of ground hay, ground yellow corn, molasses, and cottonseed meal. Average daily gains of bulls and steers on feed for 1954 and 1955 were: purebred Brahman bulls, 2.18; purebred Brahman steers, 1.58; crossbred Africander-Angus bulls, 2.16; crossbred Africander-Angus steers, 1.66; crossbred Brahman-Angus bulls, 2.41; crossbred Brah-
man-Angus steers, 1.77. There were no purebred Aberdeen-Angus on feed in 1954 and 1955.

Analysis of heat tolerance data showed highly significant correlations between respiration rates and rectal temperatures. Correlations for crossbreds ranged from approximately 0.5 to 0.6. These correlations are not considered sufficiently high to justify the use of respiration rates as a measure of body temperature or of heat tolerance. Correlations between dams coefficient of heat tolerance and performance as measured by her own birth weight, six-month weight and five-year weight and those of her progeny were not significant. Analyses are now being made to determine the correlation between respiration rates and production data.

—E. H. Vernon
Financial Statement

L. S. U. AGRICULTURAL EXPERIMENT STATION
RESEARCH FUND EXPENDITURES

YEAR ENDED JUNE 30, 1955

Expenditures—By Source

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Expenditures—By Object Classification

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Expenditures—By Location

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### GIFTS AND GRANTS FROM PRIVATE AND PUBLIC SOURCES TO EXPERIMENT STATION FOR FISCAL YEAR 1954-55

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Agricultural Experiment Station Staff

ADMINISTRATION

J. N. Efferson, Ph.D., Director
W. G. Taggart, M.S., Director Emeritus (retired)
I. L. Forbes, Ph.D., Assistant Director
Thos. E. Glaze, B.S., Assistant to the Director
Lawrence V. George, B.S., Editor
Nathalie Poirier, Personnel Secretary
Christine P. Brasher, Secretary to the Director
Mildred Cobb, Accountant (resigned April 23, 1955)
Margaret Drury, Accountant (appointed March 15, 1955)
Frances S. Stoker, Librarian

STATE STATION, BATON ROUGE

AGRICULTURAL CHEMISTRY AND BIOCHEMISTRY

E. A. Fieger, Ph.D., Biochemist; Head of Agricultural Chemistry and Biochemistry
Grace B. Adams, Ph.D., Research Assistant (part-time) (resigned May 31, 1955)
Milton E. Bailey, M.S., Research Assistant
John Francis Christman, Ph.D., Associate Biochemist (returned from Leave Sept. 12, 1955)
Martha E. Hollinger, Ph.D., Associate Nutritionist
William Holden James, Ph.D., Associate Agricultural Biochemist
Socrates Kaloyereas, Ph.D., Associate Food Preservationist
Jordan Grey Lee, Ph.D., Associate Biochemist
Russell T. McIntyre, Ph.D., Assistant Biochemist
Arthur F. Novak, Ph.D., Assistant Biochemist
Virginia Rice Williams, Ph.D., Associate Biochemist

AGRICULTURAL ECONOMICS

B. M. Gile, Ph.D., Agricultural Economist; Head of Agricultural Economics
William H. Alexander, M.S., Associate Agricultural Economist
Bill Bolton, M.S., Research Associate in Agricultural Economics
James Milton Baker, M.S., Associate Agricultural Economist (retired)
Alfred J. Burns, M.S., Research Associate in Agricultural Economics (appointed Jan. 16, 1956)
Joe Riley Campbell, Ph.D., Associate Agricultural Economist
Henry J. Casso, M.S., Assistant Agricultural Economist
Dudley B. Frickle, M.S., Research Associate in Agricultural Economics (appointed Nov. 16, 1955)
Alvin C. Harper, M.S., Research Associate in Agricultural Economics

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George Joubert, Jr., M.S., Research Associate in Agricultural Economics
Jerry M. Law, M.S., Assistant Agricultural Economist
Morris M. Lindsey, M.S., Research Associate in Agricultural Economics (appointed Jan. 9, 1956)
Joseph P. Montgomery, M.S., Associate Agricultural Economist
Ewell P. Roy, Ph.D., Research Associate in Agricultural Economics (resigned July 15, 1955)
Harlon D. Traylor, B.S., Research Associate in Agricultural Economics (resigned Sept. 15, 1955)
Fred H. Weigman, Ph.D., Assistant Agricultural Economist
Morris M. Lindsey, M.S., Research Associate in Agricultural Economics (appointed Jan. 9, 1956)
Ewell P. Roy, Ph.D., Research Associate in Agricultural Economics (resigned July 15, 1955)
Harlon D. Traylor, B.S., Research Associate in Agricultural Economics (resigned Sept. 15, 1955)
Fred H. Weigman, Ph.D., Assistant Agricultural Economist
Martin D. Woodin, Ph.D., Agricultural Economist

AGRICULTURAL ENGINEERING
Harold T. Barr, M.S., Agricultural Engineer; Head of Agricultural Engineering Research
Herbert E. Butler, B.S., Research Associate in Agricultural Engineering (appointed March 7, 1955)
John H. Hough, B.S., Assistant Agricultural Engineer
Wiley D. Poole, M.S., Agricultural Engineer
Carl H. Thomas, B.S., Assistant Agricultural Engineer
Finis T. Wratten, M.S., Associate Agricultural Engineer

ANIMAL INDUSTRY
George L. Robertson, Ph.D., Animal Husbandman; Head of Animal Industry Department (appointed July 1, 1955)
John B. Francioni, Jr., M.S., Professor of Animal Industry (teaching entirely, effective July 1, 1955)
Joseph E. Bertrand, M.S., Research Associate in Animal Husbandry
Paul B. Brown, Ph.D., Associate Animal Husbandman
R. M. Crown, M.S., Associate Animal Husbandman
Richard A. Damon, Jr., Ph.D., Associate Animal Husbandman
T. M. DeRouen, M.S., Assistant Animal Husbandman
Swayze E. McCraine, M.S., Associate Animal Husbandman
Clifton B. Singleteray, M.S., Assistant Animal Husbandman

CROPS AND SOILS
Madison B. Sturgis, Ph.D., Agronomist; Head of Crops and Soils Department
H. B. Brown, Ph.D., Agronomist (retired)
Robert H. Brupbacher, Jr., M.S., Assistant Agronomist
David S. Byrnside, Jr., M.S., Assistant Agronomist
C. T. Dowell, Ph.D., Agronomist (retired)
Bertrand N. Driskell, Ph.D., Associate Agronomist
John P. Gray, Ph.D., Agronomist
Martin W. Heitzmann, B.S., Research Associate in Agronomy (resigned Oct. 30, 1955)
Merlin T. Henderson, Ph.D., Agronomist
Maxwell D. Jeane, M.S., Research Associate in Agronomy
Jack E. Jones, M.S., Assistant Agronomist
Sherman A. Lytle, B.S., Associate Soil Scientist
Lowell L. McCormick, B.S., Assistant Agronomist—Outfield (located at Spring-hill, La., Route 1, Box 354)
Charles W. McMichael, M.S., Assistant Agronomist (located at Houma, La., % Sugar Plant Experiment Station; resigned March 31, 1955)
James G. Marshall, M.S., Assistant Agronomist
Lee F. Mason, M.S., Assistant Agronomist
Roy J. Miears, B.S., Assistant Agronomist (located at Rice Experiment Station, Crowley, La.)
Clifford L. Mondart, Jr., M.S., Assistant Agronomist
Bernell E. Newman, M.S., Assistant Agronomist
Corbin R. Owen, M.S., Associate Agronomist
Wm. H. Patrick, Jr., Ph.D., Assistant Agronomist
Walter J. Peavy, Ph.D., Agronomist
Ray Ricaud, B.S., Research Associate in Agronomy (part-time; appointed Feb. 10, 1956)
Ferd W. Self, M.S., Associate Agronomist
William J. Upchurch, Ph.D., Associate Agronomist (appointed July 1, 1955)
William H. Willis, Ph.D., Agronomist
Evie Fountain Young, Jr., M.S., Assistant Agronomist (appointed March 5, 1956)

Dairy
Jennings B. Frye, Jr., Ph.D., Dairy Husbandman; Head of Department of Dairy
Cecil Branton, Ph.D., Associate Dairy Husbandman
Alice J. Gelpi, Jr., M.S., Associate Dairy Technologist
William S. Griffith, B.S., Research Associate in Dairying (appointed March 1, 1955; resigned October 31, 1955)
James Edward Johnston, Ph.D., Associate Dairy Husbandman
George D. Miller, M.S., Research Associate in Dairying
Bobby T. Parham, B.S., Research Associate in Dairying (appointed March 1, 1955)
Thomas E. Patrick, Ph.D., Associate Dairy Husbandman
Louis L. Rusoff, Ph.D., Dairy Nutritionist
Edward J. Stone, M.S., Assistant Dairy Husbandman
Jeffrey J. Vizinat, B.S., Research Associate in Dairying

Entomology
L. Dale Newsom, Ph.D., Entomology; Head of Department of Entomology
Research
James R. Brazzell, M.S., Assistant Entomologist (appointed June 1, 1955)
Philip S. Callahan, M.S., Assistant Entomologist (appointed March 16, 1956)
Dan Fredric Clower, Ph.D., Assistant Entomologist (appointed April 16, 1955)
Emile J. Concienne, B.S., Research Associate in Entomology (located at Centreville, La.)
Alvan L. Dugas, M.S., Entomologist (on leave for 1 year, effective March 31, 1956)
Ernest H. Floyd, M.S., Associate Entomologist
Edmon J. Kantack, Ph.D., Assistant Entomologist (appointed May 2, 1955)
John S. Roussel, Ph.D., Associate Entomologist
Lonnie M. Sibley, M.S., Research Associate in Entomology
C. Egan Smith, M.S., Entomologist (retired)
Ernest A. Epps, Jr., M.S., Chief Chemist; Head of Department
Hugh C. Austin, Jr., B.S., Assistant Chemist
Frances L. Bonner, M.S., Associate Chemist
William P. Denson, B.A., Associate Chemist
Jesse L. Farr, M.S., Assistant Chemist (retired)
Joseph George Kowalczuk, B.S., Assistant Chemist
John B. McDevitt, B.S., Assistant Chemist
Clayton C. Moreland, B.S., Associate Chemist
Jesse L. Farr, M.S., Assistant Chemist

School of Forestry

Paul Y. Burns, Ph.D., Forester; Director of School of Forestry
Martin B. Applequist, M.F., Assistant Forester (on sabbatical leave, Sept. 16, 1955-Sept. 15, 1956)
Bryant A. Bateman, Ph.D., Forester
Charles B. Briscoe, M.F., Assistant Forester (appointed June 1, 1955)
James L. Chamberlain, M.S., Research Associate in Game Management (appointed July 18, 1955) (Mail address: % Rockefeller Wildlife Refuge, Grand Chenier, La.)
A. Bigler Crow, M.F., Associate Forester
Leslie L. Glasgow, M.S., Assistant Forester
Thomas Hansbrough, B.S., Assistant Forester (transferred from North La. Hill Farm Experiment Station, effective Feb. 1, 1956-Sept. 15, 1956, replacing M. B. Applequist, on sabbatical leave)
Ralph W. Hayes, M.F., Forester
William C. Hopkins, M.F., Associate Forester (appointed June 1, 1955)
Arnë K. Kemp, M.F., Associate Forester (resigned Feb. 18, 1955)
Robert W. McDermid, M.F., Associate Forester

Home Economics

Clara W. Tucker, Ph.D., Home Economist; Head of Department of Home Economics
Sally W. Babin, B.S., Research Assistant in Home Economics (temporary; appointed Feb. 9, 1956)
Anne B. Bergeron, B.S., Research Assistant in Home Economics (appointed Feb. 15, 1956)
Etta Lucille Finley, M.A., Assistant Home Economist (appointed Sept. 12, 1955)
Mina Glidden, M.S., Research Associate in Home Economics (resigned Aug. 13, 1955)
Lavon A. McCollough, M.S., Assistant Home Economist (temporary; appointed Feb. 1, 1956)
Laureame C. McBryde, M.S., Research Associate in Home Economics
Ruth I. Morrison, Ph.D., Associate Home Economist
Dorothy S. Moschette, M.A., Home Economist
Ben K. Patton, M.A., Assistant Home Economist (terminated Aug. 31, 1955)
Merrel M. Rhodes, B.S., Research Assistant in Home Economics (temporary; appointed March 1, 1956)
Marie Skellinger, M.S., Assistant Home Economist (appointed Nov. 1, 1955)
Ruby Whitehead, M.S., Research Associate in Home Economics (resigned June 30, 1955)
Horticultural Research

Julian C. Miller, Ph.D., Horticulturist; Head of Horticultural Research Department
James F. Fontenot, M.S., Assistant Horticulturist
Richard H. Hanchey, Ph.D., Associate Horticulturist
P. Lynwood Hawthorne, M.S., Associate Horticulturist
Teme P. Hernandez, Ph.D., Associate Horticulturist (in charge, Sweet Potato Research Center, Chase, La.)
Travis P. Hernandez, M.S., Assistant Horticulturist (located at Sweet Potato Research Center, Chase, La.)
LeMoyne Hogan, B.S., Research Associate in Horticulture (resigned Feb. 29, 1956)
Lloyd G. Jones, Ph.D., Associate Horticulturist
William Duke Kimbrough, Ph.D., Horticulturist
John R. King, Ph.D., Associate Horticulturist
John J. Mikell, Ph.D., Associate Horticulturist
Edmund N. O'Rourke, Jr., Ph.D., Associate Horticulturist
Donald Y. Perkins, Ph.D., Associate Horticulturist
William A. Sistrunk, M.S., Assistant Horticulturist

Plant Pathology

S. J. P. Chilton, Ph.D., Plant Pathologist; Head of Department of Plant Pathology
John Bee Baker, M.S., Assistant Plant Pathologist
Richard D. Breaux, Ph.D., Assistant Plant Pathologist (appointed Aug. 29, 1955)
Arthur R. Colmer, Ph.D., Bacteriologist
Preston H. Dunckelman, M.S., Assistant Plant Pathologist
Claude W. Edgerton, Ph.D., Plant Pathologist (retired)
Irvin L. Forbes, Ph.D., Plant Pathologist; Assistant Director of Experiment Station
John P. Hollis, Ph.D., Assistant Plant Pathologist
Norman L. Horn, Ph.D., Assistant Plant Pathologist
George Donald Lindberg, Ph.D., Assistant Plant Pathologist (appointed June 6, 1955)
Weston J. Martin, Ph.D., Plant Pathologist
Percy J. Mills, M.S., Assistant Plant Pathologist
Ellas D. Pallatseas, Ph.D., Assistant Plant Pathologist
Antonios G. Plakidas, Ph.D., Plant Pathologist
Walter K. Porter, Jr., Ph.D., Assistant Plant Pathologist
Ernest R. Stamper, M.S., Assistant Plant Pathologist
René J. Steib, Ph.D., Associate Plant Pathologist
Eugene C. Tims, Ph.D., Plant Pathologist

Poultry

Alva Burl Watts, Ph.D., Poultry Husbandman; Head of Department of Poultry
Charles W. Upp, Ph.D., Poultry Husbandman; Head of Department of Poultry
(resigned June 30, 1955; appointed as Director of Resident Teaching, July 1, 1955)
Clayton C. Brunson, Ph.D., Assistant Poultry Husbandman
Buster Hall Davis, M.S., Research Associate in Poultry (appointed April 1, 1955)
Aubrey C. Everett, M.S., Research Associate in Poultry (part-time)
William A. Johnson, Ph.D., Associate Poultry Husbandman
Kenneth N. May, M.S., Research Associate in Poultry
Charles W. Pope, M.S., Research Associate in Poultry (resigned March 21, 1956)
Benjamin A. Tower, M.S., Associate Poultry Husbandman
Walter S. Wilkinson, Ph.D., Associate Poultry Husbandman (appointed March 13, 1956)

RURAL SOCIOLOGY
Homer L. Hitt, Ph.D., Rural Sociologist; Head of Department of Rural Sociology
Alvin L. Bertrand, Ph.D., Associate Rural Sociologist
Paul H. Price, Ph.D., Associate Rural Sociologist

SUGAR STATION
Edwin C. Simon, M.S., Agronomist; Head of Sugar Station

OUTFIELD SUGARS
Thomas J. Stafford, Ph.D., Assistant Agronomist
Claude B. Gouaux, B.S., Agronomist (retired; P.O. address: Lafayette, La.)

VETERINARY SCIENCE
William T. Oglesby, D.V.M., Veterinarian; Head of Department of Veterinary Science
Lon E. Foote, D.V.M., Assistant Veterinarian
Paul Henderson, B.S., Research Assistant in Veterinary Science (appointed Jan. 1, 1956)
Robert B. Lank, D.V.M., Veterinarian
Helen E. Levy, B.S., Research Associate in Veterinary Science
Roy L. Mayhew, Ph.D., Parasitologist
Betty Johnson Torbert, B.S., Research Associate in Veterinary Science

SUBSTATIONS
FRUIT AND TRUCK EXPERIMENT STATION, HAMMOND
Walter F. Wilson, Jr., M.S., Associate Horticulturist and Superintendent
Henry G. Barwood, M.S., Assistant Horticulturist
Mike J. Giamalva, M.S., Assistant Horticulturist

NORTH LOUISIANA EXPERIMENT STATION, CALHOUN
Ralph S. Woodward, M.S., Associate Horticulturist and Superintendent
Arthur V. Davis, M.S., Assistant Animal Husbandman
James L. Heath, Jr., B.S., Assistant Animal Husbandman
John C. Taylor, M.S., Assistant Horticulturist

NORTH LOUISIANA HILL FARM EXPERIMENT STATION, HOMER
Dawson M. Johns, M.S., Associate Agronomist and Superintendent
Forest N. Baker, Ph.D., Assistant Dairy Husbandman

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Connelly O. Briles, Ph.D., Assistant Poultry Husbandman (appointed Oct. 17, 1955)

Thomas Hansbrough, B.S., Assistant Forester (appointed April 16, 1955; transferred to Forestry School February 1, 1956-September 15, 1956)

Joseph Lloyd Keogh, Ph.D., Assistant Soil Chemist

Darrell A. Russel, Ph.D., Assistant Soil Chemist (appointed Aug. 1, 1955)

James W. Vittitoe, B.S., Research Assistant in Marketing (appointed June 16, 1955)

Gerald E. Wilcox, Ph.D., Assistant Agronomist

Robert E. Wright, M.S., Assistant Horticulturist (leave of absence, without pay, July 1, 1955-June 30, 1956)

Northeast Louisiana Experiment Station, St. Joseph

John A. Hendrix, M.S., Associate Agronomist and Superintendent

Christopher B. Haddon, B.S., Agronomist Emeritus (retired)


L. F. Curtis, B.S., Research Associate in Agricultural Engineering

Sherman A. Phillips, B.S., Assistant Agronomist

LeGrand W. Sloane, B.S., Assistant Agronomist

Plaquemines Parish Experiment Station, Route 1, Port Sulphur

Ralph T. Brown, M.S., Associate Horticulturist and Superintendent

Frederick B. Schmitz, M.S., Assistant Horticulturist

Red River Valley Experiment Station, P. O. Box 5008, Bossier City

Jared Y. Oakes, M.S., Agronomist and Superintendent

Charles N. Bollich, B.S., Research Associate in Agronomy

David R. Melville, B.S., Research Associate in Agronomy

Weldon A. Nipper, M.S., Assistant Animal Husbandman

Rice Experiment Station, Crowley

Rufus K. Walker, M.S., Associate Agronomist and Superintendent

David E. Black, B.S., Assistant Agronomist

Edwin E. Goodwin, M.S., Assistant Animal Husbandman (appointed June 15, 1955)

Austin T. Harrell, B.S., Research Associate in Agronomy

Earl A. Sonnier, B.S., Research Assistant in Agricultural Engineering (resigned March 10, 1955)

Earl A. Sonnier, B.S., Foreign Trainee Supervisor (appointed July 1, 1955)

Richard P. Walker, B.S., Assistant Agricultural Engineer

Southeast Louisiana Dairy and Livestock Experiment Station, Franklinton

H. DeWitt Elzey, Jr., M.S., Associate Agronomist and Superintendent

Olen D. Curtis, M.S., Research Associate in Agronomy

Thomas E. Davis, B.S., Research Assistant in Dairying (appointed Feb. 1, 1956)

Buck Green, M.S., Research Associate in Dairy Husbandry (on military leave of absence, July 3, 1955-July 4, 1958)
Cecil B. Roark, M.S., Associate Agronomist and Superintendent
Harold E. Harris, B.S., Research Associate in Agronomy

Iberia Livestock Experiment Farm, Jeanerette
Charles E. Hyde, M.S., Research Assistant in Dairy Husbandry
Martin W. Schein, D.Sc., Associate Animal Climatologist (resigned Sept. 4, 1955)

UNITED STATES DEPARTMENT OF AGRICULTURE
(Located at State Station, Baton Rouge, La.)

Robert W. Burrell, B.S., Entomologist
Clayton C. Cantwell, B.S., Apiculturist
Theodore P. Dykstra, Ph.D., Senior Pathologist
Max J. Fielding, B.S., Associate Nematologist
Zane F. Lund, M.S., Agent (Soil Scientist)
William J. McCormick, Entomologist (transferred to U.S. Sugar Station, Houma, La., March 1, 1955)
Otto Mackensen, Ph.D., Apiculturist
Troy H. Mullins, Ph.D., Agricultural Economist (transferred to University of Arkansas, Fayetteville, Ark., Dec. 1, 1955)
David C. Neal, Ph.D., Senior Pathologist
Everett Oertel, Ph.D., Apiculturist
William C. Roberts, Ph.D., Apiculturist
Ewell P. Roy, Ph.D., Cooperative Agent (appointed July 16, 1955-June 30, 1956)
Irwin L. Saveson, B.S., Drainage Engineer
Hugo Stoneberg, M.S., Associate Agronomist
Stephen Taber, B.S., Apiculturist
Warren Whitcomb, Jr., Ph.D., Apiculturist in Charge

(Located at Rice Experiment Station, Crowley, La.)

Robert W. Helm, M.S., Entomologist
Nelson E. Jodon, M.S., Agronomist

(Located at Iberia Livestock Experiment Farm, Jeanerette, La.)
S. L. Cathcart, M.S., Dairy Husbandman
E. H. Vernon, Ph.D., Animal Husbandman

1 Part-time teaching.