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TEXAS AGRICULTURAL EXPERIMENT STATION
AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS
W. B. BIZZELL, President

BULLETIN NO. 237 NOVEMBER, 1918

Progress Report, Substation No. 11, Nacogdoches, Texas, 1909-1915

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†As of December 1, 1918.
*In cooperation with the School of Veterinary Medicine, A. & M. College of Texas.
**In cooperation with the United States Department of Agriculture.

TABLE OF CONTENTS

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BULLETIN No. 237 NOVEMBER, 1918

PROGRESS REPORT, SUBSTATION NO. 11, NACOGDOCHES, TEXAS, 1909-1915

G. T. MCNESS, SUPERINTENDENT

The substation at Nacogdoches was primarily established for the investigation of tobacco, which investigation had previously been conducted by the Bureau of Soils of the United States Department of Agriculture. This work was begun in 1903, at Nacogdoches, and other points in East Texas, upon leased land.

In 1909, the Texas Agricultural Experiment Station entered into a cooperative experiment with the United States Department of Agriculture to continue these investigations upon leased land. Under the cooperative agreement then adopted, the United States Department of Agriculture continued to conduct the investigations and the State Agricultural Experiment Station paid a portion of the expenses.

This cooperative work was conducted for two years, and in 1911 the State granted an appropriation for further investigations in tobacco and other crops, and made it mandatory for the State of Texas to own the property and conduct the investigations; the United States Department of Agriculture cooperating only in a limited manner, but it was not until 1914 that the station at Nacogdoches became one of the regular substations of the Texas Agricultural Experiment Station system.

Substation No. 11 is located in Nacogdoches county, two and three-fourths miles north of the town of Nacogdoches upon the Henderson and Nacogdoches road, on soils which are red or gray, with red subsoils. These soils belong to the Orangeburg and Greenville series. The predominating soils are the Orangeburg, of which the Orangeburg fine sandy loam forms the bulk used in the experiment work.

The station contains eighty-two and one-half acres of land. There are at the present time, 30.4 complete (net) acres used for experiment purposes, 6.9 acres in station roads and turn rows, 1.1 acres taken by the public road, 2.2 acres in farmstead, and 41.9 acres in timber and pasture.

The farmstead consists of the superintendent's cottage, office building, laborers' cottage, tobacco curing barn, stock barn, and implement shed.

The entire property is under woven wire, hog-proof fence.

The tillable portion of the station is laid off into 8x20 rod acre plats with a 16.5-foot road around each acre.

In connection with the actual investigations, there is conducted a systematic crop rotation over that portion of the station used for experiment purposes. This rotation consists of eight series, embracing two, three, and four-year rotations. By this system the soil fertility of the field is maintained and increased. Due to a badly run-down condition of the farm when secured, it has been easy to build up the soil and this is shown in the rapid increase in the yields secured since the station first started.

Since the establishment of this station a general improvement of the farming methods in the surrounding country has occurred. For the last two years an average of 600 farmers have visited the station at various times of the year in order to watch the experiments under progress and to seek information in regard to their own farming operations.

The work of the Nacogdoches County Experiment Association brings the station in closer touch with the people and through the association new crops and improved methods of farm practice are demonstrated to the people not only of Nacogdoches county but to the surrounding counties of East Texas which this station serves.

The introduction of Sudan grass and improved varieties of cowpeas alone have brought to the county more money than the cost of the station since it began operation in 1912. Exhibits from the station have been made at the State fair, the corn exposition at Columbia, South Carolina, and at local fairs in East Texas, by this means bringing before the people the work of the station and the results obtained for the betterment of agriculture in East Texas.

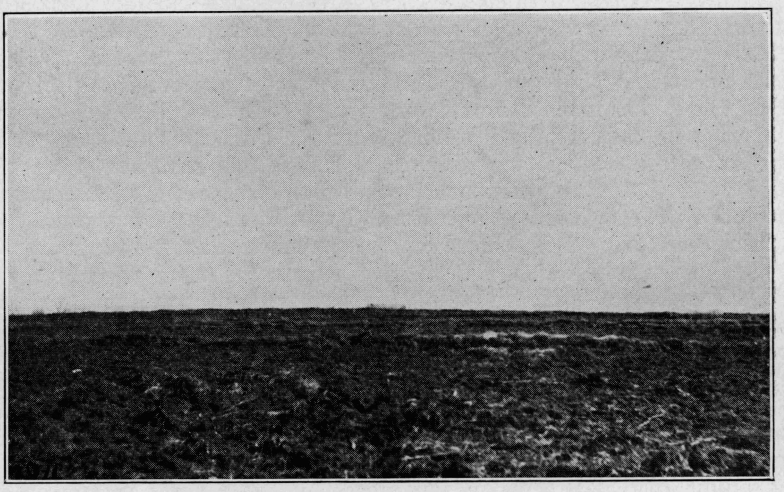

Fig. 1.—Terraced field on Substation No. 11. All of the cultivated land on the substation is terraced and many old ditches have been filled.

During the four years' operations covered by this report investigations have been conducted upon the following lines:

Introduction and testing of new field crops.
Field crop variety tests.
Plant breeding.
Method-of-production tests with staple field crops.
Fertilizer and rotation tests with field crops and tomatoes.
Vegetable culture and production tests.
Orchard introduction and variety tests.
Arboretum.
Seed production tests.
Forage production tests.
Increase plantings of the better varieties of crops.

Soil improvement tests.
Terracing and draining.
Meteorological data.

METEOROLOGICAL DATA

In 1913, the substation was equipped with apparatus for securing weather and climatic data. At the present time records are made of rainfall, snowfall, evaporation from a free water surface, percentage of atmospheric humidity, maximum and minimum temperatures, and wind movements. Obervations are made twice daily. Summaries of the substation meteorological records for 1914 and 1915 are given in tables 1 and 2.

Table 1.—Miscellaneous meteorological data, 1914.

	Mean temperature			Mean per cent. humidity	Precipitation, inches	Average wind velocity, miles per hour
	Maximum	Minimum	Mean			
January	64	40	52	59	1.22	5.3
February	57	36	47	75	5.03	5.6
March	65	43	54	64	4.24	5.1
April	75	53	64	71	4.08	4.1
May	80	63	71	79	8.96	3.4
June	92	70	81	68	1.25	2.8
July	96	72	84	57	0.26	3.4
August	90	71	80	75	4.10	2.9
September	88	65	76	57	2.91	2.9
October	77	55	66	66	0.33	2.7
November	67	45	56	75	5.76	2.9
December	49	36	42	89	9.72	3.8

Table 2.—Miscellaneous meteorological data, 1915.

	Mean temperature			Mean per cent. humidity	Precipitation, inches	Average wind velocity, miles per hour
	Maximum	Minimum	Mean			
January	55	35	45	78	4.72	4.4
February	62	41	51	78	3.87	4.7
March	59	38	48	71	2.51	5.5
April	76	54	65	63	4.04	4.3
May	84	62	73	67	4.11	4.5
June	92	70	81	59	1.09	3.3
July	91	70	80	62	5.56	3.0
August	88	69	79	72	11.14	3.1
September	88	67	77	78	2.14	2.5
October	81	55	68	68	0.97	2.7
November	71	47	59	72	4.51	4.1
December	63	40	51	79	3.35	5.0

As the Weather Bureau of the United States Department of Agriculture has had a cooperative weather observer near here for a much longer time than that included in the substation's records, it is evident that more reliable conclusions may be drawn by combining the information collected by the Weather Bureau with that of the substation. Tables 3 and 4 give rainfall and temperature data from this source.

Table 3.—Precipitation in inches.*

Year	Jan.	Feb.	Mar.	April	Crop-growing seasons May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1912....	1.96	3.57	7.18	7.46	9.44	4.66	.64	2.30	T	.91	.80	6.49	45.41
1913....	4.04	3.98	4.63	4.46	5.01	1.61	1.59	1.45	12.39	4.44	2.94	6.14	52.64
1914....	1.22	5.03	4.24	4.08	8.96	1.25	.26	4.10	2.91	.33	5.76	9.72	47.86
1915....	4.72	3.87	2.51	4.04	4.11	1.09	5.56	11.14	2.14	.97	4.51	3.35	48.01
16-year average	2.68	4.23	3.84	5.06	5.53	3.88	4.68	2.87	3.35	2.90	4.08	5.28	48.50

Table 4.—Mean temperature.*

Year	Jan.	Feb.	Mar.	April	Crop-growing season May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1912....	44	45	53	64	72	75	82	80	77	67	53	45	63
1913....	48	47	54	63	70	76	82	82	72	63	63	48	64
1914....	52	47	54	64	71	81	84	80	76	66	56	42	65
1915....	45	51	48	65	73	81	80	79	77	68	59	51	65
15-year average	**48	49	58	64	71	78	81	81	76	65	57	**47	65

The growing season is comparatively long. In the last sixteen years the last freezing temperature in the spring has occurred eight times in February, seven times in March, and one time in April. In seventeen years the first freeze in the fall has occurred three times in October and fourteen times in November.*

TOBACCO FERTILIZERS

The object of this test was to determine the effects of various amounts of fertilizers for four years on the yield and quality of tobacco, corn, cotton and oats in connection with catch crops to be plowed under for soil improvement.

This project was begun in 1912 to supplement the data contained in Bulletin No. 144, "The Culture of Cigar Leaf Tobacco in Texas," published in that year. Tobacco was the principal crop in the test, all other crops being secondary in the rotation. Very heavy applications of fertilizers were given in some plats, but these were for the purpose of studying the effect on the tobacco. The data secured is being prepared for publication as a special bulletin on tobacco, only a few general statements on this experiment being included here.

The residual effects of the fertilizers of the preceding year was noticeable during the latter part of the test. This test shows that tobacco responds to and shows a large increase in money value to the acre where a complete fertilizer is used. The value of the check or unfertilized

*All data prior to July, 1913, are from cooperative observers' records, U. S. Weather Bureau, after which time the records are from Substation No. 11. The average was calculated in decimals and these are not shown.

**Mean of the monthly mean except January, 1907, and December, 1910.

plat is $8.25 an acre while the acre value where cottonseed meal, in rather large amounts, and acid phosphate and potash are used is from $66.09 to $77.92 an acre, showing a large increase in value and a large margin of profit due to the use of the fertilizers. Cottonseed meal appears to be the prime factor in increased yields. Although the yield of cured tobacco is greater than the check, where acid phosphate and sulphate of potash are used either separately or in combination, the yields are not so great as when used in connection with cottonseed meal.

Cotton shows a gain in money value only where cottonseed meal is used and then only when it is used in reasonable amounts. The use of acid phosphate and sulphate of potash separately or in combination shows a loss of profit in cotton. The same conditions apply to corn.

Lime added to the commercial fertilizer did not appear to give any beneficial results with cottonseed meal and acid phosphate, except where sulphate of potash was used in connection with the other two fertilizers.

CORN

Variety Test

The object of this test is to determine what varieties of corn are best adapted to East Texas conditions, and to compare the yields and habit of growth of the various varieties tested.

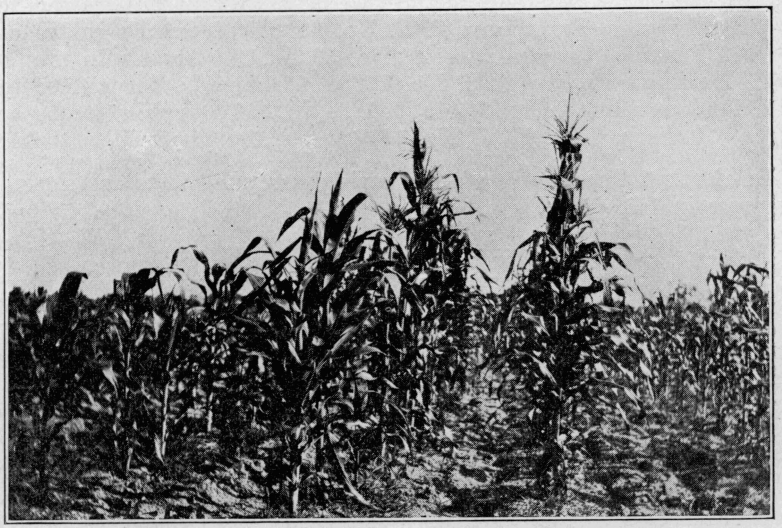

Fig. 2.—The difference in growth of corn of same planting with complete fertilizer on right and no fertilizer on left. Photographed 1914.

Each year the test was repeated four times and these four different yields for each variety were averaged. The four-year averages reported here are, therefore, really from sixteen separate tests.

To secure perfect stands of corn in this experiment, the grains were planted four in the hill and the plants were thinned out at different periods of growth to one stalk to the hill. Fertilizer consisting of 200 pounds of cottonseed meal and 200 pounds of acid phosphate was used to the acre, placing same in the drill about ten days before the corn

was planted. Frequent and shallow cultivation was practiced and this cultivation was continued until the silk on the ear had died and fallen.

In 1912 only eight varieties of corn were planted. The number was increased in 1913 to thirty-four varieties. In 1914, thirty varieties were planted, half of the test being conducted on bottom land while the balance was planted upon upland. In 1915 a total of one hundred and one varieties was planted, including a variety test of thirty-five varieties for the Texas Field Crop Association. The highest yielders of each year are as follows:

1912 Munson T. S. No. 32.....30 bushels to the acre.
Temple T. S. Selection.....26.7 bushels to the acre.
Hastings T. S. No. 68.....24.1 bushels to the acre.
1913 Surcropper T. S. No. 318.....17.6 bushels to the acre.
White Dent T. S. No. 315.....17.3 bushels to the acre.
Mexican June T. S. No. 321.....16.5 bushels to the acre.

1914 Bottom land.

Chappell's Prolific T. S. No. 909....22.7 bushels to the acre.
Chisholm T. S. No. 925.....21.2 bushels to the acre.
Selection 911. T. S. No. 911.....21.2 bushels to the acre.

1914 Upland.

Ferguson Surcropper T. S. No. 924..20.2 bushels to the acre.
Ferguson Surcropper T. S. No. 922..19.2 bushels to the acre.
Fentress Strawberry T. S. No. 59....18.0 bushels to the acre.
1915 Hasting's Prolific T. S. No. 1228.....21.0 bushels to the acre.
Squaw T. S. No. 1244.....20.0 bushels to the acre.
Foster's Cash T. S. No. 1308.....19.9 bushels to the acre.

In the last three years of this variety test the yields are shown in averages in table 5.

Table 5.—Summary of corn variety tests, 1913 to 1915.

T. S. No.	Variety	Average yield to the acre		
		1913–14–15		1914–15
		Bushels	Rank	Bushels
929, 1324....	Strawberry (Fentress)	.....	.....	17.76
922, 924, 1285, 1286, 1283, 1284, 1225.....	Surcropper (Ferguson)	16.36	1	17.04
928, 1288....	Thomas	14.63	2	15.89
911.....	U. S. Selection 159	.....	.....	15.47
927, 1245....	Oklahoma White Wonder	11.82	7	14.83
919, 1237....	Cocke's Prolific	13.29	6	14.58
917.....	Blount's Prolific	14.11	4	14.02
918.....	Virginia White Dent	14.14	3	13.77
925, 1226, 1306.....	Chisholm	13.33	5	13.29
932.....	Mosby's Prolific	.....	.....	13.00
912, 1290....	Laguna Selection 136	.....	.....	12.81
909.....	Chappell's	.....	.....	12.45
915, 1243....	St. Charle's	.....	.....	12.27
907.....	U. S. Selection 77	.....	.....	11.93
916, 1240....	Boone County White	11.64	8	11.56
913, 1233....	Creole	10.65	9	11.33
914.....	Wisconsin White Dent	.....	.....	11.27
920.....	Snowflake	.....	.....	10.91
931.....	Mortgage Lifter	.....	.....	10.10
910.....	Roger's White	.....	.....	8.22

The experiments with the corn varieties to date indicate that for upland conditions here, Surcropper and Strawberry are the reliable varieties. For rich bottom lands or where the moisture supply is good, varieties of the "Prolific" type are recommended.

Seeding Rate Test.

Tests are under way to determine the proper stand of corn for our conditions. In these tests all of the rows have been thirty-six inches apart, while the corn has been accurately thinned to an exact stand which represents the desired space. The yields from the first two years of the experiment are given in table 6.

Table 6.—Rate of seeding corn.

Spacing rate in 36-in. rows	Average yield, bushels		Average of 1913-14
	1913	1914	
18	4.4	1.75	3.07
21	.....	2.00	.....
24	2.5	2.15	2.32
30	.....	4.00	.....
36	8.7	1.45	5.07
48	.....	3.65	.....
72	11.1	1.75	6.42

These years were dry and unfavorable for corn especially on old worn land such as had to be used in this experiment. The table makes it appear that on the substation soil it is easily possible to plant or thin corn so that there is too heavy a stand on the land.

The highest yields we had from the thinnest plats, yet a fair yield was had from spacing single plants three feet apart each way. It would appear that under average conditions of soil fertility in this section the proper spacing of corn is about three by three feet each way.

Tests were made as to the proper row width for corn. These were all carried out with equal numbers of plants to the acre, but the hills were differently distributed on the land.

The results of the test when carried out with corn alone and with corn and cowpeas are shown in table 7.

Table 7.—Comparison of effect of different distribution of hills of corn in corn with and without cowpeas. Average of 1913 and 1914.

Plats had the same number of stalks of corn. Arrangement of hills, inches apart.	Yield in bushels to the acre		Average corn with and without cowpeas
	Corn without cowpeas	Corn with cowpeas	
36 x 36	9.85	5.87	7.86
72 x 18	7.52	9.50	8.51
Double 36 x 18 rows 108 inches apart	5.70	4.20	4.95
Average of all plats	7.69	6.52	7.10

In both years for corn alone the results favor the regular 3x3-foot distribution, rather than the use of wider rows.

When cowpeas were seeded in the middles, however, the yields were reduced, the six-foot middles yielding almost as much with cowpeas as

the best yield without cowpeas. On the whole the figures thus far at hand favor regular distribution of the corn, except where cowpeas are to be seeded, in which case the wide middle gives a better all round crop, since it lowers the corn yields very little and gives a very good crop of cowpeas.

The matter of planting cowpeas in corn seems to depend a great deal on the time at which the cowpeas are planted or, in fact, on the size of the corn when the cowpeas begin competition with it. To determine what effects early and late planting of cowpeas would have on the corn, an experiment was carried out as shown in table 8.

Table 8.—When to plant cowpeas in corn, as judged by yield of corn.

Stage of growth of corn when cowpeas were planted.	Average 1913 and 1914
12 inches high	4.17
36 inches high	5.12
60 inches high	6.35
Tassel	6.65

The experiment shows that the later the cowpeas are planted or the more advanced the corn when the cowpeas begin to draw on the soil for support, the greater will be the yield of corn. This seems to indicate that in corn production there is not moisture and plant food enough available at once for the two crops.

COTTON

Thinning and Rate of Planting Experiment

This test was made to see what effect the distance between the hills would have on the yield of cotton, when planted at rates of one, two and three plants to the hill. The experiment has been carried only one season and the results may be regarded as inconclusive. The largest yields were produced with two plants to the hill, with hills wide apart—eighteen to thirty-six inches. The experiment is being continued.

Variety Test

Cotton being the staple crop of East Texas, it is important that investigations be conducted looking toward the improvement of cultural methods, control of insect pests and the improvement in the quality of the staple, as well as higher yields. The testing out of various varieties under the same cultural and soil conditions for a series of years should show what cotton varieties are best adapted to local conditions. Such a test has been made at Nacogdoches each year. The varieties were planted upon a sandy loam soil, rather low in fertility, a representative type of the cotton soils of a large portion of the eastern part of the State where a definite cropping system has not been practiced.

Fertilizer consisting of 100 pounds of cottonseed meal and 200 pounds of sixteen per cent. acid phosphate to the acre was applied in the drill some time before planting time, and well incorporated with the soil. The rows were thirty-six inches wide and the cotton was thinned to twenty-one inches between plants.

Frequent and shallow cultivation was practiced each year, and cultivators were kept busy in the cotton as long as they could be used without damaging the bolls.

Three pickings were made from each variety, these being weighed separately and varieties being separately ginned to obtain the grade and ginning percentage of each.

The following table shows the results obtained from this test. All of the varieties that have been grown for three or more years are presented. The cotton varieties having high ginning percentages are all Texas bred cottons. The station recommends that every grower select his seed from selected plants, as in so doing he will always have a good yielding, high ginning strain of cotton.

Table 9.—Summary, variety test of cotton, 1912–1915.

Variety	Average							
	1913–14–15				1912–13–14–15			
	Lint turn out		Acre yield seed cotton		Lint turn out		Acre yield seed cotton	
	Per cent	Rank	Lbs.	Rank	Per cent	Rank	Lbs.	Rank
Hawkins	35.6	7	790.8	1	.....	.....	.....	.....
Cannon's W. Skinner	36.8	5	758.4	2	.....	.....	.....	.....
Mebane	37.6	4	723.3	3	37.9	3	660.8	1
Hartsville No. 9	33.4	10	707	4	.....	.....	.....	.....
Roberts	35	8	694.5	5	.....	.....	.....	.....
Rowden	38.6	3	688.7	6	38	2	650.6	2
Cleveland Big Boll	36	6	667.5	7	34.9	4	634.4	3
Texas Oak	39.1	2	634.8	8	.....	.....	.....	.....
Lone Star	40.6	1	588.8	9	39.8	1	555.0	4
Broadwell's D. J.	34.4	9	587.8	10	.....	.....	.....	.....
Willet's Red Leaf	31.1	11	531.6	11	.....	.....	.....	.....

In addition to the varieties shown in the above table, the following varieties which have not been tested throughout all these years, have made good yields when tested:

Texas Wood.
Toole.
Crowder.
Hartsville No. 7.
Culpepper's Big Boll.
Cook, T. S. No. 1153.
Virgatus.
Foster's Long Staple.

Similarly some of the best varieties from a standpoint of ginning percentage have not been tested every year. The highest of these not shown above are as follows:

Crowder.
Half-and-Half.
Cook, T. S. No. 1153.

In 1913, Half-and-Half ginned out 41.5 per cent. lint. Two varieties were higher in this respect; these being Lone Star and Webber, both of which gave a ginning per cent. of 41.7, as against 41.5 for Half-and-Half. Lone Star and Webber both produced a medium to a long staple lint, whereas, Half-and-Half lint was very short. In that year there were three varieties in the test, which produced more lint

cotton to the acre than did Half-and-Half. These were Culpepper's Improved Big Boll, Mebane Triumph and Peterkin.

In 1914, Half-and-Half made a ginning turnout of 38.5 per cent. There were five varieties in the test which did better than this. These were Cook 1153, 41.99; Texas Oak, 41.36; Toole, 39.29; Bohler's Triple Joint, 38.88; and Lone Star, 38.52. In that year ten varieties exceeded Half-and-Half in the amount of lint produced per acre. These were as follows:

T. S. No. 1153, Cook.
Toole.
Bohler's Triple Joint.
Edgeworth.
Hawkins.
Hartsville No. 7.
Cannon's World Skinner.
T. S. No. 485, Cleveland Big Boll.
T. S. No. 951, Cleveland Big Boll.
Cook's Improved Big Boll.

The variety tests of cotton justify the substation in advising the continued use of the three following well known varieties:

Mebane.
Rowden.
Lone Star.

These three varieties are well suited to the region. If the markets demand a longer staple than Mebane then Lone Star with its slightly lower yield but its excellent staple can be made to outrank the other two varieties in profit to the producer.

COWPEAS

Variety Test for Seed

During the last three years, 1913-15, fourteen varieties of cowpeas have been tested for seed yields. This test was planted in May of each year in a three-year crop rotation consisting of corn, cotton, oats, and cowpeas, the cowpeas being planted upon the oat stubble after the oats were harvested. In 1913 and 1914 the planting was made in duplicate, while in 1915 the planting was quadrupled.

Table 10.—Variety test of cowpeas for seed production, 1913-14-15.

Variety	Average yield of clean seed, in bu. to the acre	
	1913–14–15	1914 and 15
Clay	6.27	8.17
New Era	6.85	7.95
Chinese Red	.....	7.74
Red Ripper, T. S. No. 57	4.48	6.33
Whippoorwill	5.07	5.84
Brabham, T. S. No. 325	.....	5.83
Blue Goose	.....	5.74
The Unknown	4.80	5.65
Iron X Whippoorwill	5.10	5.48
Iron	4.46	5.10
Groit, T. S. No. 86	4.35	4.85
Blackeye	3.17	3.52
Red Ripper, T. S. No. 214	3.91	3.41
Tinkle's Holstein	.....	2.75

Cowpea seed production requires the selection of varieties suited to that purpose. Clay, New Era and Chinese Red are the best varieties thus far tested. Of these the Chinese Red is a very early variety and excellently suited to use for intercropping, catch cropping, etc. The other two varieties are more like the general run of cowpeas and their use is advised.

Variety Test for Forage

In the variety test for forage yields in 1912 with cowpeas planted in 18-inch and 36-inch rows, Iron T. S. No. 55 gave 1700 pounds of cured hay, the highest yield in 36-inch rows, while Whippoorwill T. S. No. 59 gave 1260 pounds, the highest yield in 18-inch rows.

The complete results of the test are shown in table 11.

Table 11.—Variety test of cowpeas for forage. Two trials each, one in 18-inch rows, one in 36- inch rows.

Variety name	Average yield pounds cured hay to the acre
Iron	1400
Peerless	1227
Whippoorwill	1185
Wonderful	1100
Brabham	1000
New Era	870
Clay	830
Red Ripper	250

The foregoing test represents one year's work, but makes it very evident that the seed-producing varieties are not the highest in forage production. The showing made by the Iron variety is especially important, since it is resistant to the "wilt." Because of this fact, it is the variety advised for forage production.

Width of Row and Rate of Seeding Test with Cowpeas for Forage

In 1912 the eight varieties tested for forage yields were planted in 18-inch rows and 36-inch rows. The results of this width of row test is shown in table 12.

Table 12.—Width of row test with cowpeas for forage, 1912.

Number of varieties average	Yield of cured hay in pounds to the acre.	
	18-inch rows	36-inch rows
8	925	1040

This experiment indicates a small gain by planting in the 36-inch rows.

The foregoing two widths of rows were tested two years with regard to the amount of seed required for best results.

Table 13.—Rate of seeding test with cowpeas in 36-inch rows.

Rate of seeding, pounds to the acre	Yield of cured hay, pounds to the acre
6	940
12	940
18	1030

Table 14.—Rate of seeding test with cowpeas in 18-inch rows.

Rate of seeding, pounds to the acre	Yield of cured hay pounds to the acre
30	960
60	1000
90	1180

These tests made it evident that much heavier seeding may be done than is usually practiced. When seed is cheap it would be desirable to use more.

SOYBEANS

Variety Test for Seed

This test was planted in 1913 and 1914 upon a sandy loam soil. No fertilizer was used and the same kind of cultivation was given the soybeans as the cowpeas tested the same years. Small yields were obtained, the stand of plants being injured by rabbits. The yields obtained are shown in table 15.

Table 15.—Variety test of soybeans for seed.

Variety	Yield to the acre, bushel		Average yield to to the acre, bu.
	1913	1914	
Virginia	4.56	1.83	3.69
Wilson	4.56	1.23	2.89
Meyer	4.35	1.42	2.88
Austin	3.35	1.4	2.87
Mammoth	2.43	1.72	2.07
Cloud	1.7	1.4	1.5
Duggar	1.36	.46	.91
Pekin	1.13	.62	.87
Jet	.85	.69	.77
Taha	.90	.65	.77
Ito San	.48	.65	.56
Hollybrook	.....	1.27	.....

Width of Row and Rate of Seeding.

In 1912 two varieties were compared for forage in 18-inch and 36-inch rows with results as shown in table 16.

Table 16.—Width of row test with soybeans for forage, 1912.

Number of varieties averaged	Yields of forage in pounds to the acre	
	In 18-inch rows	In 36-inch rows
2	1295	950

This preliminary experiment seems to indicate that planting for forage had best be in close drills.

A soybean seeding rate test was conducted in 1913 and 1914 in 18-inch and 36-inch rows. An average of the 36-inch rows for the two years gave 1080 pounds of cured forage to the acre at a seeding rate of 18 pounds to the acre while in 18-inch rows the yields were smaller and favored a heavy seeding rate. This test is shown in table 17 and table 18.

As in the test for seed yields, this test was also injured by rabbits, and the results shown are for this reason not entirely reliable.

Table 17.—Rate of seeding test with soybeans for forage in 18-inch rows.

Rate of seeding, pounds to the acre	Yield of cured forage, pounds to the acre		
	1913	1914	Average
30	800	200	500
60	1200	130	665
90	1680	220	950

Table 18.—Rate of seeding test with soybeans for forage in 36-inch rows.

Rate of seeding, pounds to the acre	Yield of cured forage, pounds to the acre		
	1913	1914	Average
6	960	*	.....
12	1260	160	710
18	2000	160	1080

*Destroyed by rabbits.

On the whole, the soybean has not been a profitable crop here. Perhaps this is due to the lack of dependable and adaptable varieties.

PEANUTS

Peanuts are very well adapted to the majority of the soils of East Texas. Experiments with them at this substation have been broadened from year to year and are of importance.

While it is common knowledge that the crop can be grown as a main crop, it has not been known that it is an excellent second crop for this part of Texas. Our investigations with peanuts as a main crop are being continued and are not reported herein. All of the data reported upon in this bulletin, except the 1912 crops, are on peanuts as a second or catch crop planted after a crop of oats was harvested, planting being done in the first week in June. Peanuts planted at this season of the year can be produced more cheaply, even though a slightly lower yield is had, than when planted during the first part of April as the main crop. When peanut planting is deferred until June not only is a crop of oats secured but there is very small expense incurred in cultivating the peanut crop.

Width of Row Test

A width of row test with Spanish peanuts was carried out in 1914 and 1915. The results are reported in table 19.

Table 19.—Width of row test with Spanish peanuts, 1914-1915.

Year	Yield in bushels to the acre	
	18-in. rows	36-in. rows
1914	36.00	36.33
1915	37.00	35.00
Average	36.50	35.66

The yields obtained make it appear that there was little difference in the crops. It is thought that with more favorable seasons the thicker seeding would make still higher yields. These, however, probably would be more profitably secured by thick planting in the row rather than by the use of narrow rows, which are difficult to cultivate.

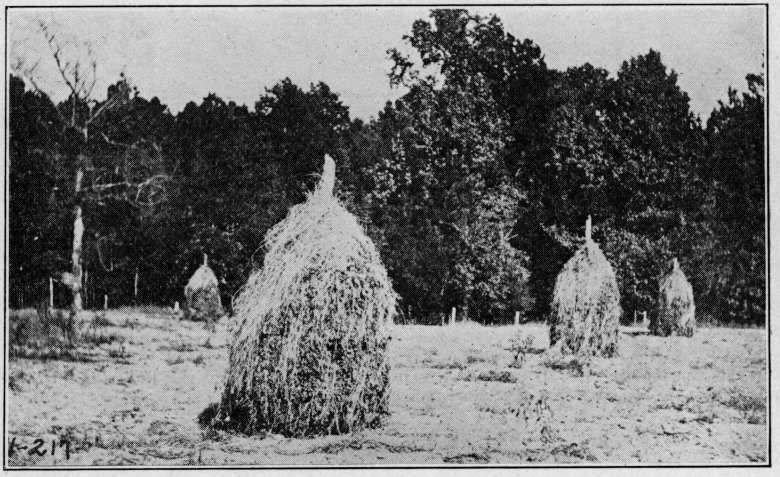

Fig. 3.—Curing Spanish peanuts from experiment plants.

Forage Test

Peanuts undoubtedly are of very great value for pasture and hay, as well as for the nuts. Since 1912 the forage production of peanuts has been tested each year on the substation. The results of these tests are given in tables 20 and 21. In general the Spanish variety has been used in these tests. In 1912, however, a variety test was planted in April. The peanuts were hulled and planted in rows 36 inches apart and 12 inches in the row for the Spanish and 15 inches in the row for the Improved Virginia and Tennessee Red.

All of the varieties made good growth of vines but on account of a drouth setting in at the close of the growing season the larger varieties failed to fill out, with the result that most of the crop was pops. The Spanish variety filled out its nuts in spite of the unfavorable climatic conditions at the latter period of growth.

This test is reported in table 20.

Table 20.—Peanut variety test for forage, 1912.

Name	Cured forage yields, pounds to the acre		
	36-in. rows	18-in. rows	Average
Spanish	4500	4200	4350
Improved Virginia	3820	3880	3850
Tennessee Red	3550	4000	3775

The forage yields of both wide and narrow rows show the Spanish to be the highest yielder, producing 4500 pounds cured forage to the acre in the 36-inch rows and 4200 pounds cured forage to the acre in the 18-inch rows.

To further test this matter of row width, the test has been continued with the Spanish peanuts and is shown in table 21.

Table 21.—Width of row test Spanish peanuts for forage, 1912-15.

Year	Yield of cured forage, pounds to the acre.	
	36-in. rows	18-in. rows
1912	4500	4200
1913	3620	2770
1914	2840	3070
1915	3210	3070
Average	3542	3277
Gain for 36-in. rows	265	

The tests for forage yields conducted for four years in succession on 36-inch and 18-inch rows show that when the Spanish peanuts were planted in rows 36 inches apart and 12 inches in the drill they gave larger yields than when planted in the 18-inch rows.

As the width of row test for forage progressed it has seemed that probably the 36-inch rows may profitably be made to carry a somewhat heavier stand than the substation has had.

Seed Preparation Test

Usually peanut planting seed is soaked twelve to thirty-six hours before being planted. This practice is advisable for the main crop in early planting in moist ground. In planting a catch or second crop in June the ground is very often dry and it has seemed somewhat doubtful whether the seed should be soaked for planting in dry ground. To furnish some data on this point it was decided to plant dry seed, comparing cracked shells and whole shells. The results of this experiment are given in table 22.

Table 22.—Shells cracked versus uncracked shells in peanuts for planting seed.

	Yield in bushels to the acre		Average
	18-in. rows	36-in. rows	
Shells not cracked	37	34	35.5
Shells cracked	37	36	36.5

There is little in favor of breaking the hulls of the peanuts before planting. The results of the test show that when planted with unbroken hulls, 18-inch rows gave as high yield as when the hulls were cracked. This was largely a matter of obtaining a stand. The expense of cracking the hulls when a large acreage is to be planted would be considerable and, if good sound seed is planted, there is no use in going to the expense of breaking the hulls.

FORAGE SORGHUMS

Both the climatic and soil conditions of East Texas are favorable for the growing of sweet sorghum, particularly for use as a silage crop. Variety tests, coupled with rate- and method-of-planting tests, indicate that for an early crop either an early grain sorghum such as feterita or one of the amber sorghums may be used to advantage. For the main crop the Sumac variety, sometimes called "Little Red Top," should be used.

When planted for silage, Sumac sorghum should be treated as a row crop, the rows being three or three and one-half feet apart and sufficient seed used to have one good plant every three to nine inches in the row. As many of the soils in this region are low in fertility, it is important that Sudan grass and the sorghums be grown on land which has been in a good rotation, or if that is not possible, about ten tons of manure and 200 pounds of acid phosphate should be used per acre. Where fertilizers must be depended upon for nitrogen, the sorghum crops should have 200 pounds of cottonseed meal and 200 pounds of acid phosphate per acre. Usually very great gains are produced in these forage crops by the use of added plant food.

CROP INTRODUCTION TESTS

Each year a number of field crops new to East Texas conditions have been tested as to their adaptability to the soil and climate and also for their economic value as crops for this section. Only a few things were thus tested previously to 1914 but Sudan grass was introduced here as a result of the 1912 tests. During 1914 there were grown in this test Japanese sugar cane, Florida beggar weed, Japanese sword bean, mung bean, *Dolichos lablab*, moth bean and kulthi bean, while in 1915 there were tested Japanese sugar cane, frijole bean, mung bean, *Melilotus alba* and a number of less well known clovers.

New Legumes

The kulthi and moth beans produce heavy yields of fine quality forage but do not produce pods early enough in the season to mature. The yields of kulthi in 1914 were 4400 pounds to the acre, while the moth bean produced 1870 pounds of forage to the acre, but on account of not producing seed in this locality and the difficulty of obtaining seed they are not recommended as suitable forage crops.

The Florida beggar weed appears adapted to low moist ground here, while in Florida it can be found growing in all corn fields after the corn is laid by. In this part of Texas, owing to the lack of humidity and soil moisture, it makes only a stunted growth upon uplands.

The Japanese sword bean appears to grow well even under adverse climatic conditions, but is of no value as a stock feed on account of not being palatable to stock. It has value, however, as a soil builder and can be recommended for that purpose.

The mung bean tested in 1914 and 1915 is a new crop that is adapted to East Texas conditions. It is a soil builder and also produces good crops of forage. The seed matures early and is a fine poultry feed. This legume can be planted after oats and treated in every way the same as the cowpea.

Dolichos lablab grows well in East Texas and produces both seed and large yields of good quality hay. In two tests made upon the station in 1914 this crop produced 2360 pounds and 2640 pounds of hay to the acre. It is also a good crop for building up the soil.

In 1915, frijole beans were tested for the first time. They were planted on April 30 and made a fairly good growth of vine but failed to produce any beans.

Of the clovers tested, aside from the Southern bur clover which is now growing wild here, *Melilotus alba,* white sweet clover, was the only one that gave promising results. Two tests were made with this clover, the yield of cured hay to the acre being 1056 pounds and 1340 pounds, respectively. On East Texas soil a liberal application of lime probably must be used in order to obtain results with this clover.

Sudan Grass

Sudan grass was first tested out upon this station in 1912, along with other new crops. From the first, this new crop showed signs of merit. The first season two cuttings were made from the one row grown. The crop was fed to various kinds of stock to see if any preference was given it in comparison with the forage crops used in this section.

In 1913, tests were made with this grass on poorly drained land, planting broadcast and using twenty-four pounds of seed to the acre. That planted on June 1 gave the largest yield, making double that of the plats sowed at an early date, thus showing that, like the other sorghums, it required a warm, well drained soil.

Table 23.—Sudan grass, time of planting test.

Date of planting.	Date of harvest	Average yield, pounds
April 1	July 24	420
April 1	July 24	.....
April 15	July 28	410
April 15	July 28	.....
May 1	July 28	850
May 1	July 28	.....

In 1914 Sudan grass was planted in 36-inch rows, 18-inch rows and in close drills, which were compared to see what effect the manner of planting would have on the yield. These plats were planted in June upon oat stubble, in duplicate, and a good one-cutting yield was obtained when the grass was planted as late as June 24.

Table 24.—Method-of-planting test.

Plat No.	Date of planting	Method of planting	Date of harvest	Acre yield, pounds	Average yield, pounds
1	June 5	18-in. row	Sept. 16	3900	
2	June 24	18-in. row	Oct. 9	3300	3600
3	June 5	36-in. row	Sept. 16	3440	
4	June 24	36-in. row	Oct. 9	2570	3013
5	June 5	Close drill	Sept. 16	3090	
6	June 24	Close drill	Oct. 9	3000	3045

These yields favor the earliest date for planting after the oats were harvested, thus emphasizing the importance of immediate action where a crop is to follow oats.

The exact method-of-planting seems to be somewhat in favor of the narrow rows.

Table 25.—Rate of seeding test, Sudan grass.

Rate of seeding, pounds to the acre	Acre yield, pounds
3	700
6	910
9	910
12	580
15	650
18	970
21	650
24	1050

The heavy seeding yielded best in this test. The experiment is not concluded. In tests at other places if the heavy seeding makes the largest yields at the first cuttings it has usually been a rather low yielder in the later cuttings. Because of this fact, it seems best to continue to advise seeding at from five to fifteen pounds to the acre.

Sudan grass is now one of the standard grasses of East Texas and has filled a long felt want amongst the dairy farmers of this section. Until Sudan grass was introduced by the Texas Agricultural Experiment Station, there was no annual grass to use here that could be planted in a crop rotation. Bermuda grass, Johnson grass and other grasses common to this section could only be used in permanent pastures, the only forage crops that could be used in a rotation being the millets and sweet sorghums.

On the East Texas farm Sudan grass now takes the place of the millets and is used in rotation with cotton and corn. Thus a long felt want has been filled and Sudan is rapidly taking rank as the leading upland hay grass of this section. It is also of importance for grazing, and too much emphasis cannot be placed upon the use of this Sudan in East Texas as a summer pasture crop, especially where a little nitrogen fertilizer can be applied to the crop. This condition holds on farms where there are small dairy herds and for the small farm which has no field grass.

Japanese Sugar Cane

Tests with Japanese sugar cane were first made upon this station in 1914, when cane sent from substation No. 4, Beaumont, Texas, was planted. This cane is like the true ribbon cane and has to be planted as seed cane, since it does not produce seed heads in this country.

The plat yielded green forage at the rate of 15,504 pounds to the acre.

To test its sirup qualities, some of the crop from this plat was taken to the mill. Nine gallons of juice of the Japanese sugar cane produced one gallon of sirup, while at the same mill it was taking eleven gallons of juice of the ribbon cane to make one gallon of sirup. The yield of sirup is not high, however, when compared to the ribbon cane. One acre of Japanese sugar cane with the yield above stated produced 64 gallons of good sirup.

The value of Japanese sugar cane, however, is as a green forage and silage crop. As soon as cut, the canes can be stacked in a building with the fodder out on all sides to prevent the canes from freezing and they will then remain good and sweet until the following fall. Cane was stacked and kept in this manner on this station in 1914 and stock fed on it the following September, at which time it was sound and sweet. If stacked in the open, it is best to stack the fodder inside and then protect the stack with oat or other straw.

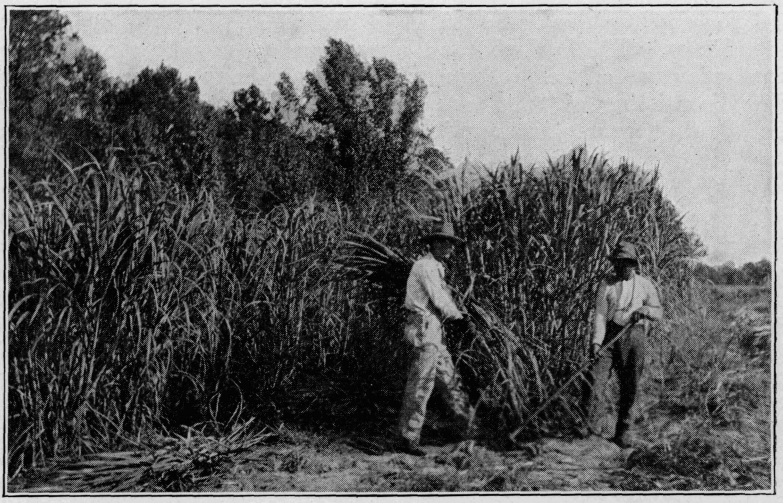

Fig. 4.—Harvesting Japanese sugarcane.

Several crops can be raised from the stubble without replanting. In 1915 a method-of-planting test was carried out. This cane was planted in February. In all plats the rows were sixty inches apart. The canes were planted in three different manners and in duplicate. The three methods of seeding were as follows: cut to two nodes to a piece of cane and dropped in the drill every twenty-four inches; single canes in a continuous row with ends just lapping; a double row of canes in a continuous row with ends just lapping.

Table 26.—Method-of-planting and seeding rate test in five-foot rows.

Plat No.	Date planted	Date germ.	Method of planting	Forage yield, acre	Average yield, pounds
1	Feb. 18	Mar. 20	2 nodes	7,050	
2	Mar. 4	April 1	2 nodes	3,700	6,375
3	Feb. 18	Mar. 20	single c	17,100	
4	Mar. 4	April 1	single c	7,800	12,450
5	Feb. 18	Mar. 20	double c	13,410	
6	Mar. 4	April 1	double c	10,200	11,805

The largest yield was obtained from the plats planted with a single cane, one plat yielding as high as 17,100 pounds to the acre. Early planting was very important.

This cane can be grown well on upland. It can be grown upon land that will not produce ribbon cane. Probably its chief use when it becomes known among the farmers will be for silage. It also affords a little grazing during the spring, but stock must be taken off in time for the production of a crop of canes.

TRUCK

During 1915 tests were started to determine what varieties of radishes, English peas, snap and lima beans, Irish potatoes, lettuce, cantaloupes and watermelons are best adapted to the soil and climatic conditions of East Texas. The land was fall plowed and planted to a cover crop of small grain which was, in turn, plowed under in the early spring. Fertilizer consisting of 200 pounds each of cottonseed meal and 16 per cent. acid phosphate was applied to the acre.

Radishes

Twelve varieties of radishes were planted. Very little difference was noticed in the rapidity of growth. The round varieties, however, matured a little earlier than the long ones.

French Breakfast appeared to be one of the most desirable varieties, yielding 15.25 pounds to the plat, while with the long varieties Long Vienna and White Strasburg were the highest yielding, giving, respectively, seventeen pounds and thirteen pounds to the plat.

English Peas

English peas were a failure on account of the late planting.

Beans

Thirteen varieties of beans were planted.

Red Valentine proved to be best.

Irish Potatoes

Eight varieties of potatoes were planted.

Dreer's Early Standard gave the largest yield of merchantable tubers, 56 bushels, culls 36.1 bushels, or a total yield of 92.1 bushels to the acre.

Bliss Triumph, which is the favorite commercial variety of East

Texas, yielded merchantable tubers, 48.4 bushels, culls, 28.6 bushels, or a total of 77 bushels to the acre.

Burbank was the lowest yielder, with 12.6 bushels of merchantable tubers, 9.3 bushels culls, or a total yield of 21.9 bushels to the acre.

Cantaloupes

Twelve varieties of cantaloupes were planted.

Nixon was the highest yielder, averaging 4.7 pounds per melon. It, however, is not a melon of high quality.

Watermelons.

Sixteen varieties of watermelons were planted. All varieties made good vine growth.

Cuban Queen and Nabob were the highest yielders. With these, however, there was a tendency for the flesh in the center of the melon to crack and have a hard woody center. This may have been due to the climatic conditions of the season.

The Watson only yielded one-third as much as the previously mentioned varieties but is a desirable variety, being a good shipper and of fine quality.

TOMATO FERTILIZER TEST

This experiment was to determine the effect of cottonseed meal, acid phosphate, sulphate of potash, nitrate of soda, and stable manure in various amounts alone and in combination upon the yields of tomatoes.

Two varieties of tomatoes, Redfield Beauty and Acme, were used with each fertilizer. Space enough was left between plats so that the fertilizer used on one plat would not affect the plats adjoining. Some time before the plants were set the fertilizer was placed in the drill and well mixed with the soil. In April the plants were transplanted to the plats and set 36 inches apart. The plants were trained to the single stem, all suckers were kept pruned and when tree bloom clusters appeared upon the plants they were topped. The plants were sprayed with Bordeaux mixture for the prevention of blossom-end rot, and with a Paris green solution for the tomato worm.

For the two years that this experiment has been conducted the highest yield was obtained from the plat fertilized with twenty loads of stable manure to the acre, while 200 pounds of cottonseed meal and fifty pounds of sulphate of potash to the acre produced the next highest yield. These fertilizers also brought about the highest yield in the test of 1915, producing 9625 pounds of tomatoes to the acre. It would seem that, in general, nitrogenous fertilizer was the controlling factor and that it was profitable in all cases.

Table 27.—Tomato fertilizer test.

Varieties used, Redfield Beauty and Acme.

Fertilizer used, acre	Year	Redfield Beauty, pounds	Acme, pounds	Total yield	Average yield, pounds
200 pounds cottonseed meal	1914	19.0	22.5	41.5	
	1915	62.0	65.0	127.0	84.2
200 pounds acid phosphate	1914	17.0	10.7	27.7	
	1915	71.0	65.0	136.0	81.8
50 pounds sulphate potash	1914	6.0	8.5	14.5	
	1915	55.0	86.0	141.0	77.7
Check	1914	1.3	4.7	6.0	
No fertilizer	1915	65.0	52.0	117.0	61.5
200 pounds acid phosphate	1914	15.3	16.5	31.8	
100 pounds nitrate of soda	1915	66.0	65.0	131.0	81.4
200 pounds acid phosphate	1914	25.0	37.5	62.5	
200 pounds cotton seed meal	1915	68.0	72.0	140.0	101.2
200 pounds cotton seed meal	1914	30.0	28.0	58.0	
50 pounds sulphate of potash	1915	88.0	87.0	175.0	116.5
Check	1914	5.0	4.9	9.9	
No fertilizer	1915	55.0	64.0	119.0	64.4
200 pounds acid phosphate	1914	17.7	10.5	28.2	
50 pounds sulphate of potash	1915	64.0	80.0	144.0	86.1
200 pounds acid phosphate	1914	50.5	48.7	99.2	
200 pounds cottonseed meal	1915	74	55.0	129.0	114.1
50 pounds sulphate of potash					
200 pounds acid phosphate	1914	30.5	38.0	68.5	
100 pounds cotton seed meal	1915	56.0	69.0	125.0	96.7
50 pounds nitrate of soda					
Check	1914	15.5	14.0	29.5	
No fertilizer	1915	34.0	27.0	61.0	45.2
200 pounds acid phosphate	1914	52.0	35.5	87.5	
100 pounds cottonseed meal	1915	57.0	59.0	116.0	101.7
100 pounds nitrate of soda					
50 pounds sulphate of potash					
20 loads stable manure	1914	76.0	92.0	168.0	
	1915	57.0	59.0	116.0	142.0

SUMMARY

This bulletin contains details and conclusions of agricultural experiments conducted near Nacogdoches in Central East Texas.

The agricultural station at Nacogdoches is one of the substations of the Texas Agricultural Experiment Station.

Meteorological data are given for the region.

A general summary of experiments with fertilizers for tobacco is presented. Cottonseed meal with other materials and in rather large amounts seemed to be the most effective agent used. Smaller amounts of fertilizers were effective for other crops than tobacco.

From eight to 101 varieties of corn have been tested during each of four years. Surcropper and Strawberry are advised for uplands. The "Prolific" varieties are advised for bottom lands. Experiments to determine the proper seeding rate for corn indicate that the stalks should be thinned to three by three feet. When corn alone and corn and cowpeas were compared, the results indicated that the later the cowpeas are planted the better the yields of corn will be.

Thinning tests with cotton are being conducted. The largest yields have been obtained from hills eighteen to thirty-six inches apart, containing two stalks to the hill. Results of three and four years of cotton variety testing are reported. Mebane, Rowden, and Lone Star are the varieties advised for use.

Of the cowpea varieties advised for seed production, Clay and New Era are suitable for general use, while Chinese Red is suitable for catch cropping. The Iron cowpea is advised for forage. Wide row planting has given more cowpea hay than narrow row planting. Heavy seeding of cowpeas has given larger crops than light seeding.

Soybean tests are reported and the crop does not appear profitable.

Peanut experiments are reported, particularly with the crop as a catch crop. Peanuts in 18-inch rows have not shown a profitable gain over 36-inch rows, when grown for nuts. The Spanish variety of peanuts is advised for forage. In width of row test with Spanish peanuts 36-inch rows produced more forage than 18-inch rows. It did not pay to crack the shells of peanuts when planted.

Sumac sorghum is advised as a silage crop.

A considerable number of new crops have been tested each year. Of these the Kulthi moth bean, Florida beggar weed, Japanese sword bean and frijole bean are of little importance. The mung bean and the *Dolichos lablab* are of value.

A large number of clovers are being tested.

Sudan grass newly introduced by the station is of great importance here as an annual hay and pasture crop. In date and rate of planting test with Sudan grass the results indicate that rather late spring planting is necessary or that early planting after oats is practical. It is advised that the crop be planted in rows at from five to fifteen pounds of seed to the acre.

Japanese sugar cane is a newly introduced crop which has considerable promise as a silage crop. It should be planted early.

Variety tests with seven different truck crops have been started and preliminary conclusions are reported.

A fertilizer test with two varieties of tomatoes has been carried for the past two years. The largest yield has been obtained from plats given twenty loads of stable manure to the acre. A nitrogenous fertilizer seems to be needed for tomatoes.