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

BULLETIN NO. 254 NOVEMBER, 1919

REPORT OF EXPERIMENTS AT SUBSTATION NO. 11, NACOGDOCHES, TEXAS

B. YOUNGBLOOD, DIRECTOR
COLLEGE STATION, BRAZOS COUNTY, TEXAS

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†As of December 1, 1919.
‡In cooperation with School of Agriculture, A. & M. College of Texas
*In cooperation with the School of Veterinary Medicine, A. & M. College of Texas.
**In cooperation with the United States Department of Agriculture.

BULLETIN NO. 254. NOVEMBER, 1919.

REPORT OF EXPERIMENTS AT SUBSTATION NO. 11, NACOGDOCHES, TEXAS.

G. T. MCNESS, SUPERINTENDENT.

The substation at Nacogdoches is located two and three-fourths miles north of the town of Nacogdoches upon the Henderson and Nacogdoches road. The soils of the Station are the Orangeburg and Greenville series, which soils have a red or gray top soil with a red sandy-clay subsoil. The predominating soil of the Station is the Orangeburg fine sandy loam, and upon this soil most of the experiments are conducted.

The Station consists of eighty-two and one-half acres of land, of which thirty and four-tenths acres are used for experimental purposes, six and nine-tenths for Station roads and turn roads, one and one-tenth for the public road, two and two-tenths acres for farmstead, and forty-one and nine-tenths acres for timber and pasture.

The farmstead consists of the Superintendent's residence, office building, laborers' cottages, tobacco barn, stock barn, implement shed and gin house, and an insect-proof seed house.

The entire property is enclosed by a 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.

The buildings and the equipment as well as the platting system on the Station have been developed primarily for the purpose of forwarding the conduct and the completion of experiments with crops, soils, and fertilizers.

In connection with the actual investigation, there is conducted a systematic crop rotation over that portion of the Station used for experimental 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. This rotation system, in connection with early deep fall-plowing, has increased the soil fertility, as shown by the increased yields obtained each year from the various experiments.

For the past three years an average of three hundred farmers have visited the Station at various times of the year in order to study the experiments under progress and to seek information in regard to their farm problems.

Exhibits from this Station have been made at the State Fair at Dallas during the time covered by this report.

The following investigations have been made and are being continued on the Station:

Introduction and testing of new field crops.

Field crop variety test.

Plant breeding.

Methods of production tests with staple field crops.
Fertilizer and rotation tests.
Orchard introduction and variety test.
Arboretum.
Seed production tests.
Forage production tests.
Increased plantings of the better varieties of crops.
Soil improvement tests.
Terracing and draining.
Meteorology.

METEOROLOGICAL DATA.

Since 1913 the Station has been equipped with apparatus for securing climatic data. Records are made of rainfall, snowfall, evaporation from a free water surface, percentage of atmospheric humidity, minimum and maximum temperatures, and of wind movements. Observations are made twice daily.

The climatic conditions for the three years, covered by this report, with the exception of the drouth of 1917, have been favorable for crop production. However, the results obtained from the tests conducted with a variety of crops, indicate that the earlier in the season plantings can be made the larger will be the yields.

Summaries of the meteorological records for 1916 to 1918 are given in the following tables:

Table 1.—Monthly meteorological data, 1916.

Month	Temperatures.			Humidity Mean Per Cent	Precipitation Inches	Evaporation Inches	Total Miles Wind Velocity
	Absolute		Monthly Mean				
	Max.	Min.					
January	77	14	54.32	77.50	8.30	1.123	4272
February	79	20	53.01	70.50	0.23	2.263	4079
March	88	28	61.87	51.00	0.72	4.437	3110
April	88	32	63.26	77.90	5.26	4.149	3929
May	93	48	72.24	78.32	11.32	4.724	3328
June	95	57	78.91	78.86	2.22	4.961	2866
July	99	68	82.19	81.74	4.09	4.443	1731
August	98	59	81.93	80.45	1.92	3.904	1780
September	99	40	76.15	78.06	0.77	4.450	1850
October	91	34	67.09	74.00	1.40	3.730	2191
November	85	19	55.58	76.00	3.73	2.057	2715
December	79	15	50.61	78.45	3.23	1.675	3879
Total	.....	.....	.....	.....	43.19	41.916	35730
Average	.....	.....	66.43	75.23			
Extreme	99	14					

Table 2.—Monthly meteorological data, 1917.

Month	Temperatures			Humidity Mean Per Cent	Precipitation Inches	Evaporation Inches	Total Miles Wind Velocity
	Absolute		Monthly Mean				
	Max.	Min.					
January	79	21	51.51	86.09	3.12	1.325	3684
February	84	15	52.8	81.32	3.87	2.313	3623
March	85	24	58.78	84.00	2.38	3.366	4975
April	84	36	63.5	78.40	3.75	4.350	4090
May	92	41	66.5	80.50	2.73	4.614	3503
June	102	49	79.1	70.96	0.48	6.880	3071
July	105	62	81.90	81.00	5.92	5.838	2163
August	103	57	82.50	75.80	0.41	7.173	1917
September	97	49	75.6	79.30	2.77	4.464	1540
October	94	26	62.64	69.16	1.27	4.496	2985
November	80	28	55.68	72.83	0.84	2.608	2073
December	78	14	46.48	81.54	0.72	1.713	2861
Total	.....	.....	.....	.....	28.26	49.140	36485
Average	.....	.....	64.74	78.40			
Extreme	105	14					

Table 3.—Monthly meteorological data, 1918.

Month	Temperatures			Humidity Mean Per Cent	Precipitation Inches	Evaporation Inches	Total Miles Wind Velocity
	Absolute		Monthly Mean				
	Max.	Min.					
January	78	1	41.95	84.45	1.18	1.568	4238
February	88	24	56.21	87.17	1.11	1.762	3993
March	89	34	64.19	76.84	1.99	4.011	3713
April	88	37	65.28	78.51	8.20	3.895	3407
May	92	51	74.50	78.19	2.10	5.451	3685
June	103	67	83.13	71.79	2.84	6.387	2146
July	102	62	83.29	72.16	1.39	7.398	2081
August	102	67	82.41	87.24	5.18	5.802	1856
September	96	44	72.65	89.03	2.81	5.028	2027
October	96	36	69.06	93.08	4.91	2.738	1898
November	80	30	54.11	89.50	7.05	2.524	2690
December	76	19	53.11	86.22	2.86	1.779	2659
Total	.....	.....	.....	.....	41.62	48.343	34393
Average	.....	.....	66.65	82.84			
Extreme	103	1					

Table 4.—Summary of meteorological data, 1916–17–18.

Years	Temperatures			Humidity Mean Per Cent	Annual Rainfall	Average Evaporation	Annual Total Miles Wind Velocity
	Absolute		Monthly Mean				
	Max.	Min.					
1916	99	14	66.43	75.23	43.19	41.916	35730
1917	105	14	64.74	78.40	28.26	49.140	36485
1918	103	1	66.65	82.84	41.62	48.343	34393
Average	.....	.....	65.94	78.82	37.69	46.465	35536

Table 5.—Precipitation during crop growing season.

Year	May	June	July	Aug.	Sept.	Oct.	Total
1916	11.32	2.22	4.09	1.92	0.77	1.40	21.72
1917	2.73	0.48	5.92	.41	2.77	1.27	13.58
1918	2.10	2.84	1.39	5.18	2.81	4.91	19.23
Average	5.38	1.84	3.80	2.50	2.11	2.52	18.15

Table 6.—Mean temperature during crop growing season.

Year.	May	June	July	Aug.	Sept.	Oct.	Mean
1916.....	72	78	82	81	76	67	76
1917.....	66	79	81	82	75	62	74
1918.....	74	83	83	82	72	69	77
Average.....	70	80	82	81	74	66	75

The growing season is comparatively long, and during the past three years the last freezing temperature in the spring occurred on March 18, 1917, and the first freeze in the fall on October 19, of the same year.

In comparing the climatic conditions for the three years with the records for the past twenty years, we find that the average precipitation was below the normal of 45.69 inches. The year 1917, with precipitation of 28.26 inches, was the lowest for the twenty years that records have been reported. The precipitation for 1916 and 1918 came within five inches of the normal. This average shortage for the period has been the limiting factor in crop yields.

FERTILIZER TESTS.

The nature of the soil in this agricultural region is such that the use of commercial fertilizer in crop production is a common practice.

Information is needed as to the amounts and the combinations of

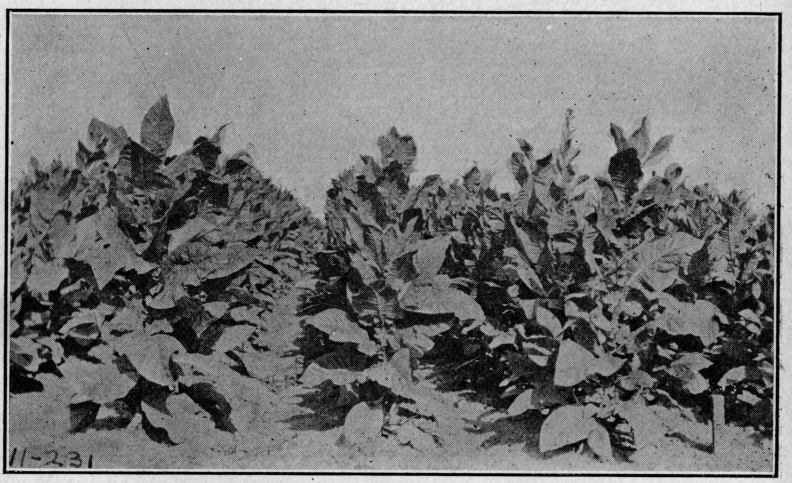

Fig. 1.—Showing view of tobacco fertilizer plats. The plat in the foreground received an application of 600 pounds of cottonseed meal, 200 pounds potash and 200 pounds acid phosphate to the acre.

fertilizers which will give the greatest production in acre-yield or acre-money value or both. No commercial fertilizer will give the maximum returns without an abundance of organic matter in the soil.

The yields reported here from plats receiving commercial fertilizer

in many cases do not exceed the yields from plats receiving no fertilizer, a fact accounted for in part by the lack of organic matter.

TOBACCO FERTILIZER.

Acid phosphate, cottonseed meal, and potash were used singly and in combinations as fertilizers for tobacco.

The table below shows the yield, the cost of the fertilizer, and the net acre-value of the product from different applications.

Tab'e 7.—Showing value of various fertilizers for tobacco, 1916 to 1918, inclusive.

Plat No.	Kind of Fertilizer and Amount Applied Pounds per Acre	Average Acre			
		Yield Lbs.	Value in Dollars	Cost of Fertilizer	Value Less Cost of Fertilizer
5	1200 Cottonseed Meal, 400 Acid Phosphate	858.333	$ 154.49	$ 30.73	$ 123.76
1	1200 Cottonseed Meal, 400 Acid Phosphate, 200 Sulphate of Potash	841.875	151.53	47.39	104.14
4	No Fertilizer—Check	614.166	100.29	0.00	100.29
3	600 Cottonseed Meal, 400 Acid Phosphate, 200 Sulphate of Potash	700.833	126.14	34.49	91.65
7	1200 Cottonseed Meal	589.166	106.04	25.80	80.24
2	200 Sulphate of Potash	551.041	89.99	16.66	73.33
9	1200 Cottonseed Meal, 200 Sulphate of Potash	574.333	103.37	42.46	60.91
8	1200 Cottonseed Meal, 200 Acid Phosphate, 200 Sulphate of Potash	552.5	99.45	44.92	54.53
6	400 Acid Phosphate, 200 Sulphate of Potash	465.833	76.08	21.59	54.49

It is seen that three out of the eight fertilizers applied show increases in yield over the no-fertilizer plat. However, in average acre-value in dollars only two of the fertilizers show increases over the no-fertilizer plat when the cost of the fertilizer is deducted.

The fertilizer composed of 1200 pounds of cottonseed meal and 400 pounds of acid phosphate gave an increase of $23.47 over the no-fertilizer, and it was the only fertilizer showing a marked increase over no-fertilizer after the cost of fertilizer was deducted. All those fertilizers in which cottonseed meal was used produced a quality of tobacco which sold in 1918 at 25 per cent increase in price over tobacco produced on plats where no cottonseed meal was used.

CORN FERTILIZER.

Acid phosphate, cottonseed meal, and potash were used singly and in combination as fertilizer for corn.

The table following shows the yield, the cost of the fertilizer, and the acre-money value after deducting the cost of the fertilizer in each case:

Table 8.—Value of different fertilizers for corn, 1916 to 1918, inclusive.

Plat No.	Kind of Fertilizer and Amount Applied Pounds per Acre	Average Acre			
		Yield Bus.	Value in Dollars	Cost of Fertilizer Dollars	Value Less Cost of Fertilizer
3	200 Cottonseed Meal, 100 Acid Phosphate	26.859	$ 40.59	$ 6.31	$ 44.28
5	300 Cottonseed Meal	26.666	40.09	7.55	32.54
2	100 Acid Phosphate	21.712	33.45	1.28	32.17
1	200 Cottonseed Meal	23.914	35.48	5.03	30.45
4–9	No Fertilizer—Check	20.359	30.12	0.00	30.12
6	200 Acid Phosphate	20.058	31.48	2.56	28.92
7	300 Cottonseed Meal, 200 Acid Phosphate	20.321	30.22	10.11	20.11
10	400 Cottonseed Meal	18.925	27.15	9.47	17.68
8	200 Acid Phosphate, 400 Cottonseed Meal	16.710	23.77	10.06	13.71

Fig. 2.—Showing plat of corn on the left without fertilizer and on the right receiving 600 pounds of cottonseed meal and 100 pounds of sulphate of potash to the acre.

The results above show plat 3, which received 200 pounds cottonseed meal and 100 pounds of acid phosphate, gave a marked increase in average acre-money value after the cost of fertilizer was deducted.

Cottonseed meal alone up to 300 pounds per acre gave a slight increase, while the greater amounts gave a slightly lower average acre-value than no-fertilizer.

The application of 200 pounds of cottonseed meal and of 100 pounds acid phosphate is found most profitable, and this is especially true where the soil is provided with an abundance of organic matter.

TOMATO FERTILIZERS.

Experiments were conducted with various fertilizers for use in the production of market tomatoes.

Cottonseed meal, acid phosphate, sulphate of potash, nitrate of soda, and barn-yard manure were used singly and in combination on

different plats. The results shown in the following table are the average results from a four-year experiment and are considered quite reliable:

Table 9.—Value of different fertilizers for tomatoes.

Amount and Kind of Fertilizer Used Pounds per Acre	Average Acre			
	Yield Lbs.	Value	Cost of Fertilizer	Less Cost of Fertilizer
20 Loads Stable Manure	3915.5	$ 117.46	$ 15.00	$ 102.46
200 Acid Phosphate, 200 Cottonseed Meal	3269.75	98.09	6.76	91.33
200 Cottonseed Meal, 50 Sulphate of Potash	3254.375	97.63	8.46	89.17
200 Acid Phosphate, 200 Cottonseed Meal, 50 Sulphate of Potash	3200.05	96.00	10.92	85.08
200 Acid Phosphate, 100 Nitrate of Soda	3011.45	90.34	5.58	84.76
200 Acid Phosphate, 100 Cottonseed Meal, 100 Nitrate of Soda, 50 Sulphate of Potash	3177.50	95.32	11.89	83.43
200 Acid Phosphate, 200 Cottonseed Meal, 50 Nitrate of Soda	3018.625	90.55	10.92	79.63
200 Cottonseed Meal	2357.5	70.72	4.30	66.42
200 Acid Phosphate	2067.425	62.02	2.46	59.56
200 Acid Phosphate, 50 Sulphate of Potash	2118.675	63.56	6.62	56.94
Check—no Fertilizer	1775.3	53.25	0.00	53.25
50 Sulphate of Potash	1870.625	56.11	4.16	51.95
Check—no Fertilizer	1664.600	49.93	0.00	49.93
Check—no Fertilizer	1209.50	36.28	0.00	36.28

It is seen that the application of twenty loads of stable manure to the acre gave much better yields and much greater profit than any other fertilizer used. Two hundred pounds of acid phosphate and two hundred pounds cottonseed meal also gave a marked increase in yield and acre-money value after the cost of fertilizer was deducted. Two

Fig. 3.—Showing view of corn variety test. Note the perfect stand and uniform conditions under which this test is conducted.

hundred pounds of acid phosphate and fifty pounds of sulphate of potash gave good results.

CORN.

VARIETY TEST.

A variety test of corn, including thirty varieties in 1916, thirty-five varieties in 1917, and thirty varieties in 1918, was conducted in replicate plantings. The results during this period showed the following varieties to be outstanding high yielders in the order given: Ferguson Yellow Dent, Hastings Prolific, White Mogul, Oklahoma White Wonder, Schieberle, Surcropper, Chisholm and Blount Prolific.

The results with the corn variety test, conducted from 1912 to 1915 inclusive, showed the eight best yielding varieties to rank in the order named, as follows: Oklahoma White Wonder, Hastings Prolific, Ferguson Yellow Dent, Surcropper, Fentress Strawberry, Chisholm, White Mogul, and Virginia White Dent.

It is seen that certain varieties, namely, Ferguson Yellow Dent, Hastings Prolific, Oklahoma White Wonder, White Mogul, Surcropper, and Chisholm have consistently been high yielders throughout the period and are considered good varieties for this region.

In 1918 a test was conducted for the purpose of comparing different varieties which had shown good results in previous tests. These varieties were planted on three different dates: (1) Early, (2) Medium, and (3) Late, so as to subject each variety to varying conditions in a single season. The average results are presented in the following table, in which the varieties are arranged in order of the average yield:

Table 10.—Average results from a comparison of some good-producing varieties planted at three different dates in the same season.

T. S. No.	Variety	Date Planted	Acre Yield Bus.	Date Planted	Acre Yield Bus.	Date Planted	Acre Yield Bus.	Avr. Yield Bus.
3008	Surcropper	Mar. 15	16.959	April 1	16.383	April 17	19.640	15.660
3083	Brazos White	Mar. 15	7.660	April 1	3.437	April 17	22.027	11.041
3007	Chisholm	Mar. 15	14.142	April 1	4.174	April 17	14.732	11.016
3094	Oklahoma White Wonder	Mar. 15	16.892	April 1	2.460	April 17	11.471	10.274
3137	Blount's Prolific	Mar. 15	11.392	April 1	7.120	April 17	11.450	9.987
327	Thomas	Mar. 15	7.464	April 1	6.875	April 17	13.259	9.199
3086	Va. White Dent	Mar. 15	11.785	April 1	1.964	April 17	13.562	9.103
2981	Hastings Prolific	Mar. 15	3.928	April 1	2.946	April 17	19.866	8.913
3009	Ferguson's Yellow Dent	Mar. 15	9.821	April 1	8.102	April 17	5.392	7.771
3060	Cocke's Prolific	Mar. 15	11.589	April 1	1.964	April 17	9.33	7.627
3467	Grier-Campbell	Mar. 15	0.687	April 1	5.892	April 17	10.804	5.794

The supplemental test conducted during 1918 shows the five highest varieties to be Surcropper, Brazos White, Chisholm, Oklahoma White Wonder, and Blount's Prolific.

SEEDING RATE TEST.

The thickness of planting corn has much to do with the yield and the quality of the product. Just how thick to plant in a given region under certain climatic and soil conditions is a matter of importance to the grower.

The series of plats, in which all factors other than that of seeding rate were identical, were planted and thinned to different numbers of stalks to the acre. The results are shown in the following table:

Table 11.—Corn seeding rate test, 1918.

Seeding Rate or Number Stalks to Acre.	Yield in Bushels Per Acre		Average Yield in Bushels Per Acre
	Planted Mar. 18	Planted April 2	
2420	14.285	10.714	12.50
3630	15.741	11.071	13.41
4840	16.071	8.214	12.14
7260	9.071	3.035	6.05
9680	10.000	.660	5.33

The results show good yields from the three thinnest seedings and the best yields from the seeding of 3630 stalks to the acre, or one stalk to one and one-third square yards.

The seeding rate of 4840 stalks per acre, or a stalk to every square yard, gave almost as large yields as the thinner seeding. The soil on which this test was conducted was only in a fair state of fertility. It is possible, therefore, that the seeding on soils in a good state of fertility should be as thick as one stalk to the square yard.

WIDTH OF ROW TEST.

Tests were conducted in 1918 for the purpose of comparing the yields of corn in wide and in narrow rows, planted at different dates and at different rates. The results secured are presented in the following table:

Tab'e 12.—Comparing yields of corn in wide and narrow rows.

Stalks Per Acre	Date Planted	Yield in Bushels Per Acre.	
		36-Inch Rows	72-Inch Rows
3630	Mar. 21	18.411	22.098
3630	April 1	23.325	29.464
4840	Mar. 21	9.330	10.803
4840	April 1	24.553	13.258
6050	Mar. 21	17.678	19.642
6050	April 1	9.575	7.857
4840 Average		17.145	17.188

It is seen that there is practically no difference in the average yield secured from corn planted in three and in six-foot rows. The several individual plats comprising the average seem to show a tendency for slightly better yields in the wide rows, and this fact is more or less in accordance with the former results secured at this Station and reported in Bulletin No. 230.

TIME OF PLANTING LEGUME AS INTERTILLED CROP—1918.

The advisability of planting cowpeas in corn appears to depend, to a large extent, on the time at which the cowpeas are planted, or on the size of the corn when the cowpeas begin competition with it.

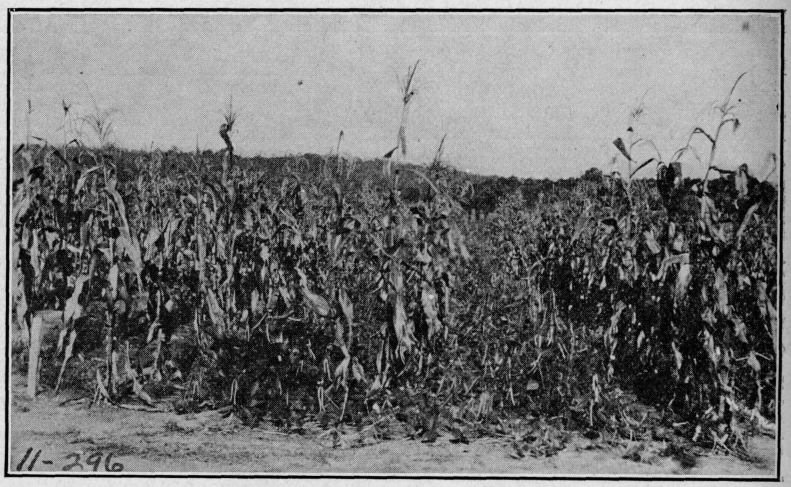

Fig. 4.—View of plat of corn in wide rows with cowpeas planted between rows on the same date the corn was planted. Note the large growth of the cowpea vines and the very ordinary development of the corn. The cowpeas have robbed the corn of moisture and plant food.

Fig. 5.—View of plat of corn in wide rows with cowpeas planted between the rows when the corn was in full tassel. Note the well developed corn and the fact that the cowpeas are just coming into vigorous growth.

To determine what effect early and late planting of cowpeas would have on the yield of corn, a test was carried out, as shown in the following table:

Table 13.—Yields of corn as affected by time of planting intertilled legume.

Corn Planted	Legume Planted	Stage of growth of corn when cowpeas were planted	Acre Yield of Shelled Corn in Bushels	Average Yield in Bushels of Both Plantings
Mar. 27.....	Mar. 27.....	00 inches high.....	.982	———
Mar. 27.....	May 20.....	12 inches high.....	4.907	———
Mar. 27.....	June 10.....	36 inches high.....	11.969	———
Mar. 27.....	June 23.....	60 inches high.....	6.383	———
Mar. 27.....	June 30.....	Tassel.....	8.9	———
Mar. 27.....	Mar. 27.....	00 inches high.....	3.683	2.332
Mar. 27.....	May 20.....	12 inches high.....	12.89	8.898
Mar. 27.....	June 10.....	36 inches high.....	20.871	16.420
Mar. 27.....	June 23.....	60 inches high.....	18.415	12.399
Mar. 27.....	June 30.....	Tassel.....	11.339	10.119

The experiment shows in both the original and the duplicate series, as well as in the average, that cowpeas planted before the corn is three feet high, results in a loss in yield of corn. If they are planted when the corn is three feet high or higher, the yield of the corn is greatest.

Previous work, as reported in Bulletin No. 237, is in accord with the results presented here, with the exception that the best yields were secured when the cowpeas were planted a little later in the stage of the development of the corn. It seems conclusive that cowpeas must not be planted in corn in the early stages of the development of the corn crop, unless other benefits are secured to offset the loss in the production of corn.

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. This test was begun in 1915, and the results include the test of that year. The results for the four years' test with Mebane cotton, planted on upland in rows three feet apart, show that two plants to the hill and twenty-one inches apart in the drill will give the highest yield of seed cotton.

VARIETY TEST.

The peculiar soil and climatic conditions in any section of the State make it necessary to determine the varieties best suited to the existing conditions by testing. A number of varieties of cotton have been tested during the past three years. In the making of these tests, varieties were planted in duplicate and triplicate plats and the results averaged. Cultivation and treatment have been the same for all varieties.

The highest yielders of seed cotton for each year are as follows:

Year	Variety	Pounds	Lint Per Cent
1916	Simpkins Prolific, T. S. No. 1834	529.66	32
	Webber, T. S. No. 1835	488.12	33
	Matchless, T. S. No. 1848	457.16	32
1917	Roundnose, T. S. No. 2469	548.28	35
	Wannamaker Cleveland, T. S. No. 2474	503.59	39
	Allen's Express, T. S. No. 2484	502.73	29
1918	Mebane Triumph, T. S. No. 3002	629.06	35
	Mortgage Lifter, T. S. No. 3021	587.81	32
	Mebane Triumph, T. S. No. 3037	577.5	35

Of the different varieties of cotton grown during the years 1916 to 1918 a number have been discarded for one reason or another, and other varieties tested in their place. The following table shows the acre-yields and ginning percentage of those cotton varieties which have been grown for the three years:

Table 14.—Average yields and lint percentage of varieties of cotton, 1916, 1917 and 1918.

T. S. No.	Variety	Average Lint Per Cent	Rank	Average Acre Yield in Pounds	Rank
1817 2469 3034	Roundnose	33.00	5	489.842	1
1818 2458 3003	Rowden	31.91	7	458.328	2
1847 2476 3021	Mortgage Lifter	32.892	6	451.853	3
1819 2470 3037	Mebane Triumph	35.426	1	433.621	4
1846 2478 3020	Surecrop	34.151	4	432.248	5
1815 2484 3045	Allen's Express	28.562	8	417.352	6
1823 2488 3046	Early King	34.51	3	361.776	7
1833 2472 3036	Lone Star	35.03	2	346.603	8

Owing to the fact that Rowden has a better staple than Roundnose, it is to be recommended even though it ranks second to Roundnose in yield.

In addition to the varieties shown in the above table, the following varieties which have not been tested throughout all the three years have made good yields: Matchless Big Boll, Wannamaker, Mebane, Union Big Boll, Cook, Webb, Bank Account, Kasch, Trice, and Triumph.

Also, some of the best varieties from the standpoint of ginning per-

centage have not been tested every year. The highest of these are given in order as follows:

	Per Cent Lint
Chisholm	46.51
Improved Champion	45.80
Mexican Big Boll	42.85
Kasch	42.22
Half & Half	41.30
Moneymaker	41.25
Peterkin	40.81
Rowden	40.00
Wannamaker	40.00
Mebane	39.78

The Half & Half cotton, although showing a good ginning percentage, is not to be recommended on account of its poor quality and short length of the staple. Three of the varieties of cotton mentioned, however, have a higher ginning percentage than the Half & Half, and they have also a desirable lint.

The length of staple is just as important in selecting a variety of cotton as is the yield and the ginning percentage. From the number of varieties tested during the three years the following list shows some of the desirable varieties in regard to length of lint:

	Inches
Snowflake	1 5/16
Express	1 3/16
Lone Star	1 1/16
Trice	1 1/16
Acala	1 1/16
Mebane Triumph	1
Webb	1
Kasch	1
Wannamaker	0 7/8
Half & Half	0 5/8

From the forty-three samples tested for length of lint, the Half & Half cotton showed the shortest staple. The staple of this variety was only ⅞-inch, while all others measured 1-inch or more.

COWPEAS.

VARIETY TEST FOR SEED.

During the last three years, 1916-1918, twenty-five varieties of cowpeas have been tested for seed yields. Plantings were made in May of each year. In 1916 quadruple plantings were made, but in 1917 and 1918 only duplicate plantings were made for seed yields. This test was conducted in a three-year rotation with corn and cotton. The pea vines were plowed under as a green manure after the seed had been harvested.

The following table shows the average acre-yield of those varieties which have been planted all three years:

Table 15.—Average seed yields of varieties of cowpeas, 1916, 1917 and 1918.

T. S. No.	Variety	Average Yield Clean Seed Per Acre, 1916, 1917, and 1918, in Bushels	Rank
56	Unknown	9.414	1
325	Brabbam	8.853	2
59	Whippoorwill	8.78	3
85	Iron	8.414	4
60	Clay	8.352	5
196	Iron-Blackeye	8.162	6
197	Iron-Blackeye	7.259	7
206	Iron-Whippoorwill	7.178	8
86	Groit	6.995	9
58	New Era	6.961	10
215	Holstein	6.950	11
204	Iron-Whippoorwill	6.538	12
87	Blackeye	6.430	13
753	Jap-Blackeye	6.39	14
2297	Cream	4.967	15
1685	Black Crowder	4.851	16
57	Red Ripper	4.798	17
214	Red Ripper	4.327	18
218	Chinese Yellow	.839	19

The average yields of these cowpeas were reduced by the low yields of 1917 when this test suffered from the drouth of that year. The Unknown cowpea, T. S. No. 56, which ranks first on the list, made eleven bushels in 1916, 14.208 bushels in 1918, and only 3.036 bushels in 1917. The proportionate yields for all varieties show the same variation for the normal years and for the year of drouth.

Fig. 6.—View of plat of Brabham cowpeas. Note the vigorous growth of the vines.

The Brabham, T. S. No. 325, and Iron, T. S. No. 85, are two varieties that can be recommended as they are both good seed and forage yielders, both being immune to the nematode. Those varieties that are hybrids, having Iron cowpea for one of the parents, appear to show the same characteristic as regards the nematode. For early seed

yields the New Era, T. S. No. 58, is recommended. It is a semi-bunch variety, having little vine, and maturing early enough to allow two plantings during the season, if desired.

Table 16.—Seed yields of varieties of cowpeas for six years, 1913 to 1918, inclusive.

T. S. No.	Variety	Acre Yield in Bushels						Average	Rank
		1913	1914	1915	1916	1917	1918		
60	Clay	2.46	4.55	11.80	12.80	4.353	7.905	7.311	1
56	Unknown	3.11	3.41	7.90	11.00	3.036	14.208	7.110	2
58	New Era	4.65	5.20	11.30	10.80	8.854	1.375	7.029	3
59	Whippoorwill	3.53	4.59	7.10	10.70	.859	14.781	6.926	4
85	Iron	3.20	3.60	6.60	9.50	3.150	12.603	6.442	5
86	Groit	3.36	5.61	4.10	15.20	.859	4.927	5.672	6
204	Iron-Whippoorwill	4.35	5.36	5.60	7.70	2.119	9.796	5.486	7
87	Blackeye	2.46	2.45	4.60	11.50	5.041	2.749	4.799	8
57	Red Ripper	.78	6.16	6.50	9.90	.830	3.666	4.639	9
214	Red Ripper	4.91	1.92	4.90	7.50	1.947	3.435	4.102	10

It is seen that Clay, Unknown, New Era, Whippoorwill, Iron, Groit, and Iron-Whippoorwill rank in order named. The results for the six years agree with those for the three years previously presented. The Brabham and some other varieties have not been tested for a longer period than three years.

VARIETY TEST FOR FORAGE.

Nineteen varieties of cowpeas were used in this test during 1917 and 1918. The varieties were planted in 36-inch rows, and as with all variety tests conducted a constant was used between the different plats, and every tenth row was a soil check. The yields in pounds of cured forage are shown in the following table:

Table 17.—Forage yields of varieties of cowpeas.

T. S. No.	Variety	Acre Yield in Lbs.		Average	Rank
		1917	1918		
60	Clay	1737.00	3410	2573.50	1
56	Unknown	1282.25	3450	2366.12	2
85	Iron	1875.00	2420	2147.5	3
753	Japanese Blackeye	1113.75	3080	2096.87	4
197	Iron-Blackeye	2158.25	2035	2096.625	5
325	Brabham	2172.5	1925	2048.75	6
204	Iron-Whippoorwill	2145.00	1705	1925.00	7
196	Iron-Blackeye	2145.0	1540	1842.5	8
211	Early Buff	1278.72	2025	1651.86	9
87	Blackeye	1815.00	1430	1622.5	10
86	Groit	1072.50	2145	1608.75	11
2297	Cream	1526.00	1485	1505.50	12
215	Holstein	1375.00	1485	1430.00	13
685	Black Crowder	1636.25	1210	1423.125	14
206	Iron-Whippoorwill	1003.70	1760	1381.85	15
58	New Era	1072.50	1485	1278.75	16
214	Red Ripper	940.00	1485	1212.5	17

Any of the varieties making a ton and over of cured forage to the acre can be recommended. The peas which in this test followed oats, were planted in June.

More cowpeas should be planted in East Texas for forage, as both the soil and the climatic conditions are adapted to their growth. In

comparing the total dry matter and the digestible nutrients in cowpeas with alfalfa, we find the following:

Forage	Total Dry Matter Per Cent	Protein Per Cent	Carbo-hydrates Per Cent	Fat Per Cent
Alfalfa	91.9	10.5	40.5	0.9
Cowpea	89.5	9.2	39.3	1.3

When one considers the amount of fertility in cowpeas, he finds that one ton of cowpeas contains 43 pounds of nitrogen, 4.6 pounds of phosphorus, and 32 pounds of potassium. Therefore, we recommend the growing of cowpeas, not only as a forage crop, but also as a green manure crop to plow under. Cowpeas which have been plowed under will supply organic matter and plant food, and thus they save the cost of expensive commercial fertilizers.

SOY BEANS.

A variety test with soy beans, in which nine varieties of beans were used, was conducted in 1916 for forage yields. This legume, being one of the oldest legumes known to man, is grown only to a limited extent in Texas. The planting and cultivation is similar to that of the cowpea. The highest yielders in the test were Meyer, T. S. No. 228, yielding 3080 pounds of cured forage to the acre; the Austin, T. S. No. 224, with 2200 pounds to the acre; the Peking, T. S. No. 221, yielding 1177.5 pounds to the acre. Some very promising yields have been had, yet it is not considered that either the best varieties for the region have been found or the best method of culture.

CANADA FIELD PEA.

The Canada Field pea is a winter legume, and is best planted with oats; both peas and oats were planted at the rate of 60 pounds to the acre broadcast. Four varieties were used: Golden Vine, Blue Bell, Scotch Blue, and Kaiser. The peas and the oats were planted on January 11, but were injured by a low temperature of 15 degrees F. in February, which damage reduced the yields. Blue Bell was the highest yielder, with 900 pounds of forage to the acre. This preliminary test, on account of the damage received from low temperature, does not indicate the value of this legume as a winter crop, and further tests are being made, as a winter legume is badly needed in the cropping system of East Texas.

PEANUTS.

This crop is well adapted to the sandy soils of East Texas, and during the last three years, owing to the demand for the oil, the acreage has greatly increased in the eastern and southeastern counties of the State. At present the Spanish peanut is the only variety acceptable to the mills. The Valencia and the Tennessee Red, although giving higher yields, are of no commercial value for milling, on account of the color of the kernel covering which discolors the oil.

Some work has been done toward determining the value of wide and

narrow rows, and of cracked seed-pods as compared to uncracked seed-pods. The results are presented in the following table:

Table 18.—Width of row and method of preparing peanut seed for planting in 1916.

	Yield in Pounds to the Acre			
	18 Inch Rows		36 Inch Rows	
	Nuts	Forage	Nuts	Forage
Shells not cracked	590	1230	570	2330
Shells cracked	800	1580	590	1890
Average	695	1405	580	2110

It is seen from the above results that better yields of nuts were obtained from the planting in narrow rows, but the forage yield was greater from the wide rows. Previous work has shown better yields of nuts from narrow rows, where other conditions are equal. It seems advisable, therefore, to plant the peanut seed in rows as close as will allow easy cultivation.

The table shows that the nuts prepared by cracking the pods have a slight increase in yield over the nuts which were not cracked, due to a slightly better stand.

Peanuts are undoubtedly of great value as a hay crop, as the test for forage yields shows. The feeding value of peanut hay is high, and the crop can be planted, as a catch crop following oats, any time in June for hay. In 1917 three acres of peanuts were planted on the Station after oats on July 24, and under the existing drouth conditions produced 3420 pounds of hay and 54 bushels of peanuts, or 1140 pounds of hay and 18 bushels of nuts to the acre.

CROP INTRODUCTION TESTS.

SUDAN GRASS.

This valuable hay-grass was first tested out on the Station in 1912, along with other new crops. The results of these early tests are shown in Bulletin No. 237 of this Station. In 1917 the seeding rate test was continued using three, six, nine, twelve, fifteen, and twenty-five pounds of seed to the acre. The following table shows the results of this test:

Table 19.—Forage yields of Sudan grass in seeding rate test, 1916.

Seeding Rate Per Acre, Pounds	Yield Forage Per Acre, Pounds
3	1300
6	1400
9	1600
12	2300
15	2600
25	3000

The heavy seeding rate yielded best in this test. The seed was planted in 36-inch rows, which are wide enough to give plenty of room

for cultivation. In all tests conducted with Sudan grass the row-plantings have given larger yields than broadcast-plantings. Sudan grass is now one of the standard grasses of East Texas and will be grown more and more each year.

While Sudan grass is a valuable hay crop in this agricultural region, it occupies a very prominent place in the formation of summer pastures. It produces very rapid growth and therefore provides almost continuous pasture throughout the growing period.

SORGHUM.

Nine new sorghums, importations received through the U. S. Department of Agriculture, were tested for their crop possibilities under conditions in this agricultural region. Three of these sorghums produced exceptionally large forage yields, and may, after more thorough testing, prove to be of superior value as silage crops.

TEFF GRASS, T. S. NO. 1526.

A small amount of seed of this African grass was received from the Department of Agriculture and was planted in the spring of 1917. The grass grew to a height of 24 inches, was killed down by a temperature of 18 degrees F., reseeded itself, and made a good growth during 1918. From indications it may be possible that Teff grass will become a good pasture grass for this section of the State.

RUSSIAN FLAX.

This test was conducted to determine the best time to plant Russian flax. Plantings were therefore made every two weeks, beginning in November, 1917, and ending in March, 1918.

Table 20.—Yields of flax in date of seeding test.

Date Planted	Seed Yield Acre, Pounds
November 27, 1917	No yield
December 1, 1917	41.25
December 15, 1917	55.0
January 1, 1918	82.5
January 15, 1918	82.5
February 1, 1918	274.5
February 15, 1918	275.0
March 7, 1918	357.5

The flax planted in November was killed by low temperature the following January. The highest yields were obtained from seed planted on February 15 and March 7, 1918, as shown in the above table.

BILOXI SOY BEAN.

This soy bean was received from Mr. Tracy of Biloxi, Mississippi. This variety is a rank grower and is well adapted for forage. One-half acre planted in 1918 produced 1990 pounds of cured forage or at the rate of 3980 pounds to the acre.

MISCELLANEOUS FOREIGN INTRODUCTIONS.

Of three foreign introductions *Amostra dehervillas,* T. S. No. 2974, proved very promising. This plant has a viney growth similar to the cowpea, and is a native of Brazil. The blooms and the fruiting habit are the same as those of the pea, and it appears to be well adapted to the soil and the climatic conditions of Texas. Seventeen plants yielded 19.5 pounds of cured forage, which would be at the rate of 9210 pounds to the acre.

Guandu, T. S. Nos. 2992 and 2993, was secured from Brazil and is known as Pigeon-pea. This plant is supposed to have been brought from India to Mexico, and is widely grown in the tropics and in subtropics for human food. The plants made good growth on the Station, but failed to mature any peas before being killed by frost.

Sesame, T. S. No. 2935, was secured from Mexico and is considered valuable for flour and oil. This plant was, also, imported from India to Mexico, and was a crop of the ancient Egyptians from two to three thousand years ago. This plant blossomed freely here and produced plenty of seed, but the plants were killed down by a temperature of 30 degrees F. The forage appears to be of no value as a stock feed, as cattle will not eat it either green or cured.

TRUCK CROPS.

During 1916 and 1917 tests were conducted with varieties of radishes, English peas, snap and lima beans, Irish potatoes, lettuce, and during 1918 also with watermelons and cantaloupes, to determine the varieties best adapted to the soil and climatic conditions of East Texas, in regards to quality and yield.

RADISHES.

Twelve varieties were planted. Very little difference was noticed in the rapidity of growth. The round varieties, however, matured earlier than the long varieties. White Summer Turnip, T. S. No. 2239, and White Strasburg, No. 2286, were two of the highest in quality and yield.

ENGLISH PEAS.

Sixteen varieties were planted. Champion of England, T. S. No. 2215, and Buttercup, T. S. No. 2217, were the best yielders. The running varieties were more prolific than the dwarf varieties.

BEANS.

Fourteen varieties of both snap and wax beans were planted. Stringless Green Pod, T. S. No. 2227, Golden Wax, T. S. No. 2220, were the highest yielders, while Round Six Weeks, T. S. No. 2229, and Hopkins Red Valentine, T. S. No. 2228, gave equally as good yields. No difference was found in the quality of the varieties tested.

LETTUCE.

Six varieties were planted, all of which made good growth. Prize Head, Big Boston, and Iceberg were all good quality.

IRISH POTATOES.

In 1916 seven varieties of Irish potatoes were tested, but in 1917, owing to the unusual conditions then existing, only two varieties were planted. In 1916 Early Rose, T. S. No. 2272, gave the highest yield of 122.933 bushels to the acre. Dreers Early Standard, T. S. No. 2267, and Bovee, T. S. No. 2270, each yielded 115.5 bushels to the acre. All varieties produced sound merchantable potatoes free of disease. In 1917 Irish Cobbler and Bliss Triumph were the only two varieties planted. The Irish Cobbler yielded 86 bushels, and Bliss Triumph, 66 bushels to the acre. The quality of all the high yielding varieties was good.

WATERMELONS.

Sixteen varieties of melons have been tested each year for the past three years. The long varieties of melons are better than the round varieties both in yield and quality. The quality of most of the round varieties was poor. The Tom Watson, T. S. No. 2289, is a good melon and the best variety for shipping. The Rattlesnake, Kleckley, Halbert Honey, Florida Favorite, and Alabama Sweet are all good varieties.

CANTALOUPES.

Twelve varieties of cantaloupes and musk-melons were planted. The netted Rocky-Ford and Paul Rose were by far the best quality cantaloupes in the test.