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TEXAS AGRICULTURAL EXPERIMENT STATION

ULLETIN NO. 215 · MAY, 1917

PROGRESS REPORT, SUBSTATION NO. 5, TEMPLE, TEXAS

1910-1914

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COLLEGE STATION, BRAZOS COUNTY, TEXAS.

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†In cooperation with A. & M. College of Texas.
‡In cooperation with United States Department of Agriculture.

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FOREWORD.

The annual progress reports of the various substations may be considered part of the general annual report. Much credit is due Mr. A. B. Conner, in his capacity as Vice Director, and Mr. A. H. Leidigh, in his capacity as Agronomist, for painstaking work in checking figures and editing this and all other substation progress reports, and grateful acknowledgment is hereby made.

B. YOUNGBLOOD,
Director.

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PROGRESS REPORT, SUBSTATION NO. 5, TEMPLE, TEXAS, 1910—1914.

By D. T. Killough, B. S., Superintendent.

INTRODUCTORY.

Substation No. 5 of the Texas Agricultural Experiment Station system is located four and one-half miles southwest of Temple and four miles northeast of Belton, in Bell County. This substation was established in 1910, to serve the central black land region of Texas. Because of the necessity of developing the farm, the first actual crop work was started in 1911. Since that time, many valuable and interesting experiment results have been secured, and much of the information thus secured has been given immediate publication in Station bulletins, in the annual reports of the Director, and in the press. This report is the first separate bulletin issued by the Station upon the work of Substation No. 5, and covers the work done at Temple from the establishment of the substation to and including the crop season of 1914.

When it was decided to place a substation in this vicinity, a number of sites were considered, and the present location was chosen, partly at least, because of its accessibility to the public. A fine pike road connecting Temple and Belton passes immediately in front of the substation, and an interurban line and the Gulf, Colorado & Santa Fe Railroad parallel this pike.

The site selected for the substation consists of ninety-six acres of land, thirty acres of which has long been in cultivation, the remaining land being in pasture and woodland. This land has been surveyed and mapped into 8x20-rod acres, for crop experiment work.

The farm is well fenced, and cross-fenced, with hog-proof fences. The buildings at this time consist of a superintendent's cottage of four rooms, costing approximately twelve hundred dollars; a four-room laborer's house; a barn 28x42 feet, and a small outhouse, which serves the combined purposes of office, workshop, and seed room. There is also a combination implement and tool shed.

The substation is locally in charge of a superintendent. Practically all of the experiment work is planned and supervised by the Director, with the assistance of members of the scientific staff of the Station.

During the first year of the substation's existence, little experiment work was attempted, as the land had to be blocked out and handled in such a way as to bring it to a uniform condition. Such improvements as were absolutely necessary were made at that time, and equipment and accessories suitable for field experiment work were purchased.

In 1912 definitely outlined systems of rotation were established on

all of the blocks of acres making up the parts of the farm suited to definite experiment use. These rotations have been of great value, not only in maintaining the land, but also in improving it. From and including the season of 1912, all of the experiments have been based upon definite projects. A considerable amount of the work under way is of such nature that dependable results may scarcely be expected in this short time. Attention has been given, however, to many local problems which have presented themselves, and only a small part of the farm has been devoted to long-time experiments, which are so technical that immediate value would not be secured from the first few years of work. In 1914 hogs were secured for experiments, but up to that time all work had been with crops, soils, and fruits.

As a result of the policy just outlined, there is becoming available here a rapidly increasing amount of data, which it is believed is important enough to justify publication. It is intended hereafter to publish at least one bulletin from this substation each year.

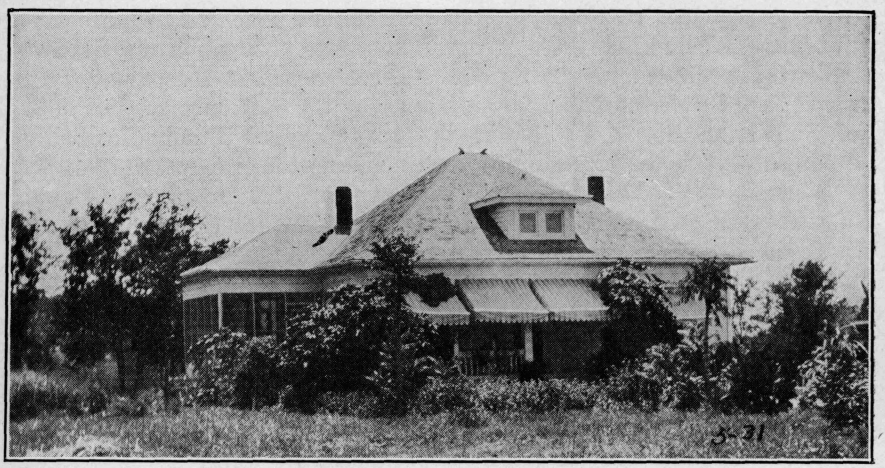

Figure 1. Superintendent's Cottage, August, 1914.

METEOROLOGICAL DATA.

Since 1913 there have been kept at this substation very complete weather records. These records include the amount and distribution of the rainfall, the temperature, the amount of moisture in the air, the amount of evaporation, and the wind movement records. These records give very definite information as to the effect of the weather on the experiments under way, and thus supplement the rainfall and temperature data collected by the United States Weather Bureau, through the co-operative observer at Temple. In agricultural experiments it is necessary to know just how the weather of a given year compares with the normal weather conditions. The accompanying table shows the rainfall of the locality for a period of twenty-six years, from 1889 to and

including 1914. It will be seen that the annual rainfall has varied from 20.45 to 59.28 inches, and that the average annual rainfall is 35.07 inches.

Of the years covered by the crop experiments reported herein, 1912 was dry, and both 1913 and 1914 received more than the average annual rainfall. Throughout these three years, however, there was unusually dry weather in the early summer, and as a result of this dry summer weather the corn crops were much smaller than what is supposed to be a fair average for this section. Conditions for the production of cotton, however, have been more favorable than for corn.

TABLE 1—PRECIPITATION RECORD.

Data from Cooperati ve Observer, United States Weather Bureau, Temple, Texas, Except 1914, Secured by Substation No. 5, Temple.

Year.	Annual Precipitation in Inches.
1889	47.99
1890	35.29
1891	31.84
1892	29.60
1893	21.45
1894	32.39
1895	34.49
1896	31.11
1897	37.05
1898	28.75
1899	33.36
1900	48.98
1901	20.45
1902	59.28
1903	31.99
1904	30.69
1905	49.83
1906	31.55
1907	36.06
1908	37.92
1909	27.11
1910	27.25
1911	27.67
1912	29.41
1913	43.65
1914	46.74
Average for 26 years	35.07

EXPERIMENT DATA.

The results given in this bulletin refer to testing, improvement and production studies with cotton, cowpeas, soy beans, Sudan grass, corn, and the grain and forage sorghums, as well as rotation work and experiments comparing different methods of soil preparation.

MISCELLANEOUS TESTS.

Tests which have been under way, but which have not been carried to the point where conclusions are possible, include experiments with varieties of winter wheat, winter oats, winter barley, and tests of newly introduced clovers and alfalfas.

FRUITS.

One of the most noticeable shortcomings on a farm in this part of the State is a lack of fruit trees, grapes, and garden crops. In the

attempt to find satisfactory varieties for these purposes, there have been planted on the substation at Temple 503 grape vines, fruit trees, and nut trees, consisting of:

5 varieties of pears
6 varieties of apples
7 varieties of peaches
3 varieties of plums
9 varieties of pecans
22 varieties of grapes.

Experiments with truck and garden crops have also been conducted on a small scale, and this work is being enlarged from year to year.

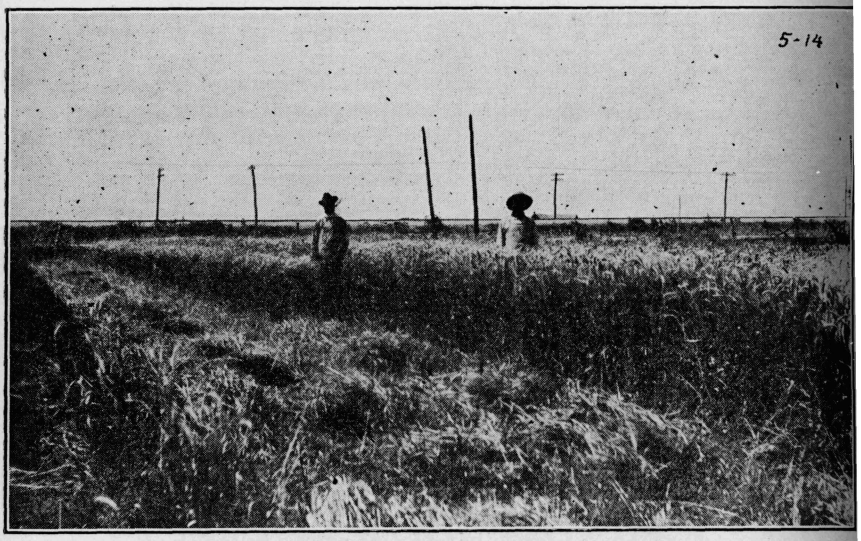

Figure 2. Wheat Experiment Plats, June 8, 1913.

No definite conclusions have been reached for these horticultural investigations. Enough work has been done, however, to make it evident that, except in so far as root rot of trees is concerned, there is no reason why a farm in this section may not be supplied with home-grown fruit, as well as in any other part of the State.

CROP ROTATION.

Perhaps the greatest handicap this substation faced at the time of its establishment was the relatively low producing power of the fields. This condition is very common to farms in this section. Experiments here indicate that plant food is not greatly needed by this soil. What is needed is early and thorough preparation of the land, and systematic rotation, which will free the fields of root rot and at the same time supply the soil with an abundance of humus-forming material.

The most practical method of keeping up the crop yields will be by means of manure and the use of a systematic rotation of crops. Such a system will require a diversification of crops on the farm, and will give a more uniform demand for labor of both men and teams. Many farmers are afraid to adopt advanced methods of crop rotation, for fear of the cost involved. Systematic cropping should pay its way. Experiments are being conducted with various practices, to determine

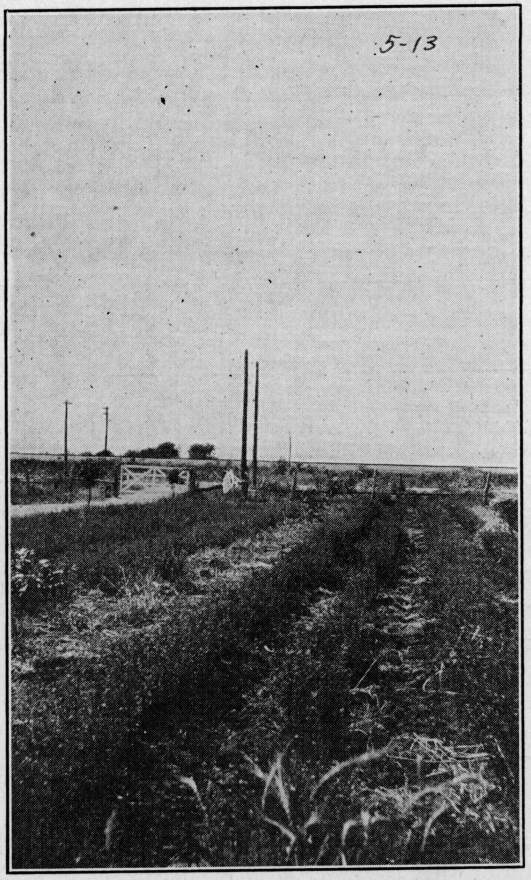

Figure 3. Variety Test of Alfalfa and Clovers, 1912.

the exact results secured from rotations. A rotation containing cowpeas, which may be plowed under for green manure, has given uniformly good results. Direct and in fact large gains are thus secured.

In 1914 the results began to be available from the experiments established to determine the effect of rotation on the yield of crops. The results available now are shown in the following table.

TABLE 2—ROTATED COTTON VERSUS COTTON FOLLOWING COTTON.

Treatment of Land.	Number of Plats.	Yield of Seed Cotton to the Acre in Pounds.
Rotated	2	849.87
Not rotated	2	522.90
Gain for rotation		326.97

The rotation seemed to reduce very materially the loss from root rot,—a fact of no small importance to the entire cotton-growing region. In fact, part of the low yields of "one crop" farms is due to this disease. A change of crops, with the plowing under of legumes, is the sanitary treatment needed; it will lessen the disease and increase crop production. Not only has rotation paid with cotton, but it has paid with corn, as the following figures will show:

TABLE 3—CORN IN ROTATION VERSUS CORN FOLLOWING CORN.

Treatment of Land.	Number of Plats.	Yield of Shelled Corn to the Acre in Bushels.
Rotated	2	25.60
Not rotated	2	17.00
Gain for rotation		8.60

A satisfactory cropping plan is as follows:

One-fourth of the land in cotton.

One-fourth of the land in corn, the soil to be given a very deep plowing at least one year in four.

First year—Corn: Plant to small grain in the fall.

Second year—Winter oats, winter barley or winter wheat: Plant to cowpeas same week as harvested; plow the cowpeas under very deeply in the early fall.

Third year—Cotton.

Fourth year—Cowpeas or peanuts: Plow under the stubble and aftergrowth.

Fifth year—Corn again.

Another rotation that is giving good results is one in which, each year, one-third of the land is planted to cotton and one-third of it put in corn, the cultivated area being given a very deep plowing at least one year out of three.

First year—Corn: In six-foot rows with cowpeas planted in the middles when corn is two feet high. Plow very deeply early in the fall.

Second year—Cotton: Plant in small grains in the fall or in Sudan in the spring.

Third year—Small grain or Sudan: If in small grain, plant to cowpeas the same week as harvested, and in the fall plow this crop under for

green manure. If in Sudan, plow the last crop and the stubble under early in the fall.

COTTON ROOT ROT.

Root rot (*Ozonium omnivorum*) is the cause of almost incalculable crop losses in this part of Texas. This plant disease is present in practically all of the land in the region served by this substation and it is a common disease on the substation land. The disease attacks not only cotton, but also fruit trees and such crops as cowpeas, soy beans, clovers and alfalfa. It does not attack grasses, corn, sorghum, or small grains.

The root-rot disease is due to the infestation of the surface soil by continuous planting of cotton and legume crops which foster the disease. It is not known how to cure the disease, but experiments here show that lack of crop rotation coupled with exhaustive and poor farming practices, causes heavy infestation of the land with the disease. Where rotation is practiced and good farming methods are followed, the severity of the losses is much lessened. And this is especially true where the rotation allows of the plowing under of a large amount of humus-forming material.

In 1914 cotton on land previously cropped to cotton continuously, with no rotation, suffered a loss of 59 per cent. of the cotton plants by root rot, whereas in the four-year rotation only six-tenths of 1 per cent. of the cotton plants were killed by root rot. Deep plowing aided somewhat in controlling the disease. This was due to the fact that plants on shallow-plowed plats seem to be attacked early in the season. The disease is of such importance and causes such heavy losses that steps are being taken to devote more attention to the study of the disease.

COTTON VARIETY TEST.

The cotton variety test embraced fifty-four varieties in 1912, ninety-four varieties in 1913, and sixty-seven varieties in 1914. The following table shows the six highest yielding varieties in the order of yield, based on an average for the three years:

TABLE 4—COTTON VARIETY TEST—1912, 1913 AND 1914.

T. S. No.	Variety.	Source.	Average Yield to Acre, Pounds Lint Cotton.
135	Union Big Boll	H. G. Hastings & Co., Atlanta, Ga	339.82
11	Lone Star	D. M. Crenshaw, Waco, Texas	339.39
152	Mortgage Lifter	H. G. Hastings & Co., Atlanta, Ga	317.34
153	Truitt	N. L. Willet Seed Co., Augusta, Ga	295.80
16	Crowder	E. A. Crowder, Marquez, Texas	294.59
130	Bank Account	H. G. Hastings & Co., Atlanta, Ga	266.12

The Union Big Boll is a very short staple variety, but has been a good producer.

An average yield for the two years, 1912 and 1913, showed varieties to rank as follows:

1. Lone Star.
2. Union Big Boll.
3. Virgatus.
4. Lone Star.
5. Mebane.
6. Rowden.
7. Triumph (Sander's selection).
8. Jackson.

Considering the length of staple and other qualities, the Lone Star produced best results in this test.

COWPEAS.

The best legume for use in rotations and for a general crop in this region is the cowpea. This is a matter of common knowledge.

The legume investigations at this substation are twofold in their purpose. First, based on the known excellence of the cowpea, it is desired to find new sorts or to improve those already available, and to find what variety is best. Varieties are being tested, to the end that the best cowpea for this part of the State may be definitely known and that seed may be made available. Second, it is desired to test out all kinds and types of legumes in order to show whether or not any of the new or little known kinds are of any value here.

That the cowpea varieties most widely known to the farmers are not as satisfactory varieties as may be found, is shown in the variety tests now under way.

Cowpea Variety Test for Seed Production.

The cowpea variety test included seven varieties in 1912, eighteen varieties in 1913, and seventeen varieties in 1914. A summary of the results secured for the three years is shown in the following table:

TABLE 5—COWPEA VARIETY TEST FOR SEED, 1912, 1913 AND 1914.

T. S. No.	Variety.	Source of Seed.	Average Yield. Pounds Seed to the Acre.			
			1912–14.	Rank.	1912-13-14.	Rank.
215	.....	U. S. Department of Agriculture*..	291.15	1	.....	.....
58	New Era....	T. W. Wood & Sons, Richmond, Va.	273.34	2	404.25	1
218	.....	U. S. Department of Agriculture*..	268.40	3	.....	.....
86	Groit.....	U. S. Department of Agriculture*..	258.06	4	.....	.....
214	.....	U. S. Department of Agriculture*..	208.71	5	.....	.....
190	.....	U. S. Department of Agriculture*..	202.27	6	.....	.....
54	Brabham....	T. W. Wood & Sons, Richmond, Va.	172.76	7	143.68	2
57	Red Ripper..	T. W. Wood & Sons, Richmond, Va.	162.55	8	112.70	6
55	Iron.....	T. W. Wood & Sons, Richmond, Va.	149.56	9	143.04	3
219	.....	U. S. Department of Agriculture*..	134.68	10	.....	.....
56	Wonderful...	T. W. Wood & Sons, Richmond, Va.	134.63	11	89.75	7
59	Whippoorwill	T. W. Wood & Sons, Richmond, Va.	123.22	12	118.98	4
60	Clay.....	T. W. Wood & Sons, Richmond, Va.	122.46	13	112.97	5
87	Blackeye....	U. S. Department of Agriculture...	113.69	14	.....	.....
50	Peerless.....	N. L. Willett Seed Co., Augusta, Ga.	72.85	15	50.23	8
208	.....	U. S. Department of Agriculture...	72.18	16	.....	.....

*Forage crop investigations.

Of the common varieties grown, New Era, Iron, and Brabham were good yielders. In the two-year test, T. S. No. 215, New Era, T. S. No. 218, and Groit were the best yielders, in the order given.

Cowpea Variety Test for Forage.

A cowpea variety test for forage in 1912 showed the following yields for different varieties:

TABLE 6—COWPEA FORAGE TEST.

Name of Variety.	Pounds Cured Forage to the Acre.
Iron	3476
Clay	3476
Whippoorwill	2244
Brabham	1760
Unknown	1540
Red Ripper	1276
New Era	1266
Peerless	966

These plats became infested with cotton root-rot disease, and, therefore, results are not wholly reliable. They are indicative, however, of forage yields of the varieties tested.

SOY BEAN VARIETY TEST.

Tests with soy beans have been conducted each year since the establishment of the substation, but these beans have given very disappointing yields. Twelve varieties were tested in 1912, twelve varieties were tested in 1913, and eleven varieties were tested in 1914, covering a total of fourteen different varieties, of which nine varieties were tested in all three of the years. Of those tested each year for three years, the following is the average yield of seed to the acre, in bushels of sixty pounds:

TABLE 7—SOY BEAN VARIETY TEST, 1912, 1913 AND 1914.

T. S. No.	Variety.	Source.	Average for Three Years' Yield in Bushels to the Acre.
228	Meyer	U. S. Department of Agriculture*	3.9
224	Austin	U. S. Department of Agriculture*	2.5
223	Virginia	U. S. Department of Agriculture*	2.4
220	Wilson	U. S. Department of Agriculture*	2.1
229	Ito San	U. S. Department of Agriculture*	2.0
225	Cloud	U. S. Department of Agriculture*	2.0
62	Mammoth	T. W. Wood & Son, Richmond, Va	1.7
227	Taha	U. S. Department of Agriculture*	1.4
230	Jet	U. S. Department of Agriculture*	1.0

*Forage crop investigations.

From the foregoing table it will readily be seen that varieties of soy beans suitable for this climate have not yet been secured. The fourteen varieties tested represent the varieties most easily obtained on the market.

GRAIN SORGHUMS.

This region may hardly be regarded as being in the grain sorghum section, but very satisfactory grain sorghum crops have been secured. On the whole, feterita has made somewhat the best yields. The weight of the crop of seed in the head is very nearly the same as that of ear corn, acre for acre. It should be noted, however, that the three past summers have been very dry, and therefore favorable to the production of grain sorghum, whereas they were exceedingly unfavorable for corn. It is thought that grain sorghum will not be so good a crop as corn to grow through a series of years in this locality. Experiments, however, indicate that it is possible for feterita to be used as a catch crop, or, in case of emergency, for midsummer planting.

Figure 4. Variety Test of Corn, June 8, 1913.

SORGOS.

Sorgo variety tests indicate that in this region the variety named sumac has made uniformly better yields of forage and hay than other varieties.

SORGHUM-LEGUME MIXTURE.

In 1912 comparison was made with sorghum and cowpeas planted together for hay. Two different kinds of sorghums and four kinds of cowpeas were used. The hay crop harvested from these mixtures was very good. These experiments did not show that any special variety of cowpeas was better than another for this purpose. Sumac sorghum was better than amber sorghum for use in the mixture. Planting at the rate of twenty pounds of seed to the acre, consisting of one part of cowpeas and eight parts of sorghum, gave a yield of 8350 pounds of cured hay to the acre. The heaviest planting gave the best yields.

Experiments with these mixtures of non-legume hay crops with legume hay crops do not indicate that satisfactory crops will be secured from such mixtures. Furthermore, the results show that in general it will be more satisfactory to raise each one of the crops by itself and then, if desirable, mix the hay when feeding.

CORN VARIETY TEST.

A corn variety test included twelve varieties in 1912, forty-eight varieties in 1913, and eighty-two varieties in 1914. The results in 1912 were of a preliminary nature, when the following varieties ranked in the order mentioned, in yield of shelled corn to the acre:

1. Laguna.
2. Singleton's Strawberry.
3. Red Indian Chief.
4. Oklahoma White Wonder.
5. Taylor's Red Cobbed.
6. Hastings' Prolific.

During the seasons of 1913 and 1914 the tests were considered very dependable. In the order of their rank the average yields of twenty varieties tested are shown in the following table:

TABLE 8—CORN VARIETY TEST.

Variety.	Source.	Average Yield 1913-1914 Bushels.	Rank.
Surcropper	A. M. Ferguson, Sherman, Texas	33.87	1
Mammoth White	Substation No. 5, Temple, Texas	31.74	2
Cater's Corn	Sam Cater, Temple, Texas	31.09	3
U. S. Selection 77	U. S. Department of Agriculture*	28.99	4
Chisholm	A. M. Ferguson, Sherman, Texas	28.84	5
U. S. Selection 159	U. S. Department of Agriculture*	28.67	6
St. Charles	Chris Reuter, New Orleans, La	27.18	7
Fentress Strawberry	J. L. F. Fentress, San Saba, Texas	27.08	8
Blount's Prolific	T. W. Wood & Son, Richmond, Va	25.38	9
Wisconsin White Dent	Chris Reuter, New Orleans, La	24.99	10
Oklahoma White Wonder	Texas Seed and Floral Co., Dallas, Texas	24.15	11
Mastodon Dent	Storrs & Harrison, Painesville, Ohio	23.29	12
Cocke's Prolific	T. W. Wood & Son, Richmond, Va	23.11	13
Chappell	U. S. Department of Agriculture*	20.52	14
Snowflake	T. W. Wood & Son, Richmond, Va	20.42	15
Mortgage Lifter	Storrs & Harrison, Painesville, Ohio	19.12	16
Texseed Giant White	Texas Seed and Floral Co., Dallas, Texas	17.00	17
Creole	Chris Reuter, New Orleans, La	16.75	18
Blow	J. A. Blow, Bullard, Texas	14.71	19
Rogers' White Dent	U. S. Department of Agriculture*	13.65	20

*Corn investigations.

Those results show Surcropper to be the best yielder for the two-year period, followed by Mammoth White, Cater's corn, U. S. Selection 77, and Chisholm.

Work has been done each year toward determining the ability of individual ears of corn to produce good yields. This work has shown much variation in the yielding powers of different ears. The best producing strains, when determined, are increased. Approximately one acre has been devoted to this ear-to-row work. In addition to the information pertaining to the yielding power of different ears, notes have been secured as to the physical characters of the different ears planted.

In 1914 an experiment was conducted to determine the relation between certain characters of corn and the yielding power of the corn. These tests show that with a good stand of corn the following facts hold good:

1. Tapering ears compared with ears of various shapes gave slightly the largest yields.
2. The deep-grained ears made the largest yields, when compared with ears having shallow grains.
3. The large ears made slightly the largest yields, when compared with ears of various sizes.
4. Comparing ears of different weight, the heaviest ears made slightly the largest yields.
5. The weight of the ear per unit of length seemed not to influence the yield.
6. The weight of the cob seemed not to influence the yield.
7. The weight of the cob per unit of length seemed to show that light weight favored large yield.
8. High stalks favored large yield.
9. Large (circumference of stalk) stalks made larger yields than small stalks.
10. Stalks having the largest number of leaves to the stalk made much larger yields than those having few leaves.
11. The stalks having a large percentage of brace roots made smaller yields than stalks having a tendency to produce fewer brace roots.
12. Stalks that produced a large number of branches in the tassels made a slightly larger yield than those that had fewer branches.
13. Stalks that produced a tassel having a long central or main branch yielded less than where this member was short.

These results may be summarized to mean that seed corn should be selected from a good stand of corn from tall, leafy plants which are relatively heavily stalked, and that large, heavy ears with deep grains should be chosen.

It is thought that, with these facts determined, more progress will be made in the future at this substation, along the line of corn improvement.

CORN SEEDING-RATE TEST.

A seeding-rate test with corn was conducted during the seasons of 1912, 1913 and 1914, with the results shown in the following table:

TABLE 9—CORN SEEDING RATE TEST.

Space, Inches Between Plants in 3-ft. Rows.	Yield in Bushels to the Acre.				
	1912	1913	1914	Average 1912, 1913 and 1914.	Average 1912 and 1914.
30	24.37	20.44	11.93	18.91	18.15
30-40	31.24	29.22	12.23	24.23	21.73
40-50	29.28	.....	16.10	.....	22.69
50-60	22.71	.....	17.20	.....	19.95
60-70	.....	.....	20.20	.....	.....
70-80	19.91	24.99	14.55	19.82	17.23

These results show that the best yields were had where the plants were spaced thirty to forty inches apart in the row. Both thinner and thicker seedings gave reduced yields. This would indicate that the corn planted in this section requires about nine square feet of ground surface to the plant for the best yield. It is of interest to note that in this experiment the wider spacing always yielded larger ears and better conditioned corn. Where condition of the corn is of importance, as in seed corn for instance, the plants should have more room than above indicated.

DISTRIBUTION OF CORN PLANTS ON LAND.

A test was conducted in 1913 and 1914 to determine the difference in yield, if any, when the same number of stalks of corn were grown on the land, but spaced differently. The three spacings placed the stalks in checks three by three feet on the land; in rows six feet apart with stalks one and one-half feet apart in the rows, and with rows three feet apart in pairs nine feet apart with stalks eighteen inches apart in the rows. These three spacings all carried the same number of stalks to the plat or acre.

The results secured are shown in the following table:

TABLE 10—EFFECT OF DISTANCE OF HILLS ON YIELD.

Manner of Distributing Hills.	Year.	Yield in Bushels to the Acre.	Average Yield in Bushels to the Acre.
Spaced 3 x 3 feet	1913	22.84	.....
Spaced 3 x 3 feet	1914	33.80	28.32
Spaced 6 x 1 1-2 feet	1913	22.73	.....
Spaced 6 x 1 1-2 feet	1914	23.40	23.06
Spaced in pairs of 3-ft rows 9 feet apart—stalks 18 inches apart in rows	1913	21.26	.....
Spaced in pairs of 3-ft. rows 9 feet apart—stalks 18 inches apart in rows	1914	23.40	22.33

It is seen that the best average yields of corn were had from stalks spaced three by three feet on the land. The variation from year to

year, however, indicates that this difference would not be as large as indicated by the average yield shown in Table 9. These results seem to favor a uniform distribution of plants on the land.

CORN VERSUS CORN AND COWPEAS.

An experiment was carried during the seasons of 1912 and 1913 to determine the effect of growing an intertilled crop of cowpeas in corn.

Figure 5. Corn in Double 3-Foot Rows, 9 Feet Apart, in Experiment to Determine What Method of Planting Corn Gives Best Yields, June 8, 1913.

Accordingly, in 1912, a corn plat planted in rows six feet apart was compared with a corresponding plat of corn in which cowpeas were planted. During 1913 corn plats without cowpeas were compared with other plats of corn with cowpeas, in three different methods of planting corn,—three-foot rows, six-foot rows and three-foot rows in pairs nine feet apart. Cowpeas were planted throughout this test during the latter part of the growing period of the corn.

The results secured are shown in the following table:

TABLE 11—CORN VERSUS CORN AND COWPEAS.

Year.	Width of Rows.	Corn Without Cowpeas. Yield of Corn in Bushels to the Acre.	Corn and Cowpeas. Yield of Corn in Bushels to the Acre.
1912	6 feet	19.91	16.94
1913	6 feet	22.73	22.39
1913	3 feet	22.84	26.16
1913	9 feet in pairs	21.26	16.94
Average		21.68	20.60
Loss			1.08

These results indicate that there is practically no difference in the yield of corn when cowpeas are or are not planted during the latter part of the growing period of the corn. The averages show only a slight difference in favor of the corn grown alone. The crop of cowpeas grown between the corn rows was worth more than the loss in yield of corn. As is well known, cowpeas enrich the land, and this is usually of value to the succeeding crop, rather than to the crop of corn in which the cowpeas grow.

GRASSES.

One of the needs of this section has been a grass that may be grown in cultivated land with profit and which has such a nature that the land may be planted any year thereafter to such crops as cotton and corn without a too great expense of combating the grass. Tests of new grasses introduced from foreign countries, and of hybrid grasses, have been very satisfactory.

Rhodes grass, introduced into this country from Africa, was tested. In 1914 this grass made a yield of 3823 pounds of cured hay to the acre, from the first cutting. Rhodes grass produces a very fine quality of hay, and it is also a valuable pasture grass. Tests with it will be continued.

Several hybrids, produced by crossing Texas bluegrass and Kentucky bluegrass, have made satisfactory growth; these plants were supplied by the Office of Forage Crop Investigations, United States Department of Agriculture, Washington, D. C. There are now on the substation nine distinct hybrids, every one of which has the appearance of being of value in this region.

Every one in this region knows that rescue grass is very satisfactory for an early spring pasture. The seed ordinarily retails for about 20 cents a pound. Experiments here have given a yield of 380 pounds of seed to the acre. At the current price, this seed would be worth $76.

SUDAN.

Sudan grass was planted broadcast in 1913 at the rates of twenty and thirty pounds of seed to the acre. The average yields were as follows:

TABLE 12—SUDAN GRASS TEST.

Rate.	Seed Yield in Pounds to the Acre.	Cured Forage Yield in Pounds to the Acre.
20 pounds to the acre	516	2800
30 pounds to the acre	386	4000

Figure 6. Sudan Grass Planted May 20, 1913. Photographed August 4.

It is seen that the 20-pound seeding gave better seed yields, where the 30-pound seeding gave better forage yields.

Sudan grass planted in eighteen and 36-inch rows at ten pounds to th acre in each case showed the following results:

TABLE 13—SUDAN GRASS TEST.

Rate.	Seed Yield in Pounds to the Acre.	Cured Forage Yield in Pounds to the Acre.
Planted in 18-inch rows at 10 pounds to the acre....	556	2950
Planted in 36-inch rows at 10 pounds to the acre...	361	2050

It is seen that the 18-inch row seeding gave better forage and seed yields than did the plantings in 36-inch rows.

Sudan grass planted in 1914 gave an average yield of 6534.5 pounds of forage and 147.6 pounds of seed to the acre.

It is advised that when planted broadcast thirty pounds of seed be used to the acre, but a better way to raise the crop is to use ten pounds of seed to the acre, planting in rows from three to three and one-half feet wide.

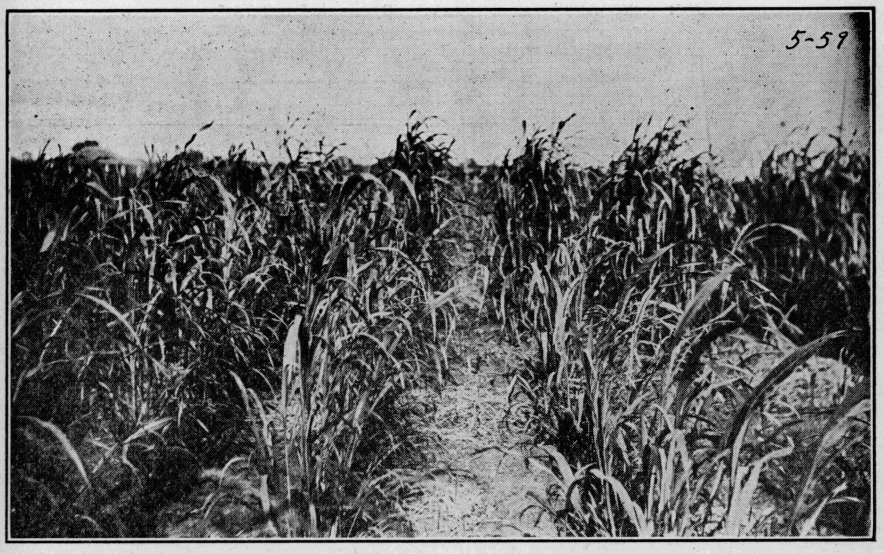

Figure 7. Sudan Grass in 3-Foot Rows, June, 1914.

Sudan grass is especially valuable for hay, but another very satisfactory use for the crop is to use it for grazing purposes. It was introduced into the United States by the Office of Forage Crop Investigations, United States Department of Agriculture, Washington, D. C., and in co-operation with the Texas Agricultural Experiment Station it was tested at this and other substations, the first success with the crop in the United States being at Substation No. 12, Chillicothe, Texas.

Sudan grass has been such a remarkably successful crop that it is now regarded as the best foreign introduction made by the Texas Agricultural Experiment Station in the last ten years.

Bulletin No. 172 of the Texas Agricultural Experiment Station gives full details regarding Sudan grass and its culture.

FERTILIZERS AND LIME.

The tests with fertilizers and lime indicate that occasionally some slight benefit may be obtained from lime and from acid phosphate on these soils. These tests were made on land in relatively poor condition and did not give so profitable gains for the amount of time and money used as were secured from rotations with cowpeas, or the gains made by variety selections of crops.

DEPTH OF PLOWING EXPERIMENT.

Not only do most farmers not plow their land deep enough, but they do not plow it early enough. There are many things to be said in favor of early plowing as a means of equalizing fall farm work and controlling insects; the best thing to say in favor of early fall plowing is that it pays its way.

In 1913 fall plowing was compared with winter plowing. This experiment resulted in a small gain in favor of fall plowing.

TABLE 14—TIME OF PLOWING TEST WITH COTTON.

Depth Plowed, Inches.	Yield of Seed Cotton in Pounds to the Acre.		
	Plowed October.	Plowed January.	Gain for October Plowing.
4	771.14	735.00	36.14
6	768.12	751.40	16.72
Average gain			26.43

In 1913 an experiment was conducted with midwinter plowing to compare deep plowing with ordinary depths of plowing for cotton. The results are very uniform, and are in favor of deep plowing.

TABLE 15—DEPTH OF PLOWING TEST.

Depth Plowed, Inches.	Number of Plats.	Yield in Pounds of Seed Cotton to the Acre.
4	1	735.00
6	1	751.00
8	2	779.15
10	2	783.50
12	1	868.12

The more shallowly plowed plats were cultivated the first time as deep as, or deeper than, they had been plowed. It is thought that but for this fact they would have made even smaller yields than were obtained.

This experiment indicates that deep plowing made a very good gain in crop yield. It must be borne in mind that deep plowing costs a great deal in comparison with shallow plowing. The differences noted here, therefore, are not net gain, but are representative simply of the gross or total crop increase received. This substation's experiments in this

connection are such as to indicate that the "ordinary" plowing and breaking in the vicinity are not deep enough.

DYNAMITING LAND AS SEED BED PREPARATION.

Dynamiting land as a method of soil and seed-bed preparation has been advocated for many widely differing regions. Those urging the use of dynamite on agricultural soils claim, among other things, that land thus "blown up" will be deeply shattered, thereby giving drainage, which will be accompanied by deep root penetration, and thus profitable increase in the crops grown will result.

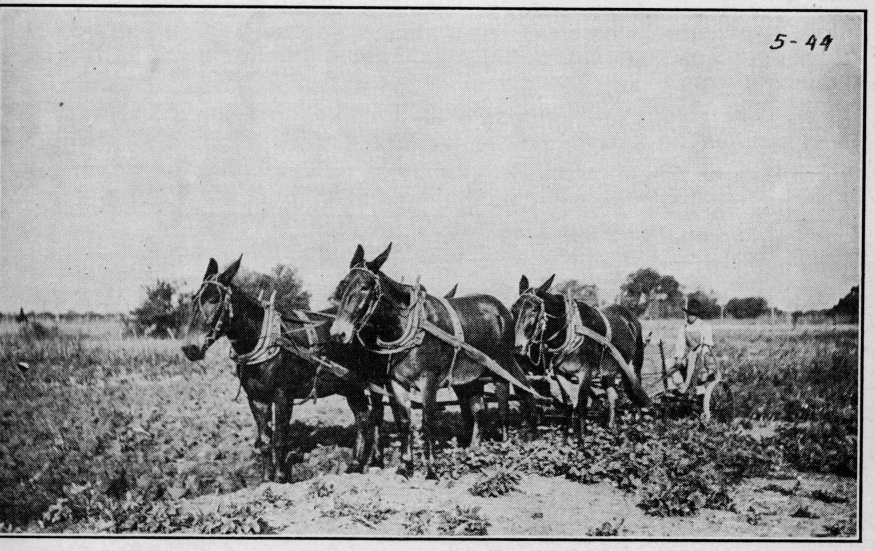

Figure 8. Team and Equipment Used in Preparing Seedbed, October, 1912.

On the type of black upland available for an experiment with dynamite on this substation, it was thought that a test of this kind should be made.

In the fall of 1911, one-half acre of land was dynamited to determine whether there would be any loss or gain in crop yield because of this practice. An adjoining one-half acre was used in comparison, being treated in every way in the same manner except that it was not dynamited. A representative of a company manufacturing explosives did the blasting. The 1912 crop was harvested, but an error was made and the results for that year are not included. The experiment evidence resulting from this dynamite test is as follows:

TABLE 16—COTTON ON DYNAMITED VERSUS NOT DYNAMITED FIELDS.

Year.	Yield Seed Cotton, Pounds to the Acre.	
	Land Dynamited.	Land not Dynamited.
1913	600	723.5
1914	936	864.0
Average for two years	768	793.7

The 1914 corn experiment on this land was damaged to such an extent by heavy rains that the stand was scattering and therefore only one year's results are available.

TABLE 17—CORN ON DYNAMITED VERSUS NOT DYNAMITED FIELDS.

Year.	Yield in Bushels of Corn to the Acre.	
	Land Dynamited.	Land Not Dynamited.
1913	23.70	25.75
Loss	2.05	

The loss on the dynamited land is very small and no greater than might have been found in comparing the adjoining half acres if all had been handled exactly alike. There seemed to be just as much lack of drainage on the one piece as on the other. Whether the dynamiting caused the small losses incurred or whether these are due to soil variation, it is certain that no increase in yield was made by dynamiting, and that the test was not profitable.

SUMMARY.

Substation No. 5 of the Texas Agricultural Experiment Station is located in Bell county, about midway between Temple and Belton. The farm consists of ninety-six acres.

The average annual rainfall, covering a period of twenty-six years, or from 1889 to 1914, inclusive, is 35.07 inches. During the period covered by this report the rainfall was especially low for the summer months of 1912, 1913, and 1914. The rainfall for the season of 1912 was very much below the normal, while for 1913 and 1914 it was above the average.

The results included in this bulletin refer to testing, improvement and production studies of corn, cotton, cowpeas, soy beans, grain and forage sorghums, Sudan grass, and rotation work and experiments in which different methods of preparation of soil are compared. Experiments with fruits and vegetables were conducted also.

Crop rotation has increased the yields both in cotton and corn. Rotation systems are recommended. Crop rotation has lessened the loss due to cotton root-rot disease, as has also deep plowing. Land

cropped continuously to cotton showed a loss of 59 per cent. due to root-rot disease, whereas cotton grown in rotation showed only six-tenths of 1 per cent. loss.

In the variety test of cotton, Lone Star has given the best results.

A cowpea variety test for seed showed the best yields for New Era, Brabham, Iron, and Whippoorwill. A variety test of cowpeas for forage showed the best yields for Iron, Clay, Whippoorwill, and Brabham.

A test including nine varieties of soy beans, through a period of three years, showed very low yields in all varieties tested, indicating that the varieties grown were not suitable to this climate and section of the State.

The grain sorghums have been grown satisfactorily as catch crops. For this purpose feterita is one of the best varieties.

Of the sweet sorghums, the sumac or red top has made uniformly better yields of forage and hay than other varieties tested.

Experiments in growing sorghum-legume mixtures do not indicate that satisfactory results will be secured from such mixtures. The results indicate that it is better to grow each crop alone.

The corn variety test, embracing forty-eight varieties in 1913 and eighty-two varieties in 1914, shows Surcropper, Mammoth White, Cater's corn, U. S. Selection 77, and Chisholm to be the best yielders, in the order mentioned.

A test of individual ears of the same variety of corn has shown some very interesting results, which when summarized indicate that seed corn should be selected from tall, leafy plants which are relatively heavily stalked with heavy ears and deep grains.

Corn seeding rate tests showed best results when plants were spaced thirty to forty inches apart in regular 36-inch rows.

When the same number of stalks of corn were grown on an acre, but spaced differently in rows of varying widths, it was found that the best yields of corn to the acre were secured from stalks spaced regularly three feet apart in rows three feet wide.

A comparison of the yields when corn alone was planted, or when corn and cowpeas were planted, showed that corn gave a slightly smaller crop when cowpeas were planted between the rows, as compared with corn grown alone. It is thought that the resulting crop of cowpeas was worth more than the slight loss in the corn.

One of the needs of this section has been a grass crop adapted to planting in rotation with the usual farm crops. Tests of hybrid grasses and newly introduced grasses from foreign countries have been very satisfactory.

Rhodes grass is a promising new introduction.

Sudan grass produced a yield of 6534 pounds of cured forage to the acre. For broadcast planting, thirty pounds of seed to the acre gave the largest yield of Sudan grass. It is advised that the crop be planted in rows, using ten pounds of seed to the acre. Sudan grass is a valuable grazing crop.

Fertilizers and lime have not given as profitable gains in crop production as has been gotten by rotation or by the use of improved crops.

Experiments are reported which show that early plowing and deep plowing gave larger crops of cotton than were secured from late plowing or shallow plowing.

Experiments in the use of dynamite as a means of fitting the soil for crops are reported and show that in both corn and cotton the land treated with dynamite made smaller yields than when dynamite was not used. The use of dynamite on this land did not give better surface drainage than where dynamite was not used.

ACKNOWLEDGMENT.

During the greater part of the period covered by this report, Mr. A. K. Short was Superintendent of Substation No. 5, and it is desired to give him due credit for conducting the experiments and recording the data presented herein.