A187-1117-10m

TEXAS AGRICULTURAL EXPERIMENT STATION

BULLETIN NO. 221 NOVEMBER, 1917

PROGRESS REPORT, SUBSTATION NO. 9, PECOS, TEXAS

1910-1914

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

AUSTIN, TEXAS:
VON BOECKMANN-JONES CO., PRINTERS,
1917

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS

W. B. Bizzell, A. M., D. C. L., President

TEXAS AGRICULTURAL EXPERIMENT STATION

BOARD OF DIRECTORS

John I. Guion, Ballinger, *President*.....Term expires 1919
L. J. Hart, San Antonio, *Vice-President*.....Term expires 1919
E. H. Astin, Bryan.....Term expires 1919
J. R. Kubena, Fayetteville.....Term expires 1921
A. B. Davidson, Cuero.....Term expires 1921
Will A. Miller, Jr., Amarillo.....Term expires 1921
John T. Dickson, Paris.....Term expires 1923
H. A. Breihan, Bartlett.....Term expires 1923
F. M. Law, Houston.....Term expires 1923

MAIN STATION COMMITTEE

L. J. Hart, *Chairman* — Will A. Miller, Jr.

GOVERNING BOARD, STATE SUBSTATIONS

P. L. Downs, Temple, *President*.....Term expires 1919
Charles Rogan, Austin, *Vice-President*.....Term expires 1923
J. E. Boog-Scott, Coleman.....Term expires 1921
W. A. Johnson, Memphis.....Term expires 1918

*STATION STAFF

ADMINISTRATION
B. Youngblood, M. S., *Director*
A. B. Conner, B. S., *Vice Director*
Chas. A. Felker, *Chief Clerk*
A. S. Ware, *Secretary*
W. T. Brink, B. S., *Executive Assistant in Charge Library and Publication*
Edith H. Phillips, B. S., *Technical Assistant*

DIVISION OF VETERINARY SCIENCE
**M. Francis, D. V. S., *Veterinarian in Charge*
H. Schmidt, D. V. S., *Veterinarian*

DIVISION OF CHEMISTRY
G. S. Fraps, Ph. D., *Chemist in Charge; State Chemist*
W. T. P. Sprott, B. S., *Assistant Chemist*
Chas. Buchwald, M. S., *Assistant Chemist*
T. B. Leith, B. A., *Assistant Chemist*

DIVISION OF HORTICULTURE
H. Ness, M. S., *Horticulturist in Charge*
W. S. Hotchkiss, *Horticulturist*

DIVISION OF ANIMAL HUSBANDRY
J. C. Burns, B. S., *Animal Husbandman, Feeding Investigations*
J. M. Jones, A. M., *Animal Husbandman, Breeding Investigations*
P. V. Ewing, M. S., *Animal Husbandman in Charge Swine Investigations*
**L. B. Burk, B. S., *Collaborating Animal Husbandman, Swine Investigations*

DIVISION OF ENTOMOLOGY
F. B. Paddock, M. S., *Entomologist in Charge; State Entomologist*
H. J. Reinhard, B. S., *Assistant Entomologist*
W. E. Jackson, M. S., *Assistant Entomologist*

County Apiary Inspectors

R. C. Abernathy, Ladonia; William Atchley, Mathis; J. W. E. Basham, Barstow; T. W. Burleson, Waxahachie; W. C. Collier, Goliad; E. W. Cothran, Roxton; G. F. Davidson, Pleasanton; John Donegan, Seguin; A. R. Graham, Milano; J. B. King, Batesville; N. G. LeGear, Waco; R. A. Little, Pearsall; S. H. Stephens, Uvalde; M. B. Tally, Victoria; R. E. Watson, Heidenheimer; W. H. White, Greenville; F. C. Belt, Ysleta; R. A. Nestor, Buffalo; H. A. Jones, Oakville; T. A. Bowdon, Palestine; E. R. Jones, Beeville.

DIVISION OF AGRONOMY
A. B. Conner, B. S., *Agronomist in Charge*
A. H. Leidigh, B. S., *Agronomist*
***H. H. Jobson, B. S., *Agronomist*
Louis Wermelskirchen, B. S., *Agronomist*

DIVISION OF PLANT PATHOLOGY AND PHYSIOLOGY
J. J. Taubenhaus, Ph. D., *Plant Pathologist and Physiologist in Charge*

DIVISION OF POULTRY HUSBANDRY
R. N. Harvey, B. S., *Poultryman in Charge*

DIVISION OF FORESTRY
J. H. Foster, M. F., *Forester in Charge, State Forester*

DIVISION OF PLANT BREEDING
E. P. Humbert, Ph. D., *Plant Breeder in Charge*

DIVISION OF DAIRYING
W. A. Doubt, *Dairyman*

DIVISION OF FEED CONTROL SERVICE
F. D. Fuller, M. S., *Chief*
James Sullivan, *Executive Secretary*
J. H. Rogers, *Inspector*
W. H. Wood, *Inspector*
S. D. Pearce, *Inspector*
W. M. Wickes, *Inspector*
W. F. Christian, *Inspector*

SUBSTATION NO. 1: Beeville, Bee County
I. E. Cowart, M. S., *Superintendent*

SUBSTATION NO. 2: Troup, Smith County
W. S. Hotchkiss, *Superintendent*

SUBSTATION NO. 3: Angleton, Brazoria County
N. E. Winters, B. S., *Superintendent*

SUBSTATION NO. 4: Beaumont, Jefferson County
H. H. Laude, B. S., *Superintendent*
J. B. Cockrell, B. S., *Scientific Assistant*

SUBSTATION NO. 5: Temple, Bell County
D. T. Killough, B. S., *Superintendent*

SUBSTATION NO. 6, Denton, Denton County
C. H. McDowell, B. S., *Superintendent*

SUBSTATION NO. 7: Spur, Dickens County
R. E. Dickson, B. S., *Superintendent*

SUBSTATION NO. 8: Lubbock, Lubbock County
R. E. Karper, B. S., *Superintendent*

SUBSTATION NO. 9, Pecos, Reeves County
J. W. Jackson, B. S., *Superintendent*

SUBSTATION NO. 10: (Feeding and Breeding Substation), College Station, Brazos County
E. R. Spence, B. S., *Animal Husbandman, in Charge of Farm.*

SUBSTATION NO. 11: Nacogdoches, Nacogdoches County
G. T. McNess, *Superintendent*

SUBSTATION NO. 12: Chillicothe, Hardeman County
****R. W. Edwards, B. S., *Superintendent*
V. E. Hafner, B. S., *Scientific Assistant*

SUBSTATION NO. 14, Sonora, Sutton County
E. M. Peters, B. S., *Acting Superintendent*

CLERICAL ASSISTANTS

J. M. Schaedel, *Stenographer*
Daisy Lee, *Registration Clerk*
C. L. Durst, *Mailing Clerk*
R. C. Franks, *Copyist*
W. L. Hearn, *Stenographer*
M. B Gardner, *Stenographer*
Mae Belle Evans, *Stenographer*
Irene Peverley, *Copyist*
Ruth Campbell, *Stenographer*
H. L. Frazier, *Stenographer*

*As of October 1, 1917.
**In cooperation with A. & M. College of Texas.
***On leave.

CONTENTS

[Blank Page in Original Bulletin]

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.

[Blank Page in Original Bulletin]

PROGRESS REPORT, SUBSTATION NO. 9, PECOS, TEXAS, 1910-1914

J. W. JACKSON, SUPERINTENDENT.

Substation No. 9 is one of the thirteen experiment substations which constitute the out-of-door laboratory of the Texas Agricultural Experiment Station, administered by the Director.

Substation No. 9 was established in 1910 in accordance with an act of the Thirty-first Legislature. The site selected is three and one-half miles west of Pecos, Reeves county, and consists of an eighty-acre tract of land.

This location is approximately 31° 25′ north latitude; 103° 31′ west longitude. The elevation is approximately 2,580 feet above sea level.

The soil on the substation is of a somewhat gyppy and salty nature, and is more or less typical of a considerable area in this part of the Trans-Pecos region. Abundant water for pump irrigation is available, the large pump at the substation being set only about forty feet deep in a 135-foot well. The water is slightly salty but the minerals are probably not present in such a large quantity as to be injurious, if proper methods of irrigation are used.

Of the eighty acres, three acres were cleared, but had not been cultivated at the time the State came into possession of the land. The improvements at that time consisted of a four-room house and shallow dug well. Water was pumped from the well to a surface tank or reservoir by means of a windmill. As soon as possible, a superintendent's house was built, as were also a two-story barn and an implement shed. An eight-inch well was drilled 135 feet deep, and a Fairbanks-Morse ten-horse power engine and a No. 4 American pump were installed.

With these improvements, the work of 1911 was carried on. Ten acres were planted to cotton and feed stuff during this year, but soon after the work was started it was found that there was insufficient water for this acreage and part of the crops failed to mature. In spite of the shortage of water, however, three-quarters of an acre planted to cotton yielded at the rate of 1,300 pounds of seed cotton to the acre. Texas Rustproof oats made 34 bushels to the acre and spring sown alfalfa made one and one-half tons of hay to the acre. June corn was a failure, while milo made 32 bushels to the acre. During this season, a small orchard was set out but has failed to give promising results.

Thirty-five acres were cultivated during the year 1912. This area was devoted to variety tests with cotton, grain, sorghums, sorgos, cow-

NOTE.—Grateful acknowledgment is hereby made to Mr. H. C. Stewert for compilation of data during the time he was superintendent of Substation No. 9. Mr. Stewert served as superintendent at Pecos from 1910 to 1915.

peas, and newly introduced crops. The season was very dry, making frequent irrigation necessary. Since that time a larger engine and pump have been installed for irrigation purposes, also the platting of the substation has been changed to give more uniform irrigation

The major work during the years 1913-14 consisted of variety tests to discover what varieties and crops were best suited to this part of West Texas. This being a territory in which scarcely any crop farming had been practiced, the first work of the substation was to determine the money and feed crops suited to local conditions; then to determine the best variety or varieties of the particular crop. The irrigation and soil conditions peculiar to this substation have necessitated more preliminary work than has seemed to be necessary at most of the substations conducted by the State Experiment Station.

There are a number of crops that have been found to be adapted to this country and which would justify the extra cost of irrigation, but some of these cannot be grown extensively, due to lack of a market, or due to lack of facilities and organizations for profitable marketing. Cantaloupes, watermelons, asparagus, tomatoes and celery are among the possibilities for money crops when the problems of marketing are solved.

Considerations of this kind and the necessity of investigating the best means of securing water have governed the development of this substation and its investigations. It is believed that enough of importance has been learned to justify the preparation of this material for a bulletin.

METEOROLOGICAL DATA.

Meteorological instruments were not installed on the substation until 1913. It is impossible, therefore, to present climatic data in detail for any considerable series of years. Such data, however, are available for Barstow, approximately ten miles east of this substation, where the United States Weather Bureau has a co-operative observer. These records are shown in Tables 1 and 2.

TABLE 1.

Monthly Absolute Maximum and Minimum, Mean and Mean Annual Temperatures, Barstow, Texas, 1906 to 1914, Inclusive. Degrees F.

	Monthly Absolute.		Mean Monthly.
	Maximum.	Minimum.	
January	89†	–4*	48.1†
February	86*	9*	48.6*
March	98*	19*	57.9*
April	99*	26*	63.5*
May	106	39	72.8
June	112	52	80.8
July	110**	60**	81.5**
August	111	56	81.3
September	106**	40**	75.7**
October	99**	21**	64 8**
November	96**	11††	53.9††
December	89**	3**	44.5**
Mean annual (for above months)	.....	.....	64.4

†1906 and 1914 missing.
*1906 missing.
**1910 missing.
††1910 and 1912 missing.

The last killing freeze in the spring occurs as early as February or as late as April. These facts emphasize the great variability of the temperature of the region, and in connection with the very low monthly mean temperature show a slow or late spring. This requires late planting of common farm crops. The requirement of the region is well recognized by the residents here, but is scarcely appreciated by even well informed people from Central Texas who visit here.

The first killing freeze in the fall occurs as early as October and as late as December. Even with the cold, late spring the temperature of the fall is such as to make it possible to raise cotton and practically all types of sorghums.

TABLE 2.

Rainfall by Months—1907-1914, Inclusive, Barstow, Texas.

	1906	1907	1908	1909	1910	1911	1912	1913	1914
January	.....	0.00	0.12	0.00	T	1.02	0.05	0.00	T
February	.....	0.00	0.00	0.00	T	2.39	0.00	0.02	0.50
March	.....	0.85	0.65	T	0.20	1.37	0.00	0.75	0.02
April	.....	0.15	1.01	0.00	T	2.10	0.30	1.22	0.00
May	0.53	T	0.55	T	T	1.41	0.16	0.00	3.93
June	1.20	0.06	0.54	0.55	1.55	0.18	0.00	1.46	0.75
July	4.23	0.76	3.30	4.50	1.46	0.85	1.92	0.20	2.14
August	2.02	0.40	1.54	0.10	1.02	0.00	1.95	0.59	2.05
September	0 54	0.86	1.36	0.50	0.69	1.32	2.20	4.70	1.40
October	0.24	5.55	0.65	T	T	0.15	0.70	3.10	6.59
November	1.46	1.22	0.18	0.55	0.01	0.85	1.70	0.85	1.52
December	0.92	0.02	0.00	0.75	0.05	1.39	1.50	0.55	1.46
Annual	.....	9.87	9.90	6.95	4.98	13.03	10.48	13.44	20.36

Average annual 11.12

The records presented above indicate a small and very irregular rainfall ranging from less than five to more than twenty inches per annum.

Rains are most likely to occur in the summer. It will be observed that the rainfall is on the whole very well suited to irrigation farming, as too many small rains are really a detriment in an irrigation region.

The precipitation as recorded at this substation since the installation of the meteorological instruments is as follows:

TABLE 3.

Rainfall by Months—1913-1914.

Month.	Inches.	
	1913	1914
January	.....	.00
February	.....	.20
March	.....	.10
April	.....	.93
May	.....	2.53
June	.....	1.32
July	.....	2.47
August	.....	1.79
September	.....	1.08
October	.....	3.01
November	.85	2.54
December	.55	1.00
Total	.....	16.97

IRRIGATION.

The cost of irrigation under existent conditions has not been extremely great. A considerable amount of investigating and "cutting and trying" has been necessary to get an adequate supply of water cheaply.

The cost of operation each year for the past three years is shown in Table 4.

TABLE 4.

Cost of Pump Irrigation, 1912 to 1914, Inclusive.

Year.	No. acres irrigated.	Supply of water.	Average inches of water supplied.	*Total cost to the acre.	Remarks.
1912.....	35	Not enough....	26.73	$ 8.88	
1913.....	35	Enough.....	29.40	10.82	Fuel expensive.
1914.....	44	Enough.....	19.92	6.23	Fuel cheaper, also more rain.

*Total costs include fuel, oil, ten per cent depreciation on machinery, labor to care for engine, and labor of one man to distribute water.

The rainfall in 1914 was so much greater than in the two preceding years that this was the governing factor in the cost. If the rainfall was fairly constant, then the depreciation and fuel cost would be very important. There has been added economy of fuel with each added improvement in the pumping plant, the economy being due to the ability to use cheaper fuel oil.

COTTON.

One of the most successful crops produced on this substation has been cotton. The late spring in no way favors this crop, but it seems peculiarly suited to the extreme heat of the summer. As a crop for

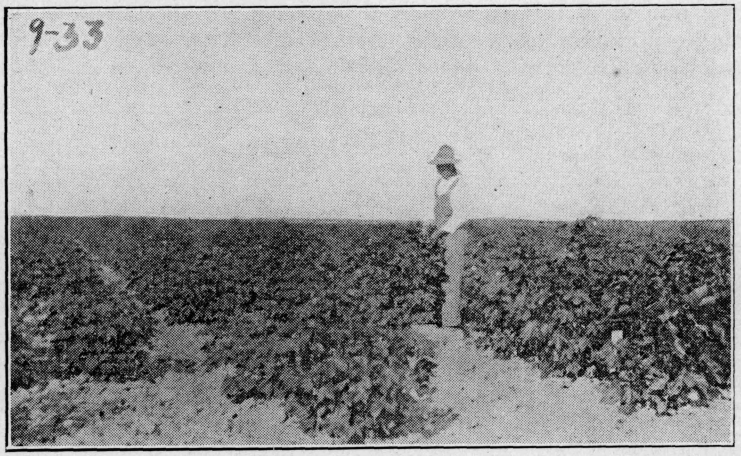

Fig. 1.—Cotton under irrigation. Protecting the flower to secure self-fertilization so that pure seed may be obtained from the field on the Station.

the irrigated farm, the cotton plant is satisfactory, in that it requires and also pays for a comparatively large amount of work. Furthermore, the cotton makes a comparatively light demand for water and is thus especially satisfactory where pumped water is used.

While it has been possible to make some investigations as to the best methods of producing cotton under irrigation, this work has been fragmentary and only of value as preliminary observation. Thus far it has seemed advisable to irrigate the cotton very slowly, in a rather deep narrow furrow.

The variety tests were uniformly conducted. All the variety tests were irrigated once before planting and three times during the growing season. About five inches of water was applied at the first irrigation, while the three later waterings amounted to from three to four inches each.

As yet, the cotton investigations on this substation consist of a study of varieties. This work has included the following tests:

In 1911—three-fourths acres of cotton.

In 1912—thirty-two varieties, of which only seven made a crop.

In 1913—forty-five varieties, repeated four times.

In 1914—fifty-six varieties.

In some cases a variety was in the test more than once in a single year, seed having been secured from two places.

Of the above varieties, four were grown during each of the three years, 1912, 1913 and 1914, while forty-three were grown in 1913 and 1914. Table 5 gives the acre yields of the cotton varieties tested for two or more years.

TABLE 5.

Summary. Variety Tests of Cotton 1912, 1913 and 1914.

T. S. No.	Variety.	Average yield lbs. seed cotton to acre.	
		1913 and 1914	1912 to 1914
487	Dongola	1187.0	
446	Simpkin's Prolific	1167.5	
118	Long Staple	1116.0	1144.0
469	Hawkin's	1112.5	
494	Cannon's World Skinner	1108.0	
414 and 504	Durango	1106.0	
6, 128 and Ck	Mebane Triumph	1087.0	884.6
348	Black Rattler	1080.0	
486	Roberts' Big Boll	1044.5	
7	Burns' Long Staple	995.0	
16	Crowder	978.5	
485 and 951	Cleveland Big Boll	965.0	
475	Texas Wood	960.0	
415	Huffman	953.5	
129	Edgeworth	942.5	
444	Haaga's Extra Long Staple	941.5	
135	Union Big Boll	917.0	
412	Foster	901.0	
482	Bohler's Triple Jointed	898.0	
152	Mortgage Lifter	893.5	
411	Hites' Early Prolific	890.0	
5, 478, 121	Allen's Long Staple	885.0	775.0
14	Long Staple	873.0	
443	Half and Half	869.5	
481	Cook's Improved Big Boll	865.0	
472	Peterkin	815.0	
413	Snowflake	812.5	
445	Webber	811.5	
474	Truitt	804.0	
130	Bank Account	796.5	

TABLE 5—Continued.
Summary. Variety Tests of Cotton 1912, 1913, and 1914.

T. S. No.	Variety.	Average yield lbs. seed cotton to acre.	
		1913 and 1914	1912 to 1914
470	Sunflower	793.0	
479	Toole	792.0	
480	Culpepper's Big Boll	775.0	
11 and 942	Lone Star	741.0	
476	Texas Oak	730.5	
466	Webber	715.5	
169	Webber	703.5	
170	Hartsville	693.5	
77	Rowden	677 5	
473	Willet's Red Leaf	582 0	
471	Dillon	563.0	
10	Yuma	449.0	472.6
477	Improved Webber	266.0	

SMALL GRAIN.

Each year since the establishment of the substation some small grain has been planted.

In 1912, 1913 and 1914 a total of eighty-seven variety tests of wheat, oats, barley, rye, emmer and spelt have been conducted. As a rule, these tests have been attended by comparatively unsatisfactory results. Among the causes of poor crops have been attacks by rabbits and excessive damage by wind storms.

In 1914 the variety test was very satisfactory. Nineteen lots of wheat yielded at the rate of from 9 to 27 bushels to the acre, while three varieties of barley yielded at the rate of from 27.5 to 38.75 bushels to the acre. Thus far it is not possible to say what varieties or types of these grains are probably best here.

Fig. 2.—Taking notes on cowpeas in variety test.

ALFALFA.

In 1911 alfalfa was seeded in the spring with and without a cover crop of oats and with and without manure. Four light cuttings of

hay were obtained. Additional seedings were made in 1912. This included plats inoculated with alfalfa tubercle bacteria furnished by the Bureau of Plant industry, United States Department of Agriculture. All plats showed tubercle development, whether inoculated artificially or not treated, indicating that artificial inoculation of alfalfa is unnecessary here.

In 1913 five lots of alfalfa and one lot of Sand Lucerne were seeded in the spring on duplicate plats. The resultant stands were good, but satisfactory growth was made. In the fall, four and one-half acres were seeded and gave every appearance of success.

In 1914 selections of alfalfa, numbering twenty-three, were seeded, the seed being furnished by the Bureau of Plant Industry, United States Department of Agriculture.

The alfalfa planted the previous fall made three light cuttings, amounting to two tons to the acre.

On the whole, the alfalfa tests on this substation have not been encouraging. The deeper soil seems to produce the crop fairly well, but the water requirement is very great. Of the varieties tested, the Peruvian and the home-grown American have given most promise.

CORN.

Corn has been planted each year and fair yields of rather inferior corn have been produced. The crop requires much more water than the grain sorghums and the yields are smaller. As a crop for this part of Texas, corn cannot be recommended except for protected places.

PEANUTS.

Peanuts have been planted each season for four years. The crop has not given satisfaction. Whether this is because of the hard, baked condition of the soil is not yet known.

The three varieties tested were: Virginia Improved, Tennessee Red. and Spanish. Of these, the Spanish has given the best stands and generally the most satisfactory yields. Rows thirty-six inches apart and eighteen inches apart were compared for three years. Slightly the largest yields were made by the eighteen-inch width rows, but the increase for the narrow rows was not enough to make such narrow rows advisable.

COWPEAS.

Cowpea variety tests were started in 1912 and have been continued each year, a total of fifty-five lots having been used. The comparable yields from the cowpea seed production tests are shown in Table 6.

TABLE 6.
Cowpea Seed Yields 1912, 1913 and 1914.

T. S. No.	Variety.	Average yield, pounds clean seed to the acre.	
		1912 to 1914	1913 and 1914
56	Unknown	425	448
57	Red Ripper	454	406
87	Blackeye	.....	388
86	Groit	.....	356
55 and 85	Iron	257	170

Of the varieties not tested during each of the above years, T. S. No. 58, New Era, has made especially good yields.

Seven lots of cowpeas were compared in a forage production test in 1912, the yields being as shown in Table 7.

TABLE 7.

Cowpea Forage Production, 1912.

T. S. No.	Variety.	Yield pounds forage to the acre.
56	Unknowa	2500
55	Iron	2330
58	New Era	2160
59	Whippoorwill	2140
50	Peerless	1920
60	Clay	1560
57	Red Ripper	1330

Fig. 3.—Cowpeas as a seed crop; date of planting test.

It is apparent that for general seed and forage purposes T. S. No. 56, Unknown, should be given first rank. T. S. No. 58, New Era, is also very good.

GRAIN SORGHUMS.

The grain sorghums have been rather successful crops here. In 1911 three varieties of grain sorghums were planted and made good growth. These were used for seed production for the next year's seed. Milo made the best yield, producing 32 bushels to the acre.

In 1912 the sorghum tests were greatly enlarged.

The grain sorghums are the most successful and reliable grain crops yet grown on the substation. They are resistant to the climatic variations. Their water requirements are such as to make them economical for the pump irrigation farm and, furthermore, they are in no sense exacting as to soil. The most serious handicap in grain sorghum here

has been loss due to birds at harvest time. This loss will doubtless be greatly lessened if the area of these crops is increased.

Table 8 gives the comparable yields for such varieties as have been grown for more than one year.

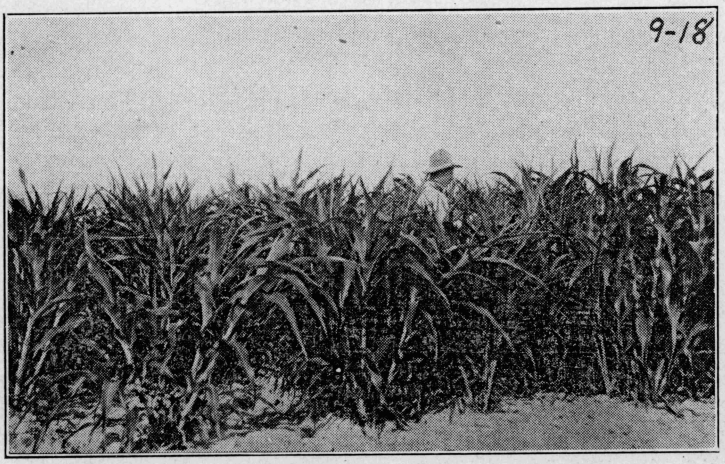

Fig. 4.—All sorghums grow well here. This crop was turned under green, thus supplying a large amount of humus-forming material to the soil.

TABLE 8.
Summary of Grain Sorghum Variety Tests, 1912, 1913 and 1914.

T. S. No.	Variety.	Average yield bushels to the acre.	
		1912, 1913, 1914	1912 and 1914
1423	Dwarf Milo*	35.23	38.59
46	Red Kafir	.....	21.25
44 and 674	Blackhul Kafir	.....	20.51
81 and 811	Feterita	.....	19.75
35	Early Blackhul Kafir	25.87	19.46
34	Dwarf Blackhul Kafir	.....	19.19

*The 1911 yield was 32 bushels to the acre, hence a four-year average for this variety would be 34.42 bushels to the acre.

In 1914 kafir and milo were planted in eight plats each, in a rate of seeding test, in rows thirty-six inches apart. The results are reported in Table 9, which gives the yields secured.

TABLE 9.
Spacing Test With Kafir and Milo, 1914.

Rate of seeding.—Distance between plants in the row, inches.	Yield in bushels to the Acre.	
	Kafir.	Milo.
2	11.60	24.82
4	13.75	18.39
6	16.78	19.82
8	13.39	16.60
10	16.42	20.71
12	16.96	12.67
14	20.35	26.01
16	14.46	28.76

These results, while not conclusive, indicate very strongly that the grain sorghums should not be planted too thickly for best grain yields. In this experiment the heaviest forage yields, both green and dry, were obtained from the thicker plantings, while the smallest yields of forage were from the thinner to medium thin plantings.

SORGOS.

Sweet sorghums or sorgos are very important here for silage and hay crops. The Sumac variety has been the best variety grown here. Table 10 gives the data secured in tests of these crops.

TABLE 10.

Summary of Sorgo Variety Tests, 1912 and 1914.

Variety.	Yield in pounds to the acre.			
	1912	1914	Average 1912 and 1914	Green silage material, 1914.
Sumac	16,000	15,216	15,608	22,770
Minnesota Amber	8,000	16,500	12,250	23,100
Red Amber	6,620	12,870	9,745	20,845
Orange	11,740	.....	.....	.....
Texas Seed Ribbon Cane	.....	14,300	.....	21,780

BROOM CORN.

Broom corn varieties were tested in 1912 and 1914. The results were as shown in Table 11.

TABLE 11.

Broom Corn Variety Tests.

Name.	Yield of cured brush in pounds to the acre.		
	1912	1914	Average two years.
Standard	820	1210	1015
Dwarf Standard	560	1210	885
Dwarf	370	1210	790

Not only did the Standard variety produce the heaviest yields, but the quality and sale values of the brush of the Standard variety were much the best of the three lots tested.

SUDAN GRASS.

Sudan grass, a crop introduced as a result of plant introduction experiments, has been tested for the last three seasons and is a very promising new crop for this region. The crop is a heavy producer of hay and roughage. It also is a good grazing crop. Experiments to determine the best planting date for the crop for hay are shown in Table 12.

TABLE 12.

Tests to Determine Planting Date for Sudan Grass.

Planting Date.	Yield in pounds of cured roughage to the acre.	
	1913	1914
April 1	4,500	5,000
April 15	5,000	No stand
May 1	5,600	4,500
May 15	.....	5,200
June 1	.....	No stand

It would appear from these two tests that the time of seeding in the spring is not extremely important. In 1914 seedings on two dates were abandoned because rains came before the plants broke through the soil and the field baked so badly that no stand was secured.

In 1913 an experiment was carried out to determine the best rate of seeding of Sudan grass. The results are given in Table 13.

TABLE 13.

Rate of Seeding Tests of Drilled Sudan Grass.

Pounds seed planted to the acre.	Yield of cured roughage in pounds to the acre.
15	2,500
20	3,770
30	4,390
40	5,160

The heaviest seeding rate not only gave double the yield of the lightest rate, but the heavy seeding rate also produced hay of a much finer quality.

One of the problems in Sudan grass growing has been the production of seed as a money crop. Seed production has been very satisfactory here, the yields having been from 209 to 745 pounds to the acre. Tests conducted indicate that for seed the crop may be planted in rows at the rate of five to ten pounds to the acre, planting being done at the same time of year as for hay.

SORGO-LEGUME MIXTURES FOR HAY.

After some preliminary trials, sorgo mixed with cowpeas as a hay crop was tested in 1914. The two best sorgos shown in Table 10 were grown in mixtures with three different varieties of cowpeas. Sorghum grown alone yielded 6 to 8 tons of forage to the acre and cowpeas yielded 1 to 1.25 tons, but it was possible to secure only about 2 to 2.75 tons of the mixture of cowpeas and sorghum.

This one experiment indicates that while the mixed hay is probably of better feeding value than sorghum alone, it is doubtful if the yield obtained will justify the practice. The detail data are given in Table 14.

TABLE 14.

Sorgo-Legume Mixture for Hay Experiments, 1914.

Mixture.		Yield in tons of cured hay to the acre.
Sorgo Variety.	Cowpea Variety.	
Sumac	Groit	2.74
Minnesota Amber	Groit	2.14
Sumac	New Era	2.65
Minnesota Amber	New Era	1.84
Sumac	Unknown	2.02
Minnesota Amber	Unknown	2.35
Average of Sumac Sorgo		2.70
Average of Minnesota Amber		2.11
Average of Groit Cowpeas		2.44
Average of New Era Cowpeas		2.24
Average of Unknown Cowpeas		2.18

The results of the 1914 test indicate that Sumac sorgo and Groit cowpeas are superior to the other varieties tested. The yields, however, were very low.

MISCELLANEOUS PLANT INTRODUCTION TESTS.

In 1912, 1913 and 1914 numerous crops not grown in this region were tested, including varieties being tested in the United States for the first time, the seed being furnished by the United States Department of Agriculture.

These plant introduction tests have included, in addition to the varieties treated of in other parts of this report, the following:

Varieties.	No. of lots.
Soy bean	55
Guar	2
Lyon bean	1
Kulthi bean	4
Moth bean	3
Yokahoma bean	1
Velvet bean	2
Dolichos lablab	6
Beggar weed	1
Chick pea	22
White clover	1
Sweet clover	3
Crimson clover	2
Lupine	2
Bur clover	2
Hairy vetch	1
Canavalia ensiformis	6
Field pea	1

Of these plants, only the Moth bean gave the appearance of possessing potential importance. The failure of several lots was due to depredations by rabbits.

TOBACCO.

Cuban Sumatra tobacco was planted in 1911. The crop made fine sinewy leaves eight to ten inches long and four to six inches wide, with a very light color. The test was not repeated.

DRY BEANS.

This region is probably adapted to the production of dry beans. Investigations on this subject have consisted in the testing of varieties or strains of snap beans, Lima beans and Frijoles. Lima beans have not been a success. Garden varieties have been difficult to produce and the yields have been small. The beans have yielded as follows:

TABLE 15.

Bean Production, 1911, 1912, 1913 and 1914.

Year.	Number of Lots.	Yields.
1911	2	Good.
1912	2	Rather poor.
1913	2	7 bu. to acre.
1914	3	Failure.

GARDEN CROPS.

Only preliminary work has been done with vegetables and truck crops. In general, it may be said that the soil must be heavily manured before these crops may be grown with any large degree of success. The application of at least twenty tons of partially rotted manure has made it possible to grow garden crops satisfactorily, both in regard to yield and quality. Nearly all the kinds of vegetables usually grown have been tried and have been reasonably successful except the garden pea, the Irish potato and the sweet potato. Cantaloupes have been grown on a rather extensive scale, having yielded at the rate of 175 crates to the acre. They must be carefully cultivated and require spraying for the aphis.

Repeated extensive experiments have been conducted with onions. The Denia onion producing 95 per cent. marketable onions, yielded at the rate of 15,860 pounds to the acre in 1913.

VINEYARD.

Grape varieties to the number of fifty-four have been planted. Generally from three to twenty vines of each variety have been used. The greater proportion of the varieties tested have been of the European type. To date, the vineyard has not been very successful.

ORCHARD.

In 1911 an orchard of four and one-half acres was set out. The trees planted included a number of varieties each of peaches, plums, apples, pears, prunes, quinces, apricots, cherries, almonds, walnuts and

pecans. Approximately fifty per cent. of these trees died during the late summer.

In 1912, two acres were set to fruit trees. The weather was very unfavorable and only about ten per cent of the trees ever started to grow. At the end of the summer but 150 trees remained alive. These consisted of pears, peaches, apricots and plums.

In 1913, the orchard continued to deteriorate. The apple trees appeared to be most severely affected, while the peaches and apricots semed to be making the best growth.

In 1914 replanting was again resorted to but the growth has not been encouraging.

Various small fruits, including blackberries, Himalaya berries, raspberries and strawberries have been tested but with very poor results.

SUMMARY.

This bulletin is in fact a detail of a portion of the Director's report. A brief history is given of Substation No. 9 and a report of the more important work accomplished up to the close of the crop year 1914.

The Station is located near Pecos in Western Texas. The soil is somewhat gyppy and irrigation is necessary.

The meteorological data presented shows temperatures ranging from 112 degrees to -4 degrees Fahrenheit, with a mean annual temperature of 64.4 degrees. Because of cold nights the spring is slow and late. The rainfall is decidedly variable in amount, ranging from approximately 5 to 20 inches per annum. The years covered in this report had probably more than the usual amount of precipitation.

Cotton has been one of the most successful crops grown in the experiments, a number of tests having produced a bale to the acre. Variety tests have been carried out and indicate that cotton varieties of excellent staple may be grown with profitable yields. No one best variety is named, although Durango, Mebane Triumph and several less well known varieties made good yields.

Alfalfa has been only partially successful. Variety tests indicate that home grown seed and the Peruvian are the better of the sorts tested.

Fifty-six lots of cowpeas have been tested. The Unknown has been the best yielder of hay and seed.

Grain sorghums are well adapted and have been the most successful of all grain crops grown here. Milo has made an average yield of 34.4 bushels to the acre for four years. In rate-of-planting tests the results secured indicate that too thick planting should not be attempted.

Variety tests of the sorgos or sweet sorghums are in favor of Sumac and Minnesota Amber, and the Sumac variety is advised for use.

Broom corn has made good yields. The variety tests are in favor of the Standard type.

Sudan grass has been very successfully grown both for hay and as a seed crop. It may be seeded in April or May. Forty pounds of seed to the acre gave greater hay yields than less heavy seedings. The seed production has been good.

Mixtures of sorghums and cowpeas have been grown. Their use is not advised.

A large number of new legumes and some other plants have been tested for adaptation with rather few favorable results.

Cantaloupes and onions have made good yields. Garden crops require that heavy manuring be practiced.

An experimental vineyard and orchard have been planted but with indifferent success.