



University of Arizona
College of Agriculture
Agricultural Experiment Station

**FIFTEEN YEARS FIELD CROP WORK
PRESCOTT DRY-FARM
1912-1927**

By
S. P. CLARK

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NOTE OF APPRECIATION

A word of appreciation is due the foremen of the Prescott Dry-Farm for their conscientious efforts in advancing the work of the farm during the 15 years of its operation. The following is a list of the foremen, together with their periods of service:

L. L. Bates, August 11, 1911, to May 1, 1916.

Hiram Dana, May 1, 1916, to January 1, 1917.

L. L. Bates, January 1, 1917, to May 1, 1918.

T. F. Wilcox, May 1, 1918, to March 15, 1920.

Leslie Beaty, March 15, 1920, to April 1, 1921.

Carl Clark, May 1, 1921, to ---.

The Prescott Dry-Farm is $7\frac{1}{2}$ miles north of Prescott, Arizona, and a short distance off the Prescott-Jerome highway and on the Santa Fe railroad $1\frac{1}{2}$ miles north of the P. and E. Junction. The altitude is approximately 5,000 feet.

FIFTEEN YEARS FIELD CROP WORK PRESCOTT DRY-FARM 1912-1927

By S. P. CLARK

ESTABLISHMENT

The establishment of the Prescott Dry-Farm was made possible by the cooperation of the Prescott Chamber of Commerce, which donated \$2,000; the Prescott and Phoenix railroad, which donated \$2,000, and a \$500 appropriation was subscribed through Governor R. E. Sloan of the Territory of Arizona. The operation of the farm has since been financed by the appropriations made by the State Legislature.

After a thorough canvass of Lonesome, Big and Little Chino, and Skull valleys in search of suitable soil for a dry-farm the present location on Granite Creek was considered the most representative as to soil types, in the region. It has the added advantage of being conveniently situated near to railways, highways, and the City of Prescott.

FROST-FREE DAYS

The number of frost-free days during the years 1910-1927 ranges from 124 in 1911 to 227 in 1913, with an average of 177. (Table I.) The average date of the last killing frost in the spring was April 24 and the average date of the first killing frost in the fall was October 18. The growing season is sufficiently long for the maturing of such crops as are grown in this district.

TABLE I.—RECORD OF THE LAST FROST IN THE SPRING AND THE FIRST FROST IN THE FALL WITH THE NUMBER OF FROST-FREE DAYS FOR THE YEARS 1910-1927, INCLUSIVE, PRESCOTT DRY-FARM.

Year	Last in spring	First in fall	Frost-free Days
1910*	May 6	Oct. 13	160
1911*	June 1	Oct 3	124
1912*	May 15	Sept. 22	130
1913	March 24	Nov. 6	227
1914	May 1	Nov. 15	198
1915	May 3	Oct. 15	165
1916	April 1	Nov. 6	219
1917	May 6	Oct 18	165
1918	March 25	Oct. 27	216
1920	April 22	Oct. 14	175
1921	May 7	Oct. 25	171
1922	May 12	Oct. 28	169
1923	May 1	Sept. 24	146
1924	April 17	Oct. 11	177
1925	April 24	Nov. 4	195
1926	March 26	Nov. 4	223
1927	April 27	Oct. 1	157
Average	April 24	Oct. 18	177

*Taken from the City of Prescott records.

TABLE II.—RECORD OF THE PRECIPITATION AT PRESCOTT, ARIZONA,* BY MONTHS WITH ANNUAL TOTALS FOR THE YEARS 1892-1927.

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual total
1892.....	1.98	1.64	1.91	.58	.85	.00	1.74	2.04	.14	1.41	.00	.61	12.90
1893.....	1.18	.47	2.26	.00	.88	.00	1.31	4.30	.57	.15	1.16	.73	13.01
1894.....	.30	.30	.88	.00	.23	T	1.13	3.88	.45	1.37	.00	3.43	11.97
1895.....	4.37	.55	T	.25	.50	T	.88	3.53	.09	.24	3.59	.50	14.50
1896.....	.55	.20	.81	.35	T	.14	4.70	2.61	1.24	3.67	.99	.97	16.23
1897.....	4.62	2.30	1.21	.37	.19	.56	2.48	5.06	3.47	1.20	T	.42	21.88
1898.....	1.97	.17	.22	.23	.92	.88	2.04	3.53	.00	.00	.68	1.25	11.89
1899.....	.97	.66	.30	.00	.02	1.65	3.03	.89	.01	1.34	1.45	.60	10.92
1900.....	.88	T	.74	2.67	.78	T	.45	1.70	.14	.62	2.35	.00	10.33
1901.....	1.10	2.52	.72	.03	1.18	.00	3.70	1.59	.00	.73	1.40	.00	12.97
1902.....	2.00	.65	1.73	.50	T	T	.28	4.64	1.59	.00	2.80	.12	14.31
1903.....	.74	1.40	3.18	1.03	T	.96	3.13	3.81	2.36	.10	.00	.00	16.71
1904.....	.35	.50	1.00	.05	.70	.00	.57	6.74	2.26	1.30	.00	.40	13.87
1905.....	4.74	7.92	6.17	3.81	.88	.00	.11	3.78	1.73	.12	8.68	1.53	39.47
1906*.....	.50	.13	5.71	1.10	.14	T	4.21	5.28	.07	.48	2.90	3.61	24.13
1907*.....	3.00	1.61	1.61	.56	.35	.50		3.93	.77	2.75	.63	.22	15.94
1908*.....	1.42	3.30	1.11	.65	1.11	T	8.80	2.35	1.00	1.11	.41	5.69	26.95
1909*.....	2.11	2.93	1.71	.13	T	.23	5.25	4.01	2.20	.00	.96	2.28	21.81
1910*.....	1.86	.28	1.18	.45	.00	1.05	1.89	2.03	.13	1.19	2.23	1.00	13.29
1911*.....	5.67	1.81	2.33	.07	.00	.30	4.76	2.78	2.02	2.62	.00	.23	22.59
1912*.....	T	T	6.04	2.26	.69	.80	6.19	2.21	.30	4.22	.03	1.23	23.97
1913.....	.05	1.82	.20	.10	.04	.00	1.99	1.95	3.10	.78	.63	.52	11.18
1914.....	.68	1.31	.41	.31	.39	.72	3.14	1.63	1.32	1.81	.36	1.88	13.96

TABLE II.—(Continued.)

1915.....	2.61	1.81	.71	1.67	.37	.05	1.67	3.05	.56	.13	1.01	2.82	16.46
1916.....	4.33	.31	1.45	.41	.05	.00	2.22	2.66	1.13	2.65	.00	.90	16.11
1917.....	.91	.67	.16	2.43	.79	.00	3.52	3.90	.49	.00	.00	.00	12.87
1918.....	1.58	.76	3.34	.04	.07	1.85	2.91	2.20	.50	.30	1.25	1.09	15.89
1919.....	.53	1.89	.80	.72	.72	.00	6.85	3.49	1.44	1.25	3.15	.05	21.00
1920.....	1.70	3.82	1.31	.03	.76	.02	2.03	1.53	.23	1.46	T	.21	13.10
1921.....	.79	.19	.60	.19	1.20	.05	5.65	3.31	.40	2.59	.50	1.70	17.17
1922.....	2.04	.38	1.19	.49	.71	.81	3.29	3.89	1.21	.30	.94	.65	15.90
1923.....	1.04	.57	1.57	.13	.12	.08	2.50	3.01	1.80	.11	1.52	2.24	14.69
1924.....	.18	.00	1.57	.91	.00	.00	.83	.11	1.31	.67	.39	1.61	7.58
1925.....	.12	.26	.25	.99	.01	.80	1.71	1.82	3.96	2.00	.78	.19	12.89
1926.....	.52	.92	.74	3.89	.58	.25	1.88	2.38	.91	.05	.41	2.46	14.99
1927.....	.67	3.34	.86	.51	.11	.95	.55	4.14	2.21	1.25	.13	1.23	15.95
Av. 36 years	1.61	1.31	1.57	.78	.45	.36	2.70	3.05	1.14	1.11	1.15	1.18	16.37
No. years above av.	14	14	11	10	16	11	15	18	16	17	12	14	12

*Data previous to 1912 taken at Prescott. Subsequent data obtained at Prescott Dry-Farm.

RAINFALL

A study of the seasonal rainfall records of any district is very important when determining what crops can be produced. Rainfall records have been kept at the Prescott Dry-Farm since its establishment in 1911. Weather records have been kept at Whipple Barracks in the City of Prescott continuously since 1869. Figure 1 and Table II give the rainfall records from 1892 to 1927.

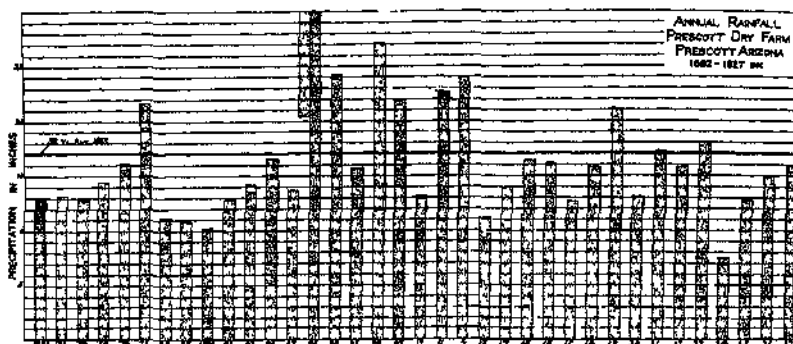


Fig. 1—Annual rainfall for 36 years, 1892-1927. 1892 to 1911, City of Prescott records, 1912 to 1927, Prescott Dry-Farm records

The rainfall at Prescott is very irregular in amount and seasonal distribution. The lowest annual precipitation on record was 7.58 inches in 1924, and the highest was 39.47 inches in 1905. The average rainfall for the 36 years, 1892 to 1927, was 16.43 inches. During 12 years of this period the rainfall has been above this average. The Prescott district has two periods of rainfall which come from January to March and from July to September. The summer rainfall is usually much heavier than during the winter months. A study of figure 3 shows that only occasionally was there sufficient moisture in October, November, or December to prepare the ground or warrant planting a winter grain crop. Figure 2 shows that seldom was there sufficient winter moisture to carry the crop through to maturity. Figure 2 also shows that over a period of 36 years only twice, in 1917 and 1926, was there sufficient moisture in April, May, or June to put the ground in condition for planting spring crops. This is the critical period for maturing winter crops and for the preparation of the ground and the planting of summer crops.

The nature of the rainfall must be considered in studying rainfall records in their relation to crop production. The summer rains in the Prescott district often come in heavy downpours of short duration,

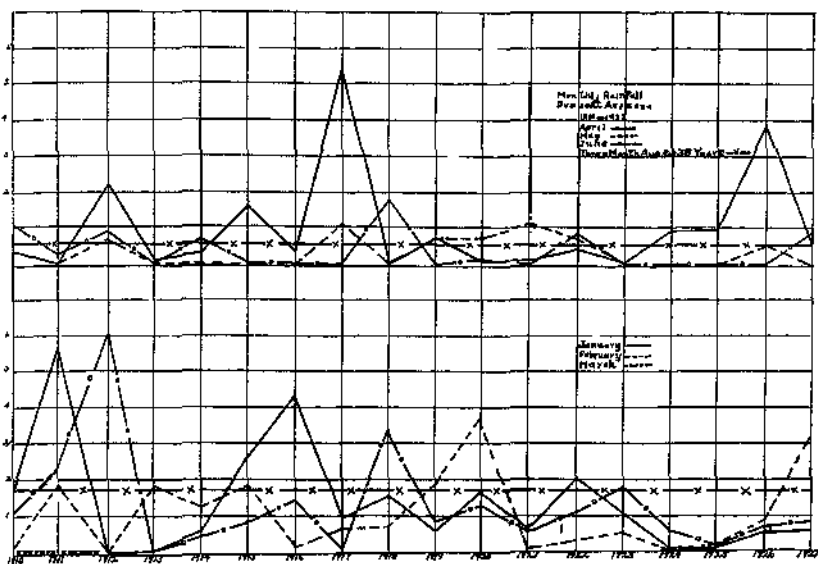


Fig 2.—Monthly rainfall, January to June, 1910-1927, Prescott Dry-Farm, Prescott, Arizona.

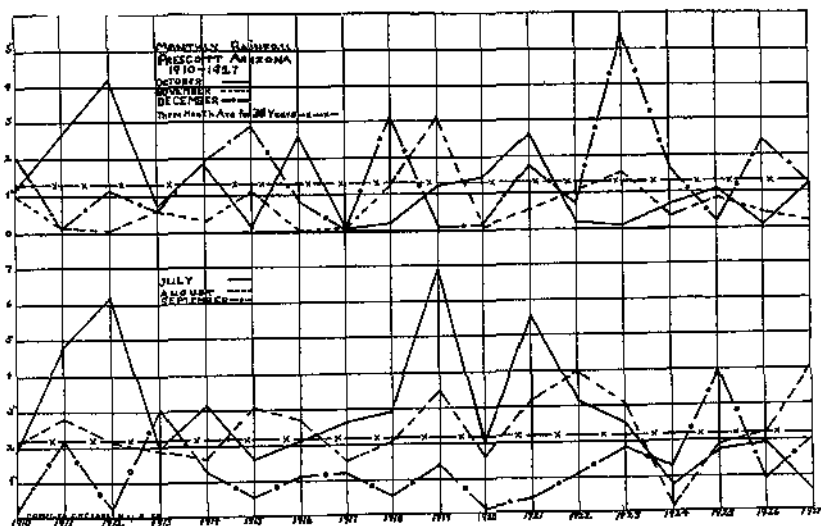


Fig. 3.—Monthly rainfall, July to December, 1910-1927, Prescott Dry-Farm, Prescott, Arizona.

causing excessive run-off, or they may come in light showers over a period but not sufficient to soak the ground enough for plant growth. A rain of an inch or more is necessary to put the soil in condition for crop growth, when it is so extremely dry after months of drought. This is well illustrated in the data contained in Tables IV and IX. During the growing period of 1921, from March 1 to November 1, the total precipitation was 13.97 inches. This is sufficient for the production of a normal crop. A study of Table IX shows that all variety test plantings were killed by drought. This is explained by reference to Table IV, where it is brought out that the July rains of that year started on the 7th with showers for 14 days, but not until the 26th, when it rained 1.13 inches, was there sufficient moisture to stimulate any appreciable plant growth. In contrast to this, during the growing period of 1926 the total rainfall was only 10.68 inches but the rains were timely and of sufficient volume to promote growth, and fair crops were harvested.

TABLE III.—MONTHLY MEAN, MONTHLY MAXIMUM AND MINIMUM, AND ANNUAL MEAN TEMPERATURES AT THE PRESCOTT DRY-FARM FOR THE YEARS 1910-1927, INCLUSIVE.

Month	1910*			1911*			1912		
	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.
January	52.8	70	-6	39.5	68	8	36.2	55	-1
February	55.7	71	8	36.4	74	6	38.8	66	9
March	66.6	79	21	46.1	74	25	40.8	63	19
April	72.0	84	24	49.2	73	20	44.8	71	21
May	80.8	97	33	53.8	80	27	55.2	85	27
June	88.0	96	40	64.6	91	32	67.4	95	38
July	90.8	97	46	69.5	95	51	67.5	93	34
August	90.7	91	49	70.2	94	48	67.5	91	48
September	87.4	94	40	65.1	89	42	59.0	86	30
October	73.8	88	21	52.2	86	22	49.5	75	21
November	60.9	74	22	40.8	69	6	43.0	73	18
December	55.3	69	18	29.6	64	-2	32.1	56	7
Ann'l mean	72.9			51.4			50.2		

*Record incomplete.

TABLE III.—(Continued.)

Month	1913			1914			1915		
	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.
January	33.6	64	1	41.8	65	18	32.9*	59*	3*
February	37.2	63	1	41.1	67	20	37.7	61	15
March	43.2	80	17	49.0	76	27	41.3	71	9
April	52.4	77	29	54.0	83	28	49.0	75	24
May	62.2	88	36	62.5	90	27	53.3	86	20
June	68.0	92	40	70.1	96	45	64.8	91	34
July	73.3	101	51	72.9	96	56	70.6	91	44
August	73.2	91	52	74.2	96	52	71.5	96	49
September	65.8	91	38	69.0	91	45	61.8	86	34
October	56.0	80	31	.....*	.....*	.....*	55.6	87	26
November	47.5	75	26	50.2	78	27	43.2	76	12
December	36.3	65	13	35.7	52	12	34.7	63	3
Ann'l mean	54.0						51.3		

Month	1916			1917			1918		
	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.
January	32.6	59	—1	30.4	56	9	34.6	70	8
February	42.0	70	0	36.8	62	13	40.2	66	12
March	46.6	78	22	38.2	76	13	45.6	71	20
April	50.8	82	23	46.8	78	21	50.8	77	23
May	55.3	84	27	50.8	78	26	55.0	79	29
June	66.2	95	34	66.2	98	33	73.0	100	42
July	71.6	96	45	73.4	96	52	70.8	96	46
August	68.0	88	45	69.7	94	48	69.1	99	43
September	63.0	88	36	64.4	95	38	65.8	91	35
October	49.8	76	24	55.0	96	21	56.6	85	22
November	40.6	86	6	46.1	75	19	44.0	77	18
December	32.4	64	0	41.6	70	15	36.5	68	6
Ann'l mean	51.1			51.6			53.5		

*Records incomplete.

TABLE III.—(Continued.)

Month	1919			1920			1921		
	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.
January	35.6	65	—1	36.6	67	14	37.4	65	16
February	36.2	57	10	41.0	68	20	43.3	76	25
March	44.2	71	21	41.1	71	17	49.7	80	21
April	55.7	83	32	46.9	72	22	52.1	84	31
May	62.5	86	42	58.2	88	30	58.0	97	42
June	62.5	86	42	58.2	88	30	58.0	97	42
July	73.4	93	50	72.6	96	44	72.8	89	54
August	73.0	94	53	69.2	95	41	70.3	91	43
September	56.8	88	44	63.6	91	33	67.0	87	28
October	51.5	74	25	50.6	82	27	59.4	87	28
November	44.4	74	4	42.6	68	15	48.6	78	18
December	39.6	64	16	32.8	59	8	42.7	69	15
Ann'l mean	53.7			51.0			54.9		

Month	1922			1923			1924		
	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.
January	34.4	61	8	41.0	69	14	35.0	64	7
February	39.6	65	—1	36.7	68	6	43.5	70	18
March	42.8	68	16	42.4	69	19	37.6	71	15
April	48.4	79	18	50.2	77	26	47.5	75	22
May	60.2	87	26	61.7	87	34	60.9	88	38
June	70.8	99	40	65.8	98	37	72.4	103	45
July	75.4	100	57	74.0	98	50	73.7	95	51
August	72.2	95	53	70.4	89	51	74.8	98	50
September	68.6	92	45	63.7	91	33	67.4	93	37
October	56.7	86	25	52.2	78	27	53.8	82	27
November	41.5	71	20	45.2	65	18	44.6	80	18
December	40.7	61	15	36.6	64	15	33.4	62	5
Ann'l mean	54.3			53.3			53.6		

TABLE III.—(Continued.)

Month	1925			1926			1927		
	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.
January	34.9	65	8	36.8	63	11	43.0	72	21
February	42.6	71	20	44.9	71	22	44.4	70	21
March	45.0	76	18	48.0	71	27	45.0	73	19
April	51.3	85	25	52.6	81	31	53.6	85	24
May	61.0	87	38	60.9	86	37	61.9	92	31
June	65.2	94	34	72.4	99	47	69.6	97	44
July	75.6	104	51	75.2	98	52	76.6	99	56
August	68.0	93	51	72.4*	96*	44*	71.6	96	52
September	66.2	93	42	68.6	89	47	66.0	91	40
October	55.6	83	32	60.1	85	32	58.0	83	35
November	45.4	70	23	49.7	78	25	49.0	78	16
December	40.7	64	20	37.0	69	10	31.8	67	5
Ann'l mean	54.3			56.6			55.8		

*Figures taken from City of Prescott records. Dry-Farm records not complete.

TABLE IV.—DAILY PRECIPITATION AT PRESCOTT DRY-FARM FROM MARCH TO OCTOBER, 1917-1927, INCLUSIVE. UNITED STATES WEATHER BUREAU RECORDS.

1917

Day	March	April	May	June	July	August	Sept.	October
1.....								T
2.....								
3.....					T	.80		
4.....					.03	.03		
5.....					.14	1.09		
6.....					.16			
7.....						.49		
8.....			.12					
9.....		.12	.10					
10.....		.04	.09		.38	T	.25	
11.....	T					.69	.08	
12.....	.07						.01	T
13.....	.09					.23		
14.....					.02			
15.....						T		
16.....		.13			.05	.48		
17.....		1.63						
18.....		.19	.06		.03			
19.....			.22					
20.....			.10		.01			
21.....								
22.....					T		T	
23.....					1.35			
24.....					.06	.01		
25.....			T		.08	.02		
26.....					.07	.06		
27.....		.30			1.02			
28.....		.02	T		.08			
29.....								
30.....							.15	
31.....			.10		.04			
Total....	.16	2.43	.79		3.52	3.90	.49	

TABLE IV.—(Continued.)

1918

Day	March	April	May	June	July	August	Sept.	October
1.....					.03		.17	
2.....							.23	
3.....					.50		.02	
4.....			.04			.16		
5.....								
6.....	.11				.04	.33		
7.....	.17					.01		
8.....	1.27				.45	T		
9.....					.15	.06		
10.....						.72		
11.....	.25					.04	.04	
12.....	.98				.07	.80		
13.....	.22	.04		.12	.79	T		
14.....				.26				
15.....				.17				
16.....								
17.....				.02				
18.....								
19.....	.04			T	.13			.10
20.....	.30			.35	.51		.04	.05
21.....								.15
22.....				.93		T		
23.....								
24.....								
25.....								
25.....								
27.....								
28.....								
29.....			.03					
30.....			T		.23			
31.....					.01	.08		
Total....	3.34	.04	.07	1.85	2.91	2.20	.50	.30

TABLE IV.—(Continued.)

1919

Day	March	April	May	June	July	August	Sept.	October
1.....					.01	.68	.11	
2.....					.28	.01	.10	
3.....								
4.....								
5.....								
6.....					.03			
7.....	.05				.02		.12	
8.....		.21			T	.96	.39	
9.....		.05					T	.14
10.....								
11.....					.75			.01
12.....					2.18			.13
13.....					.46			
14.....	12							
15.....	T				.35	.22		
16.....					1.00	.39		
17.....					.02	.01		
18.....					.21		T	
19.....					.02	.42		
20.....					.98			
21.....					.02			
22.....	.01		.04			.20		
23.....	.40		.27					
24.....	.16		.04					.72
25.....	.01		.16		.03			.25
26.....			.14			.43		
27.....		T	T	T	.32		.72	
28.....	.05	.38	.07	T	.02			
29.....		.05						
30.....		.03						
31.....					.15	.17		
Total...	.80	.72	.72		6.85	3.49	1.44	1.25

TABLE IV.—(Continued.)

1920

Day	March	April	May	June	July	August	Sept.	October
1.....	.04							
2.....	.07							
3.....						.28		
4.....								
5.....								
6.....								
7.....							.02	
8.....						.04		
9.....								
10.....	T							
11.....								
12.....								
13.....								
14.....					T			
15.....								
16.....		.03				.11	.16	
17.....	.14					.50	T	
18.....							.05	
19.....						.15		.38
20.....								.17
21.....	.05		.72		.84			
22.....	.05		.04		.07			
23.....	.32				T			
24.....	.03				T			
25.....	.36					.45		
26.....	.25				.14			
27.....					.14			
28.....				.15				
29.....								
30.....								
31.....					.84			.91
Total...	1.31	.03	.76	.15	2.03	1.53	.23	1.46

TABLE IV.—(Continued.)

1921

Day	March	April	May	June	July	August	Sept.	October
1.....								2.00
2.....								
3.....								
4.....		.19		T		T		
5.....		T				T		
6.....			.45	T		.71		
7.....			.52		.01	T		
8.....						.04		
9.....					T	T		
10.....					.01	.10		
11.....				T	T			
12.....	.12			T	.01			
13.....	.18			T	.66			
14.....	.20	T		.05	T	.16		
15.....	.10				T			
16.....								
17.....								
18.....			.23			T		
19.....	T				.05			
20.....					.47	1.01		
21.....					.03	.35		
22.....					.11			
23.....						.31		
24.....					T	T		.59
25.....					T	.34		
26.....					1.13	.13		
27.....					.14			
28.....								
29.....					.04			
30.....					.30	T	.40	
31.....					2.69	.16		
Total...	.60	.19	1.20	.05	5.65	3.31	.40	2.59

TABLE IV.—(Continued.)

1922

Day	March	April	May	June	July	August	Sept.	October
1.....						.20	.08	
2.....						.51	1.05	
3.....								
4.....								
5.....								
6.....		.35						
7.....		.12						
8.....		.02						
9.....			.15			.20		
10.....			.56					
11.....	.17					.09		
12.....	.27							
13.....								
14.....								
15.....					.28	.48		
16.....					T	.09		
17.....	.42				.63	.79	T	
18.....	.17					.48		
19.....					T	.12		
20.....					1.05	.07	.08	
21.....								
22.....				.08		T		
23.....						.30		
24.....	.16			.38				
25.....				.35				
26.....					.37			
27.....					.18			
28.....								.30
29.....								T
30.....					.76			
31.....					.02	.56		
Total....	1.19	.49	.71	.81	3.29	3.89	1.21	.30

TABLE IV.--(Continued.)

1923

Day	March	April	May	June	July	August	Sept.	October
1.....	T	T						
2.....	T							
3.....	.65							
4.....	.87							
5.....	.05							
6.....								
7.....					T			
8.....					.25	.05		.11
9.....								
10.....		T				.55	.25	
11.....	T					.04	T	
12.....		T			.07	.08	.07	
13.....			.12		T			
14.....	T				1.03		.05	
15.....						.01		
16.....		.06				T		
17.....		T				T	1.20	
18.....		T				.02	.23	
19.....		.06			.17	T		
20.....				.08	T	.18		
21.....					.31	.18		
22.....					.37			
23.....					.07			
24.....					T			
25.....						.22		
26.....								
27.....		.01			.18			
28.....					T			
29.....								
30.....						.50		T
31.....					.05	1.08		
Total....	1.57	.13	.12	.08	2.50	3.01	1.80	.11

TABLE IV.—(Continued.)

1924

Day	March	April	May	June	July	August	Sept.	October
1.....					.07			
2.....		T	T				T	
3.....			T					
4.....	T				.13		T	
5.....	.43	T			.02		T	
6.....		.11			.07		.10	
7.....		.10			.20		.15	.67
8.....		.01			T		.02	
9.....		.06			.09		1.01	
10.....		.15			.01	T	.03	
11.....		.18				T		
12.....		.30				.04		
13.....								
14.....								
15.....	.10	T					T	
16.....								
17.....								
18.....	.47							
19.....								
20.....								
21.....	.02							
22.....	.03							
23.....								
24.....								
25.....					T			
26.....								
27.....	T				.15	T		
28.....	.52				.08	.07		
29.....	T				.01	T		T
30.....			T		T			
31.....								
Total...	1.57	.91	.00	.00	.83	.11	1.31	.67

TABLE IV.—(Continued.)

1925

Day	March	April	May	June	July	August	Sept.	October
1.....							T	
2.....							.95	
3.....				T	.22		.05	
4.....					.14		.03	T
5.....			.01		.11	.17		1.03
6.....			T			T		.18
7.....	T					.24		
8.....	.02							
9.....	.05					.41		
10.....						.18		.10
11.....						.02		.19
12.....								
13.....								
14.....					.17			.31
15.....							.01	.11
16.....								
17.....				T			1.85	
18.....							.35	
19.....					.38		.72	
20.....				T		T		
21.....		.71						
22.....		.07						.08
23.....		.21						
24.....					.15			
25.....					T			
26.....				.09	.10	.53		
27.....	.18				T	.17		
28.....				.04	.17	T		
29.....				.13	T	.10		
30.....				.54	T			
31.....					.27	T		
Total....	.25	.99	.01	.80	1.71	1.82	3.96	2.00

TABLE IV.—(Continued)

1926

Day	March	April	May	June	July	August	Sept.	October
1.....			.11					
2.....		.02			T	1.81	T	.05
3.....		.03	T		T			
4.....	.02		.29	.15				
5.....	.02	.64	.08	.08		.33		
6.....	.08	.37	.10			.09	.21	
7.....	T	.04					.24	
8.....	T	.48						T
9.....	.10	.21						
10.....	.20	.17						
11.....		.20	T		.05			
12.....		.25			T	T		
13.....		.20				T		
14.....		.01				.15		
15.....	T	.03						
16.....	.11							
17.....		.01						
18.....		.35						
19.....		.51						
20.....	.10	T			.03			
21.....	T				T			
22.....					.12			
23.....					.08			
24.....					.42			
25.....	T				.16			
26.....							.46	
27.....	.11	T			1.02			
28.....		.21						
29.....		.15						
30.....				.02				
31.....								
Total....	.74	3.89	.58	.25	1.88	2.38	.91	.05

TABLE IV.—(Continued.)

1927

Day	March	April	May	June	July	August	Sept.	October
1.....						.09		
2.....						.06		
3.....	.05							
4.....	.09				T	.25		
5.....	.19					T	.02	
6.....	.03						.03	
7.....						.41	.61	
8.....			T					
9.....	.09		.11					
10.....	.20			.09				
11.....		.23		.05			.18	
12.....		.13		.28			.71	
13.....		.02						
14.....		.06	T	.35				
15.....				.03		1.58		
16.....		.02					.17	
17.....		.05					.13	
18.....								
19.....					.08	.04	.07	
20.....					.17			
21.....					T		.01	
22.....							.17	
23.....							.11	
24.....							T	
25.....					.30			.15
26.....						.60		
27.....				.15		.35		
28.....						.33		.90
29.....								
30.....	.10							
31.....	.11					.43		.20
Total...	.86	.51	.11	.95	.55	4.14	2.21	1.25

TABLE V.—ACRE-YIELD OF THE LEADING NATIVE INDIAN CORN
PRESCOTT DRY-FARM, 1912-1915.

VARIETY	Yield per acre in pounds									
	1912		1913		1914		1915		Average	
	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover
Papago Sweet.....	1,740	4,860	620	1,660	492	4,332	84	2,000	784	3,213
Pima	800	2,772	1,084	2,176	845	3,015	996	2,596	931	2,640
Yellow Hopi.....	1,124	2,397	736	1,104	470	1,124	784	1,256	778	1,470
Blue Hopi.....			1,600	2,400	444	3,297	792	1,072	945	2,256

TABLE VI.—ACRE-YIELD OF CORN ON THE PRESCOTT DRY-FARM
FOR THE YEARS 1912-1915.

VARIETY	Yield per acre in pounds									
	1912		1913		1914		1915		Average	
	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover
Reid's Yellow Dent.....	1,224	2,990	3,920	5,912	883	5,019	1,760	2,408	1,947	4,082
White Dent.....	1,226	3,752	1,405	3,760	1,234	5,087	1,080	4,000	1,236	4,150
Maul's Yellow Dent.....			368	744	1,226	3,816	1,600	3,976	1,065	2,845
Bloody Butcher.....			1,882	3,003	656	6,644	860	1,160	1,133	3,602
King Phillip.....			2,340	5,400	300	2,496	1,600	2,536	1,413	3,477
Hickory King.....			1,452	4,720	.....	.....	696	4,480	1,074	4,600

WORK STARTED

The first operations on the Prescott Dry-Farm were started August 12, 1911, and the first land was broken September 6 of the same year. The planting of small grains was started in October.

TYPE OF WORK

In a country like that surrounding Prescott, consisting of rugged mountains, rolling hills, and comparatively narrow valleys, the principal agricultural industry is, and always will be, the ranging of cattle, sheep, and goats on the browse and native grasses. In years of abundant rainfall the pasturage is excellent and the flocks and herds can range the hills the entire year. During periods of drought, which occur frequently, and sometimes are quite protracted and very severe, it is necessary that the stockman have some supplementary feed to at least carry his breeding stock through the adverse period.

It was because of the possibilities of securing a livelihood from dry-farming in combination with the ranging of livestock on the adjacent hills that the farm was established.

In order to obtain the best results it was necessary to follow certain fundamental dry-farming practices and, in addition, to work out new methods adapted to local conditions. The most important lines of endeavor included the conservation and economical use of soil moisture by means of proper and timely seedbed preparation, suitable method of planting and cultivating; the planting of crops best adapted to local conditions, including drought-resistant varieties of corn, sunflowers, grain and forage sorghums, beans, and winter cereals which could be used for silage, pasture, or hay; the maintenance of soil fertility by using different crop rotations and the application of fertilizer; the storing of feeds grown in the form of silage, fodder, or hay, and the use of cereals for winter pasture and Sudan grass for summer pasture. The storage of feed in the silo was emphasized because dry-farming to be profitable must include the keeping of livestock and the stockman cannot afford to be without a silo of some type. Cultural methods adapted to the locality with early fall plowing to facilitate absorption of fall moisture and to expose the soil to the action of freezing and thawing, and cultivation of the crop to prevent weed growth and cracking of the soil were all tested.

SUMMARY OF WORK 1911-1920*

During the years 1912-1915, seventeen varieties of native Indian corns were tested for grain and fodder production. Over a period of

*All crop records referred to in this publication previous to 1917 were taken from the University of Arizona Agr. Exp. Sta. Bul. No. 84.

4 years the leading varieties were Papago Sweet and Pima, yielding 784 pounds of grain and 3,213 pounds of stover, and 931 pounds of grain and 2,640 pounds of stover, respectively. None of the native corns gave as satisfactory yields as some of the standard American strains.

Table VI gives the grain and stover yields of the leading standard American varieties of corn over a period of 4 years. The most promising variety out of the 27 varieties tested was Reid's Yellow Dent with an average yield of 1,947 pounds of grain and 4,082 pounds of stover.

TABLE VII.—AVERAGE ACRE-YIELDS OF SIX HIGH-YIELDING VARIETIES OF CORN ON PRESCOTT DRY-FARM, 1920-1927.

VARIETY	Average silage yields in pounds
Hickory King.....	14,110
Large White.....	7,767
Papago Sweet.....	6,387
Orange County Prolific.....	6,308
Mexican June.....	5,102
Duncan Dent.....	3,119

Hickory King proved to be the leading variety for the production of silage for the period 1920-1927. When rainfall is so uncertain as it is in this district the growing of corn for grain is not profitable. During years when the precipitation comes in sufficient amounts and at favorable intervals good yields of corn can be secured.

SORGHUM

The varieties of sorghums grown in any locality should be determined by the amount of rainfall, the length of the frost-free period, insects injurious to the sorghum plant, such as sorghum midge, and the use to be made of the crop.

If silage or cured fodder only is wanted, the heaviest yielding sweet sorghum that will most nearly mature in the district is the one to plant. This is because the sargos produce more forage than any of the non-saccharine varieties and excel in palatability all but the kafirs.

If grain as well as forage is wanted, some variety of the kafirs or milos should be planted. Kafir fodder, stover, or silage is superior to most other non-saccharine sorghums. Kafir and hegari make excellent silage after the heads have been harvested and only the stover is used. Most of the other grain sorghums make poor dry fodder and indifferent silage.

Sorghums were given a thorough trial and proved the surest forage crop of those planted. Table VIII gives the average production for 1912-1915, inclusive.



Fig. 4.—Milo Maize, Prescott Dry-Farm, 1926

TABLE VIII.—AVERAGE PRODUCTION OF GRAIN AND SWEET SORGHUMS IN POUNDS ON THE PRESCOTT DRY-FARM, 1912-1915, INCLUSIVE.

VARIETY	Grain	Stover
Red Amber.....	291	4,161
African .....	.....	1,428
Sudan Grass.....	275	2,375
Sumac	411	6,248
Shallu	732	1,848
Dwarf Yellow Milo.....	1,243	3,601
Standard Milo.....	493	2,107
Red Kafir.....	.....	5,258
D. B. H. W. Kafir.....	.....	2,452
Jerusalem Corn.....	457	2,134
Feterita	296	2,303
White Milo.....	1,507	2,331
Sudan Dura.....	860	2,220
Kowliang	397	2,818
Pink Kafir.....	.....	5,257
White Kafir.....	480	3,935
Double Dwarf Milo.....	926	1,516

The leading forage sorghum for this period was Sumac, with an average yield of 6,248 pounds of dry fodder. Red Kafir and Pink Kafir followed closely with a yield of over 5,200 pounds of dry fodder per acre. All of these varieties make excellent dry feed or silage. The highest yielding grain sorghums were White Milo with an average yield of 1,507 pounds and Dwarf Yellow Milo with an average yield of 1,243 pounds. The grain from these sorghums is first-class feed for all kinds of livestock.

TABLE IX.—ACRE-YIELDS OF SWEET SORGHUMS HARVESTED FOR SILAGE IN POUNDS ON THE PRESCOTT DRY FARM, 1920-1927.

Crop	1927	1926	1925	1924	1923*	1922†	1921*	1920
Black Amber..	3,658	1,799	2,500	2,520				2,300
Japanese								
Honey Drip....	2,438	1,763	2,875	4,800				
Orange	2,682	1,626	3,575	2,280				
Red Amber....	3,048	1,314	.....	2,280				
Sumac	2,743	1,763	1,875					
Texas Ribbon	3,048	2,491	2,875	2,680				

*Drought destroyed all plantings.

†Range cattle destroyed all plantings.



Fig. 5.—Corn Varieties, Prescott Dry-Farm, 1926.



Fig. 6.—Red Amber Sorghum, Prescott Dry-Farm, 1926.

TABLE X.—ACRE-YIELDS OF SWEET SORGHUMS HARVESTED FOR SILAGE IN POUNDS ON THE PRESCOTT DRY-FARM, 1920-1927.

Crop	1927	1926	1925	1924	1923*	1922†	1921*	1920
White Milo.....	2,196	1,522	.....	2,880				880
Red Kafir.....	975	2,249	.....	2,640				.....
Sunflowers.....	244	519	.....	2,420				.....
Hegari	1,219	.....	750	2,640				.....
Feterita	1,829	.....	.....	2,920				.....
D. B. H. Kafir	1,219	519	1,250	960				760
Yellow Milo.....	.....	1,551	375	.....	2,400			840
Freed Sargo..	2,865	1,660	1,000	.....	2,400			.....
Sunrise .....	.....	1,522	750	2,400	.....			.....
Darso .....	.....	1,782	1,375	.....	2,160			800

Texas seeded ribbon cane gave the highest average yield, 2,774 pounds, for the period. This variety is well adapted to this district.

Grain yields were not secured from the grain sorghums. Yellow milo maize was the most consistent grain producer.

*Drouth destroyed all plantings.

†Range cattle destroyed all plantings.

ALFALFA

During the period from 1913 to 1916, 12 varieties of alfalfa were given a thorough trial. None of the varieties planted made growth of more than 6 or 8 inches and none were even harvested for hay, so the plantings were plowed under in 1916. These tests demonstrated that alfalfa cannot be grown successfully in this district without irrigation.

SMALL GRAINS

From 1912 to 1915 eight varieties of oats; six varieties of barley, rye, spelts; 14 varieties of spring wheat, and 18 varieties of winter wheat were tested, with various dates of planting, methods of soil preparation, and rates of seeding. Not a single crop of any variety of small grain harvested could be considered profitable. The maximum yield for winter wheat for this period was 996 pounds of grain per acre in 1915. The principal cause of failure was winter-killing, and the lack of moisture in April, May, and June. In a district where the winter snows are so limited and the fall growth is exposed to low temperatures at certain periods, fall-planted grains have little chance to carry through until spring. If there is not a good supply of winter moisture they cannot mature grain during the dry springs so common in this district.

BEANS

Beans are especially well adapted to the semi-arid conditions existing over a large part of the Southwest, above the 4,000-foot elevation. They have been grown by the Indians for a long period of time, and take a prominent place in the Indian's menu. They are valuable as green-manures to be included in crop rotations. They will grow and produce marketable crops in years of very limited rainfall and in years of favorable moisture produce profitable crops of seed and forage. Some years insects, grasshoppers, or rodents cause considerable damage.

Twenty-two varieties of beans were tested during the 4 years 1911-1915. The five most promising varieties yielded as follows:

TABLE XI.—ACRE-YIELDS OF THE FIVE HIGH YIELDING VARIETIES OF BEANS IN POUNDS ON THE PRESCOTT DRY-FARM, 1912-1915, INCLUSIVE.

Variety	1912	1913	1914	1915	Average for 1914 and 1915
Tepary	237	.....	368	720	544
Bates	742	486	282	776	529
Lady Washington.....	275	184	490	744	617
Colorado Pinto.....	....	184	174	812	493
Yellow Hopi.....	....	....	400	424	412

PLANTING METHODS

Two methods of planting corn and sorghums were tested in 1918. Table XII gives the results of the harvest. With a single exception, the crop put in with the planter returned the largest yield of feed.

TABLE XII.—ACRE-YIELDS OF CORN AND SORGHUMS IN POUNDS PRODUCED UNDER DIFFERENT METHODS OF PLANTING.

Variety	Planter	Lister
Dwarf Milo.....	2,800	2,700
Feterita	770	725
Sumac	1,760	2,300
Darso	3,000	2,000
Sudan (cured hay two cuttings). {	4,895	3,260
	1,560	680
Papago sweet corn.....	8,092	7,035
Yellow Dent corn.....	2,850	2,837
Bloody Butcher.....	8,000	7,400
White Moqui.....	2,475	2,312

SOIL FERTILITY

Soil Fertility is the foundation on which continuous profitable crop production is based. Experiments were conducted over a period of years to determine the cropping system best suited to maintain soil fertility under conditions at Prescott.

Eight one-fourth acre plots were laid off in duplicate and the following cropping system followed for 5 years (Table XIII).

Plot 1—Sorghum continuous.

Plot 2—Sorghum continuous, 2½ tons manure per year.

Plot 3—Sorghum continuous, 5 tons manure per year.

Plot 4—Sorghum, beans for seed.

Plot 5—Sorghum, corn, beans for seed.

Plot 6—Sorghum, corn, and beans for green manure.

Plot 7—Sorghum, corn, and beans, winter rye for green manure.

Plot 8—Sorghum, summer fallow.

Eliminating the crop year of 1923, when all plantings failed because of dry weather, the plot that received 5 tons of manure every year returned the highest single year yield of 14,400 pounds of silage in 1922 and also the highest average yield for the 5 years of 4,860 pounds of silage per acre. Plot No. 2, receiving 2½ tons of manure every year and planted to sorghum every year, gave the second highest average yield of 4,420 pounds of silage per acre. None of the rotations consisting of sorghum, corn, beans, or fallow in different combinations gave any promise of being suitable to local conditions as a means of maintaining soil fertility.

Tepary beans planted for green manure or for seed did not produce a profitable crop in rotation any year. This was usually because of the dry weather or because the rabbits ate the crop before it had a chance to develop and the treatment amounted practically to a summer fallow. The highest yield of corn in any rotation was 1,900 pounds in 1924, following the crop failure of 1923.

The figures presented in Table XIII indicate that the most practical way of maintaining the fertility of this district is by the limited application of barnyard manure.

TABLE XIII.—PLAN OF ROTATION, AND ACRE-YIELDS IN POUNDS ON SOIL FERTILITY PLOTS, PRESCOTT DRY-FARM, 1922-1927.

Plot No.	1922	1923	1924	1925	1926	1927
1	Sorghum 9520	Sorghum (No crop) (drought)	Sorghum 1,900	Sorghum 2,160	Sorghum 3,290	Sorghum 2,420
2	Sorghum 2½ T. manure 10,920	Sorghum 2½ T. manure (drought)	Sorghum 2½ T. manure 3,000	Sorghum 2½ T. manure 2,060	Sorghum 2½ T. manure 4,200	Sorghum 2½ T. manure 1,920
3	Sorghum 5 T. manure 14,400	Sorghum 5 T. manure (drought)	Sorghum 5 T. manure 2,280	Sorghum 5 T. manure 2,280	Sorghum 5 T. manure 3,640	Sorghum 5 T. manure 1,700
4	Sorghum 11,360	Tepary beans for seed (drought)	Corn 1,900	Tepary beans for seed	Sorghum	Tepary beans for seed 740
5	Sorghum 10,880	Tepary beans for seed (drought)	Corn 1,290	Sorghum 2,550	Tepary beans for seed	Corn
6	Sorghum 11,100	Tepary beans for seed (drought)	Corn 1,000	Sorghum 2,960	Tepary beans for seed	Corn 720
7	Sorghum 10,680	Rye Green manure (drought)	Corn 1,020	Sorghum 3,020	Rye Green manure	Corn 1,840
8	Sorghum 9,950	Summer fallow	Sorghum 1,800	Summer fallow	Sorghum 3,200	Summer fallow

CULTIVATION

Proper cultural methods are very important in order to secure maximum use of soil moisture and fertility. Cultivation tests were con-

ducted during the years 1925-1927. These tests consisted in keeping the weed growth down by the use of a hand cultivator equipped with hoes, disks, shovels, and sweeps and no cultivation. The plots were planted to Red Amber sorghum which was harvested for dry fodder.

Table XIV shows that the plots cultivated with sweeps returned the greatest yields every year the tests were conducted with an average acre-yield of 4,380 pounds of dry fodder. The plots cultivated with the shovels were second, yielding 3,654 pounds of dry fodder.

TABLE XIV.—ACRE-YIELDS OF SORGHUM SILAGE IN POUNDS SECURED UNDER SIX DIFFERENT METHODS OF CULTIVATION, PRESCOTT DRY-FARM, 1925-1927, INCLUSIVE.

Treatment	1925	1926	1927	Average
No treatment.....	1,357	3,214	2,571	2,380
Hand hoes.....	1,500	4,228	4,285	3,338
Cultivation with disks.....	1,643	4,357	4,428	3,476
Cultivation with shovels.....	2,035	4,643	4,285	3,654
Cultivation with sweeps.....	3,143	4,785	5,214	4,380

FRUIT

A small orchard in which were several varieties of peaches, plums, apples, and small fruits was maintained on the farm for several years. It was not a success because of the late spring frosts which killed the blossoms, or because of the dry weather which retarded growth and development. During years when the spring weather was favorable some excellent fruit was produced.

POTATOES

Potatoes were given a thorough trial but a profitable crop was not produced. Supplementary irrigation is necessary for the profitable production of potatoes in this district.

CONCLUSIONS

The Prescott Dry-Farm has been operated for 15 years. During this period a great many varieties of corn, grain sorghums, sweet sorghums, wheat, oats, barley, rye, beans, potatoes, and fruit have been given a thorough trial. From the returns secured it has been demonstrated that a profitable business cannot be maintained by dry-farming alone. There are two reasons for the low crop yields: (1) soil type and (2) rainfall.

The soil composing most of the farmed area is scrub oak land, of a very pronounced clay, containing a great many small stones. This type of soil is very difficult to prepare for planting and keep in good tilth. It is of such a nature that the rainfall penetrates very slowly and dries out quickly. Field "C," which takes in the low land along Granite Creek, produced the heaviest yields due to better soil and moisture conditions and during years of abundant rainfall good crops can be produced on the higher ground.

Over a period of 13 years, 1892-1904 inclusive, the average rainfall was 13.94 inches. The following 8 years, 1905-1912, the rainfall was comparatively heavy, averaging 23.51 inches with a maximum precipitation in 1905 of 39.47 inches. The Prescott Dry-Farm was established during the last of these wet years, 1911-1912. Since 1913, or for 15 years, there has been a cycle of low precipitation averaging 14.89 inches and establishing a low annual record in 1924 of 7.58 inches.

During the periods of drought the stockman needs a supply of feed to carry his livestock until the ranges improve. Results secured during the past 15 years show that a limited amount of forage can be produced practically every season, and heavy yields some years. If this forage is preserved in a pit or trench silo it can be kept, without much loss of feeding value, for several years, and will be available for use when the ranges are poor. If the land to be farmed is located where flood waters from the arroyos can be utilized or where dirt dikes can be constructed along the bases of nearby hills so that run-off waters can be diverted to the fields for irrigation, increased yields can be secured.