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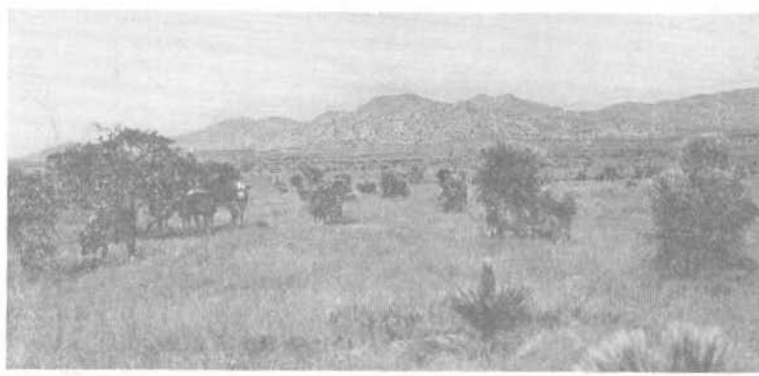
DRY-FARMING IN THE SULPHUR SPRING VALLEY

By G. E. Thompson and F. G. Gray



Native vegetation in the vicinity of the Sulphur Spring Valley Dry-Farm.

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BY G. E. THOMPSON AND F. G. GRAY

INTRODUCTION

The Sulphur Spring Valley Dry-Farm* was established by the Arizona State Legislature under a law enacted in March, 1912. The land was bought with money donated by the Southern Pacific Company and by the people of the Sulphur Spring Valley. State appropriations to the University have supplied the funds to conduct the experimental work which has been under the direction of the Agricultural Experiment Station. This farm is located in the Sulphur Spring Valley, in central Cochise County, about one mile south of Cochise. The legal description of the location of the farm is "the southwest quarter of section 20, Range 15 south, Township 24 east, Gila and Salt River Base and Meridian."

The altitude at the farm is 4,255 feet which is about the average of the Sulphur Spring Valley. The surface of this valley is more or less rolling in character. The San Simon and San Pedro valleys parallel the Sulphur Spring Valley and have conditions similar to those at the Sulphur Spring Valley Dry-Farm. The conclusions drawn from the experiments reported in this bulletin apply equally well to the three valleys.

The soil on this dry-farm varies from adobe in the lower parts to sandy and gravelly soil on the higher parts. Under the adobe soil, there is a layer of hardpan through which water does not penetrate readily, and under the sandy and gravelly areas there is a more or less Impervious layer of caliche with rocks of various sizes. The layers of hardpan and

*The manuscript for this publication was prepared by Professor G. E. Thompson in June, 1923. It has since been revised and some additions have been made by the Director of the Experiment Station and members of the Agronomy Section,

caliche lie from 1 to 4 feet below the surface. The surface slopes to the east at approximately 60 feet to the mile. There are three strips of adobe soil extending across the farm from east to west, with strips of sandy and gravelly soil between. The soil is not uniform, and all kinds may be encountered on a single acre.

This experiment farm was established largely as a result of requests from residents and settlers of the Sulphur Spring Valley who desired accurate information concerning the varieties of crops that were adapted for growing under the conditions there. They also desired information concerning the best methods of handling these crops, the best types and methods of farming, and an answer to the question: Can a dry-farmer with small capital make a good living in the Sulphur Spring Valley?

Actual work on this experiment farm began in January, 1914. The equipment of the experiment farm is about the same as that of a good average farm. There is a frame house of medium size, a combination barn and machinery shed, wagon scales, and the necessary teams and implements required for handling 60 to 80 acres under cultivation. There are two pit silos, each having a capacity of approximately 70 tons. In addition, a small pumping plant has been installed, by means of which 15 acres can be given supplemental irrigation. Advantage has been taken of the natural slope of the land and of a draw that runs through a part of the farm, and a small dike has been thrown up, by means of which flood waters can be diverted to a part of the fields. In a season of normal rainfall, it is possible by means of this dike to give one, and sometimes two or more, irrigations to 10 or 15 acres of land, depending upon the quantity of flood water.

The experimental work of the farm has been handled in such a way as to minimize the cost of the experiments conducted. The foreman, except during rush periods, has done practically all the work. The crops grown for experimental purposes are used for feed for the work animals or for conducting feeding experiments with cattle. The feeding experiments have been comparatively simple in character, having consisted mainly of a comparison of the value of the different kinds of feeds in wintering-over or fattening old range cows and young beef animals for the market. The purpose of these feeding experiments was to help dry-farmers market profitably their surplus feed and roughage, and if possible, to find a way to dispose profitably of old range cows.

When the farm was first established, a small orchard of the kind that would be desired by the average farm family and a vineyard suitable for home use were planted.

In order that the reader may have a better understanding of the conditions under which crops in the Sulphur Spring Valley must be grown, a summary of the rainfall by months for the 12 years, 1913 to 1924

TABLE I—RAINFALL IN INCHES WITH DISTRIBUTIO N BY MONTHS FOR THE YEARS, 1913 TO 1924 INCLUSIVE, AT THE SULPHUR SPRING VALLEY DRY-FARM

Year	Jan.	Feb.	Mch.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1913	0.20	1.47	0.60	0.50	0.06	0.16	1.07	1.68	0.18	0.00	2.31	0.80	9 03
1914	0.32	0.53	0.16	0 00	0.30	0 33	4.96	1.33	2 05	2.89	0.68	4.46	18.01
1915	0.97	0.98	0.18	0.48	0.00	0.00	6 40	0.34	0.47	0 16	1.06	1.45	13.49
1916	2.20	0.48	0.63	0.08	0.28	0.00	3.78	4.10	1.55	1.36	0.00	0 23	14.69
1917	1.74	0.39	0.03	0.08	0.65	T	3 73	2.94	1.01	0.00	0.00	0.00	10 57
1918	1.63	0.93	0.38	0.00	0.23	1.11	1 69	1.63	0.50	0.64	0.96	1.26	10.96
1919	0.23	0.57	0.09	0.36	0.65	0.02	3.69	1 43	3 15	1.51	3.87	0.09	15 66
1920	1.41	1.24	0.93	0.19	0.22	1.00	0.46	1.51	0.45	0.55	0.06	0.07	8 09
1921	0.46	0.22	0.07	0.11	0.05	0.21	6 43	4 97	1 23	0.37	0.66	0.64	15.42
1922	0.96	0.20	0.74	0.15	0 06	1.51	1.85	2 33	0.83	0.29	0.65	0.16	9 73
1923	0.04	0.68	0.45	0.39	0.01	0.06	4.26	3.29	.84	0 13	1 43	1.56	13.14
1924	0.20	0.00	1.05	0.61	0.03	0 08	2.34	1.27	0 38	0 00	0.00	0.38	5.96
Average	0.86	0.64	0.44	0.24	0 21	0.37	3.39	2.24	1.05	0.66	0.97	0.92	12 06

inclusive, is included in this bulletin Likewise a summary of frost records for this period is included These records should be studied in connection with the reports of success or failure with crops.

TABLE II—DATE OF FIRST SUMMER RAINS AT THE SULPHUR SPRING VALLEY DRY FARM FOR THE YEARS 1913 TO 1924, INCLUSIVE AMOUNTS OF APPROXIMATELY 25 INCH ARE TAKEN AS THE FIRST RAIN

1913	July 17	1919	May 24 (July 4)*
1914	May 31	1920	June 15
1915	July 16	1921	July 3
1916	July 12	1922	June 27
1917	May 19 (July 9)*	1923	July 5
1918	May 4 (June 20)*	1924	June 8 (June 16)*

*Where two dates are given, the second represents the second date on which a rainfall of approximately 25 inch or more occurred

In the Sulphur Spring Valley as in other parts of Arizona, many of the rains are light and of little value to growing crops and of even less value as far as storing moisture is concerned. Experience has shown that showers of less than ½ inch are practically worthless unless preceded or followed shortly by heavier rains The annual rainfall in most proved dry-farming regions of North America is 15 inches or more. The table shows the average rainfall at Cochise in the Sulphur Spring Valley for the 12 years ending December 31, 1924, to be 12 06 inches

EXPERIMENTAL WORK WITH CROPS

ALFALFA AND SWEET CLOVER

With the beginning of the experimental work, several varieties of alfalfa were planted. No variety of alfalfa yet grown has proved satisfactory under dry-farming in the Sulphur Spring Valley, and sweet clover has grown no better than alfalfa.

SMALL GRAINS

Early in the work of the farm all common varieties of small grains were thoroughly tested. None of them grew satisfactorily, except when supplemental irrigation was given. Considerable damage was done to

these crops in their seedling stages by the lark bunting, one of the sparrow family that feeds in flocks

CORN

Since the establishment of the experiment farm, corn has been grown regularly. Many varieties have been tested and many methods and times of planting have been tried. The varieties that have proved best are

TABLE III—KILLING FROSTS AT THE SULPHUR SPRING VALLEY DRY FARM FOR THE YEARS 1913 TO 1924 INCLUSIVE

Year	Last killing frost in spring	First killing frost in fall
1913	Not given	October 27*
1914	May 2	November 27
1915	March 22	November 11
1916	April 15	November 8
1917	May 6*	November 17
1918	April 20	October 27
1919	April 28	November 2
1920	April 22	October 14
1921	April 26	October 25
1922	May 11*	October 29
1923	April 23	October 24
1924	April 26	October 12
Average date	April 24	November 1

Average frost free period—190 days

*Temperatures of 30 degrees on October 27, 1913, 31 degrees on May 6, 1917, and 31 degrees on May 11, 1922, are taken as killing temperatures although not specifically reported as such in the records

those that have been grown for ages in this region and, by natural selection as well as by the aid of man, have become adapted to the severe conditions of the Southwest Some of the very early-maturing varieties of corn introduced from the northern states have given good results in the more favorable years, but on the average they have not been so satisfactory as the varieties developed from the native Indian corns of this region. The successful varieties are those that cease growth and remain practically dormant with unfavorable conditions, and begin growth quickly as soon as rains or favorable conditions appear. Rolling

of the leaves during unfavorable periods is a characteristic of these successful varieties. Quick maturity is another characteristic.

In growing corn under dry-farming conditions in the Sulphur Spring Valley, one of two methods must be chosen. Either the corn must be planted early in the spring, that is, in the last half of March or very early in April, and kept well cultivated until the beginning of the summer rains when it will complete its growth and mature quickly; or planting must be delayed until the beginning of the summer rains, which ordinarily start early in July. Most of the farmers of the Sulphur Spring Valley choose the second method. The disadvantage of delaying planting until the summer rains begin lies in the fact that the growing season after July 1 is comparatively short, and the corn may be injured by frost.

Corn is not a crop that can be grown profitably in large quantities in the Sulphur Spring Valley by dry-farming methods, but a small amount of it may be grown for home consumption.

BEANS AND COWPEAS

Under dry-farming conditions in the Sulphur Spring Valley, cowpeas, soybeans, and velvet beans have been failures. However, a variety of beans native to the Southwest, known as tepary beans, has been one of the surest crops grown. In the experimental work with tepary beans at

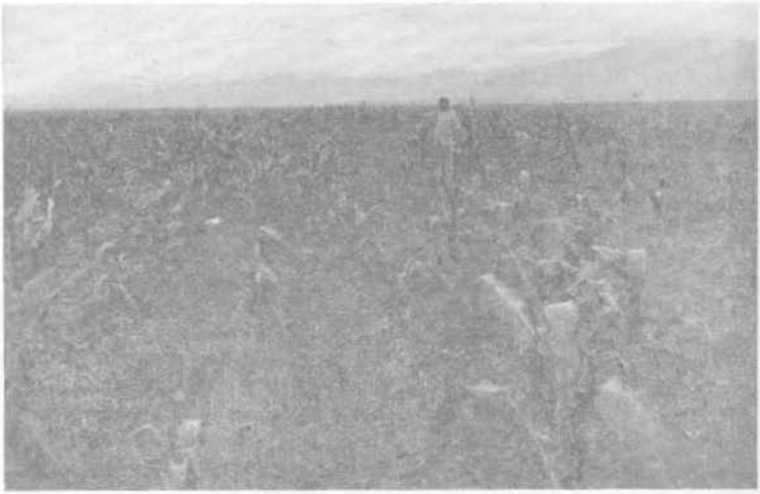

Fig. 1—A dry-farm corn field in the Sulphur Spring Valley. Planted in May, 1916. Note the stunted growth and irregular stand.

Fig. 2—A field of dry-farm tepary beans. Note the uniform growth and the large number of pods.

the Sulphur Spring Valley Dry-Farm, plantings have been made in many different ways, but a study of all results secured leads to the conclusion that the most satisfactory method of planting is in cultivated rows 3½ feet apart. When planted in this manner, 4 or 5 pounds of seed per acre should be used. Larger quantities can be planted and would be more desirable in good years, but in seasons of light rainfall (and they are in the majority), comparatively thin stands do best. The following table shows the results of the experiments with tepary beans from 1914 to 1923, inclusive.

TABLE IV—YIELDS OF TEPARY BEANS AT THE SULPHUR SPRING VALLEY DRY-FARM

Year	Date planted	Date harvested	Yields in pounds per acre
1914	July 17	Oct. 6	405
1915	July 17	Oct. 6	752
1916	July 17	Oct. 15	605
1917	July 18	Sept. 24	144
1918	July 15	Sept. 17	217
1919	July 27	Oct. 16	377
1920	June 30	———	———
1921	July 22	Oct. 13	538
1922	July 1	Oct. 16	123
1923	July 3	Oct. 21	205

An examination of the table shows that yields of threshed and cleaned seed ranged from 123 pounds to 752 pounds per acre. The crop was so light in 1920 that it was not harvested. These yields do not take into consideration certain tests that were destroyed by grasshoppers or other pests, and in some cases they represent an average of two or more plantings made to secure a stand.

With the increasing use of tepary beans for green manure crops in the irrigated valleys of the Southwest, it appears that the growing of

Fig. 3—Harvesting tepary beans on the Sulphur Spring Valley Dry-Farm. The harvester cuts two rows at a time and piles them into one window. They are shocked afterward and kept until dry enough to thresh.

this bean by dry-farmers will become more and more profitable. Tepary beans are particularly adapted to growing under hot, arid, climatic conditions. Tepary beans scattered on the ground in the fall of the year seldom will begin growth until the rainy season of the next summer; and under natural conditions they do not germinate well until the mid-summer rains begin. The experimental work of the farm has shown that it does not pay to plant tepary beans until the beginning of the summer rains.

Pink beans are also grown to some extent in the Sulphur Spring Valley, and they have done reasonably well. The most successful growers of

pink beans are those who have taken advantage of flood waters to grow the crop. Pink beans have not proved such heavy producers of seed at the experiment farm as have tepary beans, nor have they been so certain a crop. However, because of their greater market value, they have been more profitable to grow than tepary beans. They do not mature so quickly as do tepary beans, yet the best methods of growing them have been the same as those used in handling tepary beans.

MAMMOTH RUSSIAN SUNFLOWERS

In the spring of 1921, 18 acres were planted to Mammoth Russian sunflowers, and a similar acreage was planted again in 1922. The sunflowers were planted rather thickly, the purpose being to use them for silage. The following table gives the method of planting and the yields secured for each year. Although it is not shown by the figures of the table, it should be stated that thin spacing of the sunflowers resulted in heavy coarse stalks which were hard to cut and handle by machinery.

TABLE V—YIELDS OF MAMMOTH RUSSIAN SUNFLOWERS FOR SILAGE AT THE SULPHUR SPRING VALLEY DRY-FARM

Date planted	Date harvested	Width between rows	Number of days required for maturity	Yield In pounds per acre
July 6, 1921	Sept. 30	3½ ft	83	19,466
July 6, 1921	Sept 27	7 ft	83	11,882
July 20, 1922	Oct. 15	3½ ft	87	1,279
July 20, 1922	Oct. 15	3½ ft	87	1,440
July 20, 1922	Oct. 15	7 ft.	87	1,570
July 20, 1922	Oct. 15	7 ft	87	2,110
July 18, 1923	Oct. 18	3½ ft	90	3,770
July 18, 1923	Oct. 18	7 ft	90	3 770

In 1921 some supplemental irrigation was secured from flood waters
In the rows that were 7 feet apart, the same amount of seed was planted as where rows were 3½ feet apart.

These figures studied in connection with the rainfall records for the years 1921 and 1922 indicate that in the years of abundant rainfall, Mammoth Russian sunflowers will make fair yields, but in the relatively dry year of 1922, the yield was too small to be worth the cost of production. There was a slight advantage gained by spacing the rows 7 feet apart in the dry year of 1922, but in 1921, when the rainfall was unusually heavy, the largest yield was secured from rows planted 3½ feet apart.

A feeding test conducted by the Animal Husbandry Section with the silage produced from the sunflower crop of 1921 proved the sunflower

silage to be of good quality, although not quite equal to good sweet sorghum silage. It was, however, relished by the cattle in the feeding test. In feeding this silage, 10 old cows were fed for a period of 96

Fig. 4—A field of Mammoth Russian sunflowers being grown for silage. Planted July 6, 1921. Photograph taken August 10, 1921. Yield of silage, 19,466 pounds per acre.

days on a ration consisting of 62 pounds of sunflower silage and 2.7 pounds of cottonseed meal daily. During this time, the 10 cows made an average gain of 183 pounds.

THE SORGHUMS AND MILO

When the work of the Sulphur Spring Valley Dry-Farm was first started, major attention was given to corn and small grains, but during the last 5 years greater attention has been given to the sorghum crops. The sweet sorghums for forage and the grain sorghums for grain have been the most dependable, highest yielding, and generally the most successful crops grown on the experiment farm. The varieties of sweet sorghum that produced the largest yields in the years when the heaviest rainfall occurred are the Sumac and the Orange. In the dry years, smaller growing, quicker maturing, and lighter yielding varieties, such as Red Amber, Black Amber, and Freed's sorghum proved more profitable. In the experiments with sorghums, the same two methods of planting the crops were thoroughly tested as with corn, with the exception that the spring plantings were made 2 to 3 weeks later than was the case with corn. In general, the results have been about the same; that is, plant-

ings made after the beginning of summer rains have given the best yields.

Dwarf Yellow milo has been the outstanding grain sorghum on the Sulphur Spring Valley Dry-Farm. This variety properly handled is practically certain to produce some grain and a considerable quantity of forage. The forage value, of course, is comparatively small if the grain is allowed to mature fully; but if the season is so severe that it is certain a good grain crop will not be matured, the milo can be harvested for silage or fodder. The best fodder is produced if the crop is harvested when the grain is in the milk or soft dough state. Many other varieties of grain sorghum have been grown under dry-farming conditions in the Sulphur Spring Valley. However, the work at the experiment farm indicates that none of them are equal to Dwarf Yellow milo Dwarf Kafir, Feterita, Shallu, Kowliang, and Darso are included in this statement.

Hegari, grown under warm conditions, is a good combined grain and fodder crop. However, it does not thrive satisfactorily at altitudes above 4,000 feet; consequently its use in the Sulphur Spring Valley is limited.

PUMPING FOR IRRIGATION

The well that supplies water for the irrigation experiments of the Sulphur Spring Valley Dry-Farm is 104 feet deep. The water level is 74 feet below the surface of the ground. There is no appreciable draw-down when the pump is in operation. This pumping plant delivers approximately 100 gallons per minute. A small reservoir has been constructed in which the water can be stored, and this water supply has been used to irrigate 10 acres given to experimental crop production. This 10-acre area is laid out in plots of 1/10 acre each. The ground is handled in such a way that there is a definite rotation of crops on each piece. The sequence of crops is: First year, a legume; second year, small grain; and the third year, a variety of sorghum or corn. This work has proved beyond question that large yields of any of these crops can be grown, provided a sufficient amount of irrigation is supplied. As would be expected, the production of these crops by means of irrigation with the above lift is not practical, even for supplemental irrigation.

Observation of private pumping plants in the valley indicates that supplemental irrigation can be made to pay if the water lift does not exceed 40 feet. However, even under these conditions, the authors hesitate to recommend the use of pumped water for irrigation, unless the farmer is familiar with the operation of engines and pumping

machinery, skilled in irrigation work, and grows only highly productive, specialized crops.

A survey of the valley shows that considerably more than 75 percent of the pumping plants once operated are now abandoned. This in itself is proof that irrigation by means of pumped water has not been profitable for a majority of the farmers who have tried it in the Sulphur Spring Valley.

DYNAMITING SUBSOIL

In the spring of 1918 the subsoil of 1 acre on the Sulphur Spring Valley Dry-Farm was thoroughly dynamited. Holes were bored on 15-foot centers to a depth of 4 feet, and an effort was made to place the dynamite in the holes in such a position that it would be practically in the center of the caliche layer already noted; thus, when it was exploded, the caliche would be most effectively shattered. One-half stick of 20 percent Red Cross dynamite was used in each hole, and the charge for the entire block of ground was set off at one time by means of an electric device. The Giant Powder Company of Los Angeles cooperated with the Experiment Station by furnishing the dynamite, and their representative was present to supervise the placing of the dynamite in the holes. Examination after the charge had been exploded indicated that a very thorough job of shattering the caliche had been done.

In the summer of 1918, this dynamited area was planted to Freed's sorghum, and an adjoining similar area that had not been dynamited was planted in exactly the same manner to the same crop. The season was dry and a very unsatisfactory growth was secured. There was no difference, however, in the yield between the dynamited and undynamited areas.

In 1919, Papago sweet corn was substituted for sorghum on these two areas of ground. Again there was no difference in the yield. Similar results were secured in 1920, 1921, and 1922. From the foregoing, it may be stated that dynamiting the subsoil has not paid in the growing of crops on the Sulphur Spring Valley Dry-Farm.

RESULTS OF A FARM SURVEY IN THE SULPHUR SPRING VALLEY

In the spring of 1923, a survey was made of four townships in the vicinity of the dry-farm. As nearly as was possible, records were taken concerning all farms located in this area. The records show that most

of the land of this district was originally taken up by homesteaders, the average size of the homestead or farm being 160 acres. In a number of cases, the size of these farms was increased later by the purchase of additional ground; and in many cases, the actual area utilized by the farmer was increased by the use of State land or by the use for grazing purposes of nearby, unoccupied land. In 1922, the average

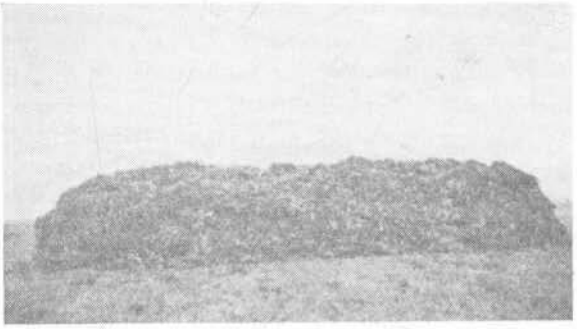

Fig. 5—Russian thistles, a common weed in the Sulphur Spring Valley, stacked for hay. The weed is rich in protein and makes good feed if cut and stacked before the spines harden and the stems become woody.

amount of land used by each settler living near the experiment farm was 1292 acres. Of all the farms surveyed, the average acreage in crops was 29 acres, and the average period that the farms were operated was 6.8 years. Of the foregoing farms, 66 percent have been abandoned. Several more farms have been abandoned since this survey was made.

In no case has a farm handled strictly as a dry-farm for the production of grain or cash crops been successful. The most successful farmers have been those that have combined raising livestock with dry-farming. In nearly all cases, the livestock kept have been beef cattle; but in every instance, livestock have been necessary for success. Many farmers in these four townships are making livestock the basis of their operations. The records further show that the farmers that have kept a flock of poultry have been more successful than those that have not kept poultry. Some of the farmers are specializing in poultry raising, and one of the largest commercial poultry farms in the State has recently been established in the Sulphur Spring Valley. Turkeys thrive especially well and their production is steadily increasing.

The farmers that have taken advantage of flood water for supplemental

irrigation on some of their fields have been more successful than the farmers without this advantage.

With the exception of a few farms particularly favorably located, orchards have not been grown. Supplemental irrigation is necessary for either fruit or shade trees.

In general, the farmers that have had some outside source of income have operated their farms longer than have the farmers who depended entirely upon the income from their farms.

Most of the farms now abandoned are utilized, at least for grazing purposes, by the farmers who have remained in the community.

The survey of these private farms corroborates the findings of the Experiment Station in practically every detail. The crops that have been successful on the Dry-Farm are the crops that have been most successful in the hands of farmers. The methods that have proved most successful on the Dry-Farm are the methods in general use by the farmers who have been successful enough to warrant their remaining on the land. The work of the Experiment Station shows, and the actual experience of the farmers of this community shows, that dry-farming in the Sulphur Spring Valley is not profitable.

DRY FARMING PRACTICES RECOMMENDED FOR THE SULPHUR SPRING VALLEY

ADJUSTMENT TO NEW CONDITIONS

The Sulphur Spring Valley, in common with most other dry-farming regions, has undergone a period of settlement followed by a period of hard times, during which many farmers abandoned their farms and many others were forced into bankruptcy. This period of hard times has been followed shortly by readjustment, and within a few years, by re-settlement of the country. It is inevitable that such should be the case. The first settlers that come into a new region are unfamiliar with the local conditions; they bring with them the crops with which they are familiar, and they attempt to put into practice methods used in their former communities.

Because of high and persistent winds in the spring and smaller rainfall and greater evaporation throughout the year in this region, these methods were unsatisfactory. Soil mulches are less effective here than in regions farther east and north, and crop plants must be chosen with more than ordinary care. The time and methods of planting must be adjusted to take full advantage of summer rains which ordinarily begin early in July. The settler who is observing and progressive and who

learns quickly to change his methods and his crops to suit the new conditions is able to survive. The safest rule for the newcomer is to follow the practices that are in common use by the successful farmers of the district.

IMPORTANCE OF LIVESTOCK

In the Sulphur Spring Valley under dry-farming conditions there is not a single instance in which crop production alone has been permanently profitable. Throughout the western states, dry-farming generally should be combined with the handling of livestock. In localities where rainfall is so limited that dry-farming is at best a hazardous occupation, it is all the more important that the handling of livestock be combined with dry-farming. Livestock, particularly cattle and sheep,

Fig. 6.—The headquarters of a successful operator on the edge of the Sulphur Spring Valley. Cattle are the foundation of prosperity here. Photo by R. H. Williams.

can be used to convert into more valuable products the rough feeds grown on parts of the farm that cannot be used profitably in the growing of other crops; they can be used also to graze range and hillside lands which nearly always surround or lie adjacent to dry-farming areas.

In practically all dry-farming regions, rough feeds can be produced in abundance during favorable years. If these feeds are harvested and stored in the proper manner, as by means of the silo, they can be preserved for years with very small loss in weight or feeding value. Authentic instances are on record of silage having been kept for 10 years in first-class condition. This means that the dry-farmer can grow silage crops in favorable years and store them by means of pit silos which are inexpensive, until the years of drought.

FIELD CROPS

As previously stated, the Sulphur Spring Valley under dry-farming conditions has not been profitable for the production of field crops. However, with due care and with proper methods of handling, the various sorghum crops can be grown. Some of these are valuable for grain, others for fodder and silage. The variety will depend upon the purposes for which the crop is grown and upon the season. This in turn will control the time of planting.

Sudan grass which is a member of the sorghum family can be used to advantage for pasture and hay in favorable localities. However, unless the Sudan grass field is located where it can secure a slight advantage by means of run-off water from higher ground, it cannot be depended upon to produce large yields.

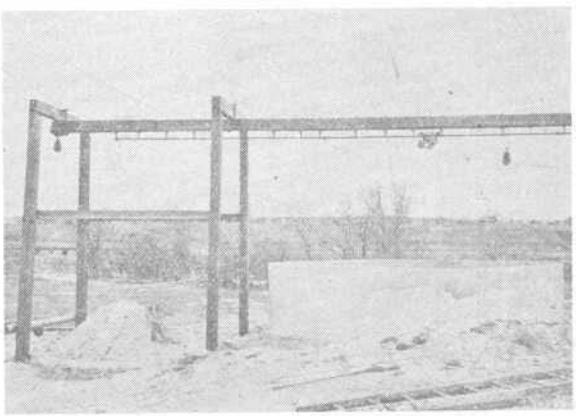

Fig. 7—A pit silo with a good type of hoist for removing the silage and loading it into wagons. Corn, sorghum, or similar feed can be economically preserved for future use by means of the silo.

Mammoth Russian sunflowers will produce silage yields of from 5 to 10 tons per acre during good years. Disregarding seed production, this crop is of practical value only for silage purposes.

Tepary beans properly handled are one of the surest dry-farm crops in the Sulphur Spring Valley. The principal objection to them has been the difficulty experienced in marketing them profitably.

Pink beans and pinto beans are not as certain crops as are tepary beans, but because of the well established market for them, they can be sold usually at a good price.

CARELESS WEED SILAGE

The weed commonly known as bledo, careless weed, or pig weed, *(Amaranthus Palmeri)*, if cut before the stems become tough and fibrous, can be used to produce a very good quality of silage. It grows naturally throughout the southern and central parts of Arizona. Immediately after the summer rains begin, these weeds spring up in cultivated fields and in waste places. They often grow to heights of 3 to 6 feet and mature and die before the earliest of the fall frosts. Yields as high as 10 tons of silage per acre can be secured from them under favorable conditions. The following table gives the chemical analysis of silage made from the careless weed compared with the chemical analyses of corn silage, sweet sorghum silage, and sunflower silage. A comparison of these analyses shows careless weeds to have considerable feeding value.

TABLE VI.—ANALYSIS OF CARELESS WEED SILAGE COMPARED WITH THAT OF CORN SILAGE, SWEET SORGHUM SILAGE, AND SUNFLOWER SILAGE

	Water	Ash	Crude protein	Crude fiber	Ether extract	N. F. E.
Careless Weed silage	81.27	4.38	2.12	6.38	0.50	5.45
Corn silage	74.43	1.84	1.89	7.3	0.42	14.13
Sweet Sorghum silage	75.17	2.88	1.13	6.41	0.48	13.93
Sunflower silage	83.26	2.89	2.27	5.31	0.45	5.82

Analyses from the Agricultural Chemistry laboratory, University of Arizona.

In the fall of 1921 a large silo near Nogales was filled with silage made from the careless weed, and during the winter this was fed to dairy cattle. The silage was strong in odor, but proved to be very good feed; it was eaten readily by the milk cows, and the milk was of good quality.

Inasmuch as careless weed grows abundantly in the dry-farming regions of the State, it is likely that it can be utilized to advantage for making silage, particularly when flood water can be taken advantage of to insure a large tonnage per acre.

SEED SELECTION

It is more important for the dry-farmer than for the fanner in humid sections to pay careful attention to the selection of seed that is adapted to his particular climatic conditions. He should make sure that a plen-

tiful supply of seed is always available. The dry-farmer can profit by the example of the agricultural Indians who have existed for generations in the arid and semi-arid regions of the Southwest. These peoples are very frugal and always keep on hand a sufficient seed supply to plant crops for 2 years. They say it is not safe to depend upon storing only enough seed to plant a single crop.

CULTURAL PRACTICES

Moisture is the limiting factor in dry-farming. Although the dry-farmer chooses crops that are regarded as drought-resistant, and crops that because of quick maturity are drought-evasive, no crop can be made to produce well unless supplied with considerable moisture.

Experiments conducted in a semi-arid climate by Miller of the Kansas Experiment Station showed from an average of 2 years' results that corn required 350 tons of water to grow and mature 1 ton of dry matter, while kafir required 287 tons, and milo 272 tons.

The dry-farmer must use every means at his command to handle the soil in such a way that rains will penetrate readily and that in so far as is possible moisture once stored will be retained until used by crops. Weed growth should be prevented on cultivated fields. Most weeds require more moisture for their growth than is required by a desirable crop. The average wild sunflower will use more water during its growth and maturity than is used by the average stalk of corn. Russian thistles, although considered very drought-resistant, are severe in their moisture

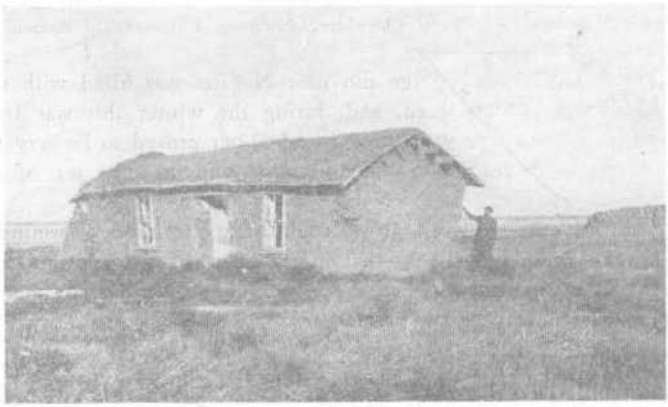

Fig. 8—An abandoned farm. The "old timers" used adobe in the construction of their buildings—the "new comers" have used lumber. This dry-farmer depended on field crops instead of livestock.

requirements. It is not only because of using moisture and thereby injuring the growing crop that weeds are undesirable; they also use plant food that is in the soil, thus robbing cultivated crops. The dry-farmer must plant his crops at the season of the year when, by the law of average conditions, they can best take advantage of the rainy season. He must plant them in such a manner that the moisture supply available will be sufficient to carry them to maturity. He must not plant too thickly.