Arid Farming, OR Farming Without Irrigation

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FEW people realize how small a proportion of the area of the state of Utah is used for agricultural purposes. According to the last census, the state covers an area of 82,190 square miles, of which 983 square miles, or a trifle more than 1 per cent, are under irrigation. Of the remaining 81,207 square miles, a few are used for farming without irrigation and for stock ranches; but the greater part of this great area of unirrigated land is practically put to no profitable use. Perhaps one-half or a little more of the unused land of the state is mountainous in its nature. Carefully guarded against overstocking, this district might become valuable ranges for limited numbers of animals. The remaining half of the unused lands is covered by the table lands and valleys or old lake bottoms which are collectively designated as deserts. Not far from 40,000 square miles, or nearly 25,000,000 acres of land, are occupied by these deserts. In comparison with this immense area, the 983 square miles or 629,120 acres of irrigated land is very small, indeed. The deserts are here. They shall always remain with us. Shall they ever remain deserts, or will they under the trained and intelligent will of man be made to serve some useful purpose? That is the question which has led to the recent general discussion of farming without irrigation as a means of utilizing the arid lands of the state.

INCREASE OF IRRIGATED AREA.

It may be said in passing that the irrigated area can also be largely increased by the proper use of the water already diverted from the rivers, and by the storage of the waters which now run to waste in the early spring and in flood times. However, the most careful calculations indicate that if the irrigated area can be increased tenfold it will be as much as can be hoped for. Moreover, it is very certain that many years, perhaps generations, will elapse before the mighty engineering structures that will make this increase possible, can be built; or before the farmer fully understands the newer and more rational methods of irrigation which will make the duty of water much higher than it is today. Arid farming has no quarrel with irrigation. Every person acquainted with the conditions of this state must admit that Utah's position as a great commonwealth, depends upon the proper practise of irrigation.

WHAT CAN BE DONE.

At the same time it must not be overlooked that 25,000,000 acres of desert land brought under cultivation, even though the acre yield be low, would be a magnificent adjunct to irrigation farming. It may be that in the future it shall be found that irrigation farming and farming without irrigation will be of co-ordinate value to the state. Certainly, the reclamation of our vast deserts, large enough in extent to accommodate an empire, is a question worthy of investigation. Should it be found that only a small fraction of our deserts can be reclaimed, it will still mean a great increase in the wealth of the state, and even if it should be found that crops cannot grow successfully without irrigation in this state, the investigation shall have been a worthy one in this age of progress. Man is not content to take things as they are, but he attempts with all his might to bend them according to his will. A state is great only as it uses its natural resources. The one great undeveloped agricultural resource of this state is the deserts. What can be done with the deserts?

FERTLITY OF THE DESERTS.

There can be no question about the extraordinary fertility of the soils of the desert lands of the state. Chemical and physical analyses agree in showing that the texture and the elements of plant food are all that can be desired for agricultural purposes. Common experience has taught that these lands, whenever irrigated, are able to produce crops in rich abundance. Moreover, the luxuriant growth of native plants over the great deserts indicates the inherent natural fertility of the soil. Sagebrush, rabbitbrush, greasewood and sunflowers, grow in profusion on certain parts of the desert. In places the sagebrush is man high; sometimes high enough to hide a man on horseback. There are forests of giant rabbitbrush, and there are other places where the ground for miles looks yellow with sunflowers. The deserts are places of abundant and continued sunshine. The temperature is favorable for rapid and sound plant growth. Soil and climate have combined to make most of the desert lands of this state ideal for agricultural purposes; the only factor in plant life which is absent is water. When the traveler picks his way with difficulty through the sagebrush and sees in the distance valley bottoms covered with rabbit brush six to 10 feet high, the suspicion is apt to force itself upon his mind that the water received by these lands as rains or snow which is able to produce such a luxuriant growth of native plants, would probably be sufficient, if correctly used, to produce profitable yields of useful crops, such as wheat, corn and other crops. There can be no question about the fact that an ordinary crop of wheat requires no more water than the thrifty crop of sagebrush or sunflowers.

AMOUNT OF WATER NEEDED.

Scientists in Europe and eastern America have carried on numerous experiments on the amount of water required by plants in their growth, and a great number of such experiments have been performed during the last two years at the Utah experiment station. The results of these experiments indicate that on the arid farms of the state it requires about 750 pounds of water to produce one pound of dry matter of ordinary farm crops. That means that it requires about 50 tons of water to produce one bushel of wheat. This water is largely taken from the soil by the roots of the plants; passes through the stems, and is finally evaporated from the plant leaves. A plant, to be in a healthy condition, requires that a stream of water be constantly passing through it. The plant has, in fact, been likened to a garden hose, which of itself can contain but a few quarts of water, but through which thousands of gallons of water may pass during the season. Now, 50 tons of water seem a large amount to be required in the production of one bushel of wheat, and most persons, without further examination, would say that no such immense quantities of water are received as rain or snow on the deserts. This, however, is worthy of investigation. Supposing 15 bushels of wheat were obtained per acre, at 50 ton of water per bushel, the total water required would be 750 tons. This amount of water, spread uniformly over one acre, would cover the land to a depth of a trifle more than 6½ inches. The water necessary to produce 10 bushels of wheat per acre would cover the land to a depth of about 4½ inches. A yield of 10 bushels of wheat on an arid farm would pay all expenses and leave something for profits; 15 bushels per acre is a very profitable yield.

RAINFALL WILL PRODUCE CROPS.

Observations extended over a series of years show that the average rainfall of Utah is not far from 12 inches. In a great many places it is from 15 to 20 inches; in many other places it varies between 5 and 10 inches. If, however, 5½ inches of water will produce 15 bushels of wheat per acre, and the average rainfall is 12 inches, there should be a possibility, by conserving the moisture properly, of making of the state one immense wheat field yielding at least an average of fifteen bushels per acre, and perhaps yielding more. The average rainfall teaches that, theoretically, there should be a possibility of growing various grain crops profitably on our deserts, depending for the water only upon that which falls directly from heaven. It is a pretty well established fact that in California and other regions of scanty rainfall, grains and various other plants thrive reasonably well with a rainfall of just a little more than five inches per annum.

ARID FARM PROBLEMS.

In fact, the real problems before the arid farmer are four in number:

1. Such soil treatment as will enable all, or nearly all, of the moisture which falls to soak into the ground.
2. Such later treatment of the soil as will keep all of the water which has entered the soil from being evaporated until it may be needed by the growing plants.
3. The developing of such varieties of crops as will be able to go through a season with a minimum amount of water.
4. Such methods of seeding, plant culture, and harvesting as will enable the plant to make use to the best advantage of all the water found in the soil.

An average of twelve inches of rain per year equals 1,361 tons of water per acre. That is enough water, if fully conserved in the soil, to produce over twenty-seven bushels of wheat. Allowing that one-half of this water is lost by evaporation before the plant can get at it, there still remains enough for thirteen or fourteen bushels per acre. Where the rainfall is very light, say six inches, there is still a possibility of growing crops profitably without irrigation; for by keeping the soil in the proper condition, nearly all the water that falls will soak into the soil and be stored there, and by allowing the land to lie fallow for one or more years, the rainfall of two or more seasons will accumulate until the soil moisture is sufficient to produce one good crop of wheat. When the present low value of these lands is considered, (the state sells them for $1.50 per acre), it would pay to obtain from them even one crop every second or every third year; it would certainly pay better to do that than to have them lie idle as they do now, covered with the apparently useless sagebrush and other related plants.

PIONEERS THOUGHT OF IT.

The question as to the utilization of the desert lands of the state is not a new one. It was asked by the first pioneers and has been discussed more or less by every person who has had occasion to travel extensively throughout the state. Early in Utah's history, attempts were made to grow grain without irrigation. Many of these trials were failures; many others were very successful. For instance; near Bear River City, farming without irrigation has been practised successfully since 1866, and the Sand Ridge near Bountiful has been covered with beautiful arid farms for at least thirty years. In Cache valley, farming without irrigation began to be developed some sixteen or eighteen years ago. Today, the whole of the west side of the valley is covered with beautiful arid farms, and among the most prosperous farmers of the county are those owning the large farms on which no irrigation is practised. These experiences in themselves furnish proof that in certain places and under certain conditions, farming without irrigation may be made profitable in this state.

In the southern part of the state no really systematic experiments on the possibilities of growing crops without irrigation have been undertaken. There, a peculiar prejudice against the art has become so firmly established that up to within a year or so it has been considered folly to attempt to grow crops south of Provo, without the artificial application of water.

FIRST SYSTEMATIC STUDIES.

Among the officers of the Utah Experiment station the possibility of reclaiming the deserts of the state has been an interesting topic of discussion at least since 1895. No systematic attempt to get at the principles which underlie successful farming without irrigation was made until the spring of 1901 when the writer and Prof. L. A. Merrill made an exhaustive examination of the conditions under which the arid farms of Cache and neighboring counties were successful. The results of the investigation indicated that arid farming should be profitable over a great area of the state. The climatic conditions of the state were likewise carefully investigated to determine if possible the districts that would most readily yield to cultivation without irrigation. The results of the work were published as Bulletin No. 75, and caused a widespread discussion. In this report the suggestion was made that in view of the magnitude of the possible interests involved in the reclamation of land without irrigation, the state should undertake the investigation of the problem, and it was suggested that the state establish four or five small experimental farms in different parts of the state on which the feasibility of growing crops without irrigation could be carefully investigated and where, also the right methods of cultivation and the development of suitable plants might be considered.

ASSISTANCE OF GOV. WELLS.

Soon after the publication of this bulletin, correspondence was taken up with Gov. Heber M. Wells, who took a very lively interest in the matter, and recommended, in his message to the last Legislature, that farms be established for the purpose of investigating the questions above mentioned. A bill was drafted by the writer, which was introduced by Senator Henry Gardner and Representative Stephen L. Chipman in their respective houses. It received the general support of the Legislature and of numerous citizens throughout the state. Especially active in the matter were the late Apostle Abraham O. Woodruff and Senator Willis Johnson. The bill passed without opposition, and was promptly signed by the governor.

THE EXPERIMENTAL FARM.

A committee on location was appointed by the board of trustees of the Agricultural college, consisting of Senator George C. Whitmore, Prof. Lewis A. Merrill and the writer. This committee examined a great number of districts thought to be suitable for arid farming, and the board of trustees, acting upon the report of the committee, located six farms as follows:

1.—Iron county farm, four miles west of Parowan.

2.—Juab county farm, about six miles south of Nephi.

3.—Sevier county farm, in Grass valley, about 18 miles southeast of Richfield, near Burrville.

4.—San Juan county farm, about six miles south of Monticello and near Verdure.

5.—Tooele county farm, about 14 miles south of Grantsville, and 10 miles west of Tooele.

6.—Washington county farm, at Enterprise, 18 miles from Modena.

The counties in which the farms are located generously donated the land, cleared and plowed it, and fenced the farms with rabbit tight fences. The supervision of the field work of these experimental farms was delegated to Prof. Lewis A. Merrill, who has performed his work exceptionally well. The chemical and other work was looked after by the writer. The farms themselves were under the general supervision of the experimnt station. Work was immdiately undertaken upon these farms, and the first crops were planted in the fall of 1903, a little more than one year ago. The season proved to be about average in the north, and a little below the average in the south. There was little precipitation in the fall to start the fall crops; and in the south there was little snow in the winter, leading to extensive winter killing. On the other hand, the spring rains were rather above the average on most of the farms. It was not expected that great yields would be obtained during the first year. After some years of tillage the soil will have greater power to absorb and retain moisture than it has in its virgin condition.

THE FIRST YEAR'S WORK.

At the time of harvesting, however, some very surprising yields were obtained. Wheat, oats, barley, and rye all yielded well. On some of the farms the yield of wheat on certain plats was not far from 30 bushels. Oats, at least one case, went above 35 bushels per acre. Field corn did remarkably well and proved its adaptability to arid conditions. Lucern, planted in the spring of 1904, made an excellent stand, and unless it becomes too thick, promises to do much better than we had anticipated. Even such crops as potatoes and sugar beets, which were planted with the expectation of failures, survived the season. In San Juan county where the rainfall was lowest, and the work least successful this year, sugar beets were grown weighing over two and one-half pounds each,and this without the reception of a drop of water other than that which fell from the heavens. The plats that were left fallow a year ago kept on increasing in moisture through the year and promise to yield much better next year than did the plats that were plowed last year and immediately sown to various crops. The exhibit at the late state fair of the crops grown on these farms demonstrated to thousands of citizens that arid farming and the reclamation of the deserts were something more than idle dreams of book farmers.

FUTURE WORK AND RESULTS.

It is of course, useless to say that the success of this one year's work demonstrates beyond a question the feasibility of profitably farming throughout the state. It is absolute folly to believe that in one year's work all the important and complicated questions relating to the best soil and plant treatment have been solved. It will take a number of years of careful experimentation before the whole matter can be said to have been put to a satisfactory test. However, in the minds of those who have given this subject careful, intelligent attention, there is no doubt but that, as the experiments progress, man will obtain a greater power over the deserts and the plants that he desires to grow there, until at last by the application of the principles of science to this problem, he will compel plants, perhaps of every kind, to grow and prosper upon our sagebrush deserts without the application of irrigation water. To be sure, some crops will be more profitable than others. Sugar beets, for instance, though they may be made to grow without irrigation, will probably never be a profitable crop on an arid farm. Wheat, corn and oats, on the other hand, may perhaps be so modified by successive generations of growth without irrigation that they will yield magnificent returns to the farmer for the time, labor and energy invested.

There are strong indications that crops grown without irrigation on our deserts will surpass in quality the crops grown without irrigation in humid climates. This question, too, needs to be investigated, for, can it be proved, for instance, that the wheat from our arid farms yields a better and more nutrious flour than that now on the market, it will increase proportionately the profit of the man who attempts to grow crops without irrigation.

WILL MAKE BETTER FARMERS.

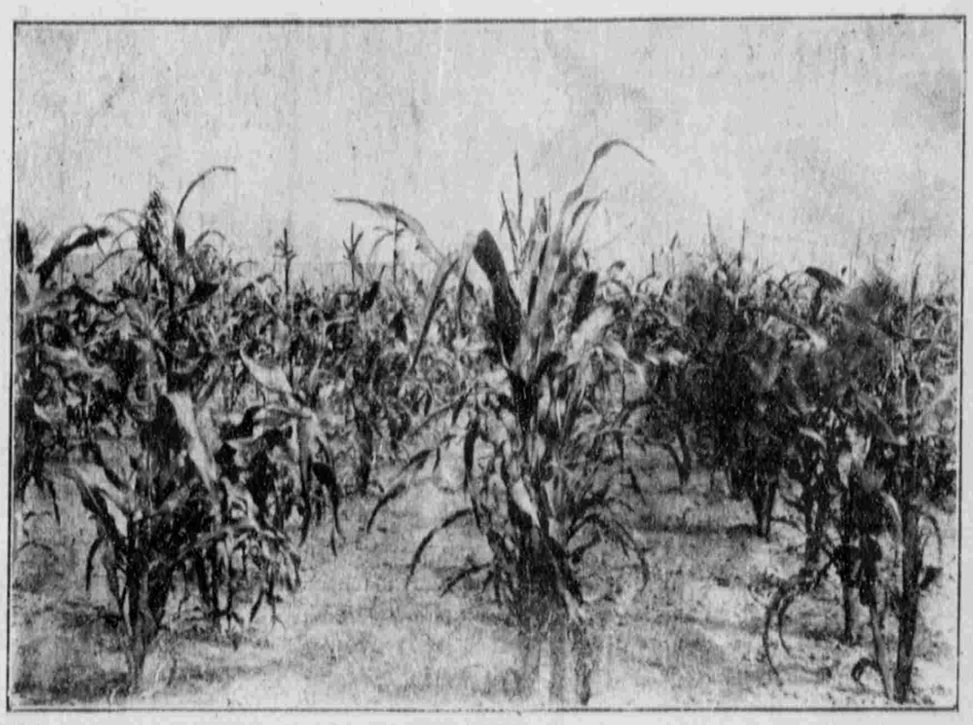
Above all, arid farming, if once developed, will lead to careful, systematic farming operations. This will react upon all the agricultural practises of the state and assist in developing better farmers. It is fresh in everybody's memory how the sugar beet industry educated our farmers as had no other single force up to the present. Arid farming, which means an intelligent battle with adverse conditions will develop our farmers similarly.

THE EXPERIMENTAL FARMS.

The farms now established by the state should by all means be continued for a period of years to come. The problem before them is of great magnitude; the questions that these farms may solve increase immensely the wealth of this state. The discoveries that may be made in the investigations will be a benefit not only to the arid farmer but to the irrigation farmer as well. The state should obtain intelligent knowledge of its vast domain of desert lands. Not only do these farms concern themselves with the deserts, but they have designs upon the mountains also. Shall our destroyed mountain ranges be covered with grass again? How shall it be done? What grasses will be used? Shall we cover our mountains with forests to take the place of those destroyed by the early logging? Will the introduction of steam machinery lead to the profitable cultivation of areas, where the low rainfall would make horse labor unprofitable? In the successful prosecution of the work of the experimental farms, these questions of fundamental importance to the state may find their solution. To the lover of the state, the true citizen, such questions appeal with strength. We cannot afford to ignore them or to overlook them or to postpone them. The coming generation will have enough to do anyway. We are told that among the first promises made by the Lord to the first man was the one that he should have dominion over the earth. No one can accuse us of having dominion over the deserts. They lie before us, vast, useless, tantalizing. It is for us to secure dominion over them. It is not impossible. Nothing is impossible today.

EXPERIMENTAL FARM EXHIBITS AT UTAH STATE FAIR.

DRY FARM PRODUCTS EXHIBITED AT THE UTAH STATE FAIR.



CORN GROWN WITHOUT IRRIGATION.

Five and a Half Million Bushels of Wheat At High Prices This Year.

THE Utah wheat crop for 1904 has been a record breaker. The yield, however, must be estimated, as there is no means at present for gathering exact statistics covering the grain yields for this state; so that estimates of local dealers in constant communication with the different producing areas of the state, must be relied on. These estimates, coming from conservative men, may be accepted as reliable.

The wheat crop in this state is figured at five and a half million bushels, as against three millions for the previous year. This was due to the exceptionally favorable conditions, especially in the matter of moisture, which sent the spring wheat shooting up with marked rapidity. Last year the big beet acreage cut down the wheat crop; but the unprecedented encouragement the wheat received from the weather this year, made the beet crop much less a factor than usual.

The total oat crop for Utah is put at two million bushels, and one quarter of a million for barley. There is little or no buckwheat grown in this state, though grain dealers here are unable to give any satisfactory reason why. There has been a good deal of complaint this fall over railroad discriminations, which make the corn rate into Utah 10 cents more from Kansas and Nebraska points than to Idaho common points, and dealers remark that discrimination against this state seems to be a constant quantity.

In a talk with President E. E. Rich of the Salt Lake Produce Exchange, on the cereal situation, he said:

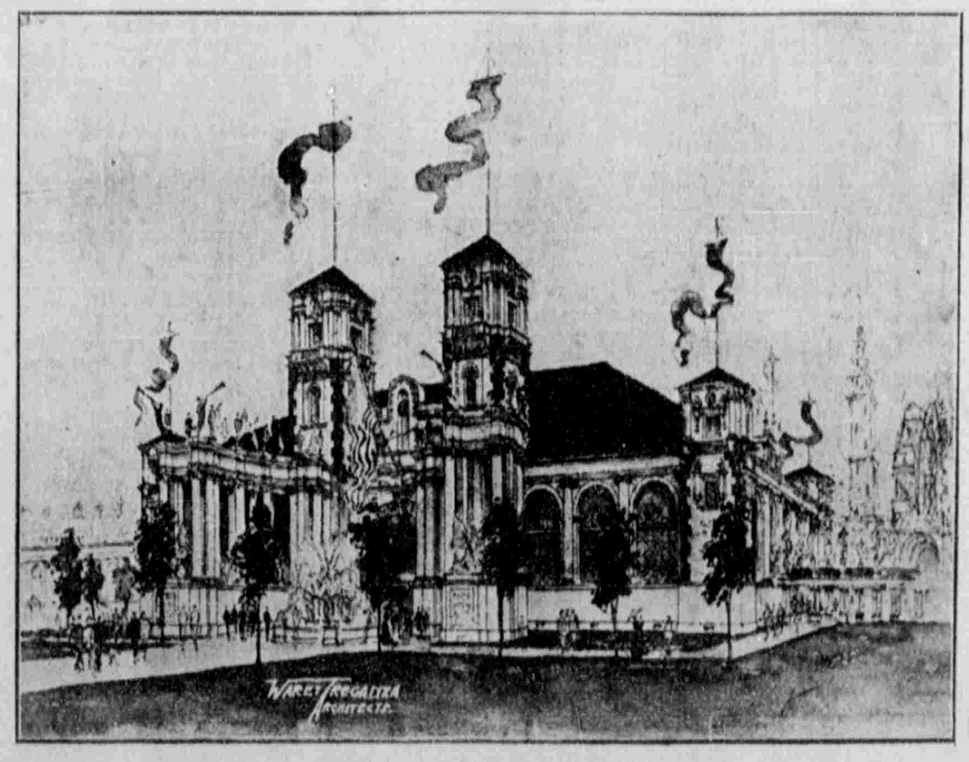
"The crop of wheat this year has been larger than the crop of 1903, for the reason that both the low and up land crops were much heavier, and in some places went 100 per cent. While the acreage was not any larger, the crops were a great deal heavier on account of the wet spring. The early frost on the 20th and 21st of August spoiled a large amount of the wheat for milling purposes, and there is estimated to be over 500,000 bushels of frozen wheat; the frost striking Morgan, Summit, Rich, Wasatch, Uintah counties, and the whole of Cache valley and the southern part of Idaho. Wheat that escaped the frost was in excellent condition, very plump and of No. 1 quality.

"Exports have been made to Colorado, Kansas City, Chicago, Tennessee and Texas. Nearly one-half a million bushels of wheat have been shipped from Cache valley and southern Idaho to the outside states. Prices have ranged from 80 cents to 97½ cents per bushel on a Salt Lake market basis. The flour mills throughout the state have done a better business in 1904 than before in ten years. They have been running night and day, turning out their full capacity of flour with good demand. What they need is a milling in transit rate so that they can ship to the Eastern and Southern states the manufactured article of flour instead of the raw material. All Eastern states have this milling-in-transit rate, but this has always been denied the state of Utah.

"The yield of oats has been splendid in the state of Utah, but are as a general rule of a second and third grade quality. The oats are mixed with other grain and foreign matters. Where the ground is not looked after in a proper way to get it ready for crops. Oats have also demanded a higher price this year than they have for several years, selling on a basis at thrashing time at $1.25 to $1.30 per hundred pounds, Salt Lake market basis. During the late spring and early summer, oats were demanding from $1.65 to $1.70 per houndred, so that the average price paid for oats during the year 1904 has been $1.50.

"The crop of barley raised is minimum, as it is a cereal not used as much as other grain. Brewing barley will run from $1.15 to $1.25. The average field barley runs from $1 to $1.10.

"The long extended drouth in this part of the west has had a bad effect on non-irrigated wheat, and dry bench farmers are feeling gloomy, as their fall sown wheat has stunted, and failed to develop under the entire absence of moisture of a southern Texas autumn."



NEW STATE FAIR BUILDING NOW NEARING COMPLETION.
(Ware & Treganza, Architects.)