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OKLAHOMA A. AND M. COLLEGE—EXTENSION DIVISION
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IRRIGATION IN OKLAHOMA

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The purpose of this circular is to afford some information as to **what** has been done along the line of irrigation in Oklahoma and its possibilities, rather than to give technical information on the subject.

Irrigation has been developed in Oklahoma but very little so far, as compared with the possibilities for its development. This is particularly true of the western portion of the state. It is unlikely that there will be any considerable extension of irrigation over the central and eastern portions of Oklahoma, as it is seldom that the rainfall is insufficient for crop production. In the extreme western part of the state, where irrigation seems to pay practically every year, plenty of water passes down the streams at some time each year for the irrigation of large portions of this country. So far nothing has been done to store any of this water. It appears feasible to build large reservoirs and utilize this water.

EXTENT OF IRRIGATION

Naturally most of the irrigation work has been done in the western part of the state. Most of those who have tried irrigation in the longitude of Oklahoma City and east are of the opinion that it does not pay except for garden and truck crops.

There are about 6,500 acres under irrigation in Oklahoma, according to an estimate made from the reports of the county agents over the state. Of this acreage about 6,200 acres are west of a line through Woodward and Altus. This acreage of some 6,200 acres is on about forty farms, while the 300 acres over the rest of the state are on about twenty farms. In this report, irrigated plats of less than an acre are not considered. This report shows the relative importance of irrigation in the eleven western counties of the state as compared with the remainder of the state.

SOME OF THE LARGER IRRIGATION SYSTEMS

The largest irrigation project in the state is in the northwestern part of Harper county on the Cimarron river. In this project about fifteen farmers are irrigating fairly regularly about 4,000 acres of land. The project was started in 1895. A competent engineer was employed to lay it out. Only one change has been made in the system as laid out and this was caused by extraordinary high water in the river. The damage done by this high water made it necessary to start the irrigation ditch higher up the river.

The system has been extended and improvements added to it at various times in recent years. It has always been handled as a private project. Each farmer does a certain fractional part of the necessary work on the main ditch, or pays for having it done. The ditch was built in the first

Acknowledgements are due Professor Hazen, Dean Knight and Assistant Director Bentley for valuable criticisms.

place with the same arrangement, and for this reason it would be difficult to figure the cost of it. The chief items of expense now are the cleaning of the main ditch about every two years, and the work at the river turning the water into the ditch.

There is no dam in the river, but the water is diverted into the ditch by means of a temporary sand dam which extends just far enough into the stream to divert the amount of water desired. It requires a man with a team and a slip scraper at this temporary dam nearly all the time when water is being used from the ditch. A slight rise in the river during the night may wash out the dam, and it is then necessary for the man and team to spend four or five hours replacing it. After the water is diverted from the river it is led across the river bottom in a shallow ditch to the foot of the hills and thence around the hills for about fourteen miles.

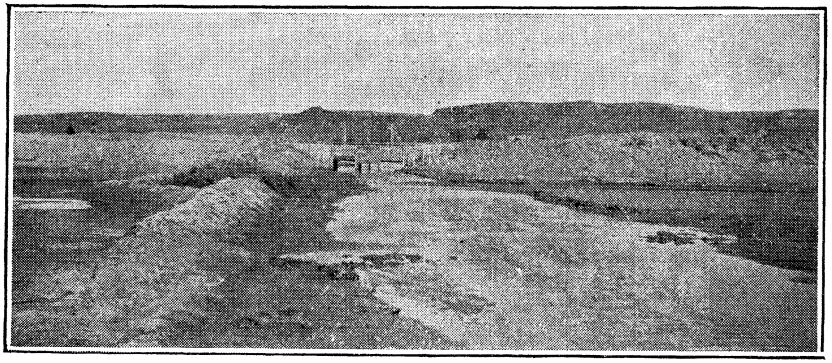

Figure 1—Headgate in Ditch in Harper County

Figure 1 shows a gate in the ditch just where it is leaving the river bed.

The fall of the main ditch varies a little, but averages about 18 inches to the mile. This is much less than the fall of the river, and accounts for the fact that the water will flow in the ditch out onto land that is above the river valley. The size of the ditch varies somewhat as the fall varies, but the average width of the stream of water is about 10 feet, and the depth in midstream about 2 feet. The amount of water flowing in the ditch when it is running near its capacity is about 12 cubic feet per second.

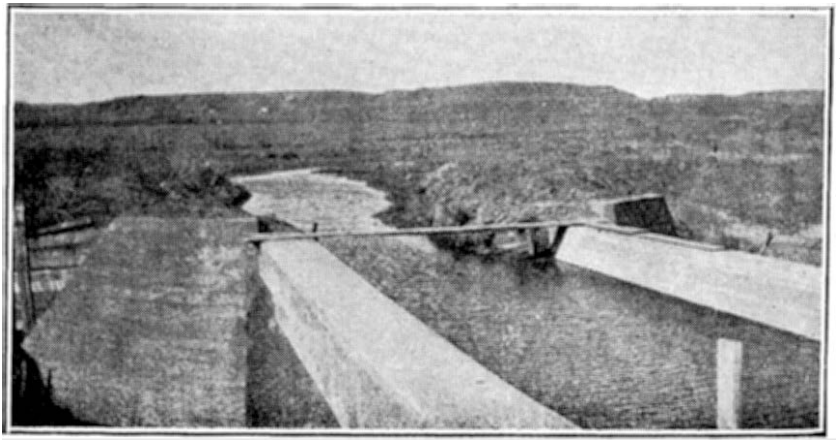

Figure 2—Concrete Flume in Irrigation Ditch

Figure 2 shows a flume on the main ditch which is used to carry the water across a ravine and permits the storm water coming down the ravine to run under it. This is the only flume used on the main ditch. The storm water from the hills along the rest of the ditch is permitted to run into the ditch, and often on over it.

The water is taken from the main ditch into small ditches, or laterals, at convenient points for irrigating the different fields, or for running to farms which do not border the ditch. The water has been applied somewhat irregularly both as to frequency of application and quantity used. There has been no means of dividing the water with any accuracy, so that often one farm would receive more water than it could utilize, while another would not receive enough to supply the crop. On the farm receiving the water too fast, much water would be wasted by running into the roads or gathering in the low places, making them too wet. It is expected that the use of measuring gates will assist in preventing a waste of water and thereby make it possible to supply all crops with water when they need it.

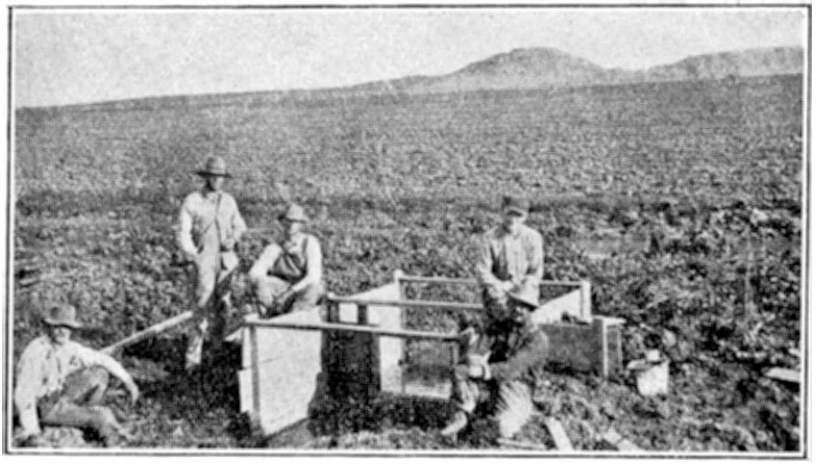

Figure 3—Weir Measuring Gate

Figure 3 shows a weir box which is used to measure the water that flows down a lateral ditch. Something of this kind is necessary to get an equitable division of the water flowing in the main ditch .

The water is distributed over the fields from the laterals by damming the lateral at intervals so the water overflows at the low places and floods the field nearby. After a sufficient amount of water has run out from above the upper dam, this dam is removed and the water runs down the lateral to the next dam, and again overflows.

The water of the Cimarron river at this place is somewhat salty, and were it not for the fact that this irrigated land is naturally well drained, it would not be possible to use the water many years without ruining the land. A few fields have become so salty that crops will not grow on them, but these consist of poorly drained spots only.

The prinpical crops irrigated are alfalfa, sweet clover and wheat. There are two or three reasons why these crops are favored. The river at this place often runs very low during the summer months, but nearly always has plenty of water flowing during the winter and spring. The wheat land may be watered in the winter and spring, and the alfalfa in the spring and early summer, until the water gives out. These crops, therefore, utilize the water when it is plentiful. It is also easier to get the necessary extra help for handling these crops. A large amount of livestock is

kept on these irrigated farms, and these crops fit in very well with stock-raising.

There is some doubt among the farmers as to whether it ever pays to irrigate wheat; but the irrigation of alfalfa and sweet clover has always proven profitable. From three to five cuttings of alfalfa may be raised per year with irrigation, while without irrigation only one or two cuttings can be raised, and during the drier years the crop dies out entirely.

IRRIGATION IN CIMARRON COUNTY

There are several farms along the Cimarron river in Cimarron county that are irrigated from the river. These systems are all much smaller than the one in Harper county, the largest covering about a section.

The main channel of the river here is less than a hundred feet wide in places, so that it is practical to put in a dam without too much expense. The dam raises the water a few feet and then it is turned into a ditch and led out above the land to be irrigated.

Figure 4—Rock Dam in Cimarron River

Figure 4 shows one of the best of these dams. The water that is not turned into the ditch runs over the top of the rock dam. In many places along this section of the Cimarron river it is possible to bring the water out above a hundred or more acres with a main ditch less than a mile long.

On one of the irrigated farms in this locality the water is raised from the river to the main ditch by means of a large chain and bucket pump and an engine, so that no dam is necessary. This pump works on the same principle as the small cistern pumps that lift the water by means of a chain with rubber plugs on it running up through a pipe. This is a very good kind of a pump for lifting water a short vertical distance. The lift in this case is about ten feet. This outfit has some expense attached for its operation, but the trouble and expense of building and maintaining a dam are saved.

The principal crop irrigated in this county is alfalfa.

The water in the river here is not salty, so there is no trouble from that source.

The irrigation plants of this county are very successful, and it is likely that there will be a great extension of irrigation in this part of the state within the next few years. Irrigation cannot be extended much more without one or more large reservoirs. In very dry years the river runs so low all the water is required for the little irrigation plants now in opera-

tion. It appears that with one or two large reservoirs to hold the storm water something like 100,000 acres could be put under irrigation in Cimarron county.

Irrigation Pumping Plants

The most common method of lifting water for the irrigation of from five to 100 acres of land is by the use of a centrifugal pump and a gas engine. There are several of these plants in Jackson county. Others are scattered over the state.

In Jackson county probably a greater variety of crops has been irrigated successfully than any other place in the state. The principal crops irrigated now are cotton, grain sorghums and sweet potatoes. Formerly alfalfa was irrigated, but the last few years other crops have given better returns, and now but little alfalfa is watered.

The usual arrangement of the centrifugal pump outfit is to set the pump on the bank of the stream a few feet above the usual water level and belt it to a kerosene or gasoline engine which is set higher up the bank, and preferably above the highwater mark of the stream. Usually the water is pumped nearly straight up into a wooden or sheet iron flume and runs down this flume by gravity flow to the high point of the irrigated field, or to a place where it will flow down a ditch to the irrigated field.

The ordinary centrifugal pump should be located less than twenty-five feet above the water to be pumped, and the nearer the water it is the better. The total lift for one of these pumps should be less than 100 feet.

Size of Pump

As an example of the size of the outfit required for certain conditions for the irrigation of forty acres where the water must be lifted a total distance of thirty-five feet, a 20-horsepower engine would be the right size. The size of the centrifugal pump required for this job would be one with a 6-inch discharge pipe at the pump, or a No. 6 pump. This outfit would pump about 1,000 gallons of water per minute. In figuring the size of the outfit for irrigating this forty acres, if one knew that there would never be more than half of the acreage requiring water at a time, a smaller outfit would answer the purpose. A 15-horsepower engine and a No. 5 pump would be large enough.

A few years ago, when many of these plants were put in, the cost of the outfit, the installation, and the ditching, were about $1,000.00 for a plant large enough to irrigate fifty acres. This would be about $20.00 per acre. For smaller areas the cost per acre would naturally be a little greater.

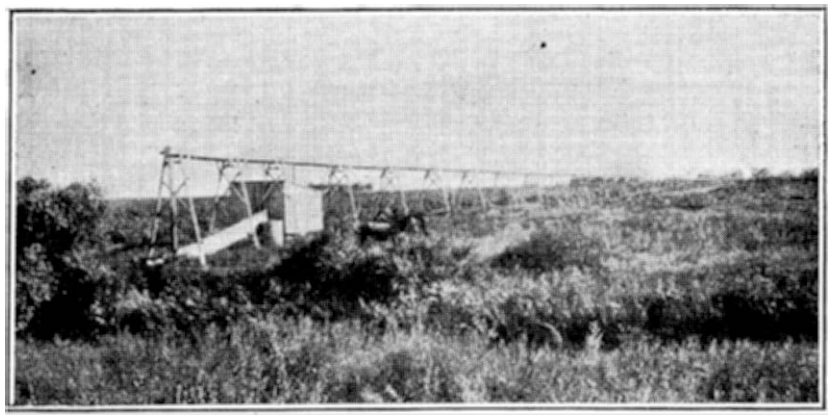

Figure 5—Pumping Plant and Flume

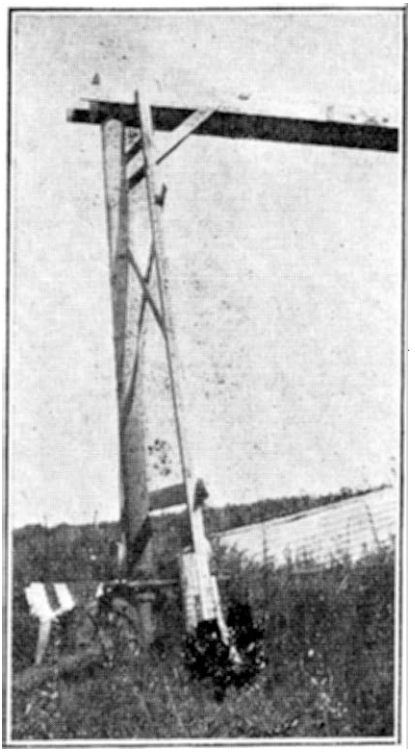

Figure 6—Centrifugal Pump

Figures 5 and 6 show a pumping plant and a flume with a metal trough.

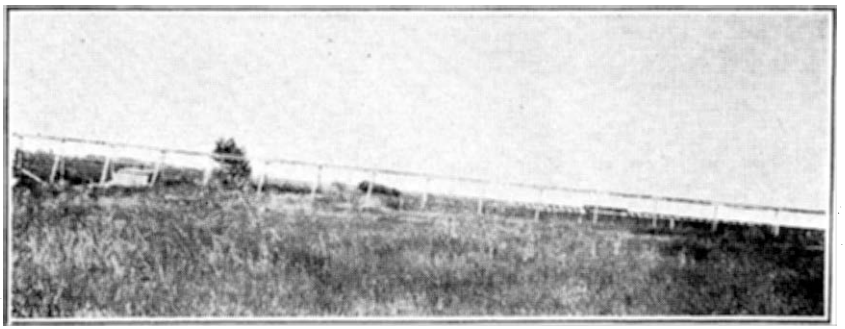

Figure 7—Flume from Centrifugal Pump

Figure 7 shows a long wooden flume, the trough being made of 1×12 boards. These flumes are usually given a fall of from 2 to 8 inches per 100 feet. If the lesser amount of fall is given, a larger flume may be required to carry the water, but the vertical lift at the pump will be less accordingly, and less power will be required to operate the pump.

Distributing the Water

The water from the pumping plant is usually distributed down the rows rather than by flooding. The alfalfa patches are usually flooded, however.

In running the water down the rows, it is best to have the rows run with a gradual fall from one end to the other so that the water will move slowly down the rows. The fall should be not more than 4 inches per 100 feet. If it is, there is a tendency for the land to wash, also the water does not soak in as fast as it should.

Usually the ditches and rows in the small irrigation plants are laid off by guess, and generally work satisfactorily. It is better to lay off the ditches and rows with a telescope level or some kind of a homemade level.

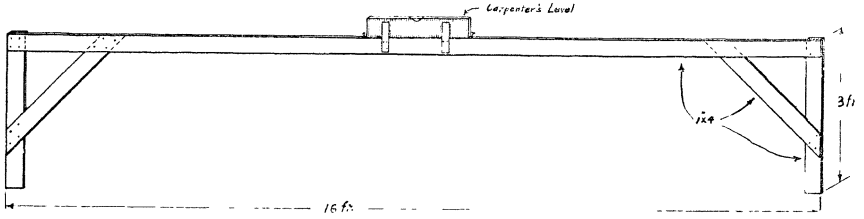

Figure 8—Homemade Level

Figure 8 shows how a carpenter's level may be fixed to lay out ditches, or the direction of the rows.

Where one leg on this 16-foot board is ½-inch shorter than the other, a fall of 3 inches per 96 feet is given the ditch or row.

If the ditches can follow the fences it makes the cultivation of the field more convenient.

Irrigation from Wells

Irrigation from wells is used on small plats of ground only in this state. The expense of pumping the water out of wells, and the difficulty of getting it out fast enough, are reasons why only small areas are watered. A great many farmers who have windmills irrigate from one-twentieth to one-half acre of garden, and find it quite profitable. The irrigation of the home garden is practical even though the well is 200 or 300 feet deep where a windmill is used to do the pumping. Where an abundance of water can be obtained within twenty-five feet of the surface, an ordinary centrifugal pump may be used to bring the water out, and the cost of the installation will not be great.

The next problem, where shallow water can be found, is that of getting a flow that will keep the pump running and yet will not ruin the well. This is quite difficult where the water is found in quicksand.

The office of rural engineering in the United States Department of Agriculture has made some investigations on this work and has found some very good methods of getting irrigation water from quicksand. One of the simplest methods is to sink a sheet iron curb into the sand and then put gravel around it. Where the quicksand and water are found within ten or fifteen feet of the surface, as they are in many places, a strong concrete curb may be sunk to the sand and into it as deep as is convenient. Inside of this curb, then, a sheet iron curb 18 to 24 inches in diameter is forced into the quicksand. Holes are cut in this curb before it is sunk so that the water can come into it freely. Several wagonloads of gravel are put around the outside of the sheet iron curb and then the sand and water are taken from the inside of it. As the sand runs in from outside the curb, the gravel will gradually take its place. After the gravel has worked down around the curb and some gravel has been put inside it, the water may be pumped out rapidly without bringing too much sand with it.

There is a considerable area in this state that might be irrigated from this sort of wells. Efforts have been made in several places over the state to irrigate from this shallow quicksand water, but on account of the difficulty of controlling the quicksand, no headway has been made.

The only way to irrigate a very large plat from a well without the fast flow from the well is by the use of a reservoir. Where a windmill is used, a reservoir is especially necessary as the flow of water is usually slow and uncertain.

The Skinner System

The Skinner system of distributing irrigation water is used on a number of gardens in the state. With this system the water is carried over the garden in overhead pipes and sprinkled over the surface through small holes in the pipes. This sprinkling of the plants is considered desirable with some garden and truck crops. This system is necessarily expensive and probably requires more careful cultivation to prevent baking than is the case with underground or furrow irrigation.

Lath Tile Irrigation

For the irrigation of gardens, the lath tile system is the most popular at this time, and is probably the best. With this system, tiling made of cypress lath is laid horizontally about ten inches under ground. Water is turned into this tile and seeps out into the soil at the roots of the plants. It is evident that the tile irrigation does away largely with surface evaporation and surface baking.

Circular No. 72, which may be obtained by writing the Extension Division of the A. and M. College at Stillwater, explains this system quite fully. The following points are set out in this circular as important in the installation and use of this system:

"Use care in placing the laths together so that all joints are dirt-tight. Lay the tile level in the ditch. Keep the feedpipe covered when not using it, and do not use water that will leave a sediment in the tile."

Th cost of the lath tile system at first appears to be high, but when one considers that a plat of ground 20 feet square with lath tile under it, and the windmill turned into the tile, will often produce more garden truck than an acre not irrigated, it is really not expensive. A great many farmers in western Oklahoma who have deep wells and windmills find this system well suited to the irrigation of a home garden.

CONCLUSIONS

Irrigation does not seem to pay except for garden and truck crops in eastern and central Oklahoma.

Field crops as well as truck crops have been irrigated profitably in western Oklahoma for several years.

Reservoirs will be necessary for a considerable extension of irrigation in western Oklahoma.

A study of the amount of water required for irrigation and of the supply available should be made before any money is spent on an irrigation system.

The cost of maintaining and operating the plant as well as the first cost should be considered.

Success or failure may depend on knowing when to apply water, and how must water to apply.

The irrigation of large areas from wells has not yet been successfully practiced in this state.

The lath tile system seems to be well suited to the irrigation of gardens in this state.