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D. E. HUTCHINSON
CONSERVATIONIST

Nebraska
COOPERATIVE EXTENSION WORK
IN AGRICULTURE AND HOME ECONOMICS
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W. H. Brokaw, Director, Lincoln

QUESTIONS AND ANSWERS FROM IRRIGATION SCHOOLS AT OGALLALA, FREMONT, AND COLUMBUS --- January, 1938.

(1) Is it necessary to have two wells for a pump?

Under many conditions, one properly constructed well will yield enough water for any ordinary irrigation pump up to 1000 gallons or more per minute. Where it is possible to get only 200 or 300 gallons per minute from a well, several may be connected to one pump in order to produce the desired flow.

(2) What form of power is recommended for field irrigation?

This depends a great deal upon conditions. For a short irrigation season, as in eastern Nebraska, the farm tractor is probably the most practical. Further west, where a long pumping season may be expected, the power unit or an electric motor is becoming increasingly popular, depending upon the availability and price of current.

(3) How big a well and what kind of a pumping plant is needed to develop alfalfa, trees and shrubs on 40 acres?

Probably an 18 or 24 inch casing and a turbine pump giving delivery of around 600 or 800 gallons per minute would be most practical.

(4) What is the best slope for a field lateral?

Field laterals are ordinarily run with a slope of 1 to 3 inches per 100 feet. It is often necessary to make them much steeper than this, in which case, drop structures are used to reduce the grade.

(5) What slope can be irrigated?

In places slopes up to five or more feet per 100 feet are irrigated. Under such conditions, it is necessary to use small streams of water, however. A slope of from 1 to 4 inches per 100 feet is better.

(6) How thick water-bearing gravel is necessary to produce a well?

A great deal depends on the size of the gravel and whether or not the water contained therein is under pressure. A strata of gravel 25 to 30 feet thick will ordinarily produce flows up to 800 or 1000 gallons per minute.

(7) Can a test well be made with a hydraulic machine?

Yes. Greater care and more experience is necessary, however, to procure a well log which correctly portrays underground conditions than with a sand bucket and a small casing.

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(8) Should a test well be sunk if you have only one practical position for a well?

Yes. There is no use spending money for a full sized well if no water is available.

(9) Will a 24 inch casing furnish as much water as a bigger casing and will the drawdown be the same?

Under identical conditions, the larger the casing, the more the flow, consequently, the less the drawdown. The yield does not increase proportionally to the diameter of the casing, however.

(10) Is there anything in witching for water with a peach stick?

No.

(11) What is the highest efficiency obtained by the best turbine pump in percentage?

Over-all effieicncy of pump and belt of 65% and 70%, or even higher, is sometimes obtained.

(12) Does the shape of the impeller affect the efficiency of the pump?

Yes, very materially.

(13) Do the formations carrying water through the Frenchman valley encourage hopes for pump irrigation?

Yes, in many places.

(14) Is a gravel packed casing better than a surged one?

Each has its place. If clean, coarse gravel is encountered, there is little use of using a gravel pack.

(15) Is money available from the government to put down wells?

No very satisfactory plan has been worked out by which an individual can borrow money from the government for the express purpose of putting down an irrigation well.

(16) What about priority rights on pump irrigation?

Up to the present, no law in Nebraska sets prior rights for pump irrigation except from streams, in which case the regulations are the same as for ditch irrigation. It is possible for a land owner to register a well and this filing may entitle him to prior rights if a law is ever passed.

(17) Can a good well be had in "hard pan"?

In certain parts of the state, notably in Cheyenne and Kimball counties, good wells are sometimes obtained in the Brule clay, commonly reffered to as "hard

pan." It is usually possible to determine when the "hard pan" will bear water by putting down a test well. The water seems to be carried in cracks in the clay.

(18) Is it necessary to use casing in porous rock or Brule clay?

It is not always necessary to use casing when drilling irrigation wells in material which will stand in the wall without support, as is the case with Dakota sandstone, Brule clay, etc.

(19) Would it be practical to undertake irrigation on the table-land with a lift of 200 feet?

Under ordinary conditions it would not be profitable to attempt such a high lift. In some states where citrus crops of high value are grown, a lift upward of 400 feet can be profitably made. Under Nebraska conditions, it is thought that a lift of 60 feet is about as high as is practical for the ordinary farm crops.

(20) What effect has pump irrigation had on the water depth, does it lower the water table?

Pumping large quantities of water from a well always lowers the water table temporarily in the direct vicinity of the well. Under some conditions, a number of wells pumping from limited ground water supplies in a valley have been known to lower the water table permanently. Along the Platte where a supply of water enters the water bearing strata, not only from the river but also from other sources, this lowering of the water table is not so noticeable. (See Geological Water Supply Paper 779, for sale by the Supt. of Documents, Washington, D. C. Price 70 cents.)

(21) Is it ever practical to carry water in pipes to the uphill side of a field?

Carrying water in pipes is not new in irrigation practices. There are many installations in the state where water for irrigation purposes is carried through pipes for a distance of more than a quarter of a mile or more. For temporary use, canvas hose may also be employed.

(22) Where should samples of soil be sent to determine whether the land will irrigate successfully?

It is doubtful whether a sample of the soil could be used to determine whether or not a field could be successfully irrigated. Successful irrigation depends upon the slope, the regularity of the surface, and many other factors besides the soil. If it is possible to secure a soils map of the county, the farm can be located and the type of soil determined. Often the county agricultural agent can be of help in determining whether or not the land is irrigatable.

(23) Will spring irrigation before crops are planted compare with fall irrigation for effectiveness?

There is not much difference between spring and fall irrigation except that there is often a longer period in the fall when water can be supplied. Farm work often starts as soon as the ground is thoroughly thawed out and would

actually be in shape to irrigate. Otherwise, there is little difference whether the water is applied in the spring or the fall.

(24) Can you advise the price that can be paid for electricity to compare with diesel power? This is based on an 80 foot lift.

This is a very difficult question to answer because there are so many factors involved, such as the length of time the outfit is used during the season and the type of crop upon which the irrigation is applied. It is ordinarily said that when electricity can be bought for $1\frac{1}{2}$ to 2 cents per kilowatt the cost will compare favorably with diesel power. The point is debatable, however, and there is much to be said on both sides.

(25) When two wells are connected together with a siphon, should the connecting pipe be down to the water level?

The connecting pipe should, of course, be just as near the water table as possible because the siphon will not operate when the water in the well draws down much more than 20 to 22 feet below the connecting pipe.

(26) What kind of a pump is best for irrigation?

This question cannot be answered directly because pumps of different designs are best adapted for different conditions. For pumping out of streams and shallow wells, the horizontal and vertical centrifugal pump is to be recommended. Undoubtedly, the turbine type of pump is to be preferred under conditions of high lift where high efficiency and long life is desired.

(27) At what point and by what method can a farmer determine under-irrigation, over-irrigation and proper irrigation?

Some experimental results are available in Nebraska from the North Platte Experiment Station and the Mitchell Experiment Station relative to the amounts of water which various crops require. In Nebraska, however, rainfall is a factor which must be considered because irrigation water is usually used to supplement moisture obtained from precipitation. Probably one of the best methods of determining how much moisture is present is by using an auger and determining how far down the soil is wet. After some experience with the irrigation of a particular field, the operator will be able to judge by the depth to which the moisture penetrated the ground how much additional moisture will be required to produce a crop.

(28) Have any comparative efficiency tests been conducted on pumps by any state or government agency?

Some isolated tests have been run by states on particular irrigation pumps. There is, however, no work being done on pumps such as is done at the Nebraska Tractor Testing Station at Lincoln on tractors.

(29) How is the efficiency of a pump influenced by shallow and deep pumping?

It is not often that the same pump will work under extremely wide conditions of lift. In other words, a pump which would produce 1000 gallons with a lift of 20 feet might not be the proper pump to use when pumping 1000 gallons against a head of 100 feet. It is always best to secure a pump which is designed for the job to be done.

(30) Is it preferable to have a large diameter well?

The larger the diameter of a well, the greater will be the amount of water produced under identical conditions. In most cases, the yield from the well with the large sized casing is not enough better, however, to pay for the extra cost.

(31) Have you any information as to the length of life of 14 gauge well casing, also 16 gauge.

No figures have been compiled at the Nebraska Experiment Station relative to the length of life of the various gauges of metal well casings. Some of the metal casings in wells which were installed in the valley of the Platte have been in for many years and still seem to be giving good results.

(32) When, or at what point, is diesel power with its high investment justified?

It is probably true that the diesel power plant can be justified when the operator uses the pumping plant between 1200 and 1500 hours per year, or more.

(33) What is the essential difference in methods of irrigating heavy black soils and the lighter, sandy soils?

The essential difference in the irrigation of these two types of soils consists in the rate of applying water and the times at which it may be applied. Ordinarily, the sandy soils will take a considerable amount of water rapidly, therefore, it may be necessary to use a larger head on each row and to move the water along faster in order that it can be carried for a considerable distance. In the heavy, black soils a small stream of water will travel for long distances because the absorption is less rapid. There is no danger of a sandy soil baking after water has been applied. In the hard, black soils of a gumbo nature it is often necessary to work the ground shortly after irrigation water has been applied.

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