Soil Moisture In Relation To Potato Production

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Making a sub-ditch in the San Luis Valley, Colorado. There are 20 rows of potatoes or 60 feet between this and the next ditch.

THE potato is not a heavy user of water, and has less power to exhaust the soil of its moisture than any other common crop. In Nebraska experiments it was found that the seasonal use of water by the potato of spinach and beets varied from 11 to 13 inches. Each inch of available water produced about 20 bushels of potatoes with the greatest demand for water during August and September depending, of course, on the planting date.

The Nebraska work also shows that when plenty of moisture is present the crop obtains 57 percent of its supply from the first foot of soil and 93 percent from the first three feet of soil. Under drouth conditions, however, potatoes are able to draw on the moisture in the fifth foot of soil. In the western states, where the annual precipitation varies between 8 and 18 inches, elaborate irrigation systems have been developed to supply the necessary moisture when it is needed.

In the eastern and central states, recent experiences with drouth have demonstrated the practicability of irrigating potatoes when the annual precipitation is below normal or when the distribution of precipitation during the growing season is poor.

Ohio experiments have shown that in dry seasons, such as 1936, irrigations on muck land equal to twice the evaporation, increased the yield of potatoes 15.6 percent and of celery 30.7 percent. In a wet season such as 1937 yields of most vegetables were not changed but the yields of spinach and beets were increased 46.6 and 29.9 percent, respectively. There do not appear to be any consistent differences between sub-irrigation and overhead sprinkler irrigation in the Ohio work. Utah experiments have shown that the blooming period is the most important stage in the development of the plant and that when only one 5-inch application of water was made at various times during the season that

Sources of Water

The water for irrigation is usually obtained by diversion from a stream and carried in a canal, by gravity, to the farm. It is there diverted by a headgate into the farm ditch. In some cases it is cheaper to pump it from the stream into the canal or farm ditch. This is especially true when the land to be irrigated is at a much higher elevation than the stream, in which case the canal or ditch would have to be too long. In most irrigation districts, however, farm ditches take water out of the canal almost as soon as it leaves the river. Some of these canals are thirty miles long in which case the farms are supplied with water in "sections".

An individual farm, for example, may have a three day "run" and then be "off" for six days while the farms in the other two sections under the same canal have their "runs". In the west, streams are highest in May

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Furrow irrigation in Weld County, Colo. Where there is a shortage of water, or where water moves laterally quite readily, only every other furrow is used.
shorten the time between picking and packing of head lettuce to an irreducible minimum.

From the standpoint of speed and capacity the truck gave the growers just what they wanted. But they were chagrined, and disappointed to find that it would not "fit" their fields.

When they used a truck of standard width, they found that the wheels on one side ran in a furrow while those on the other side ran on top of and destroyed a row of head lettuce.

They were faced with the problem of either changing the layout of their fields or the design of the truck if they were to take advantage of this new form of transportation.

The latter was the easiest course for many reasons and the tread of the lettuce field trucks was extended to 80 inches. These units have bodies 8 feet long and 20 feet long and ride on six wheels.

The two rear axles are dual drive to prevent the accumulation of mud between the wheels. Single tires are used on all wheels and these are usually 9:00-18s.

A new type crate equipped with rollers was adopted along with the wide treads. These crates are 8 feet long, three feet high and four feet wide and there are five to a truck.

A truck picks up five empty crates at a packing house and then proceeds to a field. Straddling two rows at a time, it moves slowly from one end of the field to the other while pickers load the crates.

The driver walks along and helps load if the furrows are deep enough to guide his truck. When loaded, the truck returns to the packing house where the crates are rolled onto the loading platform. The crates are then packed in the crates are quickly rolled on to the truck and returns to the field for another load.

The entire loading and unloading operations may be accomplished in forty-five minutes. Actually, head lettuce can be placed under the truck in less than an hour, although the time required is usually longer than this.

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6. FLEXIBLE. Pyrocide Dust is sold in several standard strengths, to control different types of insects at the least possible cost.

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and June when the snow in the mountains is melting. At this time the water supply in streams is greater than the demand for irrigation and intricate systems of reservoirs have been developed for the surplus. During July, August, and September the streams are usually low. The demand exceeds the supply and the stream flow is then supplemented with storage water. During the past eight years precipitation in the west has been below normal, supply of irrigation water has been inadequate and many farmers in the west have dug irrigation wells on their own farms. From these wells water is pumped to supplement that obtained directly from the streams and from storage reservoirs.

Methods of Applying Irrigation Water

There are three main methods of applying irrigation water to crops in different localities. The furrow method is by far the most popular. In this method the field must have a uniform gentle slope with a head or supply ditch across the upper end. The rows supplied by this ditch should not be much over 500 feet long. If the field is longer, a cross ditch or a secondary supply ditch across the center of the rows. A secondary distribution ditch is dug just below the head ditch and water is cut out into it in several places across the field. This ditch serves to reduce the size of the head ditch to one which can be readily handled without washing away the soil and also serves to distribute the water evenly in the furrows. Each cut out from the supply ditch to the distribution ditch supplies about 20 rows and a good irrigator can "set" and handle about 100 rows. A waste ditch must be provided at the lower end of the field which carries the waste water to another field for re-use or back to the stream. This method is usually lower in cost to install but costs more to maintain, requires more labor to operate, and requires more water than other methods.

Sub-Irrigation

Sub-irrigation is a second method which is used in a few limited localities where there is an impermeable layer of hardpan or other soil or more feet deep in the soil. The water is brought to the field just as in the case of furrow irrigation. When the field is planted one row is skipped in every twenty or so depending on the soil and a ditch is made along this skipped row. These ditches are known as sub-ditches and enough water is kept in them to keep the water table within two feet of the surface of the ground.

Experiments in the San Luis Valley in Colorado have shown that in those sandy soils two feet is the optimum height of the water table. This method requires large quantities of water to get the "sub" up but requires only enough after that to replace what is lost through evaporation and transpiration as no water is run to waste. The farmer using

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The best analysis to use varies with soil and cropping conditions. Complete fertilizers usually are required. To make sure your crops get enough potash, use fertilizers containing at least as much potash as phosphoric acid. On many sandy soils, the potash should be up to double, and on peat and muck soils, it should be up to triple the phosphoric acid.

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Soil Moisture Relation
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this system is not in absolute control of the moisture in his own field as the activities of the neighbors in running water influence the height of his water table. Heavy rains after the sub is up mean disaster. This method does not cause baking or crusting of the soil and one man has only a part time job to handle the irrigation on 160 acres of potatoes.

The third method, used to some extent in the eastern and central states to supplement rainfall but very seldom in the west, is the sprinkler system. This system is cheap to operate and economical in use of water as none runs to waste. It is also the only practical system for a hilly farm. It is, however, expensive to install, the pipes interfere with cultural and tillage operations, the soil crusts and bakes more often, more weed seeds germinate, and more cultivation is required than with the other systems.

When to Irrigate

There are many superstitions regarding the irrigation of potatoes but experiments in a number of states have proved that potatoes should be irrigated when they need it and that a check in growth at any time results in lower yields and poorer quality. In all regions it is advisable to flood the ground before planting to insure enough moisture to bring the crop up. In some instances it may be necessary to "ditch" the field and flood irrigate soon after planting in order to get the crop "up". The experienced grower can tell from the color of his plants and the "feel" of the soil taken at a depth of 6 or 8 inches, when his field needs water.

How Much Water to Apply

The soil may be considered a reservoir in which water is stored between irrigations or between rains. Tests in Utah show that about one half the volume of soil is taken up by the soil particles themselves. The remainder is held up by air spaces and moisture. These proportions vary somewhat with the soil type. Sandy and sandy-loam soils, when saturated, hold from 2.5 to 3 inches of water to the foot, of which 1.25 to 1.75 inches are available to plants. Clay loams and clays hold from 3.5 to 4.5 inches of water to the foot, and 2.25 to 3 inches are available to plants. It is obvious that the more water is held in the soil the less chance there is for the water to run off. In sandy soils it is necessary to apply more than in clay soils to get the same effect. In sandy soils it is necessary to apply more than in clay soils to get the same effect.

One of the most perplexing problems in irrigation by the furrow method is obtaining sufficient lateral movement of water in many soils. Thorough preparation of the soil and the use of small streams of water in the furrows will assist lateral movement. Subsoiling the field crosswise and irrigating often and before the soil becomes too dry will aid in overcoming this difficulty.

It is obvious from the foregoing discussion that no one can tell a grower exactly how to irrigate his crop. The grower must determine from experience the length of time and size of stream in the furrow necessary to get from 3 to 7 inches of water into the soil on his farm and there may be a difference between fields or even parts of fields.

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