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Irrigating the Garden

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IRRIGATING *the Garden*

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Irrigation Allows You to Grow More Food on Less Land. Note the Very Lush Growth and How Closely the Rows Are Together

More Than Moisture Needed for Quality

Garden irrigation is common everywhere, even where moisture is abundant. Commercial gardeners use irrigation to improve quality, boost yields. Ample moisture alone is no insurance of good quality and high yields.

Sufficient moisture must be combined with fertility, aeration, right soil temperature and general good garden practices if you expect the best results.

Plant food in the soil must be in solution before it becomes available to the plant. In extremely dry soils, there is almost no soil solution. In partially dry soils, the solution is too concentrated for plants to absorb it easily.

Hence, for good results, soil moisture must be kept at a constant and high level of availability. (See "When To Irrigate.")

Slowing up of growth due to short moisture hurts quality. It causes tough roots and tops and strong flavor. It is generally true that the smaller the moisture the less the plant food used and the slower the growth.

Irrigating the farm garden is not difficult if planning is done before planting and if the proper system is chosen for your case.

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When To Irrigate

It is not an easy matter to set up exact rules when is the "time to irrigate." This is a matter in which the gardener must use his own good judgement by "feel" and appearance of the soil and the garden plants.

Here are some tips which may be useful: There's usually enough moisture if you can form a ball when you squeeze a handful of soil. That is true with ordinary soils. Heavy soils, however, will "ball" when squeezed even though there is not enough moisture. For a more ideal moisture condition, heavy soils should have a "slick" feel or "ribbon out" between your fingers or leave a wet outline on the hand when squeezed.

A watchful gardener can tell when his plants need moisture. Plants generally turn a dark green and then a bluish green before wilting. When a plant is wilting, it has stopped growing and in no case should irrigation be delayed until this happens.

Root crops, especially potatoes, develop cracks and deformities with too much variation in moisture. All vegetables lose tenderness and crispness if grown continuous dry or alternately wet and dry. Variation in moisture is the main cause of "blossom end-rot" in tomatoes.

When in doubt, irrigate before it is needed.

Get Soil and Water Analysis

Some waters are not fit to be used for irrigation on any soils. Some waters that may be all right for some soils may not do at all on the soil on which you wish to use it.

For these reasons, it would be well to secure a soil and water analysis before you get too far into your irrigation plans. Tests will be made by the Experiment Station Chemistry department at South Dakota State College. Your county Extension agent has a form, which must be used in sending in samples to be analyzed. This also gives directions how to collect a representative soil sample. Several questions about the soil also must be answered in sending in the sample. This is necessary to give you proper service.

It is best in cases where irrigation is planned to send both the soil and water samples in together, indicating that they are to be used together. Ask your county Extension agent for the necessary forms.

Irrigation authorities at the college will give you a report on your soil and water which will provide you a better understanding of the fertility and management practices you need for good irrigation on your garden.

Getting the Water To the Land

Gravity flow through pipe lines or open ditches or pumping through pipe lines are the common methods. If the land lays right, the water can be siphoned over a dam.

In siphoning over any embankment, it is necessary that the discharge end of the siphon tube be lower than the water supply. Siphoning should not be attempted if it is necessary to lift the water more than 15 feet.

Some means of starting the siphon by removing air from the tube, thereby pulling water into it, is necessary. A kitchen or pitcher pump installed on a riser at the highest point of the siphon tube may be used to remove the air.

If the air is to be removed and the water is to be pulled in the intake end, the discharge end must remain tightly closed by a valve until the siphon tube is completely filled.

A tight valve is also necessary on the riser below the pump to prevent air leakage after the siphon starts.

Any size siphon tube may be used, depending on the amount of water needed. The lower the discharge end is below the water supply, the faster the water will flow.

If the land to be irrigated is higher than the water supply, a pump will be necessary. Manufacturers can best give information on how to install their pumps, power needs, operating speeds and general care. A two-inch centrifugal pump will discharge about 100 gallons per minute if the lift does not exceed 40 feet and if a three to five horse motor is used.

System To Use

There are three systems in general use: Overhead, surface and sub-surface. All are good but all have some disadvantages. Some problems with each are:

Overhead or Sprinkler. Equipment and installation are expensive. Operating cost is also high because of the additional equipment which must be maintained and additional power needed to pump water through pipes under pressure. The

water supply must be clean to prevent plugging and excessive wear on sprinkler heads. Wind is also a bother; it may cause uneven distribution and penetration.

Sub-Surface. Sub-irrigation through tile lines is also expensive to install. It is not recommended on soils with highly porous sub-soils—water will soak away too rapidly. Roots and sediment sometimes plug the tiles.

Surface. Land must slope right and be even enough to let furrow streams cover entire plot. There should be no low places where water will stand nor high places where the water will not reach. Some leveling is always advisable. A head ditch along the higher side of the plot should be installed from which water may be diverted down the rows. Sometimes surface gated pipe lines can be used in place of the ditch.

How Much Water?

Most garden plants take 50 to 100 percent of their moisture needs from the top 12 inches. This is probably due to the fact that fertility and air conditions are best at the top.

Proper irrigation then calls for keeping plenty of moisture in the top foot of soil. On sandy or light soils this will mean frequent irrigations. Sandy soils do not hold as much water as heavier soils and dry out more quickly. Heavy watering at one time on light soils may carry valuable nutrients too deep in the soil so lighter and more frequent irrigations are best.

Excessive use of water may cause a "seeped" or waterlogged condition which will retard or stop plant growth because it excludes air from the soil.

Different garden crops require different amounts of water but about 20 inches per season is the average. This means a depth of 20 inches on the land. Light soils should have this amount added in 8 to 10 irrigations of about two to four inches per irrigation.

The 20 inch requirement figure does not take into account evaporation or surface run-off losses which may under some conditions require another 10 to 20 inches.

A garden irrigation system should then be capable of supplying 30 to 40 inches of water during the season.

Time Needed per Irrigation

EXAMPLE: Assume your garden is a half acre and you want to put on four inches of water. This is equivalent to 2 acre inches or 2 inches of water over one acre. A flow of 450 gallons per minute (not counting evaporation or run-off loss) will provide one acre inch per hour or the required two-acre inches in 2 hours. A pump throwing 100 gallons per minute would then have to operate 4½ hours to provide one acre-inch of water. It would take 9 hours pumping to do the job.

The rate at which the soil will absorb water must also be considered. All soil types will vary at the rate they will absorb water but even heavier soils will usually take more than a quarter inch per hour.

Hence, if a four-inch irrigation is wanted on a medium loam with an absorption rate of one inch per hour, four hours would be needed.

Four inches applied in less than four hours would cause run-off losses. You should plant to irrigate so as to fill the root zone which is usually not more than four feet deep.

More water than this may cause leaching of plant foods or water logging. Less than this will cause deep-rooted crops to grow shallower.

Water Needed To Fill Root Zone

The amount of water needed to fill the three or four foot root zone will vary with soils. As a rule the depths of water to apply per irrigation should be:

Sand	**2 inches**
Sandy Loam	**3 inches**
Loam	**4 inches**
Silty Soils	**5 inches**
Clay Soils	**6 inches**

The depth of penetration is easily determined by a moisture probe, a three-eighth to a half-inch steel rod, not pointed. The probe may be easily pushed through wet soil but stops when dry soil is reached.

Vegetable Root Zones

Onions are shallowest rooted of the common vegetables and seldom remove moisture from more than the top 12 inches of soil. Celery, lettuce and radishes will take moisture from about 18 inches. Root zones of cabbage, broccoli, cauliflower and spinach extend to about 24 inches. Nearly all other vegetables have a 36-inch root zone except melons, pumpkins, cantaloupe and tomatoes whose roots extend somewhat deeper than three feet.

It should be remembered that even the deep-rooted vegetables take most of their moisture needs from the top soil where fertility, aeration and temperature conditions are more nearly ideal.

Garden Irrigation Pointers

Cultivation neither increases or reduces evaporation but improves aeration; reduces weeds competing for water.

Root crops require soil aeration. Hilling helps.

Keep water between rows; not over growing vegetables.

Stop irrigating root crops including potatoes a month before harvest. Let them harden for storage.

Irrigate just before planting; not just after.

It pays to build up fertility. This is not always true on dry land where water is limiting factor to production but under irrigation, fertility becomes extremely important.

If your garden plot is large enough so half may be summer fallowed each year, pests and weeds are reduced and moisture conserved for early spring growth.

Less than one-half acre properly fertilized, managed and irrigated, should produce all the vegetables and potatoes needed by an average family on a year-round basis.