Irrigating the Home Garden

Adequate soil moisture is essential for good crop growth. A healthy plant is composed of 75 to 90% water, which is used for the plant's vital functions, including photosynthesis, support (rigidity), and transportation of nutrients and sugars to various parts of the plant. During the first few weeks of growth, as plants are becoming established, they must have water to build their root systems.

While growing, vegetable crops need about 1 to 2 inches of water per week in the form of rainwater or irrigation water, depending on the type of soil. One thorough watering each week is usually enough for most soils. The soil should be wetted to a depth of 5 to 6 inches each time you water and not watered again until the top few inches begin to dry out. An average garden soil will store 2 to 4 inches of water per foot of depth. Keep a rain gauge near your garden and supplement rainfall with irrigation water if needed.

Reducing Water Demands:

All of the water added to the garden may not be available to plants, particularly if the soil is heavy clay. Clay particles hold soil moisture tightly, for example there are 4 1/2 inches of water per foot of this type of soil, there may be as little as 1 1/2 inches of this water available for plants. A higher level of humus in the soil brought about by the addition and breakdown of organic matter can increase the amount of water available. By causing clay particles to aggregate (stick together) humus also adds air spaces to tight clays, allowing moisture to drain to lower levels as a reserve instead of puddling and running off the top of the soil.

The moisture-holding capacity of sandy soils is also improved by additions of organic matter. Though most soil water in sandy soil is available to plants, it drains so quickly that roots are unable to reach water only a few days after a rain. Humus in sandy soil gives the water something to cling to until it is needed by plants. Addition of organic matter is the first step in improving the moisture conditions in your garden.

Mulching is another cultural practice which can significantly decrease the amount of water that must be added to the soil. Organic mulch six to eight inches deep can cut water needs in half by smothering weeds (which take up and transpire moisture) and by reducing evaporation of moisture directly from the soil. Organic mulches themselves hold some water and increase the humidity level around the plant. Black plastic mulch also conserves moisture but may dramatically increase soil temperatures during the summer if not covered by other mulch materials or foliage.

Shading and the use of windbreaks are other moisture-conserving techniques. Plants that wilt in very sunny areas can benefit from partial shade during the afternoon in summer. Young plants need particular protection, air movement across a plant carries away the moisture on the leaf surfaces causing the plant to need more water. In very windy areas the roots often cannot keep up with leaf demands causing wilt. Temporary or permanent windbreaks significantly reduce this stress.

Even with the implementation of all of these cultural practices a garden may still need a substantial amount of water. When rainfall is sparse and the sun is hot watering can benefit your garden with increased yields. It may save the garden altogether in a severe drought. Irrigation practices when properly used can:

* Aid in seed emergence
* Reduce soil crusting
* Improve germination and plant stand
* Reduce wilting of transplants
* Increase fruit size of tomatoes, cucumbers, and melons
* Prevent premature ripening of peas, beans, and sweet corn
* Maintain uniform growth
* Improve the quality and yields of most crops

Irrigation Methods:

The home gardener has several options for applying water to plants including a sprinkler can, a garden hose with a fan nozzle or spray attachment, a portable lawn sprinkler, a perforated plastic soaker hose, a drip/trickle irrigation system or a semi-automatic drip system. Quality equipment will last for a number of years when properly cared for. When making a decision as to which type of watering equipment you will use there are a number of things to consider.

The purchase of a specific type of watering equipment depends upon available water facilities, water supply, climate and garden practices. If there is no outdoor spigot near the garden the expense of having one installed may be greater than the benefits gained except in very drought-prone areas or in the case of a gardener who is fully dependent on the season's produce. Where rainfall is adequate except for a few periods in the summer it is wise to keep watering equipment simple. A rain barrel or a garden hose with a fan-type sprinkler may suffice; a water breaker for small seedlings is useful. In areas where there are extended periods of hot weather without precipitation the local water supply is likely to be short. Since overhead sprinklers waste water a drip irrigation system may be in order. Drip irrigation provides water to roots without wetting plant leaves helping to control some diseases. Timers are available that allow automatic watering with drip irrigation systems.

Several types of drip or trickle equipment are available. The soaker hose is probably the easiest to use as it requires no installation. A soaker hose is a fibrous hose that allows water to slowly seep out all along its length. It is simply laid at the base of the plants and moved around the garden as needed. There are also complete kits containing attachments and PVC hose with holes to allow gradual water release. These are intended for semi-permanent installation and usually last 2 to 5 years. With this type a flow regulator usually has to be included with the system so that the water can reach the end of the hose without being sprayed out at full force. A special double-walled type of irrigation hose has been developed which helps to maintain a more even flow. Finally,

there is the emitter-type system, best used for small raised beds or container gardens, in which short tubes, or emitters, come off a main water supply hose and go right to the roots of the individual plants. This is generally the most expensive form of irrigation and the most complex to set up but it has advantages. The weeds in the area are not watered and evaporation from the soil is minimized. This type of system is best used in combination with a coarse mulch or black plastic. Drip systems can have problems with clogging from soil particles and/or mineral salts suspended in water. New designs take this problem into consideration; some include filters and self-flushing emitters. It is wise to make a complete investigation and comparison before purchasing a drip irrigation system.

Basic Techniques and Principles for Watering:

For overhead or sprinkler watering adjust the rate of water application to about 1/2 inch per hour. A faster rate will cause run-off unless your soil has exceptionally good drainage. To determine the rate for a sprinkler, place small cans at various places within the sprinkler's reach and check the level of water in the cans at 15-minute intervals. When using the oscillating type of lawn sprinkler, place the sprinkler on a platform higher than the crop (to prevent water from being diverted by plant leaves), and try to keep the watering pattern even by frequently moving the sprinkler and overlapping about half of each pattern.

Do not use sprinkle irrigation in the evening as foliage that remains wet overnight can encourage diseases. Morning watering is preferable as there will be less water lost to evaporation than during the heat of the day. Add enough water to soak the soil to a depth of 5 to 6 inches--the precise amount required varies with the nature of your soil. Frequent light waterings will encourage shallow rooting, causing plants to suffer more during drought periods especially if mulches are not used. On the other hand too much water especially in poorly drained soils can be as damaging to plant growth as too little water, depriving the roots of oxygen needed to grow.

By knowing the critical watering periods for selected vegetables or vegetable types you can reduce the amount of supplemental water you add. This can be important especially where water supplies are limited.

In general water is most needed:
* during the first few weeks of development
* immediately after transplant
* during development of fruits

The critical watering periods for some specific vegetables are:
Asparagus -- Spear production, fern development
Broccoli, Cabbage, Cauliflower -- Head development
Beans, peas -- Pod filling
Carrot -- Seed emergence, root development
Corn -- Silking, tasseling, ear development

Cucumber, Melon --Flowering, fruit development
Eggplant, Tomato --Flowering, fruiting
Lettuce -- Head development; moisture should be constant

Drought:

In areas prone to drought, look for drought-resistant varieties when buying seed or plants.

If water supplies are short in your area and you wish to use "gray water" (water from household uses) on your vegetable garden, a few rules should be observed:
* Do not use any water run through the toilet, because of the possibility of contamination from fecal organisms.
* Avoid the use of kitchen waste water that contains grease or harsh cleaners, ammonia, bleach, softeners or non-biodegradable detergents.
* If using water from the bathtub or washing machine, use only mild, biodegradable soaps. Omit softeners and bleaches. Allow the wash and rinse water to mix, if possible, to dilute the soap content. Never use a borax-containing product (such as washing soda) in water to be used on a garden because of the danger of applying levels of boron toxic to plants.
* Apply gray water to the soil, not to plant leaves.