

Irrigating the vegetable garden

A healthy plant is composed of 75 to 90% water so adequate soil moisture is essential for good crop growth. Proper irrigation can benefit the vegetable garden by: aiding in seed germination and emergence; reducing soil crusting; reducing wilting and slow growth in transplants; increasing fruit size of tomato, cucumber, and melon; preventing premature ripening of peas, beans, and corn; and improving quality and yield of most crops.

How much water is needed?

During the growth period from April to September, vegetable crops need about 25 mm (1") of water per week in the form of rainwater, irrigation water, or both. Keep a rain gauge near the garden or check with the local weather bureau for rainfall amounts, and then supplement rainfall with irrigation water, if needed. There are ways, however, to reduce the amount of water you have to add.

During dry periods, one thorough watering each week of 25 to 50 mm (1-2") of water (300 to 600 litres per 10 square metres or 80 to 160 gallons per 12 square yards) is usually enough for most soils. Soil should be wetted to a depth of 12 to 15 cm (4.5 to 6") each time you water and not watered again until the top few centimetres (about an inch) of soil begin to dry out. The average garden soil will store about 50 to 100 mm (2-4") of water per 30 cm (12") of depth.

Reducing water demands

All of this water, however, may not be available to plants, particularly if the soil is a heavy clay. Clay particles hold soil moisture tightly. A relatively high level of humus in the soil, brought about by the addition and breakdown of organic matter, can improve this condition to some extent. 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 addition of organic matter. Though most soil water in sandy soil is available, it drains so quickly that plants are unable to reach water after even a few days following a rain. Humus in sandy soil gives the water something to cling to until it is needed by the plants. Therefore, the addition of organic matter is the first step in improving moisture conditions in the garden.

Mulching is a cultural practice that can significantly decrease the amount of water that needs to be added to the soil. A 15 to 20 cm (6-8") organic mulch can reduce water needs by as much as half by smothering weeds (which take up and transpire moisture) and by reducing the evaporation of moisture directly from the soil. Also, organic mulches themselves hold some water and increase the humidity level around the plant.



Mulching is an effective method of conserving moisture if an adequate supply of mulch is available.
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Black plastic mulch also conserves moisture, but may increase soil temperatures dramatically during the summer (to the detriment of some plants and the benefit of others) if not covered by other mulch materials or foliage.

Shading and the use of windbreaks are other important moisture-conserving techniques. Sensitive plants benefit from partial shade during the afternoon, especially while they are small. Also, air moving across a plant carries away the moisture on the leaf surfaces, meaning the plant will need more water. In very windy areas, the roots often cannot keep up with increased leaf transpiration demands, and plants wilt. Temporary or permanent windbreaks can help tremendously.



A rainwater collection system can provide irrigation water for a small garden. However, if it is not on-site the water must be transported to be of use in the garden. © Lana Bos, Dalhousie.

Irrigation methods

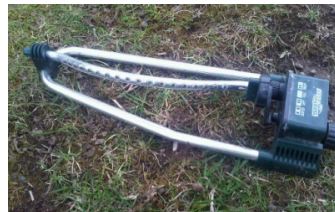
There are several options for applying water to plants - a watering can, a garden hose with a fan nozzle or spray attachment, portable lawn sprinklers, a perforated plastic soaker hose, drip or trickle irrigation, or a semi-automatic drip system. When properly cared for, quality equipment will last for years.

Several types of drip or trickle equipment are available, but the soaker hose is probably the least expensive and easiest to use. It is a fibrous hose that allows water to seep out all along its length at a slow rate.

There are also hoses with holes in them that do basically the same thing: in these water drips out through the holes. With this type a flow regulator usually has to be included with the system so that water can reach the end of the hose, yet not be sprayed out at full force. A special, double-walled type of irrigation hose has also been developed that helps maintain an even flow. Finally, there is the emitter-type system, best used in small raised-bed or

container gardens, in which short tubes or 'emitters' come off a main water supply hose. The emitters put water right at the roots of the desired plants. This is generally the most expensive form of irrigation and best used in combination with a coarse mulch or black plastic.

Drip systems generally have some problems with clogging from soil particles and/or mineral salts in water taken from springs or wells. New designs take this into consideration, and some include filters and self-flushing emitters. To ensure your needs are met, it is therefore wise to make a complete investigation and comparison before purchasing a drip irrigation system.



Visit your local hardware store or garden centre to see the many types of hoses, fittings and attachments that are available. The staff will be happy to help you find the right option for your garden's needs. © Tracy Kittilsen, Dalhousie.

Here are some basic techniques and principles for irrigating:

1. Adjust the flow or rate of water application to about 12.5 mm (1/2") per hour. Flow rates faster than this will cause run-off, unless the soil has exceptionally good drainage. (To determine the rate for a sprinkler, place small tin cans at various places within the sprinkler's reach, and check the level of water in the cans at 15-minute intervals.)
2. When using the oscillating type of lawn sprinklers, place the sprinkler on a platform higher than the crop, to prevent water from being diverted by plant leaves. Also, try to keep the watering pattern even by frequently moving the sprinkler, overlapping about half of each pattern at each new location.



3. Morning watering is preferred. Wet foliage in the evening can encourage diseases.
 4. Perforated plastic hoses or soaker hoses should be placed with holes down (if there are holes) along one side of the crop row or underneath mulch. Water should soak or seep into the soil slowly.
 5. It is best to add enough water to soak the soil to a depth of 12 to 15 cm (4.5 to 6"). It takes approximately 3 L (3 quarts) of water for each square metre (10 square feet) or 300 to 600 L for 10 square metres (80-160 gallons per 12 square yards) of garden area. However, this varies with the nature of the soil. Also, remember that frequent, light waterings encourage shallow rooting which will cause plants to suffer more quickly during drought periods. On the other hand, too much water, especially in poorly drained soils, can be as damaging to plant growth as too little water.
 6. By knowing the critical watering periods for selected vegetables, you can reduce the amount of supplemental water you add. This can be important where water supplies are limited. In general, water is most needed during the first few weeks of development, immediately after transplanting, and during the development of edible storage organs (Table 1).
 7. In areas prone to repeated drought, look for drought-resistant cultivars.
 8. If water supplies are short and you consider using grey water (water from household uses) on your vegetable garden, you should first find out if it is legal to apply grey water to the soil in your province. In areas where it is allowed, the following guidelines are recommended:
 - Do not use "black water" (any water run through the toilet) because of the possibility of contamination from fecal organisms.
 - It is preferable not to use kitchen wastewater 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. Allow 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 plant-toxic levels of boron.
 - Apply grey water to the soil, not to plant leaves.

TABLE 1. CRITICAL WATERING PERIODS FOR SELECTED CROPS

Beans	Pod filling
Broccoli	Head development
Cabbage	Head development
Carrot	Seed emergence, root development
Cauliflower	Head development
Corn	Silking, tasseling, ear development
Cucumber	Flowering, fruit development
Eggplant	Flowering, fruiting
Lettuce	Head development; moisture should be constant
Melons	Flowering, fruit development
Peas	Pod filling
Tomato	Flowering, fruiting

Activity

Compare irrigation methods.

Make a list of possible irrigation methods for your vegetable garden. For each method, consider advantages, disadvantages, and cost.

