

CONSERVING WATER IN THE HOME GARDEN

Vegetable Gardens



Reducing home water use has become a major concern for many people today. Since outdoor water use often comprises more than half of the water consumed by the average household, it is an area where many significant improvements can be made. Careful planning, proper soil preparation, efficient watering, and use of mulches can all be combined to make the most of every available drop of water.

Improve Soil Conditions

When looking for ways to save water in the garden, most attention is usually focused on irrigation systems, mulches, or other visible improvements. One less visible, but equally important way to reduce water consumption is the **addition of organic matter** to the soil.

Organic matter is derived from living or once living plants or animals. Microorganisms breakdown these residues into a fine black water-absorbing substance called humus. Adding humus to your garden is almost like adding a sponge to your soil.

All types of soil found in Kansas can benefit from the addition of organic matter. In sandy soil, organic matter binds the soil particles, increasing its water holding capacity and making more water available to plant roots. In clay soil, organic matter loosens the soil by improving its structure, which also increases water availability.

Sunshine, high temperatures and dryness, all work to oxidize or “burn up” organic matter, so it needs to be added each year. In the garden, this can be accomplished by the addition of compost, manure, or other similar types of material when preparing the soil in the fall or spring. In more permanent plantings, such as fruit, asparagus or rhubarb, the soil should be amended with organic matter before the plants are set out. Mulches can be used afterwards to supply additional organic matter.

How Much to Add

The amount of organic material to add will depend on the type used. A rough estimate is a layer 1 to 4 inches deep, applied to the soil and turned under. Concentrated material such as manure will require the smaller amount, while a looser material such as peat moss will require the larger amount.

Commonly Available Soil Amendments

Animal manures	Can contain weed seeds. Chicken manure is highly concentrated, so use less. As the straw content of the manure increases, more material can be applied.
Wood By-Products: Sawdust, wood chips, tree trimmings	Add extra nitrogen when using fresh sawdust. Avoid treated wood or wood from trees containing thorns.
Compost	An excellent soil builder.
Leaves Leaf mold	Best to compost or shred leaves first. Good soil amendment. May increase soil acidity somewhat.
Lawn clippings	Avoid clippings from Bermuda grass lawns or lawns treated with herbicides.
Peat moss	Expensive, but long lasting.
Straw/Hay	Weed seeds often present. Additional nitrogen may be needed.
Green manure/ Cover crops	Can tie up growing space unless grown in late fall or over winter. Till under at least two weeks before planting the garden.

Watering the Home Garden Efficiently

There are two factors that influence the general practices of watering: (1) the water supply available to the plant in the soil environment, and (2) the rate of water being used by the plant. The first depends primarily on the soil water-holding capacity, as well as the extensiveness of the root system of the plant. The second depends on some special characteristics of plants to retard water use and, more importantly, on the weather conditions such as temperature, wind and humidity.

Soil Types

The soil you have influences watering practices since different soil textures hold different quantities of water. Soil is composed of small particles with the largest particles classified as **sand**; medium sized particles as **silt**; and fine particles as **clay**. Varying amounts of each sized particles in any soil influences its texture.

	Coarse Soils (Sand)	Mixed coarse/ fine (Loam)	Fine Soils (Clay)
Water available (gal/cubic ft)	½ gal	1 gal	1½ gal
Depth 1" of water penetrates	24"	16"	11"
Infiltration	2"/hr	¾"/hr	¼"/hr

Some soils may have different textures of soils at different depths. A layer of clay or hardpan beneath a loamy soil can restrict drainage into a soil. In many garden situations there has been considerable disturbance of the present soil by construction or hauling fill soil into an area.

Water Applications

Some General Principles

Garden plants use water as part of the photosynthetic process and to move nutrients from the soil environment to upper parts of the plant. There is a continuous flow of water from the root system up through the plant where water is evaporated into the atmosphere. Thus, in hot, dry conditions the loss of water to the air is greater than in cooler or more humid conditions. In addition, as the plant grows there is a greater need for water as the size and complexity of the plant increases.

In contrast to landscape plants, some garden plants need adequate water to encourage rapid, vigorous growth. **Crops should never be under prolonged water stress** since yield, quality and pest resistance may be sacrificed.

Young, seedling plants with a shallow, poorly developed root system may require regular, shallow watering, while a more mature plant with its extensive root development can use water from a larger area of the soil profile.

Garden crops differ in size and complexity of the root system. Since the root system is the source of water absorption, consider the type of plant when determining which water practice would be most efficient.

The following table rates average rooting depths of some selected vegetable and fruit crops. The development of the root system of garden crops is such that most of the water is absorbed in the upper one-half of the root system. Thus, if the effective rooting depth of tomatoes is 48 inches, we should probably assume that most of the water is absorbed in the upper 24 inches and would attempt to manage our watering practices to keep an adequate water supply in this 2 feet depth area.

Shallow (under 24")		Moderate (36-48")
Broccoli	Strawberries	Beans
Cabbage	Blackberries	Beets
Cauliflower	Currants	Carrot
Corn	Gooseberries	Cucumber
Lettuce	Blueberries	Peas
Potato	Raspberries	Pepper
Radish	Dwarf fruit trees	Summer squash
Spinach		Grapes
Turnips		Semi-dwarf fruit trees
Deep (over 48")		
Asparagus	Sweetpotato	Tomato
Winter squash	Watermelon	Pumpkin
Standard size fruit trees		

Suggestions on Supplying Water to Vegetables and Fruit

In addition to differences in rooting depths, some vegetables, such as lettuce and corn, have especially sparse, less developed root systems for absorbing water from soils. Other crops such as pepper and tomato have a fibrous root system that will more effectively remove water from a given area of soil.

Cool season (i.e. spring and fall) vegetables generally root to a shallower depth than warm season vegetables and perennial vegetables. More frequent watering may be needed in stressful periods for these crops. However, since fall and spring are usually characterized by cooler temperatures and more abundant rainfall, watering during these times is usually less of a concern.

In many direct seeded crops, you must be sure that adequate water is available in the root zone to encourage germination of seeds and allow for initial growth and development of seedling plants. Thus, in dry seasons, it is often necessary to "water a crop up" or provide frequent, shallow waterings until the crop germinates and develops to beyond the seedling stage. This is especially true in seeding crops in summer for fall production.

In transplanted garden crops, providing water at transplanting time is essential to ensure water is available to support the plant until it is able to absorb water from the surrounding soil. In general, apply ½ to 1 cup of water with each transplanted vegetable, strawberry or flower plant and about 2 to 4 gallons to each bush fruit, grape or tree fruit depending on the size. Watering should be done slowly so that it soaks into the area near the plant, or watering should be done at the bottom of the transplanting hole.

Periods of Critical Water Needs

A garden crop needs water available at all times during its life cycle to survive and grow. There are several periods, however, when adequate water is critical. During these periods, the plant may respond to a lack of water by changes that are irreversible during the remainder of its life. Such examples include:

Stage	Crop
Germination	Seedlings, especially summer and fall crops
Pod enlargement	Beans, edible podded peas
Head development	Cabbage, broccoli, cauliflower
Root/bulb enlargement	Carrot, onion, potato, radish, turnip
Flowering/early fruit set	Corn, cucumber, squash, peas, strawberries
Early fruit development	Melons, all fruit crops
Uniform all season	Tomatoes, peppers, eggplants, all fruit crops
Maturing period	All fruit crops

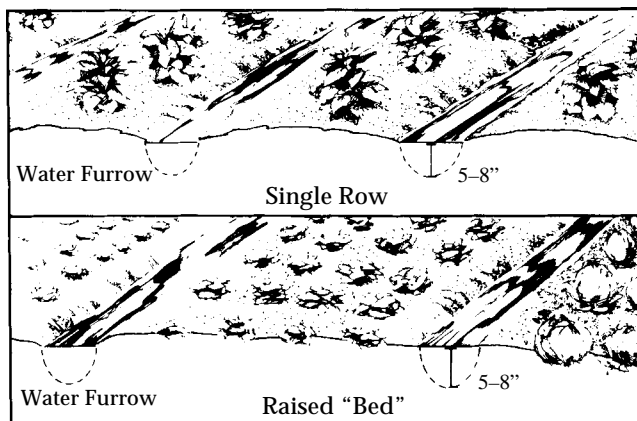
Methods of Applying Water to Garden Crops

There are three main ways of applying water to the root systems of garden crops: flood, sprinkle, or drip/trickle.

Flood: Many garden crops can be watered by “flooding” or applying a flow of water to the surface of the soil. This can be done by a trench or basin near each plant or by running water down a furrow to the side of each row.

This system works best in medium textured soils that are fairly level. Water needs to flow from one end of the garden to another and must not soak into the soil too fast in order for the water to continue to flow along the trench.

Crops are usually planted in a raised “bed” when using



this watering method so that water runs along side the bed or row and not down the row itself.

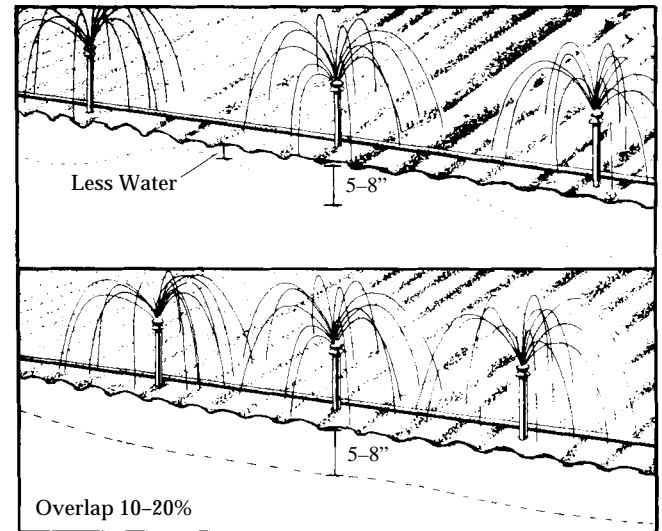
Sprinkler: The sprinkler is by far the most extensively used watering method in gardens. A sprinkler is inexpensive and can be used to water a diversity of crops in a small area. The distribution of water applied by the sprinkler should be considered since more water is usually delivered to the

center of the sprinkled area. Placing a few cans in the area to check for uniformity of water application will give you an idea of the pattern of your sprinkler.

One of the disadvantages of sprinklers is that they allow water to evaporate into the air during the sprinkling process. Using coarse droplets and lower water pressure can reduce evaporation losses, especially on hot, windy days. Watering in cooler, less windy periods can also help.

When sprinkling garden crops, be sure to apply water in such a way that the foliage of garden plants has a chance to dry as soon as possible after watering. Thus, early morning and early evening watering is preferred to late evening watering.

Drip/Trickle Irrigation: This newer method of water



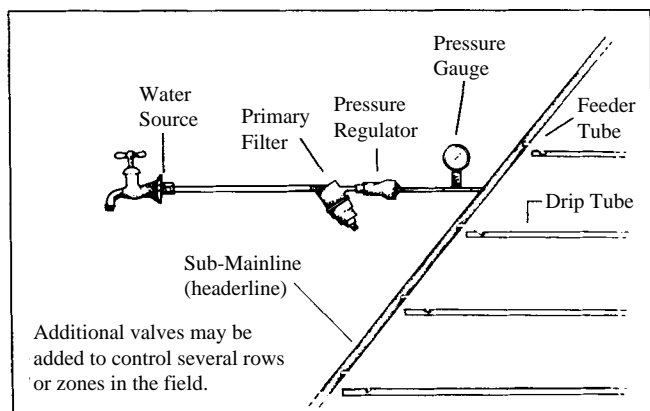
relies on the principle of keeping a portion of the root zone well supplied with water from a frequent application of water usually on a daily or every other day basis. Drip or trickle tubes are usually laid to the side of the row or between two rows. To wet a continuous strip of soil, as is required for most garden crops, you should have a hole or “dripper” in the line every 10 to 12 inches. Many drip tapes come with the holes prepunched at that interval. Other types of drip tubing are designed to “leak” over the length of the tube.

Drip systems are usually operated at low pressures (5 to 15 PSI) and usually take from 1 to 3 hours per day to supply the water lost from the crops during stress periods. Because of the danger of clogging the small pore of drip tape, filtration of water is essential in this type of system. Most garden center dealers have drip irrigation kits with filters, pressure regulators, and water distribution lines included. Most of them can offer assistance in design and layout of a drip system.

The emitter should be placed at least 12 inches away from the trunk of fruit trees or vines in order to reduce the development of trunk and root diseases.

At the end of the garden season, the system can be flushed, dried and stored in a protected location for next year. Thin drip tubing applied along each row may need to be replaced each year. Thicker tubing may last for several

seasons. Use care in hoeing near drip tubing or walking on the tubing which may punch holes that interfere with the normal slow dripping of the tape.



Water Conserving Mulches

One of the most effective ways of reducing the need to apply water to garden plants and make natural rainfall “last longer” is the use of garden mulches. The use of a mulch plays a very important part in reducing the need to water. Mulches are better adapted and are most appropriately used on summer crops when periods of water use are most intense.

Mulches provide a barrier that help prevent moisture loss from the soil due to evaporation. They can also be useful in altering the temperature of the soil, controlling weeds, lessening soil compaction, and keeping produce cleaner.

Plastic mulches: Black polyethylene mulch is preferred since clear plastic mulch encourages weeds to grow under it. Plastics usually are available in rolls from 3 to 4 feet wide. They are placed over the row or bed, the edges covered with soil, and various sized holes cut for the different crops. Black surfaces absorb heat, warming the soil for earlier production. Later, the foliage shades the plastic, reducing the heating of the soil. These mulches work best with warm season crops such as tomatoes, melons, peppers, and eggplant, which are usually established by transplant.

Organic mulches: Common materials used in gardens include compost, old hay, straw, leaves, shredded newspapers, peat moss, and grass clippings. Coarse materials need to be applied in thicker layers (3 to 4 inches) while fine materials can be applied in 1- to 2-inch layers. Organic mulches serve as insulation, reducing soil warming in the spring, so later season use is recommended. They can be left in place and tilled in during the fall for a source of organic matter. Organic mulch materials should be dried before use. Fresh materials may form molds or slime and become repellent to water if used when still green. Also, make sure that organic materials do not contain a source of weed seeds, insects or disease organisms that may spread to garden crops. Old or composted materials are preferred.

10 Ways to Improve Water Use in the Garden

1. Water deeply, but no deeper than the root zone of the plant.
2. Water slowly. Turn down the flow.
3. Water infrequently, but thoroughly. Adjust equipment for a larger water droplet size to help reduce evaporation. Frequent shallow watering causes plant roots to concentrate close to the surface, making the plant more susceptible to water fluctuations.
4. Loosen the soil surface and use mulches. Compacted areas absorb water slowly. Most mulches help to keep soil surfaces loose and receptive to water absorption.
5. Follow directions for operating and maintaining all irrigation systems. Check regularly for leaks, malfunctions or worn parts.
6. Keep your garden well-weeded to eliminate competition for water. Also consider removing surplus plants from over-crowded beds to ease water demands.
7. Use wide rows which space plants closer together, thus reducing soil water evaporation.
8. Avoid watering during windy weather.
9. Water early in the morning when humidity is the highest for reduced evaporation.
10. Locate your garden away from trees which might compete for water.

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