IRRIGATION FOR HOME GARDENS

Trickle irrigation (sometimes called drip irrigation) is an effective method of watering vegetables. It applies water slowly and directly to the root zone through a plastic tube. This system saves from 30 to 70 percent of the water required by overhead sprinkler irrigation, since much of the water applied by sprinklers is never used by plants.

Drip irrigation is the most efficient watering method around. Hardly any water is wasted through wind, evaporation, run-off or overspray.

Did you know that it can take 15 minutes to deliver just one liter of water to the soil with drip irrigation, compared to five seconds when delivering one liter by hand?

By slowly dripping water into the soil at the base of plants, water is released at a rate that's easy to absorb, only where it's needed. After all, why water the weeds?

Drip irrigation also reduces the risk of erosion, soil compaction and insect and fungal problems in plants. It's great for all garden areas

Advantages

- **Economy of Water Use.** The greatest advantage of trickle irrigation is its low water use.
- **Fewer Weeds Germinate.** Water is directed only to the crop.
- **Easy to Operate.** Once the system is installed, it is simply a matter of opening a valve to water the entire garden.
- **Less Energy for Pumping.** The trickle system requires much lower operating pressure and lower flow rate. Often the flow rate can be controlled to keep a well from running dry.
- **Fewer Leaf Diseases.** The leaves are not wetted which discourages fungus and bacterial plant diseases.
- **Allows Work in the Garden While Watering**. Only a small area around the row of plants is irrigated. Walkways and between-row areas remain dry.
- **Less Fertilizer Needed**. Fertilizer may be applied only to the immediate area adjacent to the row, as compared to conventional broadcasting where the fertilizer is spread over the entire garden.
- **Uniform Watering Pattern**. Interference from the wind results in uneven watering with overhead sprinkling.
- **Minimal contamination of groundwater Supplies**. With the limited volume of soil irrigated, leaching of fertilizer salts into the groundwater supply is largely eliminated.
- **Laborsaving**. You do not have to shut off the faucet and move the hose.
- **Savings of Insecticides and Fungicides**. Pesticides are not washed from the foliage as in overhead irrigation.

Disadvantages

- Trickle irrigation requires some time for initial installation.
- It is more expensive than most sprinkler systems.
- The tiny emission holes can become clogged with soil particles, and sometimes algae or mineral precipitates will block these holes.
- Insects and rodents may damage the trickle line emitters.

Water Movements in Soil

When water is applied to the soil, it seeps down through the root zone very gradually. Each layer of the soil must be saturated before water will descend to the next layer. This water movement is referred to as the wetting front. Water will move through a sandy, coarse soil much faster than through a fine-textured soil, such as clay or silt.

If only one-half the amount of water required is applied at a given time, it will only penetrate the top half of the root zone; the area below the point where the wetting front stops will remain as dry as if no irrigation had been applied at all.

Once enough water is applied to move the wetting front into the root zone, moisture is absorbed by plant roots and moves up through the stem to the leaves and fruits. Leaves have thousands of microscopic openings, called stomates, through which water vapor is lost from the plant. This continual loss of water, called transpiration, causes the plant to wilt unless a constant supply of soil water is provided for absorption through the roots.

The total water requirement for a garden is the amount of water lost from the plant plus the amount evaporated from the soil. These two processes are called evapotranspiration. Evapotranspiration rates vary and are influenced - by day length, temperature, cloud cover, wind, relative humidity, mulching, type and size of the plants, and the number of plants growing in a given area.

Water Stress

Water stress causes flowers and immature fruits to drop from the plant, resulting in low yields. Furthermore, the quality of vegetables will be very poor. Fruits, such as cucumbers, will be small and misshapen. Tomatoes may develop blossom-end rot and salad crops, such as celery, may have tough fibers.

There are critical periods of growth when water stress can be most detrimental. It is imperative that a good moisture supply be maintained during seed germination and seedling emergence from the soil. Young transplants that are set in the garden should be watered immediately, especially late-season crops (broccoli, cauliflower) that are planted during the hot months of July and August.

Specific vegetables have periods of growth when a good supply of water is essential. For example, sweet corn needs an abundant supply of water when the silks and tassels are forming for good pollination and well-filled ears. Vine crops, such as cucumbers and squash, must be supplied with water during flowering and early fruit development. As fruit development progresses, water absorption declines, so less water is required.

On the other hand, there are periods in the growth of some vegetable crops when water should be withheld. For example, as muskmelons reach maturity, they develop more sugar under dry conditions. Onions cure faster and store better when water is withheld after they attain maximum bulb size and about one-half of the leaves have fallen over.

Frequency of Watering

Trickle irrigation uses much less water than overhead sprinkler systems, but require a longer time to deliver a given amount of water. Water is directed to the root zone and not spread over the entire garden so a relatively small volume of soil is wetted. There is no need to water the entire area when plants are young. For example, young tomato plants generally have a root system less than 10 inches in diameter. With 36-inch rows the

tomatoes use less than one-third of the water applied by sprinklers. Watering areas of the garden not occupied by vegetable roots only encourages weed growth.

When there is no rainfall, shallow-rooted crops (such as lettuce and onions) spaced in rows 18 to 20 inches apart should be watered about 2 to 4 hours every 2 or 3 days. Under these conditions trickle irrigation saves about 30 percent of the water needed by overhead sprinklers.

Deeply rooted crops (such as tomatoes and summer squash) spaced in rows 36 inches apart should be watered every 3 to 4 days for 4 to 8 hours when there is no rain. A 70 percent water savings may be realized if a trickle system is used for rank-growing crops in wide rows because water is directed only to the area of the soil occupied by roots.

Drip irrigation components

- **Integrated drip line (piping or tubing)**
  Integrated drip line irrigation is usually made from PVC and varies in diameter, depending on the amount of water pressure required. It can be laid either above or below the soil surface or in a layer of mulch. While more water pressure is required for longer piping and extra emitters, it's important to remember that extra pressure will not water your plants more effectively.
- **Drip emitters**
  Drip emitters attach to standard PVC irrigation piping and apply a consistent amount of water to your garden plants. As a general rule, cheaper and less sophisticated emitters (which are not recommended) have highly variable flow rates that depend on water supply pressure while commercial quality emitters have pressure-compensating systems to ensure a constant flow rate.
- **Weeping hoses**
  Weeping hoses are usually made of black recycled type rubber. They can be attached to a fixed watering system or an ordinary garden hose. As with integrated drip lines, weeping hoses can be laid either above or below the soil surface or in a layer of mulch. While more water pressure is required for longer hoses, weeping hoses work most effectively at low pressures.
- **Controllers**
  Controllers are used to manage the flow of water through your drip irrigation system. Simple controllers, such as a mechanical tap timer, only require you to set the amount of watering time. More complex electronic controllers can water different garden zones at different times and even different days. Consult your local irrigation supplier for more information.
- **Backflow prevention device**
  Backflow occurs when there is a reverse pressure in the water supply system, drawing contaminants like fertilizers and other garden chemicals back into the drinking water supply through installed irrigation system. Installing a backflow prevention device can prevent serious injuries caused by contaminated water.
- **Rain switches**
  A rain switch will turn off your drip irrigation system during wet weather, preventing over-watering and saving you money. A rain switch can be connected to most electronic automatic controllers.
- **Soil moisture sensors**
  Soil moisture sensors are placed beneath the soil surface at a specified depth around your garden to measure the amount of moisture in the soil. When the moisture level drops below a predetermined level it allows the irrigation controller to operate,

watering your garden. A soil moisture sensor can be fitted to most electronic automatic controllers.

- **Joints and connectors**
  T-joints, elbows, couplers and end caps connect the piping in your irrigation system.

Designing an effective drip irrigation system

The following hints may help in the planning and design of your drip irrigation system.

- Work out the number of connectors needed when planning your drip irrigation system.
- Plants in sunny areas usually require more water due to higher evaporation rates. Plants in shaded areas will require less water due to lower evaporation rates.
- Note slopes and soil types to help work out the watering requirements for different areas of your garden. For example, gardens with heavy clay soil may need more water pressure.
- Select drip emitters according to your plants' watering requirements.
- Consider where you would need joints and connectors.
- Rain switches and soil moisture sensors are highly recommended, especially in areas with high rainfall.
- Lay the piping above ground before digging. A 10 centimeter deep trench should be adequate, although sandy soil may require a slightly deeper trench to hold the piping in place.
- To make it easier to connect joints, heat the end of your piping to soften it and make it more flexible.
- Make sure drip emitters are installed above ground so that they do not become clogged by dirt.

Watering schedule

An adequate watering schedule is the most important aspect of any irrigation system.

- Consider local rainfall levels and soil type to work out the amount of water your garden needs.
- Soil moisture sensors can be used to manage the scheduling of your automatic controller.
- Rain switches turn off your watering system when it's raining.
- Due to their established root system, mature plants need less water than new plants.
- It is also a good idea to sort plants into different watering zones and water them accordingly.
- By choosing plants to suit your local environment, you can save water and ongoing costs in your garden.

For more information about drip irrigation contact your local Extension office, nursery, irrigation company or websites like the two listed below. Information included in this handout was obtained from these sites:
http://www.sydenywater.com.au/SavingWater/InYourGarden/WateringSystems/
http://counties.cce.cornell.edu/Suffolk/grownet/home-gardening-general/trickle.html

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