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Trickle irrigation for the home garden

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Quick Facts

Trickle (drip) irrigation is one of the newer methods of irrigation.
Trickle irrigation provides each plant with near optimal soil moisture.
This method of irrigation can be automated as easily as a lawn-sprinkling system.
Prices for trickle irrigation "emitters" range from 10 cents to $2 for individual plants; they also sell by the foot for emitter-hose products.

Trickle or drip irrigation is a method of irrigation popular for its potential to increase yields while decreasing water requirements and labor input.

Limiting water use for the home garden may be necessary and increasing garden yield while decreasing the required labor generally is desirable.

The concept behind trickle irrigation is to continuously provide the plant with a near optimal soil moisture environment. This is accomplished by conducting water directly to individual plants instead of providing water to the entire garden area as with flood or sprinkler irrigation.

A wetted profile, the shape of which is dependent on soil characteristics, develops in the plant's root zone as shown in Figure 1.

Ideally, the area between crop rows is dry and receives moisture only from incidental rainfall. Trickle irrigation saves water because only the plant's root zone is supplied with moisture, and little water should be lost to deep percolation if the proper amount is applied.

Water that passes below the root zone and eventually to the groundwater table is lost to the plant and is desirable only for "leaching" or removing salts from the soil profile.

Leaching also removes nutrients from the soil and therefore should be minimized. This is easily accomplished with trickle irrigation.

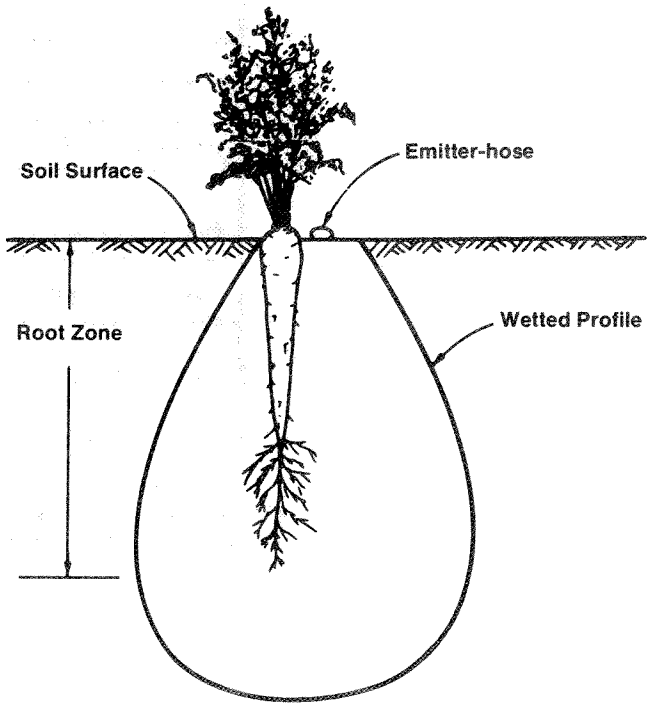

Figure 1: Idealized wetted profile below a "trickler" or "emitter."

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Equipment and Methodology

A trickle irrigation system can be automated as easily as a lawn-sprinkling system. With a little foresight, a trickle system and a lawn-sprinkling system can be controlled by the same "controller." A controller is simply a clock that opens and closes electrically operated valves for predetermined time periods. A typical "head" for a trickle system (Figure 2) might consist of a sump, pump, controller, filtering system, fertilizer injector, solenoid valve and pressure regulator, but some of this equipment is optional for home gardening. If filtered municipal water is available, the sump, pump, and probably the filter may be omitted. The degree of filtration required depends on the water quality and type of "emitter" or "trickler" used.

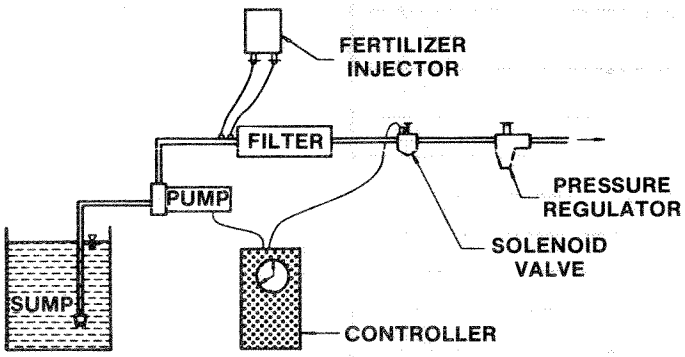

Figure 2: Typical trickle system "head."

Basically, there are two types of trickle irrigation emitter products. One is primarily for row crops with water emitted at equally spaced intervals along a distribution hose, or seeping through the hose wall. This is called emitter-hose. The second type is primarily for crops spaced at relatively large intervals, such as trees and vine crops. Both types often can be incorporated into the same garden plot, but on small gardens it's most economical to use emitter-hose.

Prices of emitter-hose with a useable life of one to 10 years range from 4 to 18 cents per foot (30.5 centimeters). Prices of individual plant-type emitters range from 10 cents to $2 per emitter. The life of the latter emitters is many years, assuming that clogging due to inadequate filtration does not occur.

Derick Fell, former director of the National Garden Bureau, has designed a 15- by 25-foot (4.6 x 7.6 meter) garden that can produce $250 worth of food using conventional gardening techniques. This is 67 cents in food per square foot (17.25 per m^2) after a $12 investment in seed. The planting details of Fell's design are shown in Figure 3.

Figure 4 shows the layout of an emitter-hose trickle system designed for the garden layout depicted in Figure 3. The system was designed with emitter-hose along each crop row and assumes a pressurized, potable water supply is available so that water filtration is not necessary. Pressure control is provided by a pressure regulator at the upstream end of the system where an ordinary garden hose may be attached. Laterals are attached to the manifold by drilling a 5/16-inch (0.79-cm) hole in the manifold and pushing a 0.25-inch (0.64-cm) microtube into it. Leakage does not occur at the low system operating pressures. The cost of this system will vary from $21 to $48, depending on the products used. The system components can be expected to last many years with the exception of the emitter-hose that may require replacement after two or three years of use.

Obviously, a drip system of this type is easily affordable and provides the potential for increasing yields while decreasing water, fertilizer and labor requirements. Mechanically timed valves also are available for approximately $25 that will close after some preset time interval and give some degree of automation to the system.

When different types of emitters are used within a system, it may be necessary to utilize more than one pressure regulator. However, the authors have successfully used vortex emitters and bi-wall emitter-hose together with a regulated pressure of 10 pounds per square inch (6.9 N/cm^2). Different products can be compatible due to differing evapotranspiration requirements of the crops irrigated.

How Long to Irrigate?

The irrigation time interval is dependent on the flow rate through an emitter. The flow rate is dependent on the system's operating pressure. For example, a particular emitter may have a flow rate of one gallon (3.8 liters) per hour at a pressure of 10 pounds per square inch (6.90 N/cm^2). If it is desirable to apply two gallons (7.6 liters) of water per day on a tomato plant, the gardener may want to irrigate for two continuous hours, or for one hour at two different times during the day. In either case, two gallons (7.6 liters) of water are applied.

Trickle irrigation has its limitations as does any method of irrigation. But for a given set of circumstances, a gardener can expect bigger yields, better quality produce and savings in water, fertilizer and labor.

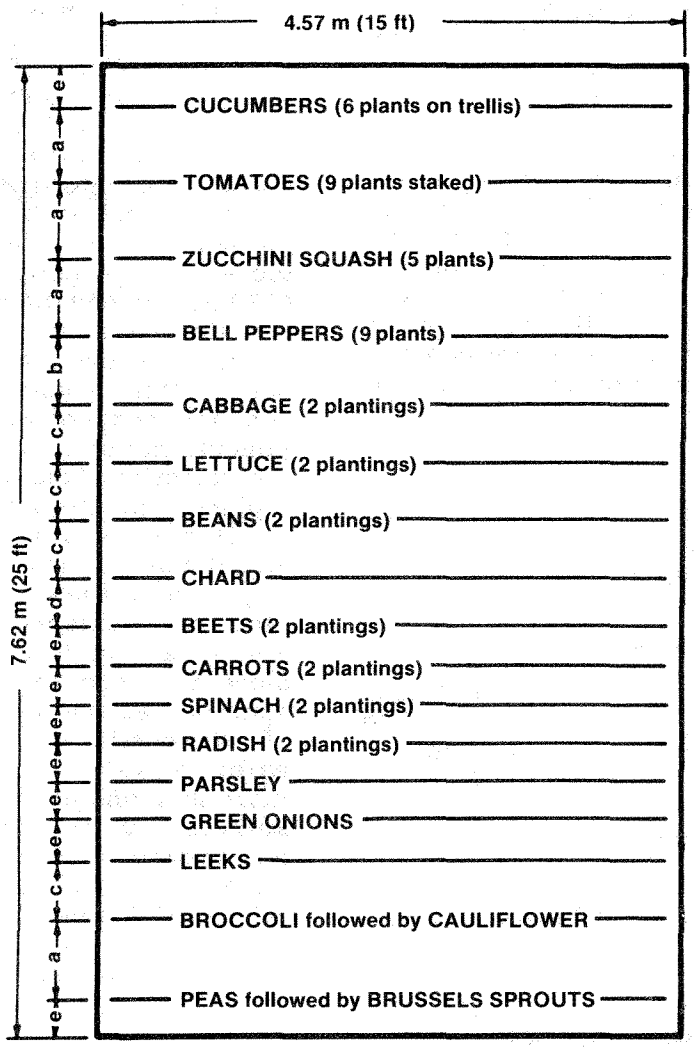

Figure 3: Planting details of Derick Fell's garden that can produce $250 worth of food in a growing season. Letters refer to dimension between rows: a = 2.0 ft (0.61 m), b = 1.75 ft (0.53 m), c = 1.50 ft (0.46 m), d = 1.25 ft (0.38 m), e = 1.00 ft (0.30 m).

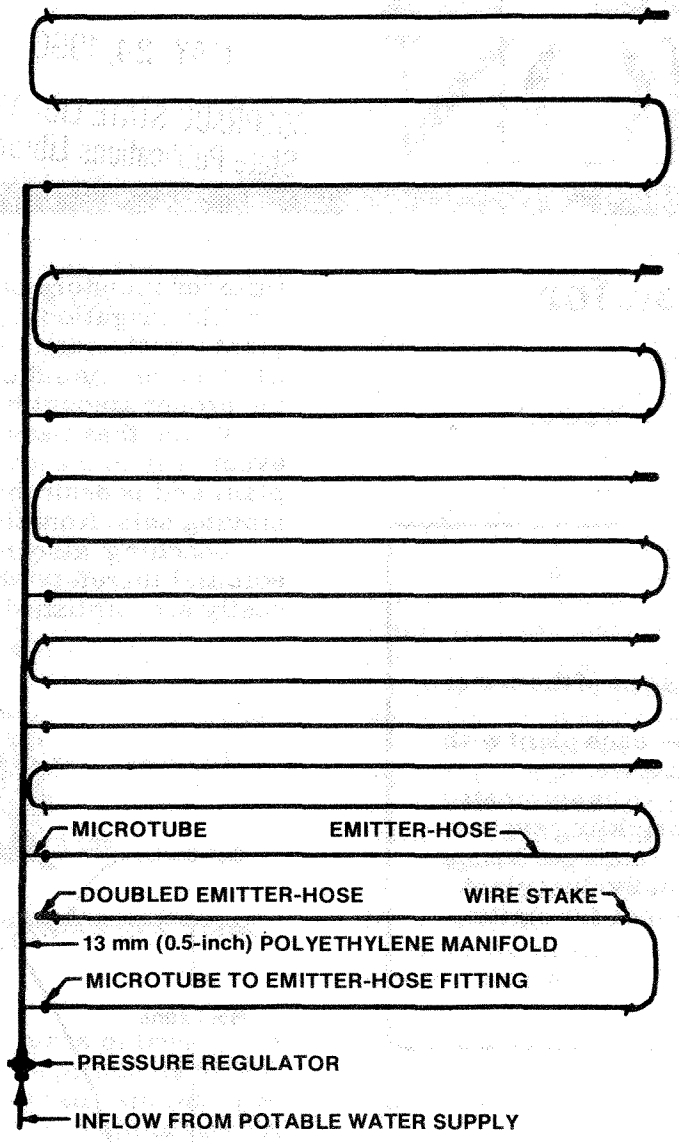

Figure 4: Layout of a drip irrigation system compatible with the garden depicted in Figure 3.