DRIP: Watering the Home Garden

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California home gardeners, increasingly aware of the need to save water, are learning that drip might be a good wav to conserve water. Many are asking how to make drip irrigation work for them. This leaflet is designed to help answer that question.

What is it?
Drip watering is the frequent slow application of water to soil through mechanical devices called emitters. Emitters are built in or attached to small plastic water delivery lines that carry water to each plant. Drip watering results in lower water use by controlled water distribution, less water applied, and lower evaporation losses.

Drip should be part of an integrated watering system. It should be used for vegetable gardens, ornamental and fruit trees. shrubs, vines, and outdoor container plants. Sprinklers can be used for lawns and other ground cover.

Equipments needed
A drip system has three pans (fig. 1), the head (A), which includes controls and a filter; (B) a transmission system of plastic pipes or hose: and (1) the emitters.

The head (fig. 2), includes an on-off valve and a regulating device to reduce the pressure from 40 to 80 pounds per square inch (psi) to the low pressure of 10 to 20 psi for drip systems. If both a vegetable garden and trees or shrubs are to be watered, separate valves will I>e needed because different flow rates, pressures, and watering times are required. The head must also contain a filter to screen out particles that might clog emitters, it should also have one or more pressure-measuring devices to help in adjusting the pressure regulator.

The transmission system is constructed with polyvinylchloride (PVC) pipe. polyethylene (PE) hose, or a combination of both. In most cases, PVC pipe is used to reach the general area of planting, with the final distribution to garden rows or individual trees and shrubs through PE hose to which emitters are attached. It is desirable to bury PVC pipe to protect it against sunlight. physical damage and to keep the entire installation less cluttered.

Emitters are used for watering trees and shrubs. Several types are available. For home use, the type that is mounted on the PE hose is preferred. New plants can be started with one or two emitters, and more can be added as the plants grow. A punch for installing emitters on the PE lines should be purchased with the emitters to insure correct size of opening.

Drip tape is used for row crops where plants are closely spaced. They include single- or double-walled PE tubing with openings in the outer wall every 8, 12, or 18 inches. Various accessories and connecting devices are needed to completely install and place the system in operation. These

are fittings to change from hose bib threads to standard pipe threads, reducers to change from 3/4-inch to 1/2-inch pipe sizes, barbed fittings to connect PE hose to PVC pipe, and adapters to connect drip tape to the PE hose. Drip irrigation equipment has become fairly commonplace in retail stores. It is sold in outlets carrying irrigation equipment, garden supplies, and home building supplies.

Designing the system

First, make a diagram of your property to scale. Figure 1 is an example. Draw in the house and garage (M), driveway, sidewalks, and any other permanent features. Locate all trees (G) and plants U) that you intend to drip irrigate and the position of your present or planned garden (N). Locate the source of water you will use (A).

Next, determine the size of pipe and hose you will need by calculating the rate of flow when the system is in full operation. Drip tape used for vegetables has output rates that depend on the brand, the hole spacing, and the water pressure. Ask the supplier for the output rate of the tubing you plan to use. The average flow listed for drip tape is 1/2 gallon per minute (gpm) per 100 feet. Determine the total length of tape to be operated at one time. Then, to calculate total rate of flow, divide the total length by 100 and multiply by the rate of flow per 100 feet.

Example: 7 rows, 50 feet long; drip tape output 1/2 gpm per 100 feet: calculate 7 rows x 50 feet x 1/2 gpm/100 feet = 1 3/4 gpm total flow. In this case, water can be delivered to the garden area through a 1/2-inch PE hose (see table). If more than 350 feet of tape are to be operated at one time, a larger PE hose is needed.

IDENTIFICATION OF COMPONENTS IN FIGURE 1

A. Head or control center.
B. 1/2-inch PVC buried main line.
C. 1/2-inch PE hose for attaching row crop laterals.
D. 1/2-inch PNC slip tee.
E. 1/2-inch PVC tee with internal barbed outlet for attaching PE lateral.
F. 1/2-inch PVC ell with internal barbed outlet.
G. Trees.
H. 1/2-inch PE hose inserted in barbed outlet E.
I. 1/2-inch PE hose with emitters added.
J. A row of shrubs, roses, other flowers, or ground cover beside house.
K. 1/2-inch PE hose, slightly buried, to which emitters can be attached when needed.
L. 1/2-inch PE hose to which one emitter for each shrub or rose bush has been attached.
M. House.
N. Row crop drip tape in garden.

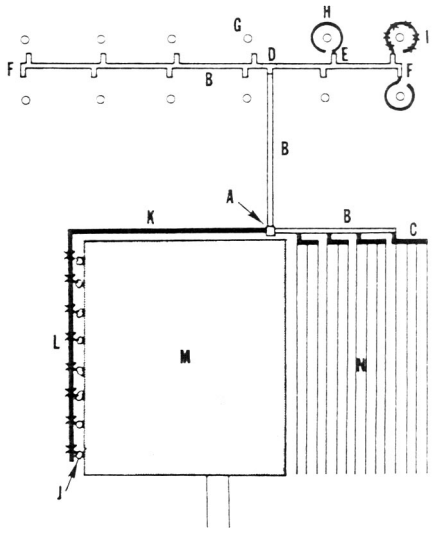

Figure 1. Example layout of a home drip system.

Emitters are used to water fruit and ornamental trees. They are attached to PE hose that is connected to a buried PVC or PE main fine. The number of emitters per tree or plant depends on the plant size. A large fruit or ornamental tree having a canopy spread of 15 feet in diameter or

more needs at least six emitters. A smaller tree or shrub needs one emitter for each 2 1/2 feet of canopy diameter. The number of emitters thus determined, multiplied by the rated output per emitter, will give the flow rate needed to water all the trees and shrubs at once.

In figure 1, there are 12 trees (G) with six 1 gallon per hour (1 gph) emitters per tree at 15 psi. The flow needed at D is 1.2 gpm because 12 trees x 6 gph - 60 min/hr = 1.2 gpm. The table shows that a 1/2-inch main line (B) will be sufficient.

For the eight small shrubs (j) on the side of the house (M), one gph emitter per shrub is indicated (L) on a PE hose (K). Additional plants and emitters may be added later; therefore, a I/z-inch PE hose is advisable.

Installation

Techniques for installing the relatively simple system in figure 1 are described in this leaflet. Professional help is recommended for more complicated situations. Check your local city codes for requirements for anti-backflow devices and their locations.

The lot in figure 1 is 90 by 120 feet, with a 40 by 50 feet house (M). It has 12 fruit trees (G) in back, 8 shrubs (J) on the left side of the house, and a 30 by 50 feet garden space on the right (N). Details of the head (A) are shown in figure 2. The main line (B) will be 1/2-inch PVC, buried about 8 inches. PVC tees (E) and elbows (F) have internal barbs and provide places to connect the PE feeder hose (H) on which individual emitters (D) are placed. Feeder hoses of 1/2-inch PE (H, K, and C) are laid on the ground or buried 2 or 3 inches. These hoses are closed at the ends by folding back 4 inches of hose and slipping a length of PVC pipe over the fold like a napkin ring. This allows quick opening to flush the system once a month.

The garden area to the right of the house (M) is watered by drip tape (N). To supply them, a 1/2-inch PVC or PE main (B) is extended from the head (A) to feeder hose (C). Drip tape can be grouped conveniently along the hose.

Installation Hints:

1. Valves can be manual or electrical and must be made of plastic or brass.
2. PVC pipe is cemented using slip fittings, and PE hose is friction fit to internal or external barbed fittings.
3. Pressure gauges below each valve are useful.
4. The entire head should be firmly supported to avoid water "chatter" or vibration.
5. During construction, be careful to keep soil particles and chips of plastic out of all lines and connections. After the system is installed, it should be flushed with water before operating.

Operation

Correct operation is important in order to obtain the advantages of drip irrigation. Drip wets a smaller area than sprinkling or flooding; therefore, it must be performed more frequently. It is recommended that water should be applied daily or on alternate days during the watering season. Applying water this frequently may cause excessive wetness, unless the amount put on each time is carefully controlled. The amount of water needed with daily applications usually can be

supplied by operating the system somewhere between 15 minutes in the spring to a few hours in the summer. This timing can be adjusted by checking sod moisture. It can be judged by sampling with a sod coring device or auger. Sample 8 to 12 inches from an emitter. Wetness of soil sample can be judged by its feel and appearance. If the soil is drier than it should be, watering time should be increased. If the soil is still quite wet just before the next irrigation, watering time should be decreased.

PLASTIC LINE SIZES FOR LENGTHS LESS THAN 100 FEET

Flow rate (gpm)	Line-size (inches nominal)
1/2 to 2	1/2
2 to 4	3/4
4 to 8	1

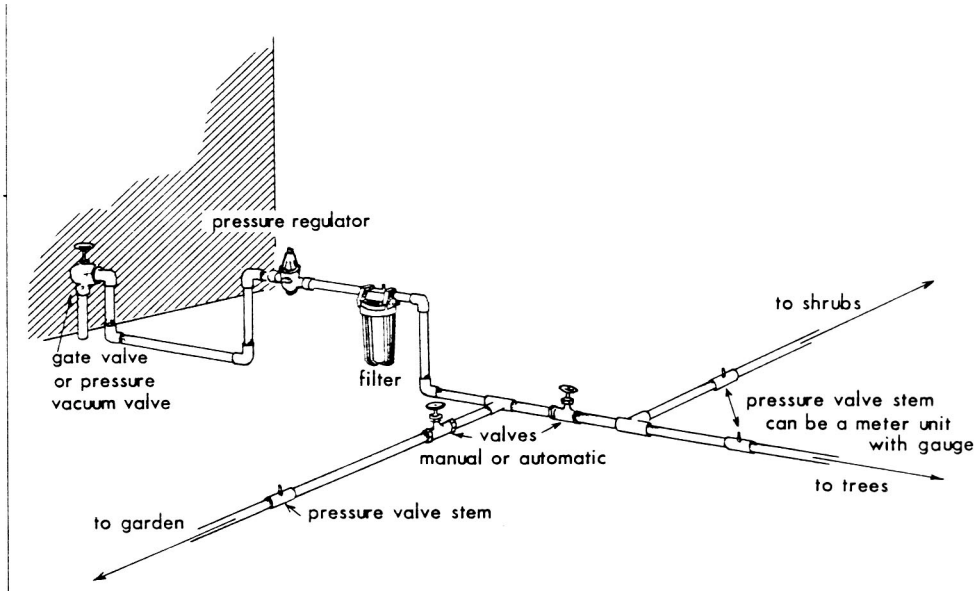

Figure 2. ''Head'' or control center details.