CHAPTER 18: Low-cost hose irrigation

INTRODUCTION

In many countries the low-cost hose irrigation installations are popular among small and part-time farmers for the irrigation of many crops. This method of irrigation is an improvement on the traditional furrow-basin and furrow irrigation approaches. The water is applied to the basins and the furrows through ¾–1½ inch plastic hoses which are portable, 'hand-move', and can be extended in various directions. When one furrow or basin has been filled up with water, the hose is moved manually to the next one and so on.

A considerable engineering development has turned this practice from an old open surface method into a highly efficient closed pipe modern irrigation method. It is a localized method using a low pressure system, and a semi-permanent hand-move installation. It has been applied on a large scale and used extensively in many southern Mediterranean countries of the semi-arid zone in family managed smallholdings of about 1 ha. Properly designed hose basin systems for trees have also been successfully installed and operated on farms up to 20 ha (Figure 18.1).

FIGURE 18.1 - Hose basin irrigation in young fruit trees.

SYSTEM LAYOUT AND COMPONENTS

The layout of the system and the hydraulics of design and operation are almost the same as in the other closed pipe low pressure systems. On the main pipeline, there are hydrants with movable or permanently laid laterals running along the crop rows. Long hoses are connected on these lateral lines at a regular wide spacing to deliver water to each basin or furrow separately. Each hose covers many basins or furrows according to its length.

The system's piping network is also similar to the other low pressure irrigation systems. It can be either a complete installation with all component parts, as in the sprinkler and the micro-irrigation installations, or a simple one. A hose irrigation system usually consists only of a main pipeline of any kind, 50–90 mm (2–3 inches) uPVC, HDPE or layflat, 4.0–6.0 bars, which also serves as a manifold, with hydrants to which the laterals are connected. The laterals can be of any kind of 50–63 mm pipe but are usually LDPE, 4.0 bars. Smaller diameter long plastic hoses are connected on the laterals. Sometimes, the hoses can be fed directly from the source of the water, which can be a small reservoir at a higher level, a low capacity pump, or a tap. There is no need for filters, injectors or other accessories for a head control.

HOSES

The hoses are the well-known and widely available garden hoses. They are elasticized soft small diameter (¾–1 ½ inch) flexible PVC tubes with plain ends. Soft black 20–32 mm PE hoses (LDPE, 2.5–4.0 bars), are also used. The length of the hoses varies from 18 to 36 m and the water flow is 1.5–8.0 m^3/h. Thus, each hose can irrigate an area of approximately 600–2 100 m^2 respectively, covered with a number of small basins or furrows according to the cultivation. These sizes and lengths have been found to be the most convenient for farmers. The average flow characteristics for 24 m hoses with flow velocities up to 2.0 m/s are presented in Table 18.1.

TABLE 18.1 - Flow characteristics of 24 m hoses

Kind of hose	Nom. diameter	Average flow - m^3/h	Pressure losses - bars
Flexible PVC	¾ in	2.0	0.40
	1 in	3.6	0.30
	1 ¼ in	5.7	0.20
	1 ½ in	8.0	0.25
Soft polyethylene (LDPE)	20 mm	1.5	0.85
	25 mm	2.5	0.70
	32 mm	4.5	0.40

SYSTEM TYPES AND DESIGN CRITERIA

The types of hose irrigation systems refer to the characteristics of the water delivery hoses, their position in the field, the general operating procedure and the method of water distribution over the land (basin or furrow). In tree groves, each tree has a basin, whose shape and size is mainly determined by the age and the spacing of the trees. With close planting spacing, two to six trees can be in one larger rectangular basin along the row. With vegetables and other field crops, the land slope, type of soil, crop, water availability and farming practices determine the dimensions of the basins and furrows.

All types have movable water delivery hoses which are transferred or dragged from one spot to another. In this sense, there are four different types or variations of the system.

Conventional hose basin for trees

With a common tree spacing of 6 *x* 6 m, one 24 m-long hose can irrigate 36 tree basins in all directions in an area of about 1 300 m^2. The laterals are placed along the rows 36 m apart (every six rows) and the hoses are fitted on the laterals every six trees (36 m). Thus, the hose spacing is 36 *x* 36 m. With other planting spacings, the lateral and hose spacings differ, but not greatly, from the above (Figure 18.2). Flexible PVC garden hoses about 1¼ inch in diameter have proved to be the most suitable kind, as they can easily cross the field perpendicularly and diagonally without being damaged (cracked). The hoses are moved by hand from one basin to another.

FIGURE 18.2 - Hose furrow irrigation in vegetables.

Drag hose basin for trees

This type of system is an improvement on the conventional one as it is easier to design and operate. The water delivery hoses are 20–32 mm soft black LDPE pipes, 2.5 or 4.0 bars, connected to the laterals. Each hose can irrigate two or four rows of trees on both sides of the lateral line. The hose can be 20–40 m long, and the area covered from 900 to 1 800 m^2. It is called the drag hose system because at the beginning of each irrigation the hoses are extended to the distant end basins and then moved to the other basins by dragging them backwards (Figure 18.3).

FIGURE 18.3 - Schematic diagram for hose basin for trees.