

## CHAPTER 12: Minisprinklers

### ***INTRODUCTION***

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With this method a single minisprinkler emitter is placed for each tree. The emitter sprays water in a circular pattern under the foliage at low rates over a limited area around the tree. This approach combines the principles and advantages of both sprinkler and localized drip irrigation.

Minisprinkler irrigation is a localized micro-irrigation approach which uses a low pressure system in a solid permanent or seasonal installation.

### ***SYSTEM LAYOUT AND COMPONENTS***

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The control station can be as simple as possible. However, a filtering device is necessary as in all micro-irrigation installations. The fertilizer injector is not always needed, as many farmers prefer to apply fertilizer manually. Nonetheless, the arrangement of the equipment should be one which will enable the installation of a fertilizer injector at a later stage.

The mains and the submains can be of any kind of permanently assembled pipes, either on the surface or buried, with hydrants (2–3 inches) rising on the surface, or protected in valve boxes where buried.

The manifold (feeder) pipelines can be either surface-laid HDPE or buried rigid PVC pipes. Other kinds of pipes can also be used, such as layflat hose or quick coupling light steel pipes.

The laterals with the minisprinklers are laid along the rows of the trees near the trunks, one line at each row, with one minisprinkler per tree.

The lateral pipelines are generally (soft) 16, 20, 25 and 32 mm LDPE pipes, 4.0 bars PN. Buried small-diameter PVC pipes can also be used for the laterals, with longer connecting small plastic tubes, rising on the surface.

### ***THE MINISPRINKLER EMITTER***

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The microsprayers used in tree orchards (Figure 12.1), called minisprinklers, spitters or micro-jets, are small plastic emitters of the static sprinkler type with a low-angle small water discharge in the form of fine drops which is uniformly distributed around the trees in a full or part circle pattern.

They can be of various mechanisms (capped with a rotating needle, non-capped with a swivel spreader, or with a deflector) with a wide range of flow rates and water diameters. All kinds have rather small flow sectional areas (nozzle diameter 1–1.7 mm approximately). The irrigation water needs to be filtered before it enters the system.

The main performance characteristics of the minisprinklers are:

- operating pressure: 1.5–2.0 bars;
- flow rate: 35–250 litres/h (generally 150 litres/h);
- wetting diameter: 3–6 m;
- precipitation rate: 2–20 mm/h (generally 4–8 mm/h);
- filtration requirements: 60–80 mesh (250–200 microns).

The minisprinkler heads are fixed to small plastic wedges or metallic rods 20–30 cm above the ground and they are connected to the PE laterals with 7–9 mm flexible plastic tubes 60–120 cm long and a barbed plunger. Thus, a complete minisprinkler emitter consists of the head, support wedge and connecting tube with plunger. All component parts are press-fit, interchangeable and easily assembled and dismantled.

FIGURE 12.1 - Irrigation of citrus orchard with minisprinklers.



## IRRIGATION SCHEDULING

As in all localized micro-irrigation methods, the amount of water stored in the root zone is restricted as a result of the limited wetted soil volume. However, with this method the wetted volume of soil exceeds 65 percent of the total volume, there thus being no urgent need for very frequent irrigations unless the soil water holding capacity is very low.

The common practice is to irrigate at a fixed interval on a weekly basis and to apply the accumulated water requirements in the preceding days. With young trees, the irrigation interval is shorter, twice a week. Farmers in most arid and semi-arid zones apply water to their tree crops (citrus, guavas, avocado, etc.) as per Table 12.1.

**TABLE 12.1 - Minisprinkler irrigation scheduling**

Age of trees (years)	Litres per tree per day	Irrigation interval (days)	Average irrigation dosage per tree (litres)	Average operation time (hours)
1-2	8-15	4-6	60	0.5
3-4	20-40	6-7	200	1.6
4-6	50-60	7	380	3.0
7 plus	80-120	7-10	900	7.5

## DESIGN CRITERIA AND CONSIDERATIONS

Minisprinklers are mainly used with intensively irrigated fruit trees (Figure 12.2). They can also be used with rainfed trees for supplementary irrigation. One emitter per tree is sufficient; therefore, the emitter spacings are identical to the tree spacings. The distance between the minisprinklers and the tree trunks is 30–50 cm depending on the age and size of the tree. For young trees, the minisprinkler heads can be mounted upside down to reduce the wetting diameter.

The emitter flow rate should be one which matches the existing conditions of water availability; the area; the number, age and size of the trees; and the number of irrigation shifts (irrigation programme). This is not a difficult task, considering the large range of minisprinkler flow rates available.

The minisprinkler emitters are short-path nozzle-orifice emitters with fully turbulent flow. Therefore, the variation in minisprinkler discharge is half the variation in the operating pressure; e.g. a 20 percent difference in pressure results in a 10 percent difference in discharge, which is considered the maximum permissible. Table 12.2 is based on this principle.