

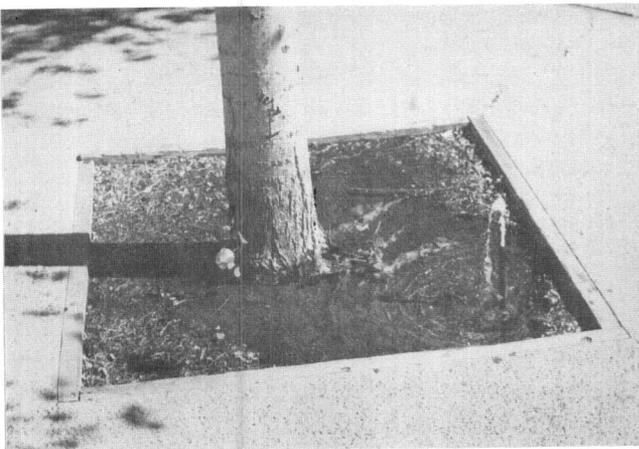
mulched vegetable production systems. Because drip emitters rely on the soil hydraulic properties to distribute water, and typical Florida sandy soils limit lateral unsaturated water movement, spray (or microsprinkler) emitters have become more popular in those tree crop production systems where it is desirable to irrigate a significant fraction of the tree root zone with relatively few emitters.

## Spray (microsprinkler)

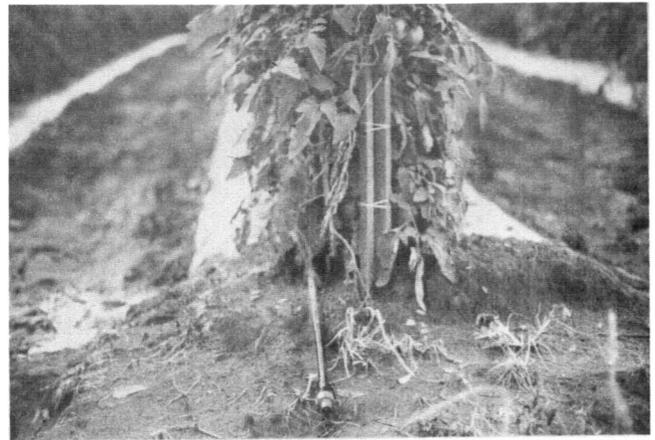
Spray or microsprinkler types of microirrigation systems, like drip systems, emit water at discrete points. However, emitters typically have flow rates much greater than drip emitters. Flow rates normally range from 8 to 30 gph, with 15 to 20 gph emitters being very common. Spray emitters distribute water by spraying it through the air over diameters of 5 to 25 ft, depending on the crop being irrigated. Emitters are typically mounted on short (6 to 12-inch) risers above the ground surface to improve distribution patterns.

Spray emitters are most commonly used in citrus microirrigation systems (Fig. 20). In citrus, the advantage of distributing water over a large diameter as compared to the much smaller diameter of drip emitters has been demonstrated to increase yields. The larger flow rates and orifice sizes also reduce filtration requirements and clogging problems.

Both spinners and fixed deflectors are used to distribute the water from spray emitters. The fixed deflector type are more often used because the moving parts in spinner emitters sometimes fail to function under field conditions.



**Figure 21.** Bubblers have high flow rates and require some means of containing the water to prevent runoff.



**Figure 22.** Line-source microirrigation systems require a lateral under the plastic mulch of each crop row for tomato production.

## Bubbler

Bubblers are relatively large flow rate microirrigation emitters (Fig. 21). Flow rates are typically 1-gpm or greater. Because of the high flow rates, relatively large orifice sizes are used, and clogging is typically not a problem, even without filtration. However, the high flow rates may result in runoff rather than infiltration into the soil. Thus, bubbler systems are typically only used in containers such as large ornamental planters or in individual tree basins, which retain the water and prevent runoff. Also, bubblers are typically operated only a few minutes per irrigation, because the required water volumes can be applied in a short period of time.

## Line-source

Line-source microirrigation systems use laterals with very closely spaced emitters, or either perforated or porous tubing are used rather than discrete emitters. Water is emitted either continuously along the lateral lengths, or at close intervals so that the wetting patterns overlap and approximate that of a continuous line source.

Line-source tubing laterals are used in Florida vegetable, strawberry and ornamental (bedded flower) production systems (Fig. 22). These are typically thin-walled tubing of the disposable, lay-flat type that have perforations or emitters molded into the tubes at 6 to 24-inch intervals along their lengths. Because of the limited water movement for typical sandy soils, 8 to 12-inch spacings are commonly used.