Drip irrigation in California

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Drip irrigation first appeared in California agriculture in 1969 or 1970. Enthusiasm rose rapidly because of the attractive newness of the method and because of high hopes for substantial water saving. With water in California both costly and scarce, the prospect seemed inviting.

Before its introduction in California, no research on drip irrigation had been conducted by the University. The first such research project, initiated by Cooperative Extension, was an avocado trial in San Diego County, which has been observed by a large number of growers, industry representatives, and scientists from around the world. Since then, many drip-irrigation research projects have been conducted throughout the state on a variety of crops. These have mainly been directed at methods of water and fertilizer management for various crops grown in different soil conditions. Meanwhile, industry has worked on equipment problems, including emitter performance, clogging, and water cleaning to avoid clogging.

Expansion of drip irrigation was rapid during the first five years, but has slowed slightly in the last one or two years. A mail survey in 1976 by C.D. Gustafson, San Diego County farm advisor, revealed that drip irrigation is presently used in California on 60,000 to 65,000 acres. Estimates by the same respondents show a potential acreage of about 100,000 by 1981.

Drip irrigation is used on many crops, mostly in four groups: orchards, vegetables, vineyards, and ornamentals. Because the systems are costly, they are feasible mainly on such high-value crops and not on close-growing field crops, which would require more tubing and emitters and generally are of lower value.

Drip irrigation has been used to irrigate soils and terrain that could not have been watered by other methods. In San Diego County there are areas having ideal climate for growing avocados but with shallow soils on steep, rocky, mountain slopes. Drip irrigation has made avocado growing possible in these areas that would otherwise remain rough mountain brushland.

Vegetables grow well in some coastal valleys where irrigation efficiency has been poor because of the sandy soil. Drip irrigation has improved both efficiency of irrigation and crop performance.

In the Central Valley of California, many soils have such poor infiltration rates that irrigation water fails to penetrate to the lower root zone except in the winter and spring. In some tests, drip irrigation applied slowly and very frequently has been able to penetrate.

Drip irrigation also has been able to save substantial amounts of water in some cases and a significant amount in all cases—which is particularly important where water is expensive and limited. The amount of savings has varied widely depending on the efficiency of the system with which it is compared. Important water savings have occurred with new crops that have small root systems and do not need water in the surrounding soil not yet occupied by crop roots.

Crops have generally responded favorably to drip irrigation where it has been well managed. This is particularly true of young plants that have a small root system and respond to high frequency of irrigation. Crops also respond well to the injection of nitrogen fertilizer in the irrigation water. The fertilizer is applied frequently in small amounts directly to the concentrated feeder-root zone near the emitters, which promotes efficient absorption by the roots. Application of fertilizers other than nitrogen has not always been successful and is not being recommended as yet.

Problems

New mechanical devices have problems that are solved in time. For drip irrigation, the most common and difficult problem is clogging of the small orifices of the emitters by mineral or organic matter in the water. Even with careful filtration, some clogging can occur. Fine silt, clay particles, and organic slimes are difficult to remove, and some waters have to be treated with chlorine or other chemicals to control organic slimes.

To make emitters less susceptible to clogging, manufacturers have evolved methods for automatic or manual flushing, which enlarge the orifice temporarily so clogging material can pass through and leave the orifice clear. Others have used larger orifices that are less likely to clog, increasing the length of the flow channel to achieve the reduction in pressure needed for flow control.

When irrigation is converted to the drip method, which may wet only 50 percent rather than all of the soil, a new cluster of feeder roots must grow to replace those that are in soil no longer wetted. A mature tree may be subject to stress if hot weather arrives before the new roots have developed. To avoid this stress, the system should be converted during fall and winter.

Drip irrigation potentially can produce large savings in labor, because water distribution is entirely mechanical, systems are easily automated, and fertilizers can be applied in the irrigation water. However, labor requirements often have not actually been reduced, because of the need to patrol lateral lines to clear clogged emitters.

The potential for savings in labor needed for weed control also has not been entirely realized. Although in new plantings weed growth is limited to the vicinity of the emitters, mechanical control around emitters is difficult, and chemical control is still inadequate.

Future

After six years of use in the field in California, it is evident that drip irrigation is here to stay. Because of the high cost of installed systems, the method will be limited to high-value crops or to situations where special problems exist that only drip irrigation can solve.

As performance of emitters improves so that efficiency of application increases, drip irrigation will find wider use because of increasing cost and scarcity of water and pressures to conserve water. With improved performance, the labor requirement will decrease. This also will serve to promote use of drip irrigation as farm labor costs escalate.

With a method still so young, many new ideas, modifications, and applications can be expected. Drip irrigation generally uses lower water pressure than sprinklers, an advantage where energy costs have increased rapidly. New developments may result in systems that operate similarly to drip irrigation while using no more pressure than that available in low head pipelines supplying water for flood irrigation. New developments in drip irrigation may help solve problems of vandalism and of water spilling on traffic surfaces in landscaped areas.

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