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On-farm Extension Demonstrations of Drip Irrigation Systems for Vegetable Growers

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Summary. On-farm extension demonstrations are one of the best participatory research and educational resources available to extension specialists and county extension staff for presentation of new technology to agricultural producers. On-farm extension demonstration programs for intensive vegetable production, of which drip irrigation is a major component, can range from a complete package [3/4-ton truck, a trailer for transporting equipment, a tractor in the 36 to 42 HP range (i.e., Ford 3910) a plastic-laying machine, a bed press pan, hillers, and drip/overhead irrigation systems] with a price tag of about $40,000 used in a multistate, statewide, or multicounty program, to a small demonstration package using a household well source with a cost of about $250. The demonstration package used will depend on the scope of the program, local conditions, and economic realities.

Throughout the United States, agricultural producers, especially vegetable producers, are concerned about potential shortages of water for irrigation and contamination of groundwater resources with fertilizers and pesticides. The time of unlimited water resources for agricultural use has passed, as droughts, population pressures, and public concern about agricultural pollution begin to restrict the amount of water available to growers. Conservation of all resources, especially water, by more efficient use is quickly becoming a high priority at all levels of government and at land-grant universities around the country.

For vegetable growers, plastic mulches used in conjunction with drip irrigation can provide a high level of control of environmental variability and optimum production with minimal water use, while conserving soil and fertilizer nutrients.

One of the primary missions of the cooperative extension service is to present new technology to agricultural producers. The on-farm demonstration program is one of the best participatory research and educational resources available to extension specialists and county extension staff for this mission (Lamont, 1986). Demonstrations are designed to encourage the active involvement of university-based researchers and extension specialists, county extension professionals, agricultural producers and representativesof industry.

How do you develop an effective on-farm extension demonstration of drip irrigation systems that will help vegetable growers decide whether the costs of a drip irrigation system can be offset by benefits, such as higher yields and/or reduced water application costs? Equipment needs and costs involved in establishing such demonstrations are discussed herein. The complete demonstration package can be modified according to local conditions and economic realities.

Water sources

The water supply used may come from wells, ponds, lakes, streams, municipal lines, or dug plastic-lined pits. Well water and municipal sources generally are fairly clean and require only a screen or disk filter for removal of contaminants. However, precipitates and other contaminants in the water should be determined by a water quality test before selecting a demonstration site. Surface water such as streams, ponds, or dug pits may contain bacteria, algae, or other aquatic life, and media filters are *absolutely* necessary.

Well water. With a household well source a small unit (Fig. 1, upper) can be used to irrigate one-third to one-half acre (0.1 to 0.2 ha). This assumes rows centered 5 ft (1.5 m) apart and drip irrigation. tape with an output of 0.3 gal/min per100 ft (1.2 liter/min per 30 m) of row. This unit uses a 3/4-inch(2-cm)Amiad200-mesh(0.60-mm) screen filter, 3/4-inch (2-cm) Senninger Irrigation Pressure Reducer at 10 psi at 4 to 16 gal/min (4.5 kg. cm^{-2} at 15 to 60 liters·min^{-1}) and a pressure gauge. The cost of the unit is about $50. The unit is an excellent choice if the demonstration is being run from a household well. The pressure gauge verifies that the pressure regulator is working properly.

A larger unit (Fig. 1, lower) can be used with a larger well to irrigate between 1 to 1.5 acres (0.4 to 0.7 ha). It consists of a 2-inch (5.1-cm) Amiad 200-mesh (0.60-mm) screen filter, 2-inch (5.1-cm) Pressure Reducer, and a pressure gauge. This unit is about $180. It can be connected to aluminum pipe by using an adapter with quick-couples (also shown in Fig. 1). The bypass shown on the unit is used to bypass the screen filter/pressure reducer and supply water directly to an overhead system (discussed below).

Surface water. They are sand- or crushed granite-filled canisters installed as pairs and are backflushed for cleaning. Canisters from 14 inches (enough for 2 acres) (35 cm enough for 0.8 ha) to 48 inches (121 cm) in diameter are used, depending on the size of the system. Two options are available for use in an on-farm demonstration. The first is to mount the engine, pump, and media filters on a 60 × 72-inch (1.5 × 1.8 -m), single-axle trailer (Fig. 2, Table 1) (Lamont, 1989). This unit has the capacity to irrigate 6.4 acres (2.6 ha) at one time using rows centered 5 ft (1.5 m) apart and drip irrigation tape with a flow rate of 0.3 gal/min per100 ft (1.2 liter/min per 30 km) of row. If zoned properly, additional area can be irrigated. The unit is about $7700. The other option is to mount only the media filters and fertigation unit on a trailer (Fig. 3). This unit requires an external gas, electric, or PTO-driven pump located at the surface water source, such as a pond. The water then is delivered to the field via aluminum pipe, which is connected to the trailer unit.

Fig. 1. *Two different-size units for use with well water. Each contains a screen filter, pressure reducer, and pressure gauge.*

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