

- * an underground network of PVC piping permanently installed with sprinklers that provide coverage for the entire area to be irrigated, or
- * above-ground portable piping systems which are placed in the field at the start of the irrigation season and are left in place during the entire season.

Both of these systems have high initial costs because pipe and sprinklers must be bought to cover the entire area at once.

Due to these high initial cost, these systems are generally limited to use on high value crops such as ornamentals, citrus, orchards, vegetables and for lawns and golf courses. The portable solid set system usually consists of aluminum pipes laid out to irrigate the entire field in one set to minimize labor.

Solid set systems can be automated to operate in zones and therefore require little labor. In addition, they have the capacity to deliver fertilizer and chemicals directly to the crop through the irrigation system (fertiligation). These systems can also be used to reduce heat stress by intermittent sprinkling. Solid set systems are common in Florida, covering more than 200,000 acres, not including home and golf course sprinkler systems (Irrigation Journal, 1987). These systems, if properly designed and operated, can have application efficiencies from 70 to 86 percent. A disadvantage of this method on some crops is that leaf wetting can promote disease and pest problems.

If freeze or frost protection is required, these systems can serve a dual purpose, thus justifying the large investment cost. As many as 80,000 acres of ornamental crops in Florida have frost and freeze protection, as well as irrigation needs, provided by this method (Irrigation Journal, 1987). When operating for freeze protection, pumping capacity requirements may be as high as 115 gpm/acre. Researchers have reported success in providing protection for strawberries, citrus, vegetables and ornamentals against temperatures as low as 15 degrees F (Burman et al., 1980).

Portable Set Systems

Portable set systems are above-ground, moveable systems in which only a portion of the field is covered at one time. These systems usually consist of

aluminum pipe that is coupled together and can be easily disassembled to be moved to different parts of the field. The advantage of portable over solid set systems is the lower initial cost. The disadvantage is the high labor requirement for moving the piping system, which is normally moved by hand. This labor requirement is of particular concern where coarse-textured soils with low water-holding capacities are common, thus requiring frequent moves of the irrigation system. These systems can provide only limited freeze protection, and only to that specific portion of the field that is being irrigated at the time.

Guns

Guns are simply large sprinklers that can be moved by hand or tractor or that are self-propelled. The self-propelled (traveling) guns were first introduced in the 1960s and are still in common use. Their capacities range from 100 to 1000 gpm with operating pressures from 60 to 120 psi. These high operating pressures have large power requirements, causing high energy costs.

An advantage of traveling guns is that they can be used to irrigate irregularly shaped fields. They have medium initial investment costs and labor requirements (see Tables 1 and 2). Because of high application rates, land irrigated by this method should be relatively flat and have soil with a high infiltration capacity. Irrigation efficiency varies (60 to 75 percent) depending on operating conditions. The well or water source capacity usually required is from 8 to 12 gpm/acre. These systems are in extensive use throughout Florida with approximately 150,000 acres currently being irrigated by this method (Irrigation Journal, 1987).

Center Pivots and Lateral Moves

The center pivot and lateral move sprinklers are large, self-propelled and highly mechanized irrigation systems. They provided major advancements in irrigation technology in the 1960s. These systems have gained widespread usage throughout the United States for agronomic crop production because they are relatively efficient, low in labor and operating costs, and medium in initial investment cost. The two common types of drive units are hydraulic (water) and electric.