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Saving Water with Trickle

By Lee Pilgrim, Editor, Texas Water Resources

One day in the middle-thirties, Dr. S. Blass was passing the tree-lined fence of a neighbor in Hadera (Israel) when he noticed that one tree was much taller than any other along the fence. Curious, he took a closer look and discovered that although the soil around the tree was dry, it evidently was being watered by a constant drip from a nearby leaking water pipe connection.

That's how trickle irrigation began. Now it is used successfully in many parts of the world. Today more than 71,800 acres in the United States are irrigated by this method. In the next five years, that figure is predicted to triple, and the extent of trickle irrigation in foreign countries-Mexico, Israel, Australia, and others-is expected to double.

Water Saver

Trickle irrigation is first, and foremost, a water saver. Developed for use in a dry, semi-arid land where two-thirds of the water supply goes for agriculture, trickle (also called drip) irrigation was designed primarily to save water.

This accounts for its importance to Texas, which is wrestling with a serious water depletion problem. Agriculturists' paramount goal is water use efficiency (i.e., crop yield obtained per unit of applied irrigation); and trickle irrigation accomplishes that.

Trickle irrigation acreage in Texas is estimated at 4,000 to 4,500 acres at the present time, and most of the systems have been installed in the past 3 or 4 years, according to Wayne Keese, Extension Agricultural Engineer, Texas Agricultural Extension Service. He says the use of drip irrigation is expected to increase steadily in the next few years, although the higher cost of plastic pipe--a major item in trickle irrigation systems--may decrease the rate of growth.

"Pecans, citrus, peaches, avocados, apples, and grapes account for most of the drip irrigated acreage," he pointed out.

Irrigation experts recognize that the trickle method must be extended to row crops before it can contribute substantially to statewide water savings. Research continues in hopes of irrigating cotton and grain crops as successfully with trickle as tree crops and greenhouse vegetables have been watered. Further research--exploring the possibility of its use on trees and shrubs in urban areas--is underway.

There are several facets to the water saving feature. First is the reduction of the amount of water lost through evaporation. In conventional irrigation systems, such as the sprinkler method, water is applied from a height of three to four feet above the soil surface, resulting in evaporation in transit, with continued evaporation from the soil surface where it collects while seeping into the ground, and from the plant foliage.

These conditions for evaporation are precluded in trickle irrigation since the water is delivered directly to the plant through a plastic pipe distribution system with emitters (small water outlets) placed at the base of the plant. Water infiltrates the soil and moves directly to the root zone, wetting only a small area of soil surface. Since the system is automated, and emitters control the water flow, very small amounts of water are applied as compared with the amount used in conventional methods of irrigation.

Minimum Run-Off

Because less of the total soil area is fully wetted, there is a minimum of run-off water and no excess water to percolate below the roots. Thus the trickle system is the most environmentally sound method today. Besides the actual reduction in water, another water conservation asset of trickle irrigation is that poor quality water (having higher concentration of salt) can be used on sandy soils. High salt concentrations are maintained on the outer edge of the wetted zone when trickle system is used; whereas in the conventional system, salt is concentrated in surface layers and is pushed down into the root zone with each subsequent application of water.

It is not surprising that research by Texas Water Resources Institute and other agencies have found that with trickle irrigation, 50 percent less water is needed to produce the same yield as conventional irrigation.

Indeed 71,800 acres is but a cubit compared with the total amount of land irrigated in the United States. Even so, trickle irrigation is considered a major breakthrough. When trickle is adapted to row crops, cotton and grain farmers will enjoy these labor saving benefits of trickle irrigation now experienced by orchard and greenhouse farmers:

- Fertilizers and, in some cases, pesticides can be applied directly in the trickle system, reducing both labor and application cost.
- Easily made automatic, the system is a labor saver. It can be set to turn on and off with time clocks or soil water sensors.

- There are no irrigation pipes to be moved around.

Another plus for trickle irrigation is that by controlling water more precisely, crop quality is greatly improved.

Good For Thirsty Pecans

Jim Bennett, who manages the Belding Pecan Farms, Ft. Stockton, is sold on the system. Already irrigating 492 acres with trickle, he now is installing the system on an additional 90 acres. He estimates an 80 percent water saving with trickle but expects the saving to decrease to 60 percent as the trees grow larger.

He says, "Irrigating labor costs--workman, maintenance, repairs, servicing filters--have dropped from $15 per month to $9 since trickle was installed."

Problems, he admits, exist. Filtration is number one. Another problem is coping with soluble iron content unique to his water supply. Bennett was able to overcome this problem by adding sulfuric acid to the system.

Irrigation experts, in general, agree that emitter clogging problems and the high cost of installation are the two major drawbacks. Research projects are underway to try to eliminate the negatives.

The system's potentials have motivated several scientists at Texas A&M University to conduct research projects. They are challenged to find ways for improving efficiency in irrigation in a state where 72 percent of all water uses--industrial, municipal, and agricultural--goes for irrigation.

Industry's Water Has Long Life

Recycling water is to industry today what artificial recharge and trickle irrigation someday will be to irrigated agriculture. Since water is a vital ingredient in industries, saving water means saving dollars; and almost every industry that can reuse water does so.

Petroleum and chemical industries are especially large water users. Refining and chemical operations involve an endless process of eating and cooling. Usually, it is water that cools the oil and chemical streams flowing from operating units. Other water is fed to boilers where it is converted to steam to drive electrical generators, pumps, compressors, and other equipment.

Exxon USA's refinery and Exxon Chemical USA's plant at Baytown are good examples of facilities which potentially could be big water consumers. However, because of water conservation facilities built over four decades, the plants actually consume relatively little water considering that they are among the nation's largest refining and chemical plants.

Reused 20 Times

If the Exxon refinery and chemical plant used cooling water only one time, it would take about 600 million gallons a day to sustain operations. That is twice the amount used by the City of Houston in a day. But, at Baytown plants, each gallon of water is recycled and reused over 20 times before it eventually evaporates or becomes so burdened with "dissolved solids" that it needs to be sent to the water treatment system prior to discharge.

In the '40s and '50s, the refinery and chemical plant stepped up this important water conservation effort. Many millions of dollars were invested in cooling towers which allow the same water to be used over and over in cooling operations.

Cooling towers are large box-like structures where water, which has absorbed heat from the oil and chemical streams on the operating units, trickles down as large fans pull cool air in through the sides of the tower. This process cools the water so it can be used again. However, with higher efficiency a major goal of industry, research is underway to improve the cooling process so that the amount of evaporation and the amount of energy used will be reduced.

Since recycling water cuts operational expenses tremendously, many large industries on the Houston Ship Channel have adopted that measure to conserve water. With that in mind, ponder this "water for thought" item: Assuming that most industries in the Texas coastal area reuse water only 10 times (cutting Exxon's rate in half for a safe margin), enough water would be saved in one year to fill 8 to 10 Lake Houstons.