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ORIGINAL ARTICLES

Drip Irrigation Benefits And Saving Water

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ABSTRACT

Drip irrigation, also known as trickle irrigation or microirrigation is an irrigation method which minimizes the use of water and fertilizer by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing, and emitters. Modern drip irrigation has arguably become the world's most important innovation in agriculture since the invention of the impact sprinkler in the 1930s, which replaced flood irrigation. Drip irrigation may also use devices called micro-spray heads, which spray water in a small area, instead of dripping emitters. These are generally used on tree and vine crops with wider root zones. Subsurface drip irrigation (SDI) uses permanently or temporarily buried dripperline or drip tape located at or below the plant roots. It is becoming popular for row crop irrigation, especially in areas where water supplies are limited or recycled water is used for irrigation. Careful study of all the relevant factors like land topography, soil, water, crop and agro-climatic conditions are needed to determine the most suitable drip irrigation system and components to be used in a specific installation.

Key words: *Drip irrigation, Saving water, Chemicals,Fertilizers.*

Drip Irrigation History:

Drip irrigation has been used since ancient times when buried clay pots which were filled with water and the water gradually seeped up into the grass. Modern drip irrigation began its development in Afghanistan in 1866 when researchers began experimenting with irrigation using clay pipe to create combination irrigation and drainage systems. In 1913, E.B. House at Colorado State University succeeded in applying water to the root zone of plants without raising the water table. Perforated pipe was introduced in Germany in the 1920s and in 1934, O.E. Nobey experimented with irrigating through porous canvas hose at Michigan State University.

Drip irrigation in New Mexico vineyard, 2002With the advent of modern plastics during and after World War II, major improvements in drip irrigation became possible. Plastic microtubing and various types of emitters began to be used in the greenhouses of Europe and the United States.

The modern technology of drip irrigation was invented in Israel by Simcha Blass and his son Yeshayahu. Instead of releasing water through tiny holes, blocked easily by tiny particles, water was released through larger and longer passageways by using velocity to slow water inside a plastic emitter. The first experimental system of this type was established in 1959 when Blass partnered with Kibbutz Hatzerim to create an irrigation company called Netafim. Together they developed and patented the first practical surface drip irrigation emitter. This method was very successful and subsequently spread to Australia, North America, and South America by the late 1960s.

In the United States, in the early 1960s, the first drip tape, called Dew Hose, was developed by Richard Chapin of Chapin Watermatics (first system established during 1964). [1] Beginning in 1989, Jain irrigation helped pioneer effective water-management through Drip Irrigation in India. Jain irrigation also introduced some drip irrigation marketing approaches to Indian agriculture such as `Integrated System Approach', One-Stop-Shop for Farmers, `Infrastructure Status to Drip Irrigation & Farm as Industry.' The latest developments in the field involve even further reduction in drip rates being delivered and less tendency to clog.

Advantages Of Drip İrrigation:

Drip irrigation can help you use water efficiently. A well-designed drip irrigation system loses practically no water to runoff, deep percolation, or evaporation. Drip irrigation reduces water contact with crop leaves, stems, and fruit. Thus conditions may be less favorable for the onset of diseases. Irrigation scheduling can be managed precisely to meet crop demands, holding the promise of increased yield and quality.

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Growers and irrigation professionals often refer to "subsurface drip irrigation," or SDI. When a drip tape or tube is buried below the soil surface, it is less vulnerable to damage during cultivation or weeding. With SDI, water use efficiency is maximized because there is even less evaporation or runoff.

Agricultural chemicals can be applied more efficiently with drip irrigation. Since only the crop root zone is irrigated, nitrogen already in the soil is less subject to leaching losses, and applied fertilizer N can be used more efficiently. In the case of insecticides, less product might be needed. Make sure the insecticide is labeled for application through drip irrigation.

Additional Advantages Of Drip İrrigation İnclude:

- Drip systems are adaptable to oddly shaped fields or those with uneven topography or soil texture; these specific factors must be considered in designing the drip system. Drip systems also can work well where other irrigation systems are inefficient because parts of the field have excessive infiltration, water puddling, or runoff.
- Drip irrigation can be helpful if water is scarce or expensive. Because evaporation, runoff, and deep percolation are reduced and irrigation uniformity is improved, it is not necessary to "over-water" parts of a field to adequately irrigate the more difficult parts.
- Precise application of nutrients is possible using drip irrigation. Fertilizer costs and nitrate losses can be reduced. Nutrient applications can be better timed to meet plants' needs.
- Drip irrigation systems can be designed and managed so that the wheel traffic rows are dry enough to allow tractor operations at any time. Timely application of herbicides, insecticides, and fungicides is possible.
- Proven yield and quality responses to drip irrigation have been observed in onion, broccoli, cauliflower, lettuce, melon, tomato, and cotton.
- A drip irrigation system can be automated.
- Drip tape or tubing must be managed to avoid leaking or plugging. Drip emitters are easily plugged by silt or other particles not filtered out of the irrigation water. Emitter plugging also can be caused by algae growing in the tape or by chemical deposits at the emitter.
- You might need to redesign your weed control program. Drip irrigation might be unsatisfactory if herbicides need sprinkler irrigation for activation. However, drip irrigation can enhance weed control in arid climates by keeping much of the soil surface dry. Tape depth must be chosen carefully for compatibility with operations such as cultivation and weeding.
- Drip tape causes extra cleanup costs after harvest. You'll need to plan for drip tape disposal, recycling or reuse.

Despite all of drip irrigation's potential benefits, converting to drip irrigation can increase production costs, especially where an irrigation system already is in place. Ultimately, there must be an economic advantage to drip irrigation to make it worthwhile.

Chemigation:

Manage irrigation and fertilization together to optimize efficiency. Chemigation through drip systems efficiently delivers chemicals in the root zone of the receiving plants. Because pf the precision of application, chemigation can be safer and use less material. Several commercial fertilizers and pesticides are labeled for delivery by drip irrigation. Injection pumps with backflow prevention devices are necessary to deliver the product through the drip lines. These pumps allow for suitable delivery rate control, while backflow prevention protects both equipment and the water supply from contamination. remember that in Oregon, water belongs to the public, not the landowner. Other safety equipment may be required; contact a drip-irrigation system supplier for details.

Water Savıng And Water Use Effıcıency:

From the practical point of view, normally the greenhouse grower is not specially interested in water saving. The scarce knowledge about the irrigation requirements among growers induce them to overirrigate, in case of doubt about the quantity of water to apply. A proper information on the irrigation requirements, spreaded at the farm level, can help to overcome this lacokf interest to reduce the water demand. Different measures to save water and improve its use, at the farm level, include reducing the water requirements, increasing the water availability and rising the yields. The use of mulching (plastic sheet, sand, grav..e.) lh, as been widely spreadedto limit the evaporation of the soil water and reduce ET. Subsurface drip irrigation can reach similar

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results. Various cultural practices affect the water demand. The use of transplants instead of direct seeding, multiple cropping, varying plant density, electing the cycles, pruning, trellising are effective, when properly managed, to save water otro increase the yield quantity and quality. An adequate greenhouse environmental management can reduce the water demand, increase the crop yields and, therefore, improve the water use efficiency. Manipulating ventilation, misting, shading and carbon dioxide (C02) injecting are effective techniques for that purpose, but not always possible in the simple and poorly equipped Mediterranean plastichouses (Boulard et al, 1991; Stanghellini, 1993; Castilla, 1994). Cropping the rainwater fkom the greenhouse roof is an easy way to increase the water resources specially relevant for its excellent quality. Another watyo mis ake a better usoe f the water stored in the soil profile; pulling up the crop immediately after the yield is over or managing rationally the complementary irrigatio in the watering schedule. Slight deficit-irrigations have been recommendeda s they do not affect yield in tomato (Villele, 1984), though they can reduce total biomass. When the soil profile is well-wetted before planting? slight deficit irrigation does not influence yield in greenhouse tomatoes and melons (Castilla et al, 1990-C; Castilla *et al*, 1996). Condensing the water fiom the saturated air can also helpt o reduce the fungal disease incidence, but economariec sn ot clear (Boularde t al, 1989).

Maximizing the uniformity of water application is one of the easier ways to save water, at the farm level, too fiquently forgotten. The evaluationo f the emission uniformity of the drip system shouldb e done periodically. In one study (Orgaz *et al,* 1986), thuly drip systems were evaluated in the Almeria greenhouse industry; the summary of the results are:A) The uniformity coefficWienCt> v aried between **51** and **93%,** the average UC being **76%.** Only 4% of the systems had excelleni uniformity whileU C th. E was unacceptable in 20% of them. B) Applied water was considered excessive in 50% of the farms studied. The subsequent spread of recommendations at the farm level for increasing drip irrigation efficiency and achieve a more accurate scheduling has been effective.

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