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Advantage and Disadvantage of Drip Irrigation System

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Abstract

The drip irrigation, also known as "trickle" irrigation, is one of the methods of water management. Under this system, water is carried to the plant under low pressure, through small diameter plastic pipes and delivered at the root zone, drop by drop through drippers. Drip irrigation is widely practised and established method of irrigation in developed countries and is slowly gaining popularity in India. It is most suited for horticulture crops, vegetables etc. and finds applicability in hard rock areas where groundwater is scarce and helps in optimisation of the limited water resources. The system has its advantages and limitations. Its advantages are in terms of savings of water (50-60%) of that required for flow irrigation, effective use of fertilizers, less labour and energy cost. The limitation for adopting of this method is its high initial cost which is beyond the purchasing capacity of small and marginal farmers and thus mainly adopted by large farmers.

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Introduction

Drip irrigation is a type of micro-irrigation that has the potential to save water and nutrients by allowing water to drip slowly to the roots of plants, either from above the soil surface or buried below the surface. Drip irrigation can work from both above or under the surface of the soil. It works effectively to ensure that all your plants get what they need. It works by exposing the roots to a direct supply of water. This method is facilitated by the use of drip emitters, which release water in a slow and steady fashion. Drip emitters are connected to a water source by a feeder hose another version of drip irrigation uses a hose that has drip emitters built into it. The goal is to place water directly into the root zone and minimize evaporation. Drip irrigation systems distribute water through a network of valves, pipes, tubing, and emitters. Depending on how well designed, installed, maintained, and operated it is, a drip irrigation system can be more efficient than other types of irrigation systems, such as surface irrigation or sprinkler irrigation (Bainbridge and David, 2001).

Components and Operation

Pump or pressurized water source, Water filter (s) or filtration systems: sand separator, Fertigation systems (Venturi injector) and chemigation equipment (optional), Backwash controller (Backflow prevention device), Pressure Control Valve (pressure regulator), Distribution lines (main larger diameter pipe, maybe secondary smaller, pipe fittings), Hand-operated, electronic, or hydraulic control valves and safety valves, Smaller diameter polyethylene tube (often called "laterals"), Poly fittings and accessories (to make connections), Emitting devices at plants (emitter or dripper, micro spray head, inline dripper or inline drip tube) (Punmin

and Pande, 1992).

Most large drip irrigation systems employ some type of filter to prevent clogging of the small emitter flow path by small waterborne particles. New technologies are now being offered that minimize clogging. Some residential systems are installed without additional filters, since potable water is already filtered at the water treatment plant. Virtually all drip irrigation equipment manufacturers recommend that filters be employed and generally will not honour warranties unless this is done. Last line filters just before the final delivery pipe are strongly recommended in addition to any other filtration system due to fine particle settlement and accidental insertion of particles in the intermediate lines (Megh, 2014).

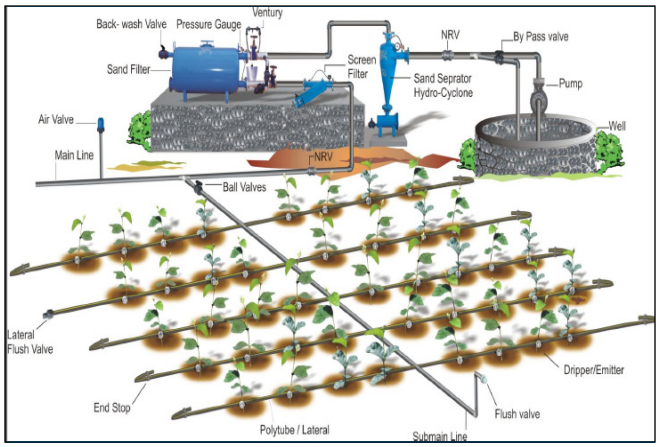

Figure 1: Layout of Drip Irrigation System

Properly designed, installed, and managed, drip irrigation may help achieve water conservation by reducing evaporation and deep drainage when compared to other types of irrigation such as flood or overhead sprinklers since water can be more precisely applied to the plant roots. In addition, drip can eliminate many diseases that are spread through water contact with the foliage. Finally, in regions where water supplies are severely limited, there may be no actual water savings, but rather simply an increase in production while using the same amount of water as before. In very arid regions or on sandy soils, the preferred method is to apply the irrigation water as slowly as possible.

Advantages of Drip Irrigation System

- Fertilizer and nutrient loss is minimized due to localized application and reduced leaching.
- Water application efficiency is high if managed correctly.
- Field levelling is not necessary.
- Fields with irregular shapes are easily accommodated.
- Recycled non-potable water can be safely used.
- Moisture within the root zone can be maintained at field capacity.
- Soil type plays less important role in frequency of irrigation.
- Soil erosion is lessened.
- Weed growth is lessened.
- Water distribution is highly uniform, controlled by output of each nozzle.
- Labour cost is less than other irrigation methods.
- Variation in supply can be regulated by regulating the valves and drippers.
- Fertigation can easily be included with minimal waste of fertilizers.
- Foliage remains dry, reducing the risk of disease.
- Usually operated at lower pressure than other types of pressurised irrigation, reducing energy costs.

Disadvantages of Drip Irrigation System

- Initial cost can be more than overhead systems.
- For subsurface drip the irrigator cannot see the water that is applied. This may lead to the farmer either applying too much water (low efficiency) or an insufficient amount of water; this is particularly common for those with less experience with drip irrigation.
- Drip irrigation might be unsatisfactory if herbicides or top dressed fertilizers need sprinkler irrigation for activation.
- Drip tape causes extra clean-up costs after harvest. Users need to plan for drip tape winding, disposal, recycling or reuse.
- Waste of water, time and harvest, if not installed properly. These systems require careful study of all the relevant factors like land topography, soil, water, crop and agro-climatic conditions, and suitability of drip irrigation system and its components.
- In lighter soils subsurface drip may be unable to wet the soil surface for germination. Requires careful consideration of the installation depth.
- Most drip systems are designed for high efficiency, meaning little or no leaching fraction. Without sufficient leaching, salts applied with the irrigation water may build up in the root zone, usually at the edge of the wetting pattern. On the other hand, drip irrigation avoids the high capillary potential of traditional surface-applied irrigation, which can draw salt deposits up from deposits below.
- The PVC pipes often suffer from rodent damage, requiring replacement of the entire tube and increasing expenses.
- Drip irrigation systems cannot be used for damage control by night frosts (like in the case of sprinkler irrigation systems)

Conclusion

In drip irrigation, water is applied to each plant separately in small, frequent, precise quantities through dripper emitters. It is the most advanced irrigation method with the highest application efficiency. The water is delivered continuously in drops at the same point and moves into the

soil and wets the root zone vertically by gravity and laterally by capillary action.

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