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Drip Irrigation System for Sustainable Agriculture

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Shivani Ranjan¹, Sumit Sow¹

¹PG Scholar, Department of Agronomy, Bihar Agricultural University, Sabour, Bhagalpur- 813210.

Abstract

Water is important for optimum production of crops both in terms of quality and quantity. Increasing population is leading to increase in demand of food and as we know that agriculture uses a considerable portion of the water. So, we can say that the demand of water is increasing with the demand of food. About 70% of the global freshwater is used in agriculture. In many developed countries this use has been decreased because of increase in the use of irrigation practices with higher water use efficiency like drip irrigation. Farmers are aware of the current and the upcoming competition for water so they know that the adoption of efficient irrigation systems is beneficial for them. Drip irrigation is an efficient irrigation method that delivers water slowly and directly to the plant root systems when network of pipes. It reduces the loss of water due to evaporation which is very common in other type of irrigation methods like flooding. It is also called as micro irrigation. Management of the drip irrigation system requires proper knowledge of the system, climate and environmental conditions for the growing crop. The impact of climate variables for plant growth and production in different season should be properly understood so that management practices for optimum production can be achieved.

Keywords: Drip irrigation, Water use efficiency.

Introduction

In drip irrigation system, water is supplied to the crop drop by drop at very low rate from a system of small diameter plastic pipes fitted with outlets called emitters for drippers. It is also called as trickle irrigation. It does not wet the whole soil profile like surface or sprinkler method of irrigation, it only gets a part of soil in which roots grow. In other words, it delivers water and nutrients directly to the plant roots on in the right amount at the right time so that each plant can achieve its proper growth and development. Drip irrigation is 40% more efficient because it uses 40% less water than conventional method of irrigation. Usage of fertilizer can also be optimized this way (Smith et al., 2016). Due to globalization of trade and economic liberalization of policies it has become inevitable to use modern irrigation practices in agriculture, especially in horticultural crops to obtain higher yields of good quality products and to earn good revenue by the farmers (Berbel et al., 2018).

Crops Suitable for Drip Irrigation

Drip irrigation is more suitable for crops like vegetables, soft fruit, tree or vine crops in which one or more emitters can be provided for each plant. Some examples are- Banana, papaya, mango, guava, grapes, watermelon etc. In general, only high-value crops are considered because drip irrigation involves high capital cost for installment.

Drip System Layout

Components of drip system includes-

- 1. Pump unit:** It takes water from the source and provides the right pressure for delivery in the pipe system.
- 2. Control head:** It controls the discharge and pressure of the entire system using valves. It also has filters to clear the water such as screen filters and graded sand filters for removal of fine particles suspended in the water. Fertilizers can also be applied along with irrigation water. Some control has fertilizer and nutrient tank for addition of measured dose of fertilizer into the irrigation water.
- 3. Main, sub mains and laterals:** The function is to supply water into the fields from the control head. They should be buried below ground to avoid degradation by direct solar radiation.

4. Emitters or drippers: They are used to control water discharge from laterals to the plants. They are placed more than one metre apart with one or more emitters used for a single plant.



Clogging of Laterals

Clogging may occur due to different physical impurities like sand particles and organic substance, chemical impurities like calcium carbonate and biological impurities like algae and other microorganisms. The problem due to different physical impurities can be overcome by proper management of different components in the system and the problems due to chemical and biological impurities can be overcome by acid treatment and chlorination respectively (Adin et al., 1991). The maintenance includes repair and replacement of the parts of the irrigation system to prevent leakage and closures and washing of the filter and irrigation pipes to remove the accumulated impurities (Lamm et al., 1995).

Advantages of Drip Irrigation

1. It saves about 30-60 % of water using which more area can be irrigated. It enables higher yield of good quality produce.
2. It saves labour as well as fertilizers.
3. It helps to control soil erosion.
4. Water use efficiency of drip irrigation is around 90%.
5. Saline water can be used for irrigation by this system.

Conclusion

Drip irrigation is the most effective form of irrigating crops (Gonzalez, 2015). Government has launched a programme called *Pradhan Mantri Krishi Sinchai Yojana* or 'more crop per drop'. Under this programme, financial assistance of up to 55 per cent is given to small and marginal farmers and 45 per cent for other farmers for adoption of micro-irrigation systems. The funding pattern between the Union governments and the state government's share since November 2015 has been 60:40 for all states except the North East and the Himalayan states, for which the funding pattern is 90:10. Farmer should be made aware of such programmes. Use of irrigation systems with reduced impact on the environment, such as drip irrigation can also be used for the distribution of systemic plant production products (Najafi et al., 2007). Drip irrigation leads to sustainable agriculture by decreasing water loss and an increase in water use efficiency.

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