

## Micro Irrigation: A Way Forward for Enhancing Water Productivity in India

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### Article History

Received: 25. 08.2020

Revised: 15. 09.2020

Accepted: 22. 09.2020

### INTRODUCTION

In India, perhaps more than 80 per cent of the available water is used for irrigation. Irrigation is the controlled application of water through man-made systems to meet the water requirements of agriculture. Irrigation is an artificial application of water to crops or plants, especially when an agricultural field does not get enough water through rains. Having perhaps the largest irrigated area in the world, India faces acute water scarcity. We need to adopt irrigation methods that help in not only in saving freshwater, but also provide sufficient water to plants for growth. One such method now being followed in India is 'micro-irrigation'. In this Unit, you will learn about the main features and functions of drip and sprinkler irrigation system. The Unit also deals with the classification of micro-irrigation system, types of drip and sprinkler irrigation system, characteristics of land gradient, crops grown under micro-irrigation system, and the various aspects related to layout and design of the system. Sprinklers spraying water over lawns, gardens and agricultural fields are a common sight in both urban and rural areas. They not only spray water evenly but also help conserve the valuable natural resources. In sprinkler irrigation system, the sprinklers sprinkle water into the air through nozzles, which subsequently, break into droplets and fall on crop canopy as well as the field surface. You might have seen certain equipment, pipes and drippers in nurseries and agricultural fields through which water is supplied to irrigate plants directly. This mostly happens in drip irrigation system, wherein the water is supplied to plant roots directly through a network of plastic pipes, lateral tubes, valves and emitters.

### Micro-irrigation System

Micro irrigation is the slow application of continuous drips, tiny streams or miniature sprays of water above or below the soil surface.

In this Session, you will learn about the main features of micro irrigation system and its classification. Micro irrigation system is effective in saving water and increasing water use efficiency as compared to the conventional surface irrigation method. Besides, it helps reduce water consumption, growth of unwanted plants (weeds), soil erosion and cost of cultivation. Micro irrigation can be adopted in all kinds of land, especially where it is not possible to effectively use flooding method for irrigation. In flooding method of irrigation, a field is flooded with water. This results in significant run-off, anaerobic conditions in the soil and around the root zone, and deep irrigation below the root zone, which does not supply sufficient water to the plants. It is, therefore, one of the most inefficient surface irrigation methods. Micro-irrigation can be useful in undulating terrain, rolling topography, hilly areas, barren land and areas having shallow soils.

#### **Status of Micro-irrigation in India and world**

About 42 million ha area is potential under drip and sprinkler in the country (Raman, 2010). Out of this, about 30 million ha are suitable for sprinkler irrigation for crops like cereals, pulses and oilseeds in addition to fodder crops. This is followed by drip with a potential of around 12 million ha under cotton, sugar cane, fruits and vegetables, spices and condiments; and some pulse crops like red gram, etc.

The percentage of actual area against the potential estimated under drip irrigation in different states varied between nil in Nagaland to as much as 49.74% in Andhra Pradesh, followed by Maharashtra (43.22%) and Tamil Nadu with 24.14%. In case of sprinkler irrigation, the percentage of actual area against the potential estimated was as much low as 0.01% (Bihar) and the highest of 51.93% (Andhra Pradesh). Compared to the potential of 42.23 million ha in the country, the present area under MI accounts for 3.87 million ha (1.42 million ha under drip and 2.44 million ha under sprinkler) which is about 9.16% (Table

1). The present figures thus reflect the extent of MI systems covered under different government programmes as well as own investment by the farmers. However, the actual area under MI may vary according to the extent of use by the farmers. (Palanisami et al., 2011). However, as far as world's statistics is concerned, USA stood first, with 53.0 % of area in the total irrigated area covered under sprinkler and micro irrigation followed by China (13.7 %) and India stood third position with 8 % area (Table 2).

#### **Features of micro-irrigation system**

- Water is applied via pressurized piping system. Micro-irrigation requires pumps for developing the required pressure for delivering water through pipelines, regardless of whether the source of water is surface or underground.
- Water is applied drop-by-drop for a long period in case of drip irrigation system.
- Water is applied at a low rate to maintain the optimum air–water balance within the root zone.
- Water is applied at frequent intervals as per the requirement of plants.
- Water is supplied directly to the plants and not to the other areas of the field, thus, reducing wastage.
- Soil moisture content is always maintained at ‘field capacity’ of the soil. Hence, crops grow at a faster rate, consistently and uniformly.

Field capacity is the moisture or water content present in the soil after excess water has drained away and the rate of downward movement has decreased, which takes place within 2–3 days after a spell of rain or irrigation. It means that after drainage stops, the large soil pores are filled with both air and water, while the smaller ones are still filled with water. At this stage, the soil is said to be at field capacity and is considered to be ideal for crop growth.

#### **Classification of micro-irrigation system**

Micro-irrigation system can be broadly classified into two categories:

- Sprinkler irrigation system
- Drip irrigation system

#### **Advantages of micro-irrigation system**

Micro-irrigation system has a number of advantages over surface irrigation system. Some of the advantages of micro-irrigation system over surface irrigation system are described as follows.

- Helps in saving water
- Uniform water application
- Helps in saving electricity
- Improves chemical application
- Reduces weeds and diseases
- Improves tolerance of crops to soil salinity
- Suitable to various topography and soil type
- Regulates water through automation
- Reduces labour costs
- Improves quality and yield

#### **Demerits of micro-irrigation systems**

- High initial cost
- Pressurized irrigation water
- Requires some management and maintenance
- Clogging
- Salt accumulation near the root zone
- Seed germination
- Moisture distribution/restricted root zone

#### **CONCLUSIONS**

Micro irrigation system is effective in saving water and increasing water use efficiency as compared to the conventional surface irrigation method. Besides, it helps reduce water consumption, growth of unwanted plants (weeds), soil erosion and cost of cultivation. irrigation can be adopted in all kinds of land, especially where it is not possible to

effectively use flooding method for irrigation. In flooding method of irrigation, a field is flooded with water. This results in significant run-off, anaerobic conditions in the soil and around the root zone, and deep irrigation below the root zone, which does not supply sufficient water to the plants. It is, therefore, one of the most inefficient surface irrigation methods. Micro-irrigation can be useful in undulating terrain, rolling topography, hilly areas, barren land and areas having shallow soils and which is suitable for all type of agricultural and horticultural crops.

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