

# Low-Cost Rain Hose Irrigation for Increasing the Water Productivity of Short Duration Crops

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## Abstract

In India, spatial and temporal variation of precipitation has been boundless varying from 11000 mm to 90 mm. The average annual per capita water availability has declined from 5000 cubic meter in year 1950 to 1545 cubic meter in year 2011 and estimated to reduce further to 1341 and 1140 cubic meter in year 2025 and 2050, respectively. Agriculture sector, which provide 54.6% of total employment to growing population, alone consumes more than 90% of total groundwater draft in irrigation. In context of rapid depletion of water resources, there is need to increase water use efficiency. Efficient method, like microirrigation, can play pivotal role in management of irrigation water demand. Properly designed and managed drip and sprinkler irrigation system have irrigation efficiency about 90% and 70%, respectively contrast to surface irrigation method which have just about 40%. These drip holes are made with nano punching technology to ensure uniform flow of water. Rain Hose is affordable spray irrigation technology. It's replacement for Sprinkler Irrigation System. It's easy to install and maintain. Rain Hose is suitable for closed spaced crops, onion, turmeric, groundnut, lawn, nurseries, carrots, grams, ginger, leafy vegetable etc. Rain hose has many advantages, such as low cost, convenient laying and use, and simple maintenance. Compared with the transmission flood irrigation method, the rain pipe irrigation can bring a very significant effect of increasing production, and can also effectively avoid the problems of soil compaction, field runoff, soil erosion, and fertilizer efficiency reduction that may be caused by flood irrigation. Farmers with closely spaced crops with low height can greatly benefit from this method of irrigation.

## Introduction

Water is a scarce natural resource and the major requirement in the agricultural sector. Efficient utilization of available water resources is crucial for a country like, India, which shares 17% of the global

population with only 2.4% of land and 4% of the water resources. Population growth is increasing the demand for water in India, especially for agricultural purposes. Further, per capita availability in terms of average utilizable water resources, which was 5247 m<sup>3</sup> in 1951 (presently 1453 m<sup>3</sup>) is expected to dwindle down to 1170 m<sup>3</sup> by 2050. Agricultural and rural development are closely tied to essential resources like land and water, which play significant roles in addressing global challenges such as hunger, poverty, climate change and the depletion of natural resources. Agricultural sector alone consumes 80% of the ground water (Harsha, 2017). The declining trend of groundwater level in all parts of the country also indicates that the assured supply of good quality water will become a concern for country's development (Manivannan et al., 2017).

## Water Demand

Meeting the food and fibre demands of a growing global population is a considerable challenge. To date, irrigated agriculture has been responsible for 40% of the total food and fibre production whilst using only 18% of world's arable land, Irrigation requirements, however, account for nearly 70% of the world's total freshwater withdrawals and have significantly altered hydrological and environmental conditions in both surface and subsurface water resources. The groundwater is applied to the field by flood irrigation method with efficiency less than 40%.

## Water-use efficiency

On the contrary, Micro irrigation (MI) techniques like drip and sprinkler help in water saving up to 40% over conventional flood irrigation methods through enhanced water use efficiency thereby enabling irrigation with extended coverage for a longer duration from the same source of water. Water use efficiency of Micro Irrigation including drip irrigation is as high as 80 to 95%. The MI techniques also help in reducing water-logging, fertiliser usage, labour expenses and other input costs and in

enhancing the agricultural productivity and farmers' income besides sustaining soil health.

The overall efficiency of the flood irrigation system range between 25-40% (Amarasinghe, 2007). Overall, micro irrigation shows superiority over other traditional irrigation methods in term of water use efficiency, energy saving, yield increase and net return per unit volume of groundwater (Kumar and Palanisami, 2010; Chandrakanth et al., 2013). The groundwater table can be improved with construction of various artificial conservation practices and improve crop productivity (Paul and Panigarhi, 2016). All these emphasize the need for water conservation and improvement in water-use efficiency to achieve More Crops per Drop. The efficient use of available water for irrigation is a major challenge. Technological innovations such as micro-irrigation play an essential role in water-resource management.

This has generated criticism and debate about the (un) sustainability of irrigated agriculture. Irrigation managers must often justify the use efficiency and productivity of water in competition and comparison with other uses and users. The challenge is to enhance water allocation decisions to reduce negative environmental impacts, whilst continuing to satisfy food and fibre demands. Research and investments have been oriented towards applying cost effective technology, precision agriculture, and environmentally friendly techniques to pursue sustainable water use in agricultural development.

### Rain hose Irrigation

Rain hose with laser nano punched holes is an affordable irrigation system for overhead irrigation. Rain Hose is flexible hose with pattern of drip holes. It is an alternative to the sprinkler irrigation but both are adopting the spraying technology. It's replacement for Sprinkler Irrigation System. It's easy to install and maintain. Rain hose is an emerging irrigation technique which is widely used for closed spaced crops onion, turmeric, groundnut, lawn, nurseries, carrots, grams, ginger, leafy vegetable etc.

The spraying pattern in the rain hose irrigation will be linear on either side up to the full stretch of the rain hose. Variation in the spray width and the

discharge of water from the nozzles of rain hose under different flow rates are studied for various available diameters of rain hose. There is no standard available on the optimum combination of length and diameter of rain hose.

A Catch-can method-based field test was conducted to estimate the influence of length and diameter of rain hose for four flow rates and the pressure values through the main pipe viz., were noted down.

### Product Features

- It requires low pressure and saves water.
- It sprays fine drops of water evenly, which helps to improve seeds germination rate and survival.
- After fertilizer application, Rain hose irrigation helps to gradually wet the top dressed fertilizer, and effectively allows the fertilizer to penetrate into the ground and reach plants roots, without leaching.
- It helps to maintain soil looseness
- It is the most suitable equipment for irrigation of sandy soil and Undulated field.
- Easy to install, saves labour costs.
- Resistant to UV radiation.

**Suitable crops:** For closely spaced crops, onion, vegetable crops, groundnut, leafy vegetables, cabbage, plantain, cocoa, dragon fruit, lawn, nurseries, carrots, etc

### Advantages

- It costs less than sprinklers and is simple to install and maintain.
- To maintain a consistent flow of water, these spray holes were created using laser punching technology.
- Irrigate using both a high-water pump pressure and gravity flow.
- In just ten minutes, irrigate a location.
- very portable
- There are several different diameters available.

### Components of rain hose system

- Main Pipe (Preferably bigger in size than the rain hose)
- Start Connector
- Rubber (To curb leakages)
- Endline plug (To stop and build pressure in the hose pipe)

### Length or size of a rain hose

- A pressure head of 30M is necessary for the system.
- The diameter size affects the rate of water outflow.
- With a radius of 3 meters for 32 mm pipes, 5 meters for 40 mm pipes, and 7 meters for 50 mm pipes, it irrigates in opposing directions.
- This water jet is one meter high.

It is significant to remember that the pipe's diameter spans from 32 to 50 mm. Based on crop water requirements and the area of irrigation, a producer selects the optimal size. For instance, a farmer watering a crop covering 1 acre will be able to do so easily with a 32 mm rain hose pipe. A 50 mm rain hose pipe will work better for another planter with 5 acres of land to irrigate. 800 meters of 32 mm rain hose pipes, 600 meters of 40 mm pipes, and 400 meters of 50 mm pipes are needed for one acre of crops.

### Different rain hose systems, their spraying width and length

Product name	Spraying width	Laying length
Mini Rain Hose – 250 / 20 mm / 400 Meter	4 Meter	15 Meter
Rain Hose – 350 / 32 mm / 100 Meter	6 Meter	25-40 Meter
Rain Hose – 350 / 40 mm / 100 Meter	6 Meter	30-50 Meter
Rain Hose – 350 / 50 mm / 100 Meter	6 Meter	75-100 Meter
Rain Hose – 350 / 63 mm / 100 Meter	6 Meter	100 Meter

### Components required in rain hose installation

End-caps. They close the end of the pipe to prevent further water flow

Starter off-takes. They connect the rain pipe to the PVC or HDPE main line that supplies water to the rain hose from a water pump or highly elevated water tank Pipe connectors. To connect one rain hose pipe to another Mini valves. To control water flow to the rain hose pipe hose to hose connection. Use the connector to attach one rain hose to another end cap. Insert the end cap at the end of the hose

### Advantages of using a Rain Hose

**Premium Quality:** Rain Hose Pipe is manufactured from polyethylene with added UV stabilizer and additives to protect the pipe for many years from sunlight and other climatic conditions. Nano punching technology so that there is a uniform flow of water.

**Economical:** Rain hose pipe reduces water & energy consumption Its spray Irrigation technology saves water more than 60% and irrigates more crops in less time, saving electricity & labour.

**Easy To Use:** Rain hose pipes are lightweight, portable, and flexible, easy to install and reallocate. These rain irrigation pipes are quick to set up and can be carried very quickly from one place to another.

**Fittings:** Each rain pipe unit comes with a 100mtr rain pipe, including a male adapter, joiner, end cap, and take-off valve.

**Weather Resistance:** Rain hose pipes are UV resistant and withstand all weather conditions and temperatures. Wide Coverage: With the help of appropriate water pressure rain hose pipe can spray up to 10 to 15 feet on both sides. To perform best, it requires 2kg/cm<sup>2</sup> water pressure.

### General rain hose maintenance tips

- Don't let water build up in the hose
- Be mindful of colder conditions
- Avoid direct sunlight
- Don't use the hose pipe nozzle as a handle
- Store your hose away properly after use

### Conclusion

In India, groundwater has become dominant source of Irrigation. On the other hand, there is large gap between the ultimate and utilized surface water potential. Rapid depletion of water table, low

irrigation efficiency, and frequent droughts indicate towards water crisis in near future if existing water use pattern is not rectified. Irrigation infrastructure needs to be further improved to harvest rainwater and increase storage capacity in order to utilize runoff water.

Micro irrigation has scope for improving irrigation efficiency up to 90 per cent. Further, micro

irrigation and optimum crop plan will play decisive role in conservation of water resources and food security of the nation. Virtual water trade should be balanced instead of orienting it towards export. Farmers should be made aware of the various government schemes to utilize their utmost potential which is lacking in some states.