

Micro-irrigation:

Way forward for precise use of irrigation water in agriculture

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Micro-irrigation not only saves water, but also saves money by lowering fertilizer use, labour costs and other input costs, as well as increasing farmers' income. When compared to traditional irrigation methods, this technology allows for more areas to be irrigated with the same amount of water. Furthermore, due to the simplicity of irrigation, water-scarce, cultivable wasteland and undulating land areas can be quickly brought under cultivation. Current programmes, such as the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) at the national level and various state-level water policy efforts, make it possible for marginal and small farmers to buy equipment to irrigate their fields. Micro irrigation's good outcomes have improved food security by increasing crop yield and productivity, and increasing irrigation area from the same source of water, resulting in increased nutritional security for the country.

Keywords: Bio-decomposer, Crop residue management, Recycling, Waste material

PRESENTLY India is dealing with two problems, viz. water constraints and population growth. Nearly 600 million people have been affected by the ongoing water crisis, which is projected to increase by 2050 and the country's population is expected to reach 1.6 billion. India's agriculture sector is the country's top water consumer. It accounts for around 90% of the country's yearly freshwater withdrawals of 761,000 billion litres. Water use per capita in the agricultural sector ranges from 4,913 to 5,800 kilolitres per year. Concerns about water scarcity have also been exacerbated by climate change. Climate change has a considerably more visible influence on Indian agriculture, where 85% of farmers are small and marginal, and 60% of agriculture is dependent on monsoon whims. As a result, the role of irrigation takes a centre stage. However, since the introduction of the 'Green Revolution' in the mid-1960s, continued irrigation through

traditional practices has begun to show its numerous negative effects on groundwater quality and height, water logging, soil salinity, soil health and crop productivity, partial factor productivity, and farm practice cost economics.

The Government of India is committed to making water security a top issue. It will prioritize completing long-delayed irrigation projects and launching the 'PMKSY' with the slogan 'Har Khet Ko Paani.' There is a need to thoroughly investigate all possibilities, including river connection where possible, to ensure efficient use of water resources and avoid future floods and droughts. We need to encourage water conservation and groundwater recharging by harvesting rainwater through 'Jal Sanchay' and 'Jal Sinchan.' Micro-irrigation will become more common to ensure that 'Per drop-more crop' is achieved.

Micro-irrigation

When the Parliament was rocked by the issue of farmer suicides, it recognized the importance and potential benefits of micro-irrigation as a way to double the farmer's income while also ensuring agricultural sustainability and environmental purity. Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) is a comprehensive flagship programme introduced by the Union government. Financial assistance of up to 55% for small and marginal farmers and 45% for other farmers is provided under this programme for the adoption of micro-irrigation systems. Since November 2015, the funding pattern between the Union and state governments has been 60:40 for all states except the North East and Himalayan states, where the funding pattern is 90:10.

Micro-irrigation can boost yields while lowering water, fertilizer and labour costs. The approach lowers

water loss by conveyance, run-off, deep percolation and evaporation by providing water directly to the root zone. Traditional irrigation approaches can not avoid these losses; however, micro-irrigation has paved the road for improved water use efficiency of 75–95% thanks to its water-saving approach. Fertigation, which combines water and fertilizer application through irrigation, is another resource-saving strategy made possible by micro-irrigation. Fertigation results in a balanced nutrient application, a 7–42% reduction in fertilizer requirements (saving the farmer money), greater nutrient uptake, nutrient usage efficiency and also environmental protection. It is quite apparent that in the present scenario, vertical expansion of agricultural lands is not possible. As a result, we must concentrate on degraded wastelands to boost yield and productivity. This can be made possible through micro-irrigation.

The schemes on micro-irrigation

The Government of India has been executing the Centrally Sponsored Scheme (CCS) on Micro-irrigation since January 2006.

In June 2010, the scheme was up-scaled to National Mission on Micro Irrigation (NMMI), which continued till the year 2013–14.

1st April 2014, NMMI was subsumed under National Mission on Sustainable Agriculture (NMSA) and implemented under “On-Farm Water Management” (OFWM).

1st July 2015, the scheme has been subsumed under PMKSY and implemented as the ‘Per Drop More Crop’ component of PMKSY.

Advantages of micro-irrigation

- Micro-irrigation ensures a 50–90% water use efficiency.
- In comparison to flood irrigation, water savings range from 30–50%, with an average



Drip irrigation in maize



Drip irrigation in wheat

- of 32.3%.
- There is a significant reduction in electricity use.
- The use of micro-irrigation saves money spent on fertilizers.
- Increase in average fruit and vegetable yield.
- It boosts the revenue of farmers in general.

Challenges to the adoption of micro-irrigation

- Inadequate water supply at the farm level.
- Inadequate attention to micro-irrigation technology on a national scale.
- It has a high installation and maintenance cost, as well as difficult procedures for redeeming government subsidies for micro-irrigation installation.

- Slower adoption of the Drip Irrigation Method (DMI).
- Subsidy reimbursement delays.
- Farmers frequently face difficulties in acquiring the financial aid they want. Energy is the most important input for an irrigation system, and for large irrigation systems, electricity is a viable supply that is still out of reach for most farmers.

According to data from the Ministry of Agriculture and Farmers Welfare (MoA&FW), the country's net irrigated area is 68.6 Million ha. Micro-irrigation covers 12.9 Million ha of agricultural area, with drip irrigation covering 6.11 Million ha and sprinkler irrigation covering 6.79 Million ha. This means that just 19% of the country's total irrigated acreage is under micro-irrigation



Drip irrigation system

Table 1. States with more than 30% of the area under micro-irrigation

State	Net irrigated area (thousand ha)	Drip irrigation	Sprinkler irrigation	Per cent of the area under micro-irrigation
Sikkim	16	6.35	5.26	73
Andhra Pradesh	2,716	1,388.13	519.17	70
Karnataka	3,104	752.82	1,148.70	61
Maharashtra	3,163	1,314.78	561.65	59
Mizoram	16	5.09	2.45	47
Tamil Nadu	2,385	735.81	311.06	44
Gujarat	4,233	852.02	747.75	38



Sub-surface drip in maize



Sub-surface drip in wheat

(2005–06 to 2020–21). However, some states are even having more than 30% area under micro-irrigation (Table 1)

Micro-irrigation with NABARD financial assistance

An initial budget of ₹5,000 crores (₹2,000 crores for 2018–19 and ₹3,000 crores for 2019–20) have been granted for a dedicated micro-irrigation Fund (MIF) developed with NABARD to encourage public and private investments in micro-irrigation. The fund's major goal was to make it easier for the states

to mobilize resources for extending micro-irrigation coverage. Subsidy assistance is available up to 5.00 ha to all category farmers in each village, regardless of their economic situation.

Way forward

In India, micro-irrigation needs to be adopted on a large scale, particularly in the Indo-Gangetic plains, where soil salinity is high. Drip irrigation is the most efficient method, using 85–90% of the water available. According to FICCI, significant electricity savings of

30.5% have been projected, and great fertilizer-use efficiency has been observed, resulting in an average consumption decrease of 28.5%. Another benefit is that optimal soil moisture conditions are maintained, which helps to boost overall production and profitability. Micro-irrigation devices have been found to assist increase the output of both fruit (42.3%) and vegetable (52.8%) crops in several studies.

SUMMARY

It is self-evident that micro-irrigation is critical to achieve long-term sustainability in Indian agriculture. However, there is still a long way to go, and additional demonstrations, training and awareness initiatives are needed to bring the Indian farming community up to speed on micro-irrigation procedures. Farmers are one of the most vulnerable groups in our society. We need to work with the community to demonstrate the technique's practical and achievable benefits. Precision farming will drive the next agricultural revolution, and micro-irrigation can help farmers to achieve their aim of making farming more sustainable, profitable and productive.

'Per drop more produce,' on the other hand, can only be reached by deploying innovative and effective irrigation systems, which can only be developed if a healthy business is in place. To enable the effective scaling up of irrigation technology, research and extension agencies must continue to support them.

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