

India's Micro Irrigation: A Study

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ABSTRACT

The problems of water scarcity and low agricultural productivity in India have been discussed with the support of micro irrigation, which uses sprinkler and drip irrigation systems. The paper provides an in-depth study of the implementation of micro irrigation in the nation, including its status, effects, and difficulties. The paper suggests measures such as increased financial support and incentives for farmers, specific instruction and extension services, and reduced implementation of government programs in order to promote the wide implementation of micro irrigation. Maximizing the potential advantages of micro irrigation in India also requires encouraging public-private partnerships for the transfer of technology and ensuring the availability of high-quality equipment. In comparison to the standard irrigation method, which has a water use efficiency of only 35–40%, micro irrigation has been shown to be effective way to save water and make water use more efficient. Many factors, such as characteristics of the soil, the crop, and the environment, system design, etc., affect the proper management of drip irrigation. An effective planning system that chooses the quantity and timing of drip irrigation can incorporate the effects of these variables. One of the best irrigation techniques is micro irrigation.

Keywords: Agriculture, Irrigation techniques, Micro-irrigation, Water management, Water saving techniques.

INTRODUCTION

In order to maintain agricultural productivity and provide food security for its constantly expanding population, India, with its enormous and broad agricultural landscape, must overcome a few obstacles. The effective management of limited supplies of water is one of the greatest challenges we face, which is made more difficult by the effects of climate change and unpredictable monsoons. Micro irrigation technologies have emerged as promising responses to these problems, optimizing water use and boosting agricultural output.

Micro irrigation, which consists of sprinkler and drip irrigation systems, is an alternative to conventional flood irrigation methods, which frequently result in significant water waste and decreased crop yields. Micro irrigation delivers water directly to the plant's root area in a controlled and specific manner, minimizing the loss of water through evaporation and rainfall while maximizing water utilization.

The use, impact, and associated difficulties of micro irrigation in India are thoroughly examined in this study. This study wants to clarify the potential of micro irrigation to revolutionize Indian agriculture by examining the experiences of farmers, experts, and policymakers as well as by utilizing quantitative data from government reports and secondary sources.

MICROIRRIGATION

Over time, micro irrigation has grown slowly. The coverage of this has increased by 9.6% annually since 2005, reaching 9.39 million hectares of land. However, in 2015, the total area that could have been watered with micro-irrigation was 69.5 million hectares. Although farmers are adopting micro-irrigation techniques more frequently, there is still a very low level of market adoption. Between 2005–2006 and 2018–19, there was an increase in public spending of more than 10 times. As a result, the number of people covered by Michigan rose to 11.41 M ha in 2018–2019, an increase from 2.24 M ha in 2005–2006. In 2018–19, sprinkler systems accounted for 53.1% of the total coverage (11.41 MHA), and drip systems covered the remaining 46.9% of the area. As of February 3, 2021, India has a much lower average penetration of micro irrigation i.e. 19% than many other nations.

Micro irrigation can be useful for regions with fragile soils, curves terrain, rolling topography, hills, and dry land. There are three different categories of soil types based on depth: a depth of shallow soil (less than twenty-five cm), short depth (between twenty-five and 45 centimeters), and deep soil (above 45 cm).

Drip irrigation is one of the most popular types of micro irrigation in India. Drip irrigation, which applies water directly to the plant's root zone, significantly reduces conveyance and application losses when compared to the conventional flood irrigation technique. The advantages of these technologies in water-scarce areas have been the subject of extensive research worldwide.

OBJECTIVES

The objectives of this study: -

- The purpose of the study is to assess how micro-irrigation affects water efficiency and conservation.
- The study will examine how micro-irrigation can improve soil health and biodiversity while reducing water use and other environmental harms.
- The study's goal is to look into potential growth & improvement areas for micro-irrigation in India as well as its prospects.
- The goal of the study is to examine the rates of adoption of drip and sprinkler systems, among other micro-irrigation methods, in various Indian states and regions. In addition to examining any regional variations in adoption rates, it aims to identify the factors influencing farmers' decisions to adopt micro-irrigation.
- The study aims to add to the quantity of knowledge already available on India's micro-irrigation. Policymakers, researchers, and stakeholders in the agriculture industry will benefit from its insightful information.

METHODOLOGY

- Information has been gathered from several official websites, including those of various governments.
- A discussion of the study's data analysis methods.

Challenges for Indian agriculture:

Indian agriculture has two main challenges:

- India's agriculture heavily depends on monsoon rains, which makes water availability unpredictable. Water shortages are a problem in many areas, and they are made worse by inefficient water use.
- Unpredictable weather patterns, such as unexpected rains, droughts, and extremely high temperatures, are a result of climate change. These climate-related uncertainties make it difficult for farmers to plan and manage their crops.
- Large losses of agricultural products are caused by inadequate post-harvest infrastructure and storage facilities. Food waste is a result of this, which has an impact on farmers' income.

Contribution of agriculture to the withdrawal of fresh water:

One of the main sectors that significantly helps in the removal of fresh water from various sources is agriculture. In order to use water for various human activities, including agricultural irrigation, freshwater withdrawal refers to the quantity of water that is taken from natural water sources like rivers, lakes, and groundwater sources. Based on climatic factors, agricultural practices, and water availability, the contribution of agriculture to freshwater withdrawal varies from region to region. Agriculture's most water-intensive practice is irrigation. It involves supplying crops with water when the natural rainfall is insufficient to meet their needs. Irrigation is a significant source of freshwater withdrawal in many areas, especially in areas that are dry and semi-dry. According to estimates from the World Bank from 2010, groundwater supplied 80 percent of rural and urban water supply and 60 percent of irrigated agriculture.

Dependency of population on agriculture:

In India two-third of the population rely on agriculture & agricultural production. According to the survey, forty-seven per-cent of the population rely on agriculture for a living, and sixty-five percent of the population lives in rural areas as of the year 2021 information. Fast urbanization has caused a migration from rural to urban areas, which decreased some regions' dependency on agriculture. Despite being a major population's main source of income, this industry suffered under British rule.

Government schemes to encourage Micro irrigation:

The Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) was introduced on 01-07-2015 with the intention of improving physical access to water on farms, enhancing the area that can be irrigated consistently, increasing the amount of cultivable land, increasing the effectiveness of on-farm water use, introducing sustainable water conservation practices, etc. by the Central Government of India. It includes two components. Those are: -

- Per Drop More Crop (PDMC): This aspect aims to increase water use effectiveness using drip and sprinkler irrigation systems as micro irrigation methods. Farmers receive financial support to install these systems.

- Har Khet Ko Pani (HKKP): This part seeks to provide irrigation facilities to all arable land, with a focus on micro-irrigation techniques in water-stressed areas.

Rashtriya Krishi Vikas Yojana (RKVY) was launched in 2007 as a general program to guarantee the complete growth of the agricultural sector and related industries. This scheme encourages the use of cutting-edge technologies for farming, such as micro irrigation. Farmers are given monetary rewards to use water-saving irrigation techniques.

Current status of micro-irrigation

From 77 lakh hectares in 2015 to 1.29 crore hectares in 2021, the country's micro-irrigation area has grown. It has been noted that in the sample area of Satara tehsil, the maximum sugarcane production per acre through CIS was 63.2 tonnes and 68 tonnes through DIS. Dripper and sprinkler irrigation are examples of micro irrigation techniques that have been proven to be efficient for boosting agricultural productivity, conserving water, and managing water resources sustainably. The Indian government has been actively promoting micro irrigation through programs like the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) - Per Drop More Crop (PDMC) and Har Khet Ko Pani (HKKP) components. Farmers are given incentives in the form of subsidies, and other forms of assistance to promote the installation of drip and sprinkler systems.

SUGGESTIONS

Through various programs, the government consistently seeks to encourage micro-irrigation technology so that farmers in India can use it. For tackling the shortage of water, enhancing agricultural productivity, and promoting sustainable water management practices in India, micro irrigation has proven to be an invaluable tool. Some suggestions are as follows:

- The government consistently aims to promote micro-irrigation technology through a variety of programs so that farmers in India can utilize it.
- The aim of the government was to use this technology over the largest possible irrigation area.
- To facilitate group purchases of micro-irrigation equipment, reduce costs, and improve negotiating power, promote the formation of FPOs or co-operatives.
- Farmers need to be motivated to allocate their water use according to the types of crops they are growing, where they are in the growth cycle, and the weather.

By putting these recommendations into practice, India may speed up the implementation of micro irrigation, resulting in more responsible water use, increased agricultural productivity, and better living conditions for farmers all over the nation. Therefore, the government must encourage this modern technology to the farmers by publicizing the scheme through various modes like advertisement & newspapers on social media. The government should educate the farmers free of cost about the different schemes.

CONCLUSION

In conclusion, micro irrigation has an opportunity to completely transform India's agricultural landscape by clearing the way for efficient and sustainable water use, better farmer livelihoods, and long-term agricultural durability in the face of water scarcity & issues related to climate change. Micro-irrigation techniques, like drip irrigation and sprinkler systems, have made significant advancements in terms of adoption across numerous states and crops over the years. Micro irrigation will continue to play a significant role in agricultural development of India & water resource management in the years to come with focused efforts and ongoing support. Some benefits of using this process are:

- The process of micro-irrigation saves an average of 32.5 percent water compared to irrigation by flood.
- The usage of micro irrigation reduces the demand for fertilizers.
- From the use of this process the productivity of fruits and vegetables are also increased.
- Using the same amount of water, expanding the area that is being micro irrigated.
- Micro-irrigation technology not only prevents water accumulation and helps with health management, it also saves water.

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