वर्ष 1 अंक 4 नवंबर 2025 VOLUME: 1 ISSUE: 4 NOVEMBER 2025 ONLINE ISSN 3107-8559 कृषि विज्ञान की मासिक पत्रिका किसानगज़ट

(A No. 134) Water Use Efficiency and Management in Indian Agriculture

Kavita Devi

Swami Keshwanand Rajasthan Agricultural University, Bikaner (SKRAU)

India faces significant **water stress**, with per capita water availability declining. The agricultural sector is the largest consumer, utilizing approximately **80%** of the nation's developed fresh water resources. The overall efficiency of traditional irrigation systems (like canal and flood irrigation) is low, often ranging from **35% to 50%**. Improving water use efficiency is critical for sustaining food security and farm incomes.

Key Practices for Enhancing Water Use Efficiency (WUE)

The focus for improving WUE is on moving from traditional, high-wastage methods to **precision and conservation practices**.

1. Micro-Irrigation Systems

These technologies deliver water directly to the plant's root zone, drastically minimizing wastage.

- **Drip Irrigation:** Water is applied drop-by-drop. It can increase water use efficiency to **90-95%** and save up to **40-60%** of water compared to flood irrigation. It is highly effective for orchard crops, plantation crops, and widely-spaced row crops.
- **Sprinkler Irrigation:** Water is sprayed over the crops, simulating rainfall. It is best suited for closely spaced crops and sandy/loamy soils.

2. Precision Agriculture

This involves using technology to apply the right amount of water at the right time.

- **Smart Irrigation:** Utilizing **IoT** (Internet of Things) devices, **AI models**, and **soil moisture sensors** to monitor real-time soil and weather conditions, thereby optimizing irrigation schedules and preventing overwatering.
- **Fertigation:** Applying fertilizers along with irrigation water through the micro-irrigation system, which increases **Fertilizer Use Efficiency** by delivering nutrients directly to the root zone.

3. Agronomic and Soil Management Practices

- **Mulching:** Covering the soil surface with organic materials (straw, compost) or plastic film to reduce water evaporation and control weed growth, which also conserves water.
- **Rainwater Harvesting:** Collecting and storing rainwater for later use, or promoting maximum absorption into the earth to recharge groundwater.
- **Conservation Tillage:** Minimizing soil disturbance to enhance the soil's water retention capacity and infiltration rate.

- **Crop Alignment:** Selecting and promoting crops that are less water-intensive or drought-resistant, aligning crop choices with regional water availability.

Government Initiatives: Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

The PMKSY, launched in 2015, is the flagship scheme aimed at providing end-to-end solutions for irrigation. Its core objective is **"Har Khet Ko Pani" (water to every field)** and **"Per Drop More Crop"** (enhancing water use efficiency).

The scheme operates through the convergence of four major components, implemented by different Ministries:

Component	Implementing Ministry/Department	Primary Focus
1. Accelerated Irrigation Benefit Programme (AIBP)	Ministry of Jal Shakti	Fast-track completion of ongoing Major and Medium irrigation projects.
2. Har Khet Ko Pani (HKKP)	Ministry of Jal Shakti	Creating new water sources, including surface minor irrigation (SMI) and the Repair, Renovation, and Restoration (RRR) of water bodies.
3. Per Drop More Crop (PDMC)	Dept. of Agriculture & Farmers Welfare	**Promoting Micro-Irrigation** (drip and sprinkler) at the farm level through substantial **subsidies** (up to 55% for small/marginal farmers).
4. Watershed Development Component (WDC)	Dept. of Land Resources	Integrated development of rainfed areas, focusing on soil and water conservation, check dams, and groundwater regeneration.

The **Per Drop More Crop (PDMC)** component, in particular, drives the adoption of micro-irrigation by providing financial assistance and technical support to farmers, with an overall goal of making Indian agriculture water-smart and sustainable.