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Q7

What is water-use efficiency? Describe the role of micro-irrigation in increasing the water-use efficiency.

UPSC Civil Services Mains 2016 · GS III · 12 marks · Crops, Irrigation and Marketing

Major crops - cropping patterns in various parts of the country; different types of irrigation and irrigation systems; storage, transport and marketing of agricultural produce and issues and related constraints; e-technology in the aid of farmers.

Core demand of the question

- Define water-use efficiency in agriculture
- Describe how micro-irrigation (drip and sprinkler) raises that efficiency
- **Name supporting schemes:** Pradhan Mantri Krishi Sinchayee Yojana and **Per Drop More Crop**

Revision summary

Water-use efficiency is crop output or income per unit of water applied or consumed.

Surface irrigation loses much water to evaporation, seepage and percolation.

Drip and sprinkler put water in the root zone and allow **fertigation**, raising yield per drop and often cutting pump hours.

Limits are capital cost, clogging and the risk of expanding thirsty crops.

PMKSY (2015) and **Per Drop More Crop** subsidise micro-irrigation as the national programme.

Introduction

Water-use efficiency in farming is the useful crop output (or income) obtained per unit of water applied or consumed. Indian irrigation is still dominated by **flood and furrow** methods that lose water to evaporation, seepage and deep percolation. **Micro-irrigation** - drip and sprinkler - puts water (and often fertiliser) in the root zone. That is the practical route to **more crop per drop**.

Body

What water-use efficiency means

- Agronomic efficiency is **yield per cubic metre** of irrigation water; economic efficiency is **rupees of produce per unit of water**.
- Basin efficiency also counts **return flows** reused downstream; on-farm efficiency is what the farmer controls at the plot.
- India's challenge is **low on-farm efficiency** in rice-wheat and sugarcane belts, falling groundwater, and climate-unreliable monsoon.
- Efficiency is not only hardware. It needs **scheduling, crop choice, lining of canals, and pricing or community rules** that discourage waste.

Role of micro-irrigation

- **Drip irrigation** delivers water in drops to the root zone through emitters. It cuts evaporation and wetting of unproductive soil, and it suits horticulture, cotton, sugarcane and vegetables.
- **Sprinklers** spray water like rain. They suit cereals, pulses and fodder on undulating land where drip laterals are costly.
- Both methods raise **application efficiency** well above typical surface irrigation, so the same reservoir or tube-well serves more area or the same area with less pumping.
- **Fertigation** with drip places nutrients with water, raising fertiliser-use efficiency and cutting leaching into groundwater.
- Less waterlogging and soil crusting improve **root health and quality** of produce, which matters for export horticulture.
- Energy use per kilogram can fall because pumps run fewer hours, which also eases the **power-subsidy** burden of States.
- **Limits:** high **capital cost**, clogging in saline or dirty water, need for filters and farmer training, and weak results if farmers still grow water-guzzling crops on a larger command.

Policy support

- **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY, 2015)** unifies irrigation efforts with the motto Har Khet Ko Pani and **Per Drop More Crop**.
- The **Per Drop More Crop** component subsidises micro-irrigation systems, often with State top-up, and links them to water-user groups.
- **National Mission for Sustainable Agriculture** and earlier **National Mission on Micro Irrigation** laid the subsidy path that **PMKSY** absorbed.
- Efficiency also needs **participatory irrigation management**, canal lining, and crop diversification away from paddy in severely over-exploited blocks.

Flow diagram

Irrigation water -> Flood furrow losses
 Irrigation water -> Micro irrigation drip sprinkler
 Micro irrigation drip sprinkler -> Higher water-use efficiency
 Micro irrigation drip sprinkler -> Fertigation less pumping
 PMKSY Per Drop More Crop -> Micro irrigation drip sprinkler
 Higher water-use efficiency -> More crop per drop

Conclusion

Water-use efficiency is more yield and income from each unit of water. Drip and sprinkler raise that efficiency by cutting non-beneficial losses and enabling **fertigation**. **PMKSY's Per Drop More Crop** is the Union vehicle; it works when hardware comes with training, maintenance and sensible crop choice.

Facts & figures

PMKSY

Pradhan Mantri Krishi Sinchayee Yojana (2015): umbrella irrigation mission, including Har Khet Ko Pani and Per Drop More Crop.

Per Drop More Crop

PMKSY component that subsidises drip and sprinkler systems to raise on-farm water-use efficiency.

Drip irrigation

Emitters deliver water to the root zone; well suited to horticulture, cotton, sugarcane and vegetables.

Sprinkler irrigation

Overhead spray resembling rain; useful for field crops on uneven land.

Fertigation

Applying fertiliser through the micro-irrigation line so nutrients reach the root zone with less leaching.

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