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Q4

How and to what extent would micro-irrigation help in solving India's water crisis ?

UPSC Civil Services Mains 2021 · GS III · 10 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

- How and to what extent would micro-irrigation help in solving India's water crisis?
- Treat drip and sprinkler as a large help, not a full solution
- Keep the explanation within a 10-mark length

Revision summary

Drip and sprinkler cut evaporation and can save roughly a third to half of applied irrigation water, more on horticulture.

PMKSY Per Drop More Crop is the Union vehicle for subsidy and area expansion.

Gains die if free power and paddy MSP use the saved water to grow more of the same crop.

Small-farmer cost, clogging, and service quality still limit spread.

Recharge, diversification, and urban water reform must accompany micro-irrigation.

Introduction

India's water crisis is a crisis of over-extraction, **flood irrigation**, and thirsty cropping in dry districts. Micro-irrigation - drip and sprinkler - puts water at the root or as a fine spray. It can save a large share of farm water. It cannot, by itself, refill aquifers if policy still rewards paddy on a desert tube-well.

Body

How micro-irrigation helps

- **Drip** feeds the root zone and cuts evaporation and conveyance loss that flood channels waste.
- **Sprinkler** suits cereals, pulses, and fodder on undulating land where drip laterals are costly.
- Field studies and **PMKSY** literature commonly show **water saving of about 30 to 50 per cent**, and higher on horticulture, with better nutrient use when fertigation is added.
- Less pumping means **lower diesel and power demand**, which eases the farm-power-groundwater loop.
- Yield and quality gains in fruits, vegetables, sugarcane, and cotton raise income per drop, which is the economic case for **Per Drop More Crop** under **PMKSY**.

To what extent it solves the crisis

- Agriculture takes the bulk of freshwater. A wide shift from flood to micro systems would delay aquifer collapse in **Punjab, Haryana, western UP, Rajasthan, and Tamil Nadu** hard-rock and alluvial belts.
- Extent is limited while **free power, MSP-backed paddy-wheat, and flood canal warabandi** still make wasting water rational.
- Micro-irrigation does not create new rain. **Watershed works, aquifer recharge, crop diversification, and urban leak control** must sit beside it.
- High capital cost, clogging, and weak after-sales service keep adoption uneven among small holders unless subsidy, clustering, and solar pumps are well designed.
- If saved water is used to expand area under the same thirsty crop, the basin gains nothing. That is the **rebound** risk.

Policy that stretches the gain

- Pair **PDMC** subsidy with **crop shift**, metering or at least feeder separation, and **Atal Bhujal** style community groundwater rules.
- Use micro-irrigation first on **horticulture, sugarcane, and cotton**, then on cereals where sprinkler is proven.

Flow diagram

Drip and sprinkler -> Less evaporation and conveyance loss
Less evaporation and conveyance loss -> Yield and fertigation
Less evaporation and conveyance loss -> Lower pumping
Rebound thirsty crops -> No basin gain
Drip and sprinkler -> Partial solution
Crop shift recharge pricing -> Larger water-crisis relief

Conclusion

Micro-irrigation is one of the few farm tools that can cut water use and raise yield together. It will ease India's crisis only as far as cropping, power, and groundwater rules stop putting the saved litre back into paddy.

Facts & figures

PMKSY

Pradhan Mantri Krishi Sinchayee Yojana: umbrella for irrigation, including Per Drop More Crop micro-irrigation.

PDMC

Per Drop More Crop: subsidy and cluster support for drip and sprinkler.

Atal Bhujal Yojana

World Bank-aided groundwater management in notified water-stressed blocks; a complement to hardware.

Flood irrigation

Dominant Indian method with high conveyance and evaporation loss, especially in canal commands.

Rebound effect

Using water saved by drip to expand thirsty cropped area, which can cancel basin-level savings.

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