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Water Management in Agriculture: Securing Every Drop for the Future

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Water is to farming what oxygen is to life. Yet in many parts of the world, especially in India, agriculture is locked in a paradox it's the largest consumer of freshwater (80–85%), but also the most vulnerable to drought, inefficient use, and climate variability. As groundwater levels decline and rainfall patterns become erratic, efficient water management is no longer optional it's critical. This article explores smart irrigation practices, traditional water wisdom, emerging technologies, and inspiring farmer stories that show how water-smart agriculture is both possible and profitable.

The Water Crisis in Agriculture

Factor	Current Status in India
Groundwater depletion	70% of irrigation from groundwater; rapid decline
Irrigation efficiency	< 40% in traditional flood systems
Rain-fed agriculture	52% of cropped area still rain-dependent
Climate change impact	Increasing frequency of droughts and unseasonal rains

A World Bank report warns that India will have only 50% of its water demand met by 2030 if current usage patterns continue.

Scientific Principles of Efficient Water Use

Water-use efficiency (WUE) is the ratio of crop yield to the amount of water used. The goal is to maximize WUE without sacrificing productivity.

Practice	Scientific Benefit
Drip irrigation	Delivers water directly to roots; reduces evaporation losses by 60–70%
Mulching	Conserves soil moisture; reduces evaporation
Laser leveling	Ensures uniform water distribution
Deficit irrigation	Triggers stress tolerance without major yield loss
Soil moisture sensors	Real-time monitoring avoids over- or under-irrigation

Research from ICAR-CRIDA shows that precision irrigation techniques can save up to 50% water and increase yields by 25–30% in vegetables and pulses.

Traditional Wisdom Meets Modern Innovation

India's water culture has centuries-old roots in traditional systems like:

- Phad system (Maharashtra)
- Zabo (Nagaland)
- Kunds and Johads (Rajasthan)

Today, farmers are blending these ancient practices with modern technologies like remote sensing, IoT, and GIS mapping.

Water-Saving Technologies and Their Impact

Technology	Description	Cost (Approx.)	ROI / Payback
Drip irrigation	Tubes deliver water at root level	₹40,000/acre	1.5–2 years
Sprinkler system	Water sprayed in fine droplets	₹30,000/acre	2–3 years
Soil moisture sensors	Measures real-time water needs	₹3,000– ₹5,000/unit	1 season (vegetables)
Solar pumps	Renewable energy for irrigation	₹1–2 lakh/unit	3–4 years

Subsidies under schemes like PM-KUSUM and the Micro Irrigation Fund (NABARD) make these technologies more accessible.

Real-Life Stories from the Fields

Farmer Sita Ram – Rajasthan Sita Ram installed drip irrigation with government support. His water use dropped by 60%. "My yield didn't fall," he says, "but my electricity bill did."

Rekha Devi – Bihar Using a soil moisture sensor, Rekha adjusted watering schedules. "Earlier I guessed; now I know," she says.

Women's Collective – Telangana Women farmers revived a check dam and used contour bunding. Crop cycles increased from one to two per year.

Policy and Institutional Support

Scheme	Focus	Beneficiaries
PMKSY (Per Drop More Crop)	Promotes drip/sprinkler systems	82 lakh hectares
PM-KUSUM	Solar water pumps and grid support	Small and marginal farmers
Watershed Mission	Catchment-based conservation	80+ districts
Jal Shakti Abhiyan	Rainwater harvesting and aquifer recharge	Nationwide

Challenges and the Path Forward

Challenge	Strategy
High upfront costs	Expand subsidies and cooperative ownership models
Fragmented land holdings	Promote group/cluster irrigation setups
Low awareness	Farmer field schools, SMS-based advisory
Over-extraction	Introduce water budgeting and regulation frameworks

Conclusion

Water-smart agriculture is not only about technology it's about mindset, tradition, and participation. With the right tools, practices, and policies, we can make every drop count. "In the future, water will be wealth. Let's teach every farmer to be rich in wisdom and water."

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