

AGRICULTURE FORUM FOR TECHNICAL EDUCATION OF FARMING SOCIETY

Kota, Rajasthan



Water Wise: Modern Irrigation & Conservation

Authors

**Anant Sharma¹, Kanika², Ajay Verma³,
Priyanshi¹ and Swapnil Srivastava⁴**

Ph.D. Research Scholar, ¹Department of Agronomy,

²Department of Soil Science and Agricultural Chemistry,

³Department of Extension Education, Acharya Narendra

Deva University of Agriculture and Technology,
Kumarganj, Ayodhya- 224229 (Uttar Pradesh), India

⁴Department of Agricultural Biotechnology, Sardar
Vallabhbhai Patel University of Agriculture and
Technology, Meerut-250110 (Uttar Pradesh), India

INTRODUCTION

Why Water Matters Now

Water is the foundation of life — for people, ecosystems, and especially agriculture. Yet the world is facing a growing freshwater crisis:

- ~70% of global freshwater withdrawals go to agriculture, far more than any other sector.
- Up to 40% of that water is wasted due to inefficient irrigation practices.
- Nearly 4 billion people live in water-scarce regions for at least one month each year.

This means farms are using most of our limited water, but much of it never reaches the crops. A shift to smarter irrigation and conservation is essential for food security, climate resilience, and long-term sustainability.

Modern Irrigation Techniques — Getting More from Every Drop

1. Drip Irrigation

- Water is delivered **directly to the plant's roots**, reducing evaporation.
- Efficiency rates can reach **80–90%**, compared to 50% or less for traditional systems.
- Supports **fertigation**, meaning nutrients are applied with water — boosting crop health while reducing waste.
- Studies show drip irrigation can cut overall water use by **20–60%** compared with flood/furrow systems.

Best for: orchards, vineyards, vegetable beds, and high-value crops.

2. Sprinkler Irrigation

- Sprinklers mimic rainfall to cover entire fields.
- Modern pressurized sprinkler systems like **center pivots** ensure even water distribution.
- A good option for **large fields** and areas where terrain is uneven.

💡 Compared to flood irrigation, proper sprinklers significantly reduce runoff and surface evaporation.

3. Subsurface Irrigation

- Delivers water below the soil surface right to the root zone.
- This method **virtually eliminates surface evaporation** and increases efficiency.
- Particularly useful in **arid climates** and high-value crop production.

4. Smart/Sensor-Driven Irrigation

- Soil moisture sensors, weather stations, and automated valves work together.
- Water is delivered only when plants need it, not on a schedule.
- The **global smart irrigation market** was valued at ~\$1.8B in 2024 and is expected to reach ~\$3B by 2029 as adoption grows.

Table: Modern Irrigation Techniques at a Glance

Irrigation Method	Water Efficiency	Ideal Crops / Use Case	Key Benefit
Drip Irrigation	80–90%	Orchards, vegetables, vineyards	Direct water to roots, reduces evaporation & allows fertigation
Sprinkler Irrigation	65–75%	Cereals, row crops, uneven terrain	Simulates rainfall and covers large areas uniformly
Subsurface Irrigation	85–95%	High-value crops in arid regions	Water delivered below the soil surface, with minimal evaporation
Smart/Sensor-Based	75–95%	All crops (combined with	Optimises water based on soil

		drip/sprinkle r)	moisture & weather data
Rainwater Harvesting	N/A	Supplemental irrigation for all crops	Reduces reliance on groundwater and surface water

Top Conservation Strategies — Use Less, Grow More

1. Rainwater Harvesting

- Captures runoff from roofs and fields into tanks or ponds.
- Water can be stored and used during dry spells, reducing pressure on groundwater and rivers.

2. Mulching

- Organic materials (straw, leaves, wood chips) or plastic films cover soil.
- Keeps soil cool, reduces evaporation, and stops weed growth — which steals water from crops.

3. Crop Selection & Rotation

- Drought-tolerant crops like sorghum or millet use less water than thirsty staples like rice.
- Rotating crops improves soil structure and increases moisture retention.
- Example: rice may require **2,500–3,000 m³ of water per ton produced**, while soy needs under **500 m³ per ton**.

4. Soil and Water Management

- Practices like **contour farming** and **cover crops** reduce surface runoff.
- These help rainwater soak into the soil and recharge aquifers naturally.

5. Integrated Water Resource Management (IWRM)

- Involves planning at the **watershed level** so farms, towns, and industries share water fairly.

- Protects aquatic habitats and ensures long-term availability for all users.

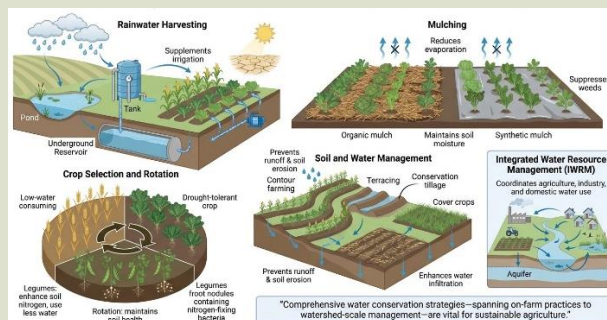


Figure: Water Conservation Strategies for Sustainable Agriculture

The Numbers Don't Lie Global Snapshot

- Agriculture accounts for about **70–72% of total freshwater use** worldwide.
- Up to **40% is lost** due to outdated irrigation — that's water that never reaches crops.
- **4 billion people** live with water scarcity challenges.

U.S. Reality Check

- Irrigation makes up nearly **47% of U.S. freshwater withdrawals** for agriculture.
- Irrigated farmland is less than **17% of harvested land** but delivers **>50% of crop value** — showing how powerful water efficiency is.

Farm Level Savings

- **Drip irrigation** can cut water usage by up to **60%** vs older methods.
- Sensor-based systems lower water use even further by applying water only when needed.

Real World Success Stories

(a) India's Micro-Irrigation Drive

Regions like Andhra Pradesh have expanded micro-irrigation to **125,000+ hectares**, helping **100,000+ farmers save water** and improve yields.

(b) Israel's High-Tech Farming

By combining sensors with drip irrigation and data analytics, Israeli agriculture thrives in desert conditions — a model for water-scarce regions.

(c) Africa's Rainwater Harvesting

Small tanks and ponds have enabled communities to grow food even during dry seasons, thereby augmenting food security and local economies.

Benefits of Being Water Wise

- **Save Water** — Less waste means more water for crops and communities.
- **Boost Yields** — Plants with consistent moisture grow stronger.
- **Lower Costs** — Reduced pumping saves energy and money.
- **Protect Soil** — Controlled irrigation prevents salt buildup and erosion.
- **Adapt to Climate Change** — Drought-proof farms with smarter water use.

What's Next? The Future of Water-Wise Farming

(a) AI & Machine Learning

Predictive systems that adjust irrigation based on weather forecasts and plant needs.

(b) IoT Connections

Farmers can monitor moisture levels and water systems remotely from smartphones or computers.

(c) Recycled Water for Irrigation

Treated wastewater is being safely reused for irrigation — easing demand on freshwater supplies.

(d) Climate-Resilient Crops

Breeding plants that need less water and tolerate heat will change the farming game.

Water is finite. Farms are major users — but they also hold the key to massive savings. Modern irrigation and water conservation protect crops, communities, and our planet's future.

Be Water Wise. Conserve water. Grow smarter. Sustain life.