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Water-Saving Techniques in Horticultural Crops: A Step Towards Sustainable Farming

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INTRODUCTION

Water is one of the most critical resources in agriculture, especially in horticulture, where fruit and vegetable crops are often sensitive to both drought and over-irrigation. With increasing pressure on freshwater due to population growth, urbanization and climate change, efficient water management has become essential for sustainable horticultural production. Farmers need to adopt water-saving techniques not only to conserve water but also to ensure better crop health, productivity and profitability.

This article highlights the importance of water-saving practices, discusses various modern and traditional techniques and outlines their benefits for horticultural crops.

Why Water Conservation is Crucial in Horticulture?

Horticultural crops such as fruits, vegetables, flowers and spices are **high-value but water-sensitive**. Excess water can lead to root rot and nutrient leaching, while water scarcity can cause poor fruit set, reduced yields and lower quality.

Key Reasons for Water-Saving in Horticulture:

- **Limited water availability** and over-extraction of groundwater
- **Uneven rainfall** and increased frequency of droughts
- High **evaporation losses** in hot and arid regions
- Need to **reduce production costs** and improve water-use efficiency
- To support **sustainable and climate-resilient agriculture**

Major Water-Saving Techniques in Horticultural Crops

1. Drip Irrigation

Drip irrigation is the most effective method for water-saving in horticulture. It involves delivering water directly to the root zone of plants through a network of pipes, emitters and valves.

Benefits:

- Saves **30–60% water** compared to conventional flood irrigation
- Reduces **weed growth** and evaporation losses
- Improves **fertilizer efficiency** when combined with fertigation
- Enhances **yield and quality** in crops like tomato, pomegranate, grapes and banana

Suitable Crops:

All fruit trees, vegetables (tomato, brinjal, capsicum), flowers, spices and plantation crops.

2. Mulching

Mulching involves covering the soil around plants with **organic** (straw, dry leaves, crop residues) or **inorganic** (plastic sheets) materials to retain moisture.

Benefits:

- Reduces soil evaporation
- Maintains soil temperature
- Suppresses weeds
- Improves soil structure and fertility

Suitable Crops:

Papaya, guava, watermelon, capsicum, strawberry and vegetables grown in raised beds.

3. Rainwater Harvesting

Rainwater harvesting involves collecting and storing rainwater for irrigation use during dry periods. This can be done through:

- Farm ponds
- Check dams
- Rooftop tanks
- Recharge pits

Benefits:

- Reduces dependence on borewells and canals
- Improves groundwater recharge
- Useful for life-saving irrigation during droughts

Application:

Widely suitable for both rainfed and irrigated orchards, especially in semi-arid regions.

4. Fertigation

Fertigation is the application of fertilizers through irrigation systems, particularly drip irrigation.

Benefits:

- Saves **both water and nutrients**
- Provides **timely and targeted nutrient delivery**
- Reduces **leaching and runoff**
- Enhances **nutrient uptake and crop yield**

Suitable Crops:

Tomato, capsicum, chili, cucumber, banana, grape, citrus and other fruit crops.

5. Use of Drought-Tolerant Varieties

Developing and promoting crop varieties that require **less water** or are **drought-resistant** is another long-term solution.

Examples (Kumar et. al., 2023):

- **Tomato:** Arka Vikas (Sel 22)
- **Citrus and Mango:** Some rootstocks offer drought resistance
- **Chilli**: Arka Lohit
- **Dolichos bean**: Arka Jay, Arka Vijay
- **French bean**: Arka Komal

These varieties can withstand water stress and maintain production even under low irrigation.

6. Scheduling Irrigation Based on Crop Needs

Many farmers irrigate crops based on fixed schedules rather than actual plant needs. Scientific irrigation scheduling involves:

- Monitoring soil moisture levels
- Considering crop growth stage
- Using evapotranspiration (ET) data

Tools like tensiometers, moisture sensors and mobile apps can help optimize water use.

7. Raised Bed and Furrow Planting

For vegetable crops, raised bed planting helps:

- Improve drainage
- Minimize water stagnation
- Focus water delivery to root zones
- Reduce water loss in wide areas

Suitable for onion, garlic, leafy greens and cucumber.

8. Canopy Management and Pruning

In fruit orchards, regular pruning and proper canopy management reduce transpiration and water loss by:

- Improving light penetration
- Decreasing leaf area under stress
- Enhancing air circulation

This is especially effective in mango, citrus, guava and pomegranate.

9. Crop Rotation and Intercropping

Crop combinations that make better use of available water can lead to significant water savings. For example:

- Intercropping leguminous vegetables with fruit crops can improve soil moisture retention and nutrient cycling.

Government Support for Water-Saving in Horticulture

To encourage water-efficient irrigation and conservation, the Government of India offers support through:

PMKSY (Pradhan Mantri Krishi Sinchayee Yojana)

- Water harvesting structures such as check dams, nala bund, farm ponds, tanks
- Creation of new water sources through Minor Irrigation (both surface and ground water)
- Extension activities for promotion of scientific moisture conservation

MIDH (Mission for Integrated Development of Horticulture)

- Financial support for micro-irrigation and water-saving structures in horticulture

Soil Health Card and Custom Hiring Centres

- Encourage balanced irrigation and nutrient practices

Role of Farmers and Extension Services

Water-saving practices must be customized according to:

- Crop type and variety
- Soil characteristics
- Climate and rainfall patterns
- Availability of infrastructure

Agricultural universities, Krishi Vigyan Kendras (KVKs) and NGOs must educate and demonstrate these techniques at the **village level** through **on-farm demonstrations and training programs**.

CONCLUSION

Water is a limited and precious resource that must be managed wisely in horticulture. By adopting modern water-saving techniques such as drip irrigation, mulching, fertigation and rainwater harvesting, farmers can not only conserve water but also increase yields, reduce input costs and improve crop quality. In a changing climate scenario, sustainable water use in horticulture is not just a best practice — it's a necessity.

"More crop per drop is the mantra for the future of horticulture

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