

## Dryland Horticulture: Enhancing Productivity in Arid Regions

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### Introduction

Dryland horticulture is a method of growing food in which crops may survive without water for at least six months or more. This means that farmers can grow crops even when there is little rainwater to irrigate their land. Dryland horticulture can help reduce risks and increase productivity and profitability. Dry land horticulture not only increases farmers' income, but it also delivers consistent returns and livelihood security to rural communities. Dry land farming in India is seeking new opportunities because traditional crops are insufficient to meet growing demands. Dry areas can produce more food by selecting the correct crop and using the most recent enhanced varieties and production technology. There is a lot of room for expanding horticultural crops in dry land areas, and it has a huge potential to change the country's horticulture landscape.

Arid climate (Dry land) is a climate where a lack of moisture limits plant development, but does not always prevent it. Water is an ever-present constraint in this environment.

The monthly variations in precipitation and potential evapo-transpiration in the months with less rainfall than usual are added up to determine the amount of water deficit. A sparsely forested area with 0-250 mm of annual precipitation falls within these area. Rains are inconsistent and short-lived, causing significant losses rather than charging the soil profile. In arid zones and dry climates, rainfall is minimal and lasts for 2-4½ months, followed by dry months. Rainfall is also erratic, falling in a few heavy storms of short duration, causing severe losses rather than charging the soil profile, resulting in soil and atmospheric water stress for the most of the year. Soils in dry or arid climates are gritty and structureless, having a very low water retention capacity. Thus, dry regions have unique eco-climatological characteristics and can exist in the tropics, subtropics, and temperate zones of the world. Dryland horticulture improves land productivity, resilience to climate unpredictability, and benefits dryland farmers. Successful dryland horticulture requires careful crop selection and agroecology-specific resource management.

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The country's dryland regions have significant potential for producing fruits, vegetables, and horticulture crops.

### Reasons for creating dry land zones

1. Deforestation is the indiscriminate felling of trees.
2. Adaptation to suboptimal agricultural systems and agronomic methods.
3. Cattle overgraze grassland and trees indiscriminately.
4. Increased area in dry and semiarid regions can be attributed to over-exploitation of ground water resources and unequal distribution of surface irrigation.

### Characteristics of dry land areas

1. These areas are prone to extreme temperatures (over 40°C in summer).
2. Delayed and irregular rains.
3. High wind speeds and scorching winds.
4. Droughts and soil degradation occur frequently.
5. Deep water table.
6. Dry land soils are shallow, with little water holding capacity and fertility.

### Key Principles of Dryland Horticulture

- **Crop Selection and Adaptation:** It is critical to choose crops that are naturally drought-resistant or have evolved to thrive in arid environments. Olives, dates, pomegranates, and certain melons are among the common

crops that can be grown in such areas. Indigenous or regionally adapted cultivars are frequently more suitable to dryland settings due to evolutionary adaptation to the local climate.

### ➤ **Water Management Techniques:**

Collecting and storing rainwater using techniques such as check dams, rain barrels, and cisterns provides a supplemental water source during dry periods. Drip irrigation and micro-sprinklers send water directly to plant roots, reducing evaporation and runoff. Mulching, cover crops, and reduced soil tillage all help to conserve soil moisture and prevent water loss.

### ➤ **Soil Management:** It is critical to keep

the soil fertile and structure. Composting, organic additions and crop rotation help to increase soil health and moisture retention. Implementing erosion management methods, such as terracing and planting ground cover, helps to reduce soil loss and maintain soil integrity.

### ➤ **Crop Management:** Adjusting

planting dates and densities can help you save water and increase yields. For example, during the rainy season, plant drought-resistant crops or stagger your planting to spread out your water consumption. Proper plant trimming

and training can improve air circulation, decrease water loss, and improve fruit quality.

- **Pest and Disease Management:** Utilizing a combination of biological, cultural, and chemical controls helps manage pests and diseases in a way that minimizes water use and environmental impact.

### Characteristic traits of arid/dry land horticulture crops

1. Dryland crops should be deeply rooted and perennial.
2. Crops grown on dry ground should have low water requirements.
3. The crop should have thick, tiny leaves that are shiny.
4. Crops should be resilient and adaptable to harsh monsoons.
5. Crops should lose leaves in the summer and flower and fruit during the wet season.

### Crops for dryland horticulture

- **Fruit crops for dryland:** The selection of fruit crops in drylands is critical. Fruit crops like Kherji, Ber, Phalsa, Indian Fig, Karonda, Ber, Aonla, Jamun, Wood apple, Custard apple, Guava, Sour Lime, Lemon, Tamarind, Pomegranate, Mulberry and Date is suitable for these regions.

- **Dryland vegetable crops:** Rainfed environments typically grow bitter gourd, bottle gourd, ridge gourd, sponge gourd, watermelon, round melon, long melon, snapmelon, drumstick, cluster bean, cowpea, okra, amaranth, brinjal, chillies, and tomato.

- **Floriculture in the Drylands:** Dryland environments have led to the cultivation of decorative plants such as tuberose, chrysanthemum, crossandra, marigold, jasmine, and aster, as well as cut flowers such as rose, carnation, gerbera, tulip, lily, alstroemeria, orchid, and anthurium in protected structures. In addition to flower production and commercialization, flower seedlings and foliage plants can also be commercially grown. The market has significant prospects because to its low volume and high value.

- **Medicinal and aromatic crops for the drylands:** Aromatic plants such as isabgol (Gujarat Isabgol-1 and 2), aloe (Aloe vera), senna (Anand Late Selection), egyptian henbane (HMI-80-1), palmarosa (Rosa Gross 49a), lemongrass (NLG 84), and vetiver (Hyb 8) can be cultivated commercially under dryland conditions to generate

additional income through crop diversification.

- **Spices for Dryland:** Cumin (GC 4), fennel, fenugreek (Ajmer Fenugreek 4, high yielding), until, ajwain (Ajmer Ajwain 93, early maturing), and nigella (Ajmer Nigella 20) are suitable for multi-story cropping and income creation. Spices can be grown alongside fruit crops to boost agricultural income.

## Challenges in Dryland Horticulture

### ➤ Water Scarcity

**Unpredictable Rainfall:** The erratic nature of rainfall in dryland locations makes it difficult to plan and manage agricultural water requirements properly.

**Water Quality:** In some dryland areas, water sources may be saline or contaminated, necessitating further treatment or soil management methods.

### ➤ Soil Degradation

**Erosion:** Wind and water erosion can deplete soil nutrients and limit moisture retention.

**Salinization:** Irrigation and rainfall can cause salt deposition in the soil, affecting crop development.

## Extreme weather conditions

**Heat Stress:** High temperatures can produce heat stress in plants, resulting in decreased yields and poor fruit quality.

**Frost:** Sudden temperature decreases can harm plants that are used to dry weather but not extreme cold.

## Benefits of Dryland Horticulture:

### 1. Sustainability.

**Resource Efficiency:** Dryland horticulture encourages efficient use of water and other resources, which is critical in water-scarce areas.

**Reduced Environmental Impact:** By eliminating the need for substantial irrigation infrastructure and water usage, local water resources can be conserved and the ecological imprint reduced.

### 2. Economic Opportunities.

**High-Value Crops:** Many dryland horticultural crops are high-value and can bring major economic benefits to farmers, such as better livelihoods and income stability.

**Market potential:** Dryland crops frequently have niche markets and can be sold at higher prices due to their distinctive features and restricted availability.

### 3. Food Security

**Diverse Diets:** Growing a range of crops in dryland locations can improve food security by diversifying local diets and lowering reliance on imported food.

**Local Resilience:** Communities can strengthen their resilience to environmental shocks and disturbances by planting crops that are adapted to local conditions.

## Conclusion

Dryland horticulture plays a crucial role in managing and utilizing land and water resources in arid and semi-arid regions. By focusing on drought-resistant crops, efficient water and soil management, and innovative practices, dryland horticulture contributes to sustainable agriculture, economic stability, and food security in some of the world's most challenging environments. As climate conditions continue to evolve, ongoing research and adaptation will be key to optimizing dryland horticulture and supporting resilient agricultural systems.

