

Name of Solution:

High Density Plantation (HDP) in Apple

Submitter: ICAR

Solution Overview

- What is it, and what problem does it solve? Brief 2–3 sentence description.
- It is a modern orchard management system aimed at maximizing productivity and fruit quality by planting trees closer together than in traditional systems.
- HDP plantation aims to transform traditional orchards into modern, profit driven enterprise thereby positioning HDP as a sustainable future for apple economy.

Key Features & Benefits

Main components and why it is useful? Bullet points summarizing methods, tools, and value added.

Key Components and Features of HDP in Apple:

Key components:

- Closer Spacing: HDP spacing: as close as 3 x 1.5 m or 3 x 1.0 m, depending on the rootstock and training system.
- Support system: Trees require support structures to grow upright due to weaker root systems. Galvanized steel poles and wires are used for staking and training.
- Drip Irrigation and Fertigation System: Precise water and nutrient delivery directly to the root zone. Essential for M9-type rootstocks which have shallow roots and enhances growth and fruit quality while reducing input waste.
- Use of Dwarf Rootstocks: Dwarfing rootstocks like M9, are used to control tree size and allow closer spacing.
- Training Systems: Tall spindle with trellis systems is used to manage tree architecture in HDP.
- Hail nets/fencing: Protection in hail/frost-prone areas (Optional)

Key features:

- Improved Quality: Better fruit color, size, and uniformity due to improved light distribution and canopy control. Improved yield ensures higher consumer acceptability and market (domestic and global) demand.
- Higher Yields: HDP allows for earlier and higher yields per hectare (50-60 t/ha) due to a greater number of plants, better light interception and canopy management.
- Ease of Management: Easier to prune, train, spray, and harvest due to smaller tree size and two-dimensional canopy system.
- Optimized Land Use: Accommodating more number of plants (2222 Or 3333 per ha of land).
- Resource Efficiency: Reduce water (40-50% saving through drip irrigation), labour, fertilizer, pesticide etc cost through modern techniques.

Benefits:

- Early bearing (as early as 2–3 years after planting).
- More efficient use of land, water, and nutrients.
- Increased profitability per unit area.
- Higher number of grade A fruits (>90%) with higher yield

Where It Works and Where It Can Work

Existing and potential target regions, agroecologies, or farming systems. Include examples if available.

It works under following regions and systems:

- Temperate climatic conditions, with chilling hours >800–1200 hours (depending on variety)
- Already HDP in apple is successfully operational in Himachal Pradesh, Jammu & Kashmir, and Uttarakhand.
- Preferable terrain for HDP is flat land or land with gentle slope.

Evidence & Impact

What results has it shown? Stats, pilot outcomes, or testimonials.

- SKUAST-Kashmir and ICAR--Central Institute of Temperate Horticulture (CITH), Srinagar and HDP demonstrations under HDP mission by Department of Horticulture, Kashmir has shown following outcome
- Early bearing (Year 2–3)
- Fruit yield of 50-60 tons/ha by Year 5
- Higher labour efficiency (>30%)
- Lower chemical use due to better pest/disease control in uniform canopy.
- Higher proportion of grade A fruits (>90%)

Scalability & Adoption Support

Why it can be scaled and what's needed to adopt it? Low-cost, adaptable, partner-ready, etc.

It can be scaled up due to following reasons:

- Proven Models: Successful pilots in India (J&K, Himachal) and global apple-producing regions have validated HDP.
- Modular Adoption: Can be scaled from small 0.5-acre farms to large commercial orchards.
- Standardization: Rootstocks, trellis designs, irrigation systems are now standardized and available in India.
- Policy Support: Government subsidies, training programs, and convergence with horticulture missions support uptake.

Need to adopt it due to its:

- Early and higher returns Short (3–4 years): Early market entry: where fruits come under commercial bearing in 2–3 years vs 6–8 years under traditional orcharding.
- Higher productivity (50-60 t/ha): 4–6 times more yield per hectare with maximum (>90%) grade A fruits having uniform color, size.
- Higher market rates (>Rs 70 -100 per Kg)
- Lower input use due to higher precision: More fruit per unit water, fertilize and labour.
- Higher revenue (>12 lakh/year) after 5th year of establishment against 2-3 lakh per year in traditional orcharding

Partners & Contact Info

Who's involved and how to connect? List of key contact and partners + email / phone.

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