

Complete Process of Apple Cultivation in India

1. Climate Requirements

- **Temperature:** Ideal temperature ranges between **21°C to 24°C** during the growing season.
- **Chilling Hours:** Apple trees require **1,000–1,500 chilling hours** below 7°C during dormancy for proper flowering and fruiting.
- **Altitude:** Best grown at altitudes between **1,500–2,700 meters above sea level**.
- **Rainfall:** Requires **100–125 cm of annual rainfall**, but excessive rain during flowering can affect fruit set.

2. Soil Requirements

- **Type:** Well-drained **loamy soils** rich in organic matter.
- **pH Level:** Ideally between **5.5 and 6.5**.
- **Drainage:** Good drainage is essential to prevent root rot. Avoid heavy clay or waterlogged soils.

3. Selection of Planting Material

- **Varieties:**
 - **Traditional Varieties:** Red Delicious, Golden Delicious, Royal Delicious, American Trel, Granny Smith
 - **Hybrid and Improved Varieties:** HRMN-99, Super Chief, Oregon Spur, Starkrimson
- **Rootstocks:** MM111, MM106 (Semi-dwarf), M9 (Dwarf)
- **Quality:** Disease-free, certified plants from nurseries.

4. Nursery Establishment and Grafting

- Apple plants are propagated through **budding or grafting** on rootstocks.
- **Steps for Nursery Preparation:**
 - Prepare raised nursery beds.
 - Sow seeds for rootstock and allow them to grow for a year.
 - Perform **T-budding** or **whip grafting** with desired varieties.
 - Maintain proper spacing and irrigation in the nursery.

5. Land Preparation

- **Plowing and Leveling:** Land should be **deep-plowed and leveled**.
- **Organic Matter:** Add **well-decomposed FYM (Farmyard Manure)** at **10-15 tons/ha**.
- **Pit Digging:**
 - Pits of **1m x 1m x 1m** are dug before planting.
 - Fill pits with **FYM, topsoil, and biofertilizers** for better root growth.

6. Spacing and Plant Population

- **Traditional Orchard:** 6m × 6m spacing, about **250 trees per hectare**.
- **High-Density Plantation:** 3m × 3m spacing, up to **1,000 trees per hectare**.
- **Ultra-High Density Plantation:** 1.5m × 1.5m spacing, over **3,000 trees per hectare** using dwarf rootstocks like M9.

7. Root Dip Treatment Before Planting

- Before transplanting, roots should be dipped in a **Bavistin (fungicide) solution** (0.2%) to prevent fungal infections.
- **Hormone Treatment:** Dipping roots in **IAA (Indole Acetic Acid) solution** enhances root development.

8. Transplanting Process

- **Best Season:** Late winter to early spring (**January–March**) for temperate regions.
- **Procedure:**
 - Plant saplings in prepared pits.
 - Fill with **topsoil mixed with FYM**.
 - Water immediately after planting.
 - Support plants with **stakes** in high-wind areas.

9. Nutrient Management and Fertilization

Growth Stage	Fertilizer Requirement (Per Tree Per Year)
First Year	10 kg FYM, 100 g NPK (12:12:12)
Second Year	20 kg FYM, 250 g NPK
Fruiting Stage	40 kg FYM, 500 g NPK, 100 g Boron

- **Micronutrient Management:** Zinc and Boron sprays help in flower and fruit development.

10. Irrigation and Water Management

- **Frequency:**
 - **Young trees:** Water every **7-10 days** in summer.
 - **Bearing trees:** Water every **15-20 days**.
- **Methods:**
 - **Drip irrigation** (preferred for high-density planting).
 - **Basin irrigation** for traditional planting.
- **Water Stress Effects:** Lack of water can lead to **poor fruit set and low yield**.

11. Pest and Disease Management

Major Pest/ Disease	Control Measure
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Codling Moth	Spray Chlorpyrifos (0.05%)
Aphids	Neem oil or Dimethoate (0.03%)
Apple Scab	Spray Mancozeb (0.25%)
Powdery Mildew	Sulfur dusting or Wettable Sulfur (0.2%)

12. Pruning and Training

- **Pruning Time:** Late winter (January–February).
- **Types of Training Systems:**
 - **Modified Central Leader** (for normal orchards).
 - **Spindle Bush** (for high-density planting).

13. Flowering and Pollination

- Apples require **cross-pollination**, so **bee hives** (5–7 hives per hectare) are introduced.
- Pollinizer varieties like Golden Delicious should be **planted at a ratio of 1:8**.

14. Harvesting and Yield

- **Harvesting Time:** August–October (varies by variety and region).
- **Yield (Per Hectare):**
 - **Traditional Orchard:** 10–15 tons.
 - **High-Density Orchard:** 40–50 tons.
 - **Ultra-High Density Orchard:** 60–80 tons.

Financial Analysis of Apple Cultivation (Per Hectare)

1. Expected Cost of Cultivation

Input	Cost (Rs)
Land Preparation	20,000
Saplings (1000 plants)	3,00,000
Fertilizers & FYM	50,000
Agrochemicals	40,000
Irrigation Setup	70,000
Labour	60,000
Miscellaneous	30,000
Total Cost	5,70,000

2. Expected Income (Per Hectare)

Item	Details	Income (Rs)
Yield	50,000 kg	-
Market Rate	Rs 80/kg	-
Total Income	50,000 × 80	40,00,000

3. Profit Estimation

| **Total Revenue** | **40,00,000** |

| **Total Cost** | **5,70,000** |

| **Net Profit** | **34,30,000** |

Conclusion

Apple farming in India is highly profitable, especially with high-density plantations. While the **initial investment is high**, the **returns are substantial** if proper management practices are followed. The key to success lies in **choosing the right variety, maintaining proper orchard management, and ensuring effective pest control**.