

Hi-Tech Horticulture

Hi-tech Horticulture in India

Horticulture an integral part of food and nutritional security and is also an essential element of economic security. Adoption of horticulture has brought prosperity in many states viz. , Maharashtra, Karnataka, Andhra Pradesh and Kerala.

What is Hi-Tech Horticulture?

- Hi-tech horticulture is a knowledge based horticulture system which make use of technology to increase the value and quality of farm produce.
- It is technology which is modern, less environment-dependent and capital intensive but with a capacity to improve productivity and farmer's income.

- It is useful not only for production of fruits, vegetables and flowers but also for conservation, plant protection, post-harvest management including value-addition.

Importance and scope

The present scenario of horticulture sector in India is encouraging

- Due to increase in population, there is a great pressure on natural resources added with global warming and climate change, decreasing land holdings, and high demand of quality horticultural fresh produce.
- Situation demands a shift towards modern technologies of crop production.

- The precise production techniques for efficient use of inputs at the appropriate time and quantity for maximization of yield and quality in different horticultural crops.
- It is a chain system of culturing fruits, flowers, vegetables and spices with a proper linkage from selection of seed/variety to the finished product through the process of modern technique of crop production through post-harvest management techniques.
- Hi-tech horticulture has overcome a barrier of agro-climates making most of the vegetables and other horticultural products available to the consumers in all calendar months although at a premium price.

Technologies use

1. High Density Planting
2. Integrated nutrient, water, weed and pest management
3. Precision Farming
4. Organic farming
5. Use of modern immuno-diagnostic techniques for quick detection of viral diseases
6. Post-harvest technologies including cold chain etc.
7. Use of genetically modified (GM) crop varieties
8. Protected cultivation
9. Micro-propagation

Advantages of high-technology farming

1. Increase in yield up to 5 to 8 times – high productivity per unit area
2. Significant saving in key inputs like water (up to 50%), fertilizers (25%) and pesticides.
3. Better growth and uniformity in quality
4. Feasible even in undulating terrains, saline, water logged, sandy & hilly lands

Potential areas for Hi-tech horticulture

1. Urban and peri-urban areas to meet requirements of fresh produce like vegetables, fruits and flowers round the year
2. Areas with limited land and water resources
3. Areas where availability of land for cultivation is restricted because of snowfall and where low temperature is prevalent restricting cultivation of crops under open field conditions.
4. Small and marginal land holdings for adopting intensive production technologies
5. As an agri-business enterprise for enterprising youth in rural and urban peripherals

High Density Planting

- Pioneered for temperate fruits in Europe.
- First planted in Europe at the end of 1960.
- HDP is defined as planting at a density in excess of that which gives maximum crop yield at maturity if the individual tree grows to its full natural size.
- HDP is one of the improved production technologies to achieve the objective of enhanced productivity of fruit crops.
- Based on plant population HDP is termed as low HDP with less than 250 trees/ha, higher HDP with 500-1250trees/ha, and ultra HDP with more than 1250 trees per ha.

- The exact limits of plant density to be termed as are not yet well defined.
- Yield and quality of the produce are two essential components of the productivity.
- HDP aims to achieve the twin requisites of productivity by -
 - Maintaining a balance between vegetative and reproductive load without impairing the plant health.
- In India, HDP has been proved useful in many fruit crops
 - e.g. Pineapple, banana, mango, apple and citrus.

Principle of HDP

- To make the best use of vertical and horizontal space per unit time and
- To harness maximum possible returns per unit of inputs and resources.
- Increased capture sunlight per unit area.
- Land use efficiency.
- Appropriate vegetative reproductive balance of the plants

Components of HDP

- Planting system
- Canopy management
- Use of dwarfing rootstock/interstock
- Training and pruning
- Shoot pruning
- Root pruning
- Use of growth regulators

Advantages of HDP

- Best utilization of land and resources.
- Higher yield per unit area with quality fruits.
- Reduces labour cost resulting in low cost of production
- Facilitates more efficient use of fertilizers, water, solar radiation, fungicides, weedicides and pesticides.
- It is amenable to modern inputs application techniques such as drip irrigation, fertigation, mechanization etc.
- Early economic returns.

Disadvantages of HDP

- In long run, it results in heavy competition for space, nutrients and water.
- Overcrowded growth of canopy results in buildup of high humidity, reduced cross ventilation in the orchard, which are conducive for more incidence of pests and diseases.
- The trees in close plantings soon begin to crowd each other and yields decline
Efforts to breed dwarfing rootstocks that can control the growth of mature trees have been largely un successful.
- Effective canopy management appears to be the largest barrier to success of high density orchards.

Methods of HDP

- High density can be achieved by close planting which in turn is made possible through control of tree size or planting in a system which accommodates more number of plants.
- Manipulation of tree vigor is an important prerequisite for success of high density planting in any fruit crop.
- High density of fruit orchards is generally achieved by controlling the size of tree or through improved planting system.
- Tree size can be controlled by applying different methods such as - Use of genetically dwarf scion cultivars, Use of dwarfing rootstocks and inter stock Training and Pruning, Use of growth retardants, Induction of viral infection, Use of incompatible rootstock, and Use of genetically dwarf scion cultivars etc.

HDP system of Mango growing

Attributes	HDP system
Plant Spacing	5x5 meter
Tree Numbers	160 plants/acre
Bearing	After four year
Production	Higher yield
Management	Easy to manage due to small tree size
Labour requirement	Requires less labour
Production Cost	Lower cost of Production
Harvesting	Easy
Quality	Small canopy, better air and sunlight penetration, mini disease incidence and high-quality fruits with good colour development



Economics of High Density Mango Cultivation

- High-density planting technique is a modern method of Mango cultivation involving the planting of mango trees densely, allowing small or dwarf plants with modified canopy for better light interception and distribution and ease of mechanized field operation.
- HDP orchard gives increased yield as well as returns/unit area due to increasing the number of trees/unit area. It is possible by regular pruning and use of growth regulators for maintaining the size and shape of the tree.

Model investment pattern in Mango orchard (rs/Acre)

Sl. No.	Particulars	HDP	
		Value	%
A.			
1.	Rental value of land	13250	4.44
2.	Bore	21310	7.13
3.	Pump set	25418	8.51
4.	Sprayer	1328	0.44
5.	Plant material	9750	3.26
6.	Digging of fit & planting	12188	4.08
7.	Staking	1500	0.50
8.	Fencing	-	0
	Sub Total	84744	28.37
B.			
	I st year	55364	18.54
	II nd year	52856	17.70
	III rd year	52856	17.70
	IV th year	52856	17.70
	Subtotal (I+II+III+IV)	213932	71.63
	Total Establishment Cost (A+B)	298676	100.00

Maintenance cost of high density mango orchard during gestation period (rs/Acre)

Sl. No.	Particulars	High density Plant					
		I	II	III	IV	Total	%
	Variable Cost						
A.	Labour cost						
A.	Land preparation	1275	1275	1275	1275	5100	2.38
1.	Gap filling	1330	-	-	-	1330	0.62
2.	FYM Application	1400	1400	1400	1400	5600	2.62
3.	Fertilizer application	1424	1424	1424	1424	5696	2.66
4.	Weeding	1352	1352	1352	1352	5408	2.53
5.	Inter cultivation	1850	1850	1850	1850	7400	3.46
6.	PPC spraying	992	992	992	992	3968	1.85
7.	Irrigation	2195	2195	2195	2195	8780	4.10
8.	Total Labour Cost	11818	10488	10488	10488	43282	20.23
B.	Material Cost						
1.	Seedling for gap	950	-	-	-	950	0.44
2.	FYM	3200	3200	3200	3200	12800	5.98
3.	Fertilizers	4218	4218	4218	4218	16872	7.89
4.	PPC	3210	3210	3210	3210	12840	6.00
	Total Material Cost	11578	10628	10628	10628	43462	20.32
1.	Premium paid	950	950	950	950	3800	1.78
2.	Managerial Cost (10% of TC)	5033	4805	4805	4805	19448	9.09
	Total Variable Cost	29379	26871	26871	26871	109992	51.41
II.	Fixed cost						

Maintenance cost of Mango orchard in bearing period (V year & onwards) (Rs./Ac./Year)

Sl. No.	Particulars	HDP	
		Value	%
	Variable cost		
A.	<u>Labour cost</u>		
1.	Ploughing/ harrowing	1220	2.53
2.	Application of FYM	950	1.97
3.	Application of Fertilizers	1458	3.03
4.	Application of PPC	995	2.07
5.	Weeding	1350	2.80
6.	Hoeing/ <u>Agati</u>	2415	5.02
7.	Irrigation	2195	4.56
8.	Harvesting	2800	5.82
9.	Miscellaneous/ Pruning	2428	5.04
	Total <u>Labour cost</u>	15811	32.85
B.	<u>Material cost</u>		
1.	<u>FYM</u>	3200	6.65
2.	Fertilizers	4218	8.76
3.	PPC	3945	8.20
4.	Total material cost	11363	23.61
5.	Premium if paid	950	1.97
6.	Managerial Cost (10%)	4376	9.09
	Subtotal (A+B)	32500	67.52
II.	<u>Fixed cost</u>		
	Land revenue	35	0.07
	Apportioned Establishment cost	9956	20.68
	Depreciation	4220	8.77
	Interest <u>on</u> fixed capital	1421	2.95
	Total fixed cost	15632	32.48
	Grand Total (I+II)	48132	100.00