

## Hi-tech Horticulture: The Emerging Era

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Horticulture is the branch of agriculture concerned with the cultivation, production, and sale of fruits, vegetables, flowers, herbs, ornamental or decorative plants. It forms a major share of agriculture. With the increasing population and climate change, food insecurity is increasing day by day. Achieving food, nutritional and income security is a matter of prime concern. Food security is therefore a multi-dimensional phenomenon, going beyond the availability of supply and involving human nutritional security and farmer's income security. In the present scenario, the increasing population is to be fed from declining land and water due to climate change. The effect of climate change is likely to increase in terms of high temperatures, weather instability, the emergence of new pests and diseases, in addition to the danger of increasing sea levels and water decline from glacier sources, therefore to feed the increasing population we have to work smartly and also it is our moral responsibility to preserve the natural resources for future generations

The Food and Agriculture Organization (FAO) forecasts a 15-20 percent decline in global agricultural production by 2080. Consequently, designing appropriate solutions to reduce the effects of climate change is one of the greatest challenges for plant scientists today. To meet the needs of agriculture, strong research and development support is required to provide science-based solutions to improve the quality of life of people including farmers who also consume food and produce food for their livelihoods.

Hi-tech horticulture is a technology that is trendy, less environment-dependent, and capital intensive however with a capability to boost productivity and farmer's financial gain. Hi-tech horticulture is beneficial not just for raising fruits, vegetables, and flower's crops however conjointly for conservation, plant protection, and post-harvest management together with value-addition.

In general, hi-tech agriculture practices requires a high level of preciseness for the application of inputs and management of the crop right from sowing to harvesting.

**Advantages of hi-tech farming:**

- Yield increases up to 5 to 8 times – high productivity per unit area
- Better quality growth and uniformity is there
- Big savings in key inputs such as water (up to 50 percent), fertilizers (up to 25 percent), and pesticides.
- Possible even in problematic areas like undulating terrains, saline, and waterlogged areas.
- Produce is available during off-seasons
- One can reap the benefits throughout the year
- Impact on natural ecosystems will be reduced
- Less runoff of chemicals into rivers and ground waters.

**Hi-tech horticulture involves the following:**

- Integrated Nutrient Management(INM)
- Integrated Disease Management(IDM)
- Protected/greenhouse cultivation
- New technologies like GPS, GIS
- Precision farming
- Vertical gardening
- Use of Drones
- Hydroponics
- Fertigation
- Food processing
- Value addition

**1. Integrated nutrient management(INM):**

INM refers to preserving the soil fertility and the supply of plant nutrients to an optimal level to ensure the required crop production by maximizing the benefits from all

available plant nutrient sources in an integrated way. Hi-tech horticulture heavily depends on the judicious use of water and nutrients. As land is limited and production has to be increased, the soil will be unable to provide the nutrients required for the proliferation of crop. So it is necessary to use fertilizers in balanced proportions. The use of drip irrigation has resulted in higher yields as it works on the principle of the specific area requiring water and nutrition.

## **2. Integrated Disease Management(IDM):**

It means compiling up the different methods of disease control. Physical, chemical, mechanical methods are together used to eradicate the different diseases in different crops.

## **3. Protected\Greenhouse cultivation:**

This is the type of cultivation where the microclimate around the plant is fully\partially controlled to protect the plant from adverse climatic situations. This not only provides a higher yield in limited space but also gives the facility of growing crops in unfavorable environments and during off-seasons. Mostly the cut flowers used for export purposes come from hi-tech floricultural units. Even the government is promoting protected cultivation by giving various schemes with subsidies.

### **Benefits of protected cultivation:**

- ✓ Ensures the production of any plant at any place and is available throughout the year
- ✓ Blemish-free high-quality product
- ✓ Insect pests and diseases can be controlled easily
- ✓ Water requirement reduces
- ✓ Labour requirement is less
- ✓ Earliness as it reduces crop duration

## **4. Precision farming:**

Precision farming focuses on the very latest technologies and innovations concerning the production of the crops. This means that the grower knows exactly how to direct his

production process to achieve optimum yield and quality of the crop concerned. By combining minimum input with maximum production without waste of energy, it not only promotes environmental wellbeing but also increases its profitability. All the hi-tech horticultural tools come under precision farming.

#### **5. New technologies like Global Positioning System (GPS) and geographic information systems (GIS) :**

GPS receivers collect location information for mapping the boundaries of the fields, irrigation systems, roads, and the problematic areas in crops like weeds or diseases. GPS accuracy helps farmers to build farm maps with correct acreage for field areas, positions on the road, and distances between points of interest. In farm preparation, field mapping, soil sampling, crop scouting, and yield mapping, such technologies are used. These advanced systems allow the farmers to produce their crops accurately by applying the accurate quantities of pesticides, herbicides, and fertilizers.

#### **6. Use of Drones:**

Drones are the wireless and sensor-equipped devices used for surveying in the fields. They easily capture the whole data at lower altitudes and also capture high-quality images. These are also used for spraying insecticides and pesticides in the fields.

#### **7. Hydroponics:**

An emerging cultivation practice where the plants are grown in water. The nutrients are supplied through the mineral nutrient solution in the water solvent. It not only reduces the weed and disease infestation arisen by the soil but also results in higher yields. Tomatoes, pepper, cucumber, and lettuces are some common plants which are grown using hydroponics.

#### **8. Vertical farming:**

The practice of growing crops in layers which are stacked vertically is referred to as vertical farming. Here plants are grown by incorporating different soil less farming techniques like hydroponics and aeroponics. Currently, the production of mushrooms, poultry, hydroponic fodder, strawberry, leafy-vegetables particularly lettuce, herbs,

ornamental horticulture, and other crops production are happening with the help of vertical farming.

### **9. Food processing and value addition:**

As most of the crops in horticulture are perishable in nature, it is necessary to process them so they can be used for longer periods. Moreover, horticulture food processing forms a major percent of the entire food processing industry. For long term use, horticultural foods such as fruits and vegetables are processed into various value-added products such as pickles, preserves, squashes, marmalade, concentrate, fruit mixes, jam, jelly, canned vegetables, and canned fruits. Talking about flowers, they not only excel for their aesthetic value, but they are also rich sources of nutraceutical goods. Hi-tech horticulture has scope for many new avenues in the future.

### **Disadvantages of hi-tech farming:**

- Initial expenses are very high means requires high capital
- Skilled labour is required to operate
- Need for research and development
- Requires time and commitment
- Experience and technical knowledge is very necessary
- Water and electricity risks are always there
- System failure threats
- Diseases and pests may spread quickly

### **Conclusion**

As the world is developing new techniques day by day if one incorporates modern innovations and techniques with traditional agriculture, we can feed the increasing population despite having so many challenges. This will not only help in sustainability of the produce but will also help to improve the economic conditions of farmers.