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IMPORTANCE OF HI-TECH HORTICULTURE IN FRUIT PRODUCTION

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INTRODUCTION

India is the second largest producer of fruit crops in the world after China. India has a large diversity of fruits in its basket and accounts for 13% of world's total fruit production (Bhairwa et al., 2012). The country is a home to a wide variety of fruits due to its varying agro-climatic conditions. India's diverse climate ensures availability of all types of fresh fruits throughout the year, still we are lagging in export potentiality, productivity and quality of fruits, because of low land holdings, rain fed farming, improper utilization of natural resources, over emphasis on chemical fertilizers and pesticides. In the present time of increasing input costs, decreasing commodity prices and environmental concerns, farmers and Government authorities are looking for new ways to increase efficiency, cut costs and subscribe to sustainable production, while hi-tech horticulture looks promising for better productivity. With the advancement in agriculture, there is an urgent need to adopt hi-tech horticulture to enhance production as well as the quality of the fruit crops. Hi-tech horticulture is the specialized form of horticulture integrates with ecology and environment, where it mainly focuses on the efficient utilization of the precious inputs. The benefits of such system includes consistent higher yield, enhancement in marketable fruits and most importantly earlier production and higher profitability.

HI-TECH HORTICULTURE:

Hi-tech horticulture is the deployment of technologies, which are modern, less environment dependent and have the capacity to improve the productivity and quality of horticultural crops.

Hi-tech horticulture includes:

1. Use of micro-irrigation system
2. Protected cultivation
3. High density planting
4. INM (Integrated nutrient management)
5. IPM (Integrated pest management)
6. Mechanization
7. Precision farming

MICRO-IRRIGATION:

Micro irrigation is defined as the frequent application of small quantities of water on or below the soil surface as drops or miniature spray through emitters placed along a water delivery line. Systems operating at low flow rates and water is dissipated from a pipe distribution network under low pressure in a predetermined pattern. Main advantage is the localized distribution of water, normally in proximity of the plant or the root systems.

Fertigation is the application of fertilizers or other water soluble products through an irrigation system. This system allows adjustments of fertigation program

according to both the stages and rate of growth of plants and changing climate conditions.

PROTECTED CULTIVATION

A better understanding of the growth factor requirements and inputs for enhancing crop productivity has greatly contributed to protected cultivation, which allows some control over wind velocity, moisture, temperature, mineral nutrients, light intensity, and atmospheric composition. With globalization of markets, shrinking land and climate change, the protected cultivation of high value crops has emerged as the single most important technology for ensuring:

1. High productivity
2. Improved quality
3. Profitable returns

NEED FOR PROTECTED CULTIVATION:

1. Year round cultivation of fruits
2. Least pesticide residues in harvested products
3. Easier plant protection operations inside the green house
4. Efficient utilization of precious inputs like water and nutrients
5. Weed free cultivation
6. Protected cultivation generate self employment for the educated rural youth in the farm sector

Potential fruit crops for protected cultivation: I) Strawberry, II) Papaya, III) Grape, IV) Banana, V) Pineapple, VI) Custard apple

HIGH DENSITY PLANTING (HDP):

High density planting is an innovative technology mainly adopted to increase the plant population per unit area for increasing the production of fruit crops and also to overcome low productivity.

COMPONENTS OF HDP:

1. Use of dwarf scion varieties
2. Adopting dwarfing rootstocks
3. Efficient training and pruning
4. Use of plant growth regulating chemicals
5. Suitable crop management practices

ADVANTAGES OF HDP:

1. Best utilization of land and resources
2. Quality production of fruit crops
3. Increase in yield per unit area
4. Easy for intercultural, plant protection and harvesting
5. Obtain export quality of the harvest

Mango varieties suitable for HDP: Amrapali, Alphonso, Dashehari, Banganapalli

Banana varieties suitable for HDP: Dwarf Cavendish, Nendran, Robusta

Guava varieties suitable for HDP: Sardar, Sweta, Lalit, Allahabad Safeda

INTEGRATED NUTRIENT MANAGEMENT (INM):

Integrated nutrient management is the maintenance or adjustment of soil fertility and plant nutrient supply at an optimum level to sustain the desired crop productivity. In other words, INM is the use of different sources of plant nutrients integrated to check nutrient depletion and maintain soil health and crop productivity.

DIFFERENCE BETWEEN CONVENTIONAL FARMING AND INM:

In conventional farming, people give more emphasis on grain yield through use of chemical fertilizers, use of high yielding varieties and chemical pesticides. In INM it integrates/combines the objectives of production with ecology and environment, that is, optimum crop nutrition, optimum functioning of the soil health and minimum nutrient losses or other adverse effect on the environment.

NEED OF INM:

1. Decline in productivity of the crop due to decrease in effective nutrient supply
2. Poor utilization of the nutrients by the crop
3. Soils which receive plant nutrients only through chemical fertilizers are showing declining productivity despite being supplied with sufficient nutrients. The decline in productivity can be attributed to the appearance of deficiency in secondary and micro-nutrients. The physical condition of the soil is deteriorated as a result of long term use of chemical fertilizers.

COMPONENTS OF NUTRIENTS:

1. Labile soil nutrient pool
2. Inorganic or mineral fertilizers
3. Organic manures/composts/vermicompost
4. Bio-fertilizers

ADVANTAGES OF INM:

1. Enhances the availability of applied as well as native soil nutrients
2. Improves and sustains the physical, chemical and biological functioning of soil
3. Synchronizes the nutrient demand of the crop with nutrient supply from native and applied sources

INTEGRATED PEST MANAGEMENT (IPM):

Ecosystem based strategy that focuses on long term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices and use of resistant varieties.

MECHANICAL CONTROL:

It can be achieved through Eradication. Quarantine plays a vital role in this as it is a legal restriction on the movement of agriculture commodities.

Other methods that are used for eradication purpose includes:

1. Crop rotation.
2. Field sanitation.
3. Chemical and heat treatment
4. Eradication of alternate hosts
5. Mechanically the pests can be controlled by using the traps

BIOLOGICAL CONTROL:

Viruses, bacteria, fungi and sometimes insects are also used for controlling the pest, as Mycoviruses such as Penicillium stoloniferum filterate destroys Agaricus bisporus, Mycoparasites such as Trichoderma harzianum reduces the infection of Sclerotium and Myconematicide such as Arthrobotrys is predacious on nematodes and kill them. Besides this, sowing resistant varieties also plays a crucial role in the biological control.

REQUIREMENTS FOR IPM:

1. Chemical pesticides are harmful and have long term impact on the human health and ecosystems.

2. Insects may become resistant to chemical pesticides

3. Lastly, the impacts of over-utilization of pesticides on wildlife are extensive and expose animals and birds to the unnecessary risks.

4. Mechanization:

Mechanization is machinery used in the operation of an agricultural area or farm. A substantial contribution to agriculture has been the escalation from manual and stock-animal labor to gas-powered implements.

Advantages of mechanization:

1. Substitute for labor
2. Increase productivity of farm staff

3. Labor skills and strengths often inadequate for large scale production and materials handling

AGRICULTURE MECHANIZATION:

1. Farm tractor applications
2. Primary tillage implements (Mould board plough, disc plough, chisel plough, rotary plough)
3. Spraying equipment (Hand operated knapsack sprayer, power operated hydraulic sprayer, controlled droplet application sprayer)
4. Harvesting machines (Combine harvester, backhoe)
5. Planters and seeders

PRECISION FARMING:

Precision farming is a concept of using the new technologies and collected field information, doing the right thing, in the right place, at the right time. Collected information is used to evaluate precisely optimum sowing density, estimate fertilizers and other input needs and to more accurately predict crop yields. In other words, it is "Digital Agriculture" involving very large scale farm level mapping, comprehensive database creation on required resources and making a detailed plan of work for maximizing the yield. It helps in avoiding unwanted practices to a crop, regardless of local soil and climate conditions i.e., it reduces inputs and assures quality produce. Healthy land and quality water, both are becoming a limitation to agricultural productivity. That is why precision farming is needed. The scope is there for high value and commercial crops grown in large farms.

COMPONENTS OF PRECISION FARMING:

1. Crop characteristics: Stage of crop, crop health, nutrient requirements
2. Detailed soil layer with physical and chemical properties, depth, texture, nutrient status, salinity and toxicity, soil temperature, productivity potential
3. Micro-climate data (daily and seasonal) about crop canopy temperature, wind direction and speed, humidity
4. Surface and sub-surface drainage conditions
5. Irrigation facilities, water availability and other planning inputs of interest
6. Farm machinery and equipment equipped with sensors.

Utilization of various hi-tech horticulture: Remote sensing, Protected cultivation, Fertigation etc.

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CONCLUSION:

India has a wide range of diversity of climate and soil on which a large range of fruit crops can be grown. The fruit crops need promotion for achieving sustainability of small holdings, crop diversification, increasing employment, providing an enormous export potential, improving environment and more than anything to achieve nutritional security. Hi-tech horticulture is becoming developed and becoming profitable day by day for the growers. Hi-tech horticulture system offers great scope to produce organic fruits, minimize insect-pest incidence, avoid fruit cracking, prevent frost injury and most importantly utilize the resources more efficiently. We can transform from productive to profitable, from sustainable to competitive, from production driven to market driven and lastly from localized to globalized through hi-tech horticulture.

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