

Horticulture vii.
arboriculture: study
and selection;
planting,



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Horticulture may be defined as the crop science which deals with the production, utilization and improvement of fruits, vegetables, ornamental plants and plantation crops including medicinal and aromatic plants. i.

Horticulture crops generally require intensive cultivation. ii. Horticulture produces are highly perishable. iii. Horticulture crops are the rich sources of vitamins and minerals. iv.

Cultural operations such as propagation, training, pruning, harvesting and marketing are skilled operations and are specific to horticulture crops.

Horticulture consists of the following divisions: i. Pomology: Study of fruit crops ii. Olericulture: It is scientific study of vegetables. iii. Floriculture: It is the art of growing, selling, designing and arranging flowers and foliage plants. iv.

Spices: Spices are those plants, the products of which are made use of as food adjuncts to add aroma and flavour e. g. pepper, cardamom, clove etc. v.

Condiments: Condiments are also plants, products of which are used as food adjuncts to add taste only e. g. coriander, cumin. vi.

Plantation crops: Which are grown in extensive scale. vii. Arboriculture: Study and selection; planting, care and removal of individual trees, shrubs, vines and other perennial woody plants. Importance of horticulture: i. Horticulture crops contribute to rational income. ii. Horticulture crops generate more employment opportunities.

iii. These are highly remunerative and profitable than cereals. iv. Fruits and vegetables are regarded as 'protective foods' since they supply minerals and vitamins. v. Fruits yield more calorific value.

vi. Many horticultural produces and their by products are the important raw materials for many industries.

Agro climatic zones for horticultural crops:

1.

Temperate Northern region: Jammu and Kashmir, Himachal Pradesh, Uttaranchal, West Bengal. Temperate fruits and cool season vegetables are the important horticultural crops. 2. North western arid region: Rajasthan, Gujarat, parts of Punjab and Haryana.

Arid fruit crops like Ber, Pomegranate, Aonla, Date Palm, Wood apple and spices like coriander and cumin. 3. North Eastern sub tropical humid region: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tirupura. Fruits like Banana, Pine apple, Citrus, Jack fruit, plantation crops like tea etc. 4. North central subtropical region: U. P. Bihar, M.

P. and parts of Maharashtra. Mango, Sapota, Sweet Oranges and Guava. 5.

South central tropical region: Tamilnadu, Andhra Pradesh, Karnataka and parts of Maharashtra. Mango, Guava, Sapota, Pine apple and Turmeric. 6.

Coastal tropical humid region: The entire region stretching along the Bay of Bengal in the East and Arabic sea in the West. Banana, Mango, Cashew and

Coconut. 7. Southern hilly region: Comprising of Western ghat and Eastern ghat. Coffee, Tea, Cardamom, Pepper, Oranges and Pine apple etc.

Establishment of orchard:

Establishment of orchard is a long term investment and deserves a very critical planning. The selection of site, planting system and planting distance, choosing the varieties and the nursery plants have to be considered carefully to ensure maximum production. Location and site: Criteria for selection: 1.

Location should be in a well established fruit growing region for getting benefits of others experience and selling produce through cooperatives. 2. It should be closer to a market. 3. The climate should be suitable for the chosen fruit crops. 4. Adequate water supply should be available round the year.

5. Before a grower establish an orchard, he must ensure the following factors. (i) Suitability of soil, its fertility, the nature of sub soil and soil debris.

(ii) Site must have proper drainage and no water stagnation during rainy season. (iii) Irrigation water must be of good quality. (iv) There must be proper transport facilities either by road or rail within the reach. (v)

Suitability of climate must be ensured for immunity against dangers like cyclone, frost, hailstorms. (vi) Whether there are seasonal gluts or over production in any particular period of the year. (vii) Whether there is assured demand in the market for the fruits to be grown. (viii) Availability of labour in the proximity.

Planning of an orchard: A careful plan of the orchard is necessary for the most efficient economic management. 1. Optimum spacing to accommodate maximum number of trees. 2. Stores and office building in the orchard should be constructed at the centre for proper supervision.

3. Wells should be located at convenient places at the rate of one well for 2-4 ha. 4. Each kind of fruit should be assigned in a separate block. 5.

Fruits ripening at the same time should be grouped together. 6. Pollinators should be provided in deciduous fruits. Some variety, require pollen from other variety, to set fruits in them, otherwise, they will be barren.

Such pollen donors are pollinators. Each 3rd tree in every 3rd row should be planted with a pollinator. 7. Irrigation channels should be laid along the gradients. 8. Roads should occupy minimum space for the economy.

9. Short growing trees should be allotted at the front and tall at the back for easy watching and to improve appearance. 10. Fruits attracting birds and animals should be close to the watchman.

11. A good fence is essential. Live fence is economic, cheap, should be drought resistant, easy to propagate from seed, quick growing, dense foliage, standing severe pruning and thorny plants, e. g. Agave, Prosopis juliflora, Pithecolobium dulce.

12. Wind breaks, rows of tall trees planted close together around the orchard, are essential to resist velocity of wind. Trees: Casuarina equisetifolia, ptenaspermum, polyalthia longifolia, eucalyptus globulus,

Grevillea robusta, Azadiracta indica. Laying out of orchards: Any method of <https://assignbuster.com/horticulture-vii-arboriculture-study-and-selection-planting/>

layout should aim at providing maximum no. of trees per ha., adequate space for proper development of the trees and ensuring convenience in orchard cultural practices. Broadly 2 types: (a) Vertical row planting pattern (b) Alternate row planting pattern. (a) Vertical (square system, rectangular system): The trees set in a row is exactly perpendicular to those trees set in their adjacent rows.

In the later planting pattern (i. e. Hexagonal, Quincunx, Triangular), the trees in the adjacent rows are not exactly vertical instead the trees in the even rows are midway between those in the odd rows. The various layout systems used are: 1. Square system: Each corner of a square, whatever may be planting distance. This permits intercropping and cultivation in two directions. 2. Rectangular system: Any two rows are more than the distance between any two trees in a system.

No equal distribution of space per tree. (b) Alternate row planting pattern: The various layout systems used are: 1. Hexagonal system: Planted in each corner of an equilateral triangle.

6 trees form a hexagon, 7th in the centre. This system provides equal spacing but difficult to layout. Accommodates 15% more trees than the square system. 2. Diagonal or quincunx system: Square system with one tree at the centre, the central filler must be of short duration. 3. Triangular system: Square system, difference being that those in the even numbered rows are midway between those in the odd rows instead of opposite to them. 4.

Contour system: On the hills, planted along the contour across the slope. It particularly suits to land with undulated topography. Main purpose is to minimise land erosion and to conserve soil moisture. In South India tea is planted in contours either in single edge system or in double edge system.

Horticultural Soil:

The soil act as a substratum and provides nutrients and water necessary for plant growth. Kinds of Soil: Sandy soil is suitable for vegetables to obtain early crops and rapid root growth. It is the most common medium for propagating cuttings. Loam of tall types are highly suitable for horticultural production it holds and releases nutrients for plant growth.

Soil fertility: The capacity of soil to nourish and sustain plant growth is known as soil fertility. Plantation crops like coffee, cardamom and species need fertile soils rich in organic matter and humus content. Soil depth: Shallow soils with hard and compact subsoil layers like canker, heavy clay should be avoided for fruit crops as in such soils, the roots grow in the top layer of soil parallel to the surface such trees are easily uprooted by winds or premature death of trees may also occur. Drainage: Drainage depends upon the nature of sub soil. In a good sub soil, trees can stand drought better because of deeper root penetration on wet, heavy soils with improvable sub soil poor performance is noticed due to poor aeration and inadequate drainage.

Climate:

Climate is one of the important complex factors which influences the production of horticultural crops. Temperature: Optimum temperature range varies with crops and based on the optimum temperature requirement, <https://assignbuster.com/horticulture-vii-arboriculture-study-and-selection-planting/>

horticultural plants are broadly classified into (a) temperate (b) subtropical (c) tropical plants. If a tropical plant is grown in subtropical zone their growth and performance may not be good.

Light: The intensity of light, quality and its duration affect the growth and development of horticultural plants. **Atmospheric humidity:** Humidity affects the growth and development of horticultural crops. High humidity during flowering and fruiting promotes the incidence of pests and diseases. **Rainfall:** Total rainfall and its distribution decide the growth and development of horticultural crops. **Air pollutants:** The air pollutants like ozone and photo chemical oxidants such as sulphur dioxide reduce the assimilation rate, growth and development of plants leading to reduction in yield and quality of the produces. **Hailstorms:** Occurrence of hails during preblossoming or blooming period of apple, plum, peaches generally affect the fruit set.

Harvesting and Marketing:

Monetary returns of the fruit grower and the reputation of his fruit produce depends on the following factors: 1. Stage of picking of fruits. 2. Packing methods. 3.

Storing and transporting. 4. Processing and delivery to the consumer in the form and at the time of the consumer desires to have the fruits. **Picking:** Picking refers to the harvesting of fruits from the trees at the right time.

The time of picking depends upon: (i) **Variety:** Certain variety only ripen in trees and certain variety will ripen even when they are harvested at 3/4th maturity. (ii) **Purpose:** For which it is meant, e. g. tomatoes for table

purposes can be harvested at red ripe stage, whereas for distant markets they may be harvested during breaker's (colour change) stage. (iii) Distance from the market: The closer the market, ripe fruits may be picked, if distance is more mature green stage. Methods to determine proper time: 1.

Maturity index: Following are the rough but ready maturity tests of fruits employed to pick the well matured fruits. (a) Colour changes: (mango, papaya). (b) Increase in size. (c) Softening of the tissue of the fruits e.

g. figs, grapes. (d) Case of detachment from the stalk e. g. sapota, annona. (e) Shrivelling of fruit stalk, water melon. (f) Time elapsed from the date of flowering to picking maturity. (g) Sound by tapping jack and water melon produce hollow and dull sound at ripening stage.

2. Accurate tests: (a) Colour charts: Charts prepared for different stages of maturity. (b) Penetrometer: Instrument measuring the softness of tissues as an index of maturity. (c) Sugar/acid or Brix/acid ratio: Based on the principle that acid content reduces and sugar increases on ripening. The fruit growers should bestow more attention and considerable care during the picking season to reduce to a minimum level of careless handling of fruits by pickers.

1. Picking must commence from lower branches advancing towards the top to reduce dropping of fruits. 2.

Dropping of the fruits from the tree should be avoided. 3. During picking, care must be taken to avoid any possible damages to the branches especially to the spurs as the subsequent cropping depends upon them. 4. Picking easily in the morning is best, fruits kept in shade. After picking fruits

should be kept in coolest place available, which is well ventilated to arrest respiration and breakdown as much as possible. 5.

There should not be any bruises while picking on it lowers the marketability of the fruits. 6. If picking is done in mid-day or hot weather, the fruits should be kept in a shed overnight to cool.

Handling, Grading and Storage of fruits:

Production of horticultural produce is limited by certain climatic condition and through proper storage of fruits, the availability, of produce is extended. Factors influencing storage: Fruits and vegetables contain about 85 and 95% moisture content respectively. As these are living tissues after harvesting respiration goes on. So any storage procedure should aim at slowing down, regulating or preventing the increased respiration. Temperature: The rate of respiration can be controlled by temperature regulation low temperature slows down. Humidity: Maintaining high humidity during storage minimizes responsible.

Storage atmosphere: In addition to O₂ and CO₂ other gases may affect storage of fruits like ethylene by hastening ripening. These storage atmosphere can be improved by ventilation which mean introduction of outdoor air into the storage room. Methods of storage: 1.

Air cooled storage: Fruits placed in racks in insulation box. Keeping the ventilator open during night to admit the cool night air and during the day shut down. Thus storage rooms can be kept cool. 2. Air cooled storage refrigerated with ice: A few storages are filled with ice and salt and equipped

with furs for quick cooling. 3. Treating with wax emulsions: In the absence of cold storage, fruits are dipped for a minute in a wax emulsion and dried completely for 10-15 minutes. 4.

Refrigerated storage: 1. Prompt cooling of produce 2. Maintenance of optimum R. H. 3. An even holding temperature with 1. 0- 2. 0 °C fluctuations 4.

No need to depend upon the external conditions of air, their movements 5. Most efficient and scientific way of storing. Refrigerated storage involves the use of refrigerant (Freon NH₃-CH₃Cl). 5.

Controlled atmospheric storage (CAS): By reducing the O₂ supply available to the fruit and by increasing the amount of CO₂, around the fruit or by lowering the temperature, the respiration can be slowed down in fruits and vegetables. A combination of all these principles is involved in controlled atmospheric storage. 6. Preservation by irradiation: Potatoes, Onion, garlic and other crops lose their commercial value by sprouting or rooting during storage. These processes can be delayed by irradiating the produce with gamma.

7. By use of chemicals: Certain chemicals increase the shelf-life of fruits by delaying the ripening and senescence KMnO₄ an ethylene absorbent absorbs ethylene, from banana held sealed polythene bags. 8. Evaporative cooling (cool chambers): Evaporation of water produces a considerable cooling effect and this evaporative cooling occurs when air that is not saturated with water vapour, is blown across the wet surface. Cooling chamber works in the

principle of evaporation cooling. This structure essentially contains a single <https://assignbuster.com/horticulture-vii-arboriculture-study-and-selection-planting/>

layer of bricks as floor and a double layer of bricks as side wall with an interspace of 7.

5 cm wide filled with river sand. The top of the storage space is covered with piloted vetiver roots or gunny cloths in a bamboo structure. Once the cool chambers are saturated with water, sprinkling of water once in the morning and once in the evening is enough to maintain temperature and humidity. These storage chamber maintain a very high humidity of about 95% throughout the year.

These chambers are ideal for storage of fresh fruits and vegetables for a short period. Ripe mangoes can be stored upto 10 days as against 4 days in room temperature. Similarly citrus fruits like grape fruit and orange can be stored upto 60-90 days as compared to 8-15 days in ambient room temperature.

Training and pruning:

Certain fruit plants if left to grow of their own wild and do not bear abundantly unless trained or pruned to a specific form. When a plant is tied, fastened, staked or supported over a trellis or pergola in a certain fashion or some of its parts are pruned with a view to giving the plants a framework, the operation is called ' training' On the other hand ' pruning' refers to the removal of plant's parts such as buds, developed shoots and roots to maintain a desirable, form by controlling the direction and amount of growth.

TrainingPruning1. It concerns form primarily 2. It determines plant's outline its branching and framework 3. Generally concerned with first few years of

the tree growth to determine its annual framework¹. It affects functions only

2. Assists more in what the tree does in respect to fruiting
3. This operation is carried out annually.

Objectives of training:

1. To admit more light and air to the centre of the tree and to expose maximum leaf surface to the sun.
2. To direct the growth of the tree so that various cultural operations, such as spraying and harvesting can be done at the lowest cost.
3. To protect the tree from sun burn and damage.
4. To secure a balanced distribution of fruit bearing parts on the main limbs of the tree.

Method of leader training: The method of leader training should be suited to the normal habit of the fruit tree the common system of training followed:

Open centre: The main stem is allowed to grow only upto a certain height and the leader stem is pruned to encourage scaffold branches production.

This system is also known as vase-shaped system.

2. Central leader: A tree is trained to form a trunk which extends from the surface of the soil to the top of the tree. This system of training is also known as closed centre one.
- 3.

Modified leader: Intermediate open centre and central leader. This is developed by first training the trees to the leader type, by allowing the central axis to grow unhampered for the first 4 or 5 years. The central stem is then headed back and lateral branches are allowed to grow. So it possesses the advantages of both the system.

Trees trained with the help of a support can be: 1. Power system: (Pandal, pergola system) in grapes, cucurbitaceous vegetables, vines spread over a criss cross network of wires. 2.

Espalier system: Trained to grow flat on trellis or on horizontal wires by training the branches perpendicularly to the main stem, 3. Kniffin system: Two trellis of wire are strung supported by vertical parts. 4. Telephone system: Overhead trellis (3-4 wires). 5. Tatura trellis: Multi-layered wire trellis (v-shaped). Trees trained do not require support but will be trained to a particular shape.

(a) Head system: (Grapes) vine is allowed to grow single stem with the help of stakes. (b) Palmelle: Central leader having 3-4 tiers of two opposite branches trained at an angle of 30° from the vertical. (c) Spindle brush: Central stem with 15-20 semi-horizontal branches. (d) Dwarf pyramid: Central leader tree and fully grown trees consist of central erect stem with 20-30 branches 45°-90°. (e) Head and spread system: Variation of modified leader system.

Primary branches are taken in different tiers, each tier being 60 cm above the lower tier. Precaution should be taken to maintain the desired frame of the tree for long duration of time. Pruning: Commonly, trees are pruned annually in two ways. Shoots or branches considered undesirable are removed entirely without leaving any stub, called 'thinning out'. Removal of terminal portion of the shoots, branches or limb, leaving its basal portion intact is called 'beading back' thinning out. Involving large limbs as in old

and diseased trees: bulk pruning. Objectives: (i) To remove surplus branches.

(ii) To open the trees so that the fruits will colour more satisfactorily.

(iii) To train it to some desirable form. (iv) To remove the dead and diseased limbs. (v) To remove the water sprouts.

(vi) To improve fruiting wood and to regulated production of floral bud.

Season of pruning: Winter pruning is preferred to reduce bleeding summer pruning may have a dwarfing effect or an invigorating influence. A light summer pruning may aid in coloration of fruit in certain variety. Special pruning techniques: 1.

Root pruning culture of dwarf fruit trees. 2. Ringing removal of a complete ring of bark from a branch to increase fruit bud formation in certain fruit crops. 3. Notching: Partial ringing of a branch above a dormant lateral bud. The practice of notching below a bud (nicking) is effective in starting a floral shoot.

4. Smudging: Practice of smoking the trees like mango, to produce off-season crop in Philippine. 5. Bending: Bending of branches for increasing fruit production in guava. 6. Coppicing: Complete removal of the trunk in trees like, Eucalyptus and Cinchona leaving 30-35 cm stump alone. 7.

Pollarding: Removing growing point e. g. silver oak. 8.

Pinching (In herbaceous plants removal of growing point). 9. Disbudding (removing unwanted flower bud). 10.

Alternate differential pruning

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Propagation of Horticultural Crops:

I. Sexual propagation Seed: Most annuals, biennials and many perennial fruit plants; vegetables crops; plantation, aromatic and medicinal plants; ornamental, flowering and shade providing shrubs and trees. II. Asexual propagation (i) Propagation by Apomictic seedlings: Citrus, mango, apple etc.

(ii) Propagation by vegetative structures: A. Propagation by division: Division of stem tubers'. Potato, caladium etc.

Division of tuberous roots: sweet potato, turmeric, dahlia, bigonia etc.

Division of rhizomes: Ginger, banana, blueberry, bamboo, iris, oxalis etc. B.

Propagation by separation: Bulbs: Onion, daffodil, Bird of Paradise, tulip, narcissus, hyacinth etc.

C. Propagation by suckers: Pineapple, banana, chrysanthemum, blackberry, raspberry etc. D.

Propagation by runners: Strawberry E. Propagation by stolon: Doob grass. F.

Other vegetative structures: Bulbils: Lilies Offsets: Pineapple, banana, cacti

and succulent, tulip, iris, lily etc. III. Propagation by cuttings: (a) Stem

cuttings: Grape, fig, pomegranate, mulberry, kiwi fruit, olive, quince, rose, ,

honeysuckle wisteria, weeping willow, poplar etc. Semi-hardwood cuttings:

Mango, guava, jackfruit, camellia, lemon, rhododendron etc. Softwood

cutting: Juniper, hollyhock, azalea, lilac etc. (b) Leaf cuttings: African violet,

bigonia, bryophyllum etc. (c) Leaf bud cuttings: Blackberry, Lemon,

cammelia, hydrangea, kalanchoe etc. (d) Root cuttings: Blackberry, fig, cherry, apple, pear etc.

IV. Propagation by layering: (a) Tip layering: trailing black berry, raspberry etc. (b) Simple layering: Ornamental climbers, bougainvillea, grape, lemon etc. (c) Stooling/Mound layering Apple rootstocks, guava, mango, litchi, Gooseberry etc. (d) Serpentine layering: Clematis, American grape etc.

(e) Trench layering: Apple rootstocks, cherry, plum etc. V. Propagation by grafting: (a) Whip grafting: Temperate fruit plants (b) Cleft grafting: Avocado, apple, pear, plum, camelia etc. (c) Bridge grafting: For different fruit plants (d) Side grafting: Mango, avocado, junipers etc.

(e) Inarching: Mango, sapota, guava, litchi etc. (f) Veneer grafting: Mango (g) Epicotyl grafting: Mango VI. Propagation by budding: (a) T-budding: Citrus, plum, peach, cherry, ber, rose etc.

(b) Patch budding: Walnut, Indian rubber tree etc. (c) Chip budding: Mango, grapes etc. (d) Ring budding: peach, plum, ber, mulberry etc. VII.

Micropropagation: (a) Shoot tip culture: Citrus, papaya, grape, orchids, asparagus, lily, gladiolus, strawberry, carnation, chrysanthemum etc. (b) Embryo culture: Citrus, rhododendron etc. (c) Single cell culture: Carrot, sunflowers etc.

(d) Embryo rescue: Grape