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2. Indian Institute of Vegetable Research(IIVR), Varanashi
3. Indian Institute of Spices Research(IISR), Calicut, Kerala
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5. Central Institute of Temperate Horticulture(CITH), Srinagar
6. Central Potato Research Institute(CPRI), Kufri, Shimla
7. Central Tuber Crops Research Institute(CTCRI), Thiruvananthapuram,Kerala
8. Central Plantation Crops Research Institute(CPCRI) Kasargod,Kerala
9. Central Institute of Arid Horticulture(CIAH), Bikaner, Rajasthan
10. Central Institute of Post Harvest Engineering and Technology(CIPHET), Ferozepur Punjab
11. ICAR Research Complex for Goa, Ela, Old Goa
12. ICAR Research Complex for North Eastern Hill Region. Barapani, Meghalaya
13. National Research Centre for Banana. Trichirapalli, Tamil Nadu
14. National Research Centre for Citrus, Nagpur, Maharastra
15. National Research Centre for Onion and Garlic, Pune, Maharastra
16. National Research Centre for Grape, Pune, Maharastra
17. National Research Centre for Medicinal and Aromatic Plants, Anand, Gujarat
18. National Research Centre for Mushroom, Solan
19. National Research Centre for Orchid, Gangtok, Sikkim
20. National Research Centre for Cashew nut, Puttur, Karnataka
21. National Research Centre for Seed Spices, Ajmer, Rajasthan
22. National Research Centre for Oil Palm, Eluru, Andhra Pradesh
23. National Research Centre for Pomegranate, Solapur, Maharastra
24. National Research Centre for Makhana, Patna, Bihar
25. National Research Centre for Litchi, Muzaffarpur, Bihar
26. National Horticulture Board(NHB), Gurgaon, Haryana

## Components of Nursery

A nursery should consist of the following components

1. Building Structures:
  - This includes office, sale counter, packing shed, potting shed, store, implement shed and residential quarter.
2. Progeny Tree Block:
  - The current choice of kind and variety of fruit crops and collection of true to type mother plants have strong bearing on the success and goodwill of a nursery industry.
  - Suitable fruit crops should be selected to meet the demand of the customers.
  - There should be a collection of good number of promising varieties of popular crops to make a wide choice.
  - The progeny tree should be healthy, disease free, genetically true to type and free from pest attack.

- The pedigree of these plants should be known to the nursery man.
3. Propagation Structures:
    - Structures like green house, glass house, poly house, hot bed, cold frames, lath house, shade house, mist house are used to create congenial condition for the propagation of plants.
  4. Nursery Bed

## Management of Young Nursery Plants

Management of young nursery plants

1. Irrigation: the young seedling should be frequently watered with low pressure. Excess and deficit of moisture is harmful. Proper care should be taken to avoid subsoil congestion through provision of proper drainage.
2. Nutrition: Proper nutrition has profound effect on growth. The growing media should have liberal dose of manures and decomposed organic manure. A light and frequent dose of nitrogen will boost the growth of young seedlings.
3. Weed control: The nursery should be kept weed free including roads and channel to avoid chances of further spread.
4. Plant protection: In the initial stages the seedlings are more prone for pest and diseases. Therefore, prophylactic measures should be undertaken.

*Common pests:* Ants, Snails, Rodents, Cutworms and sucking pests.

*Diseases:* Collar rot, Damping off, Nematodes, Wilt etc.

### Preparation of land

- The land should be cleaned properly for free movement of men and machinery.
- All the trees, bushes and creepers should be removed.
- The soil of the area designed for growing fruit plants needs thorough preparation.
- A virgin land requires a deep ploughing and harrowing.
- The land should be repeatedly ploughed and bring the soil to a fine tilth.

### Layout plan

- The marking of position of the plant in the field is referred as layout.
- The layout plan of the orchard should be prepared carefully, preferably in consultation with horticultural experts.
- The orchard layout plan includes the system of planning provision for orchard paths, roads, water channels and farm building.
- A sketch of the proposed orchard should be prepared before the actual planting is taken up.

### Method of layout

- For laying out an orchard, according to square system, a base line is first established and position of the trees is marked along this line by laying wooden stakes in the ground.
- Another base line at right angle to the first base line, is then marked along with the other edge of the field with the help of a carpenter square or a cross staff.

- The right angle can also be drawn with the help of measuring tape.
- One end of this tape is fixed at three metre distance from the corner along the first line and the tape is then stretched along the second base line for a distance of four metre.
- The diagonal distance between these two points should be five metre.
- The wooden stakes are put in the ground at the desired distance along the second line.
- All the four rows are thus established and staked.
- Three men, one putting the peg in the field and others correcting alignment while moving along the base line, can easily stake the whole field.
- The marking of position of the plant in the field is called “layout”.

### **Aims**

1. To provide adequate space to plants.
2. To accommodate more number of plants.
3. Easy intercultural operations.
4. System of planting

### **Planting Systems**

#### **Square system**

It is the most commonly used method and easy to layout in the field. In this system, plant to plant and row to row distance is the same. The plants are at the right angle to each other, every unit of four plants forming a square. This system facilitates the interculture in two directions after the orchard is planted.

#### *Advantages*

1. Most easy and popular one.
2. In this row to row and plant to plant distance is kept similar.
3. Plants are exactly at right angle to each other.
4. Interculture operations can be done in both the directions.
5. Adequate space for inter-cultivation of remunerative crops like vegetables.

#### **Rectangular system**

In this system, the plot is divided into rectangles instead of squares and trees are planted at the four corners of the rectangle in straight rows running at right angles. Like square system, this system also facilitates the interculture in two directions. The only difference is that in this system more plants can be accommodated in the row keeping more space between the rows.

#### *Advantages*

1. Lay out in rectangular shape.
2. More space between row to row.
3. Inter-cultural operations can be done in both the ways.
4. Plants get proper space and sunlight.

#### **Hexagonal system**

In hexagonal system, the trees are planted in the corners of equilateral triangles. Six trees thus form a hexagon with another tree at its centre. This system, though a little difficult for execution but accommodates 15 percent more plants. Cultivation of land between the tree rows is possible

in three directions with this system. This system is generally followed where the land is costly and very fertile with ample provision of irrigation water.

#### *Advantages*

1. Accommodates 15 % more plants than the square system.
2. Plants are planted at the corner of equilateral triangle.
3. Six trees are planted making a hexagon.
4. The seventh tree is planted in the centre and called septule.
5. This requires fertile land.

#### *Disadvantage*

Lay out is difficult and cumbersome.

#### Quincunx system

- This system is exactly like the square system but one additional tree is planted in the centre of each square.
- The number of plants per acre by this system is almost doubled than the square system.
- Fruit trees like papaya, kinnow, phalsa, guava, peach, plum etc. can be planted as fillers in the permanent trees provides an additional income to the grower in the early life of the orchard.
- The filler trees are uprooted when the main orchard trees start commercial fruiting.

#### Contour system

- This system is usually followed in the hilly areas with high slopes but it is very much similar to the square/rectangular system.
- Under such circumstances, the trees may be well planted in lines following the contour of the soil with only a slight slope.
- Irrigation and cultivation are then practiced only across the slope of the land as this practice reduces the chances of soil erosion.
- In this system layout is done as in square/rectangular system, first by establishing the base line at the lowest level and then marking for the trees should be done from the base to the top.
- Bench terraces are used where the slope is greater than 10 per cent.

#### Triangular system

- In this system, trees are planted as in the square system but the plants in the 2nd, 4th, 6th and such other alternate rows are planted midway between the 1st, 3rd, 5th and such other alternative rows.
- This system provides more open space for the trees and for intercrop.

#### **Methods of Layout**

##### *Methods of layout*

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The right angle can also be drawn with the help of measuring tape. One end of this tape is fixed at 3 metre distance from the corner along the first line and the tape is then stretched along the second base line for a distance of 4metre. The diagonal distance between these two points should be 5 meter. The wooden stakes are put in the ground at the desired distance along the second line. All the four rows are thus established and staked. Three men, one putting the peg in the field and other correcting alignment while moving along the base line, can easily stake the whole field.

The marking of position of the plant in the field is called “layout”.

***Aims of layout***

1. To provide adequate space to plants.
2. To accommodate more number of plants.
3. Easy intercultural operations.
4. To improve aesthetic view of the land.