Planting Geometry

*Rimpika, Rajesh Kanwar, Shilpa, Ankita Sood and Meena Kumari
*Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan,
Himachal Pradesh, India
*Corresponding Author's email: rimpikathakur1989@gmail.com

Planting geometry defines the spatial arrangement and spacing of individual plants within a planting area or field, often arranged in rows and columns or the arrangement of the plant in the different rows and column in an area for efficient utilization of Natural resources.

Principles of Geometric Planting
- Regular spacing to minimize shading
- Orientation based on Sunlight availability
- Efficient use of land and soil resources

Geometric Planting Patterns
System of planting
The following are the important systems of planting generally followed on the basis of Agro-climatic conditions.

1. **Square Planting:** 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 (Fig. 1.1). The plants are at the right angle to each other, every unit of four plants forming a square. Under this system, intercultural operations can be done conveniently and easily. Square or almost square spacing design has been used in plantation forest, as it has been claimed to maximize productivity. Eg. Lodgepole pine, Scots pine and Norway spruce.

Aims:
- To provide adequate space to plants.
- To accommodate more number of plants.
- Easy intercultural operations.
- To improve aesthetic view of the land.

Advantage:
- Most easy and popular one.
- In this row to row and plant to plant distance is kept similar.
- Plants are exactly at right angle at each corner.
- Inter culture operations can be done in both the directions.
- Adequate space for inter-cultivation of remunerative crops like vegetables.
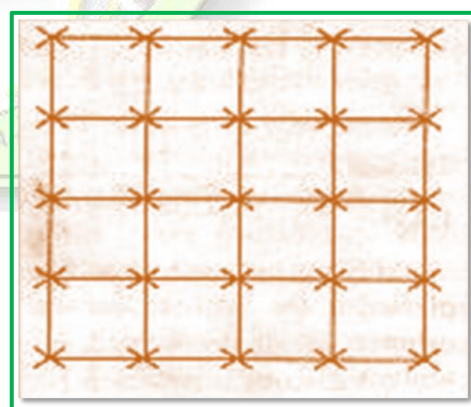

Fig 1.1: Square System of Planting

2. Quincunx or diagonal planting: This planting is exactly like the square system but one additional tree is planted in the centre of each square (Fig.1.2). The number of plants per acre by its this system is almost doubled than the square system. The central tree is usually the filler which is kept for a short period or till the main trees develop to full canopy size. This provides an additional income to the grower. If the

main trees become crowded, the middle tree can be headed back after few years and finally removed.

Calculations: Calculation of number of different fruit crops per hectare with different system of planting by using the following formulae:

i.   Square and rectangular systems:

No. Of plants required for 1 ha = $\dfrac{10,000 \text{ sq. m}}{\text{Row to row distance (m) x plant to plant distance (m)}}$

ii.   Hexagonal system:

No. Of plants required for 1 ha = $\dfrac{10,000 \text{ sq. m}}{1/2 \times \text{plant to plant distance (m) x distance between two rows(m)}}$

Where, distance between two rows is; $\sqrt{3}/4$ x plant to plant distance (m)

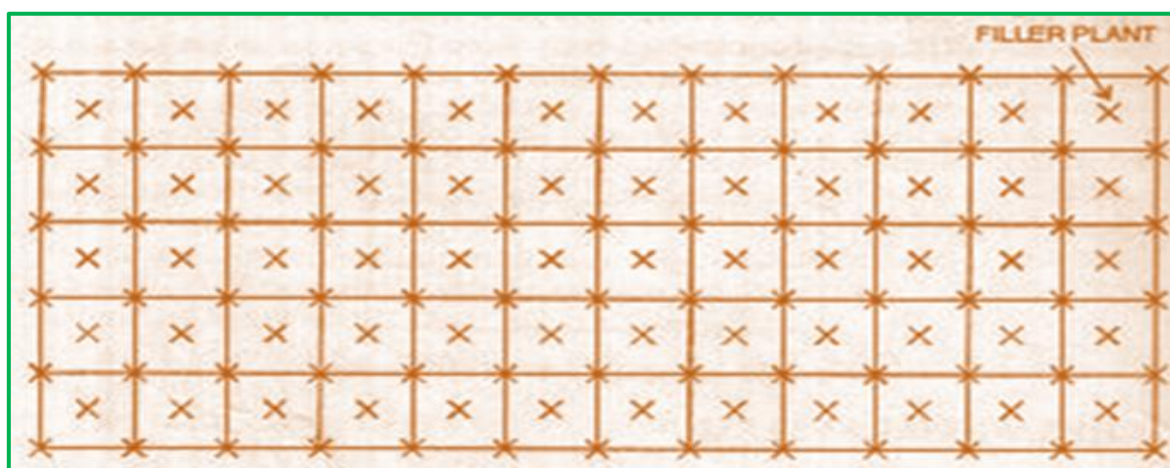iii.   Quincux system: In this case the number of plants become doubles that of square system.

Fig 1.2: Quincunx System of Planting

3. Hexagonal planting: In this system, the trees are planted in the corners of equilateral triangles (Fig.2.1). Six trees thus form a hexagon with another tree at its centre. As a seventh tree is accommodated in the centre of hexagon, this system is also called as 'septule'. This system, though a little difficult for execution but accommodates 15 percent more plants. The limitations of this system are that it is difficult to layout and the cultivation is not so easily done as in the square system. This system is generally followed where the land is costly and very fertile with ample provision of irrigation water. For laying out the plot, a base line is drawn in one side as in the square system. Then an equilateral triangle having rings at each corner and with sides equal to the lengths of the required distance is made of heavy wire or chain. Two of these rings are then placed on the stakes of the base line and the position of third ring indicated the position of a tree in the second row. This row is then used as the base line and pegs are set in the third row. In this way entire plot is laid out.
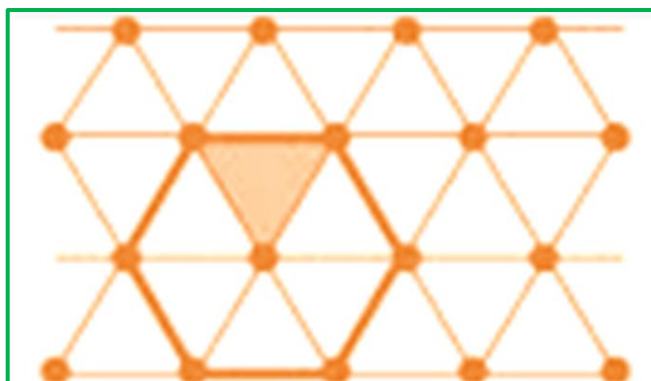

Fig 2.1: Hexagonal system of planting.

Advantage:
- Accommodates 15 % more plants than square system.
- Plants are planted at the corner of equilateral triangle.
- Six trees are planted making a hexagon.
- If seventh tree is planted in the centre called septule.
- This requires fertile land.

Disadvantage: Lay out is difficult and cumbersome.

4. Rectangular planting: In this planting 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 (Fig. 2.2). 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:

* Lay out in rectangular shape.
* More space between row and row.
* Inter-cultural operations in both the ways.
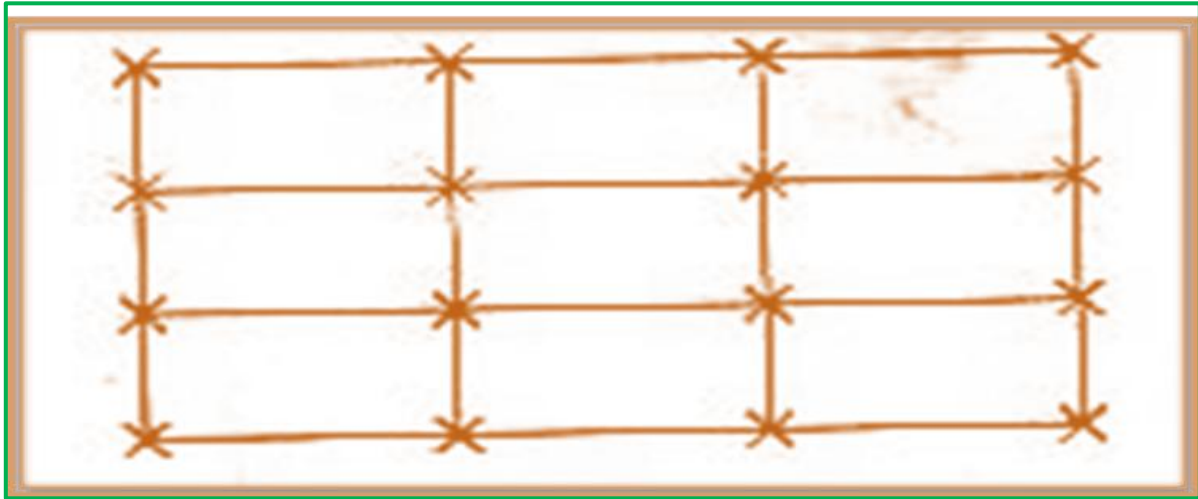* Plants get proper space and sunlight.

Fig 2.2: Rectangular system of planting.

5. Equilateral triangular planting: In this planting 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 (Fig. 2.3). This system provides more open space for the trees and for intercrop.
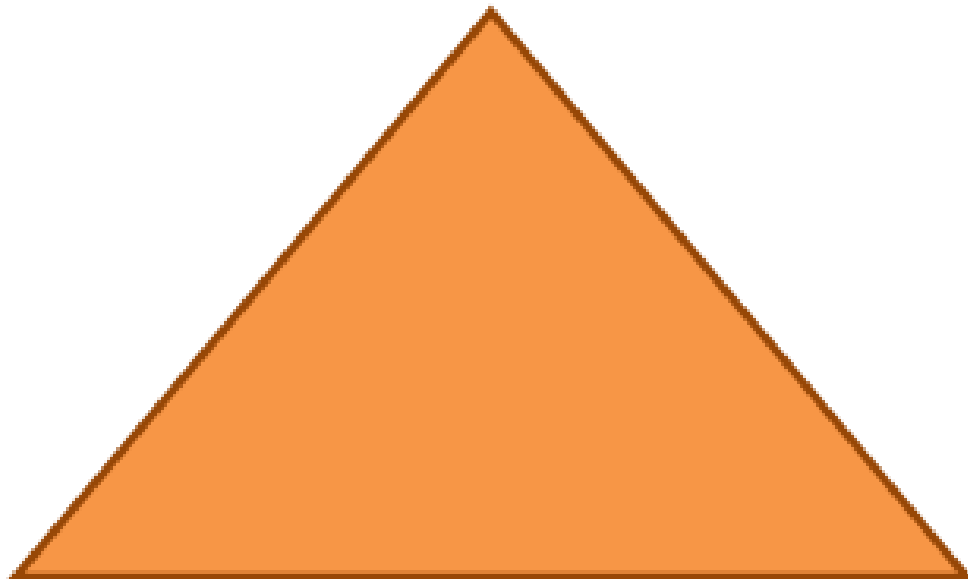

Fig 2.3: Triangular system of planting.