

Laying out of orchards

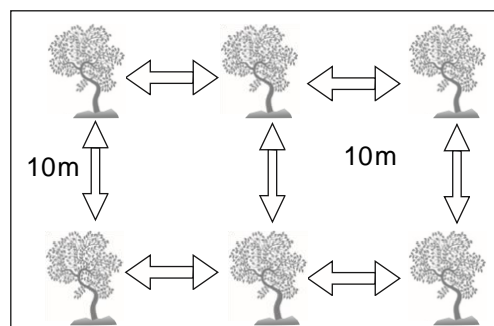
Any method of layout should aim at providing maximum number of trees per hectare, adequate space for proper development of the trees and ensuring convenience in orchard cultural practices. The system of layout can be grouped under two broad categories viz. (a) vertical row planting pattern and (b) alternate row planting pattern. In the former planting pattern (e.g. square system, rectangular system), the trees set in a row is exactly perpendicular to those trees set in their adjacent rows. In the latter planting pattern (i.e. Hexagonal, Quincunx and 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.

Planting Methods

Among the prevalent systems of layout, Square, Rectangular, Quincunx, Hexagonal and Contour are practiced. However, for high density planting single hedge row system (Rectangular method) or double hedge row system can be adopted. For normal orcharding square system is very much common.

(i) Square Planting

In this method, the orchard space is divided into squares and the trees are planted at the four corners of the square, in straight rows running at right angles. It is easy to layout. All cultural operations in the orchard can be carried out in either direction.



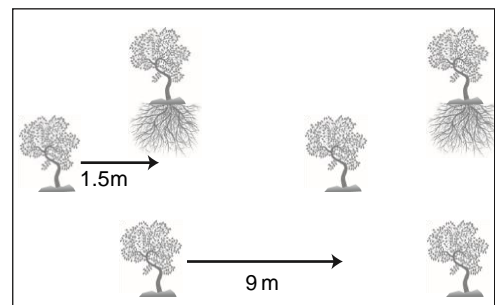
(ii) Rectangular Planting

In this case, planting trees are set out in straight rows that line up at right angles to one another with spacing between them in a row somewhat less than that between rows forming a rectangle (plant row). Like square

planting, this is easy to layout and manage with respect to cultural and harvesting operations. This layout is often adopted for high density planting system in single or double hedge row methods. The advantage of a rectangular pattern over a square pattern is that, by removing alternate trees in every row, additional width is obtained in the drive row when fillers are removed. This can only be accomplished, when the in-row spacing is greater than half the between-row-spacing. Such a plan allows for more space for the trees as they mature and also adequate space for power driven equipment (tractor / harvester).

(iii) Quincunx (Five Spot)

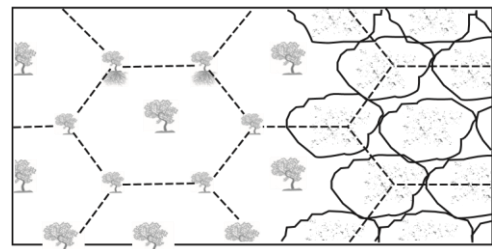
In this, planting is done in the same way as in the square or rectangular pattern except that a fifth tree is set in the centre of the square or rectangle. The central tree is usually the filler which is kept for



a short period or till the main trees develop to full canopy size. Alternatively, this space can be utilized for growing perennial short statured plants. If the main trees become crowded, the middle tree can be headed back after few years and finally removed. This arrangement permits more plants than the main square or rectangular pattern.

(iv) Hexagonal

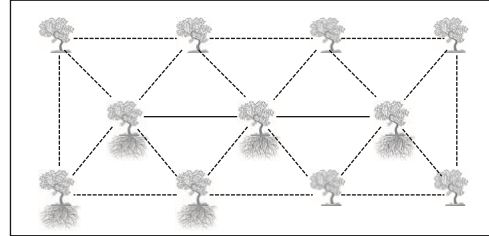
A pattern in which plants in alternate rows are spaced in the form of an equilateral triangle. This allows



maximum use of the land with about 15% more plants per unit area, compared with a square pattern of the same dimensions. This is widely used where the land is expensive and fertile.

(v) Triangular Planting

A pattern in which plants in alternate rows offset half the space between plants in a row. The distance between the rows is the same or more than that in a row. Thus a series of iso-scales triangles (two sides equal, instead of three as in an equilateral triangle) are formed.



This is easier to layout than the hexagonal pattern but results in 9% fewer plants than the equivalent square or rectangle.

(vi) Single Hedge Row Planting

The distance between trees in a row is usually one half one-third the distance between rows. This is practiced only for high density plantings. The yield potential



and longevity of the orchards under hedge row system are yet to be ascertained. Initial results have shown that such plantings are more remunerative during early fruiting years.

(vii) Double Hedge Row System

This arrangement is used for better use of the land during the early years of tree growth but does necessitate removal of the extra plants to keep them in bounds when they begin to crowd. After removal of the trees, the planting will become a square or rectangular one with original spacing. In double hedge row system, the additional row of the same crop and variety is permitted whereas; in hexagonal or triangular system other plants can be adjusted. The pattern in

this system is consists of two closely spaced rows with a wide middle between the rows.

(viii) Contour Planting

The contour planting is used on rolling slopes or hillsides where some terracing may be needed. This planting arrangement permits production from sloppy waste land that otherwise could not be utilized. Considerable care must be taken to stop erosion by heavy rains or by irrigation by diverting the water to run among the tree rows rather than straight down slope. Any of the regular patterns described above can be used for planting trees on the sloping terrain. If the gradient of the slope is high, terraces are constructed following the natural contour as much as possible. The edges of the terraces are slightly higher than the side against the hill so that the irrigation water remains in the terraces. Drip irrigation and sod culture greatly minimize the problem of soil erosion. While planting the trees, marking for the tree points is from lowest level to the top is needed. Rows or group of rows are laid out along the contour.

Planting distance

The minimum vertical distance between any two trees or plants is referred as the planting distance and this varies depending upon many factors. The principles in deciding the planting distances are the following.

1. Trees when fully grown, the fringes of trees should touch each other but the branches should not interlock.
2. Trees root will spread over a much larger area than top and there should be proper room for the roots to feed without competition.

Factors which decide the planting distance are the following.

1. Kind of fruit trees - mangoes are planted at a distance of 10m x 10m, guavas at a distance of 5m x 5m while papayas are planted at a distance of 2m x 2m.
2. Rainfall - wider spacing should be given in low rainfall areas than the high rainfall areas for a kind of tree.
3. Soil type and soil fertility - in heavy soils less spacing should be given because the top and root growth are limited.
4. Rootstocks - trees of the same variety grafted on different root stocks will grow to different sizes and as such require different planting distances. eg. Apple
5. Pruning and training - trees trained on head system requires closer spacing than the other type of training system.
6. Irrigation system

In general, if the spacing is too wide, it is obvious that the yield per unit area would be greatly reduced. Only in very, exceptional cases would this be justifiable. Ordinarily it is more profitable to plant the trees closer together and supply the needed water and food materials. If the trees are too close together, the trees grow tall rendering pruning, spraying and harvesting difficult. There is root competition and inadequate nutrition and the trees as such give less yield and produce smaller fruits of poor colour. Cultivation also becomes difficult in the closely planted orchards. Close planting results in a greater yield per unit area in the early life of the tree but less in the more important later years. Close planting is therefore a false economy.

The total number of trees per hectare for various important horticultural crops under a) square b) hexagonal and c) triangular system of planting are given below:

Crop	Plant distance	Number of plants/ha		
		Square system	Hexagonal system	Triangular system
Mango	10*10	100	115	89
Sapota	8*8	156	189	139
Acid lime	5*5	400	461	357
Coconut	7.5*7.5	177	205	159