

Scientific ways of new orchard plantation

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An orchard is a long-time venture and mistakes committed at the initial stages of orchard establishment are very difficult to correct at later phases as they cause an unbearable loss to the growers. Orchardist can prevent many risks through adopting appropriate orchard establishment practices like soil and climate, planning, site selection, provision of irrigation channels, paths and roads, buildings and plantation at suitable spacing, and procurement of healthy nursery plants. It is necessary to know the scientific background and behaviour of the fruit plant and their adaptability to a wide range of climatic condition. The main aim of this article is to minimize the losses for new growers who want to plan a new orchard plantation and their care and maintenance.

Keywords: Orchard plantation, Layout, Planning, Training and pruning

ALTHOUGH many fruit trees are adaptable to a wide range of agro-climatic conditions, it does not mean that commercial fruit growing will succeed everywhere. Therefore, it is necessary to follow some guidelines before planting an orchard.

Soil and climate

Soil for an orchard should be well drained, loamy, fertile and free from hard pan up to the depth of two meters. The water-table should be below three metres and not fluctuating. Waterlogged, marshy and salt affected soils should be avoided for fruit growing. Before the plantation of an orchard, it is necessary to check the nutritional status and other conditions of the sub-soil and water so that fruit trees can be selected accordingly.

Fruit plants are widely grown in different range of climatic conditions. In higher hills of Himachal Pradesh and Jammu and Kashmir, having 900 to 1,000 chilling hours which is most suitable for deciduous fruits plants like Apple, Soft pear, Peach, Plum, Apricot, Cherry, Kiwi etc. Under lower hills and sub-mountain zone, we

can grow low chill (150-250 chilling hours) cultivars of Pear, Peach, Plum, Citrus, Guava, Mango, Pear (Hard and Semi soft cultivars), litchi, Grapes etc. Whereas, Amla, Ber, Pomegranate, Date are mostly suitable for Semi arid and Arid zone of India.

Layout and Planting system for fruit trees

Layout is helpful for a systematic distribution of fruit plants, which makes it easy to supervise an orchard and accommodate maximum number of plants per hectare with sufficient available space for proper tree growth and development. Similarly, orchard operations viz. weeding, irrigation, spraying, manure and fertilization;

intercropping and harvesting also can be performed easily. A complete sketch of the orchard should be drawn on paper before execution of the final layout in the field.

PLANTING SYSTEMS

Square system

In Punjab, farmers commonly follow the square system of planting to establish an orchard. In this system, the distance from plant-to-plant within a row and row-to-row is the same. Plants are planted at right angle to each other and every unit of four plants forms a square. The intercultural operations in the orchard are carried out in both directions. In young and non-bearing orchards,

Table 1. Spacing in fruit plants under square system

Fruit Plant	Spacing (m)	Number of plants/acre
Mango/Sapota	9.0 × 9.0	49
Litchi/Sand Pear/Ber/Amla	7.5 × 7.5	72
Peach/Loquat	6.5 × 6.5	90
Citrus/Soft Pear/Guava/Plum/Fig/Kinnow	6.0 × 6.0	110
Pomegranate Kandhari/Ganesh	4.0 × 4.0/3.0 × 3.0	240/440
Grapes (Bower system)	3.0 × 3.0	440
Banana	1.8 × 1.8	1,230
Papaya/Phalsa	1.5 × 1.5	1,760

intercropping up to 3-6 years (depending upon the type of fruit plant) preferably of leguminous crops like moong, mash, cowpea, gram, peas, lentil, etc. and vegetables like onion, tomato, radish, beans, cauliflowers, cabbage, leafy vegetables etc. can be done in the vacant space between the rows to generate additional income and to improve the soil physico-chemical characteristics (Table 1).

Rectangular system

The rectangular system is useful for intensive or high density plantations. Trees are planted along parallel rows running at right angle; the distance from plant-to-plant within a row is less than the distance between the rows. The cultivation of intercrops and cultural operations are carried out only between the rows. This system has advantage over the square system as space between the rows can be utilized properly. Kinnow mandarin is recommended at high density plantation (6×3 m), however, every alternate plant within the row should be uprooted to widen the distance (6×6 m) after 15 years of the tree age (Table 2).

Quincunx or diagonal system

In Quincunx or diagonal system, the field is laid out similar to the square system. Then, rope is stretched through the diagonal points of the squares and additional wooden pegs are fixed at the points where diagonals cross each other for planting fillers. By and large, pear, mango, litchi and sapota fruit crops are planted at a distance of more than 7 m. These types of fruit plants have long juvenile or gestation period i.e. takes nearly 6-9 years to come into commercial bearing. Under such conditions, filler fruit plants like

papaya, Kinnow, phalsa, guava, peach, plum etc. are planted in between the permanent trees and system of plantation is known as Quincunx or Diagonal or Filler system. These filler plants are precocious, of short duration and should be removed after few years when the main fruit crop comes into commercial bearing. It gives an additional income to the growers during the juvenile period of the main orchard.

Method of layout

For laying out an orchard with the square or rectangular system, select a baseline just parallel to an adjacent orchard, path or *pucca* bund. This should be drawn at half the distance of the recommended spacing for a fruit crop e.g. pear is planted at 7.5×7.5 m and a baseline is drawn at a distance of 3.75 m from the boundary of the field. At least three points should be marked at a proper distance from the boundary with wooden sticks or ranging rods. Stretch the rope across the field along one side of the ranging rods. This represents the first row as well as the baseline. Now, stretch the measuring tape along this row and fix wooden pegs to locate the position of the trees. Another row or a baseline at a right angle towards the end of the first baseline should be drawn after leaving a gap of half the spacing from boundary with the help of carpenter square or cross-staff.

The right angle can also be drawn by the Pythagoras theorem method, where right angled triangle is drawn with the sides and hypotenuse in the proportions of 3:4:5 (Fig 1). One end of the measuring tape should be fixed at 3 m distance along with the first row and then stretch the tape along the second row for a distance of 4 m. The right angle of the row is established when diagonal distance between these two points is exactly 5 m. Similarly, made the right angle at the other end of the baseline where the last wooden peg is fixed. Then, the position of the rows towards either side of the boundary are marked by taking tree spacing along these right angled rows to the baseline and wooden pegs is fixed to mark the location of trees. Stretch the

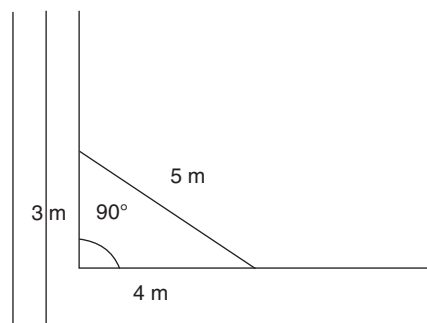


Fig. 1. Method of layout

rope across the corresponding points to get the position of the plants on each row and finally fix the wooden pegs in these positions. Spacing between rows and plants can be adjusted on the basis of type of planting system to be followed for the establishment of an orchard.

Digging and filling of Pits

The orchard site should be properly laid out by keeping roads, water channels and paths within the orchard before planting. The land should be properly cleaned and levelled with the help of Laser Land Leveller well in advance to save the irrigation water and restrict soil-borne diseases. One metre deep and one metre wide round pits should be dug for each plant. Refill the pits with a mixture of top-soil and farmyard manure in equal parts. To each pit, add 15 ml of Chlorpyrifos (20 EC) mixed in about 2 kg soil against white ants. The refilled pits should be watered a few days before planting the trees.

Selection of Nursery Plants

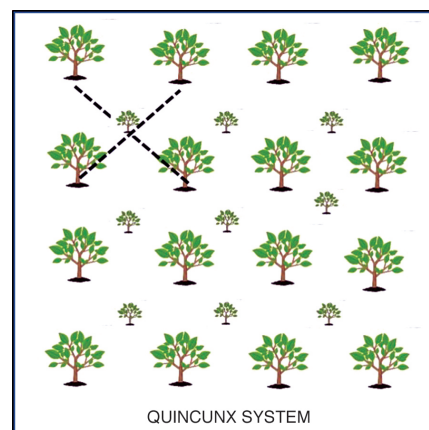
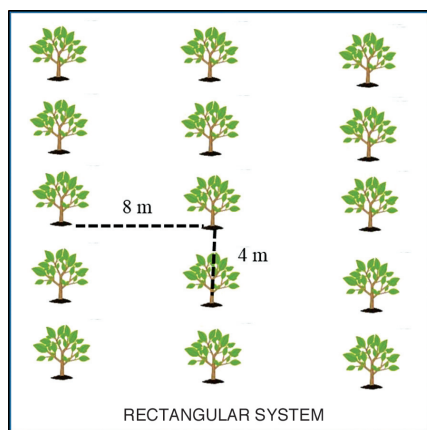
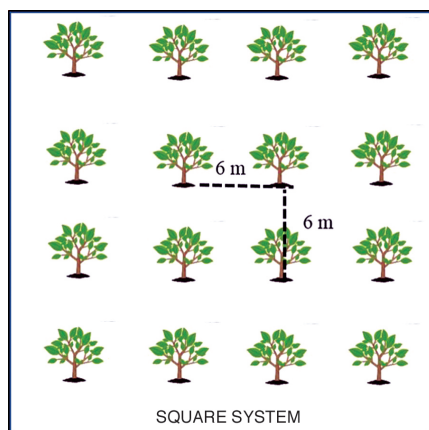
Healthy fruit plants free from diseases and insect-pests and of known pedigree should be obtained from reliable nursery and preferably near the orchard site. The plants should be of medium height budded or grafted on the recommended rootstock. The bud union should be smooth. Evergreen plants should be lifted with well-sized earthen balls whereas deciduous plants should be taken out with major part of the root system intact. Tying material should be removed from the bud/ graft union before transplanting.

Windbreaks and Hedges

A good windbreak should be

Table 2. Spacing in fruit plants under the rectangular system

Fruit Plant	Spacing (m)	Number of plants/acre
Grapes (Y-Trellies system)	4.0×1.5	660
Peach/Plum	6.0×1.5	440
Kinnow	6.0×3.0	220
Guava	6.0×5.0	132
Patharnakh	8.0×4.0	120



provided on the windward side of the orchard well before the orchard is established. Eucalyptus, Arjuna, Jamun, seedling Mango, Mulberry etc. are good windbreak plants. In the spaces between windbreak trees, a hedge of Bougainvillea, Jatti Khatti, Galgal, Karonda, etc. may also be planted. Hedges of citrus species should not be planted around a citrus orchard.

Suitable planting time

- Evergreen fruit plants: There are two planting times for evergreen fruit plants, viz. February-March and September-October. Planting of Citrus, Mango and Litchi should preferably be done during September-October.
- Deciduous fruit plants: These are planted in a dormant stage preferably during December-mid January before the start of new growth e.g. Peach and Plum. However, Grapes and Pear can be transplanted upto mid-February, before the emergence of new sprouts.

Irrigation methods

A proper irrigation system must be planned to obtain uniform water distribution. The main water channel should be made at a right angle along with the higher level of the field. The length of sub-water channels will depend upon the type and gradient of soil. Do not make long water because it reduces irrigation efficiency. Among the various irrigation methods, drip irrigation system has great potential to use irrigation water judiciously and efficiently along with improvement in the yield. Drip system supplies water in the near

vicinity of the roots of the plants through devices called drippers/emitters @ 2-10 litres per hour at low pressure (0.20-1.5 kg/cm²) to meet daily crop consumptive use. Sometimes in place of drippers, micro-sprinklers are used which supply water @ 20 to 40 litres per hour depending upon the nozzle size and the working pressure. Field surveys show that drip systems allow irrigation of 50-200% additional area enabling it to give additional produce.

Planting and Care of Young Plants

Bore holes of suitable size in the centre of the filled pits with the help of planting board. The tree should be planted in these marked holes in such a way that bud union remains about 9 inches above the ground level. Soil around the plants should be pressed firmly with feet followed by a light irrigation. After irrigation, if the plant is tilted, it should be stalked at *vattar* condition. After planting, provide supports to the plants. Remove dead and diseased portions by careful pruning. Provide adequate protection against vagaries of summer and winter season. Keep examining the young plants regularly and remove stock sprouts.

Training and pruning

Fruit trees may be pruned at any time, but it is better to avoid those periods when trees are in active growth. The best time for pruning the bearing trees is after the harvest of the fruits during late winter or early spring. Deciduous and Evergreen fruit plants: End December and January till new growth emergence such as. Apple, Pear, Peach, plum Grape, Citrus

(mandarins, Sweet oranges and lime and lemons). Ber : Second fortnight of May and fourth week of April in variety 'Sanur-2' to get better yield of high quality fruit, pruning of such branches is necessary to open up the tree for proper ventilation and provide more chances for inner wood to bear fruit. Removal of dead and dried wood is necessary to check the spread of diseases. The main objective of training in fruit trees:

- To provide a strong framework and branches suitable for bearing a heavy remunerative crop without breakage of the branches.
- The flowers and fruits are borne on the current season's growth/one year old growth so, that may prove useful to encourage new shoots after the harvest.
- Dead, diseased, inter-crossing branches and suckers coming up from the base and sides of the framework should also be pruned back annually

The plantation of orchard requires technical skills for better growth and development of fruit trees especially related to site selection, layout, and management of orchard till harvesting. This technical support is provided by different extension functionaries like Krishi Vigyan Kendra's, Regional Research Stations (RRS) and the State Department of Horticulture for various services from time to time. In the end, we hope that the farmers can play a pivotal role in diversification by following above guidelines and lime light for other farmers.

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