

PRINCIPLES OF ORCHARD ESTABLISHMENT



An **orchard** is an intentional plantation of trees or shrubs that is maintained for food production.

SITE AND LOCATION OF THE ORCHARD

- Topography of soil.
- Proper climate
- Location of site
- availability of trained labor and inputs
- Water source
- transport facility
- Market survey

PRELIMINARY OPERATIONS

- ❖ Removal of existing vegetation and uprooting of stumps
- ❖ Proper cleaning of the land before the layout.
- ❖ A deep cultivation & laser leveling required for virgin land.
- ❖ Irrigation system, permanent water channels and paths should be prepared.
- ❖ Growing of green manuring crops Sunhemp, Dhaincha, Cluster bean, Cowpea, Khesari, Berseem, Green Gram





COMPACT MODEL DISC HARROW

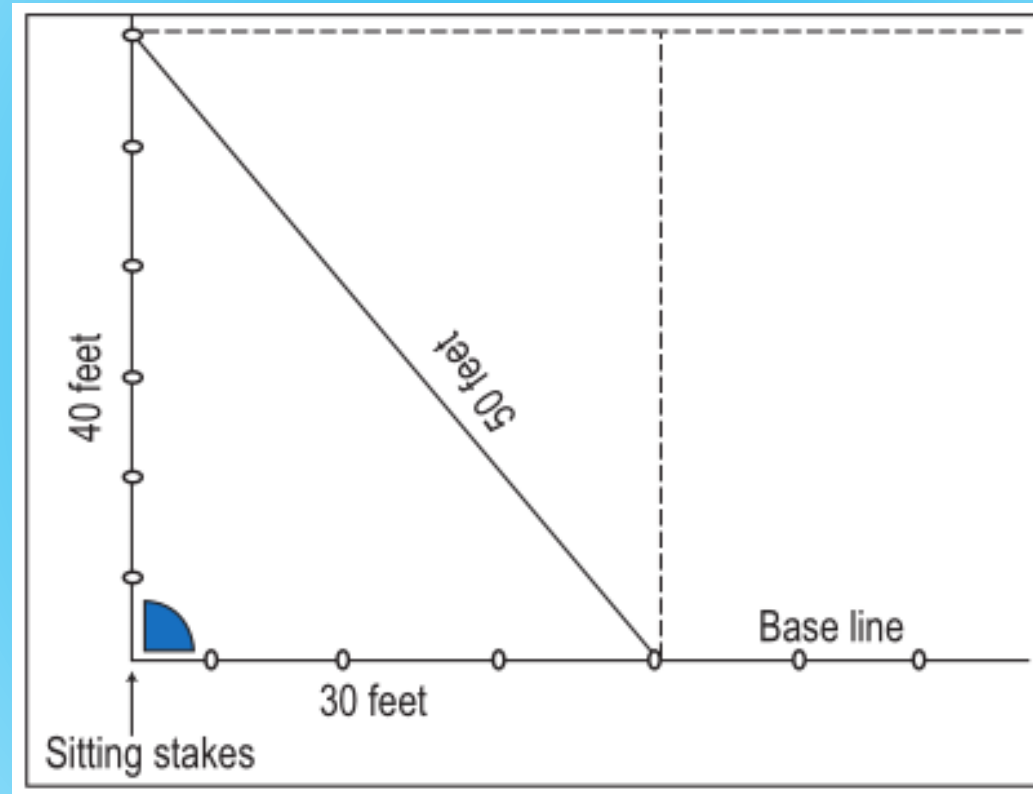


LASER LEVELLER

SOIL RECLAMATION

- If the soil analysis show the lower pH than required (5.6-6.0), **lime** should be applied
- If there is magnesium deficiency, **dolomite** should be used to improve the soil pH.
- If the soil is very acidic, heavy lime applications may be necessary. Two-third of the recommended quantity of lime must be scattered over the planting area, mixed with the top soil and then ploughed as deep as possible, at least 9 to 12 months before planting.
- Calcium (lime) moves very slowly downwards into the soil and must therefore be applied into the depth of the root zone.
- If a lighter lime application (2-4 t/ha) is required, the lime can be applied into the soil at least three months before planting.

LAY OUT OF ORCHARD



FENCING

- To protect the trees of the orchard from frequent visits of wild and stray animals, and to prevent stealing of fruits and other orchard properly, some kind of fence is highly necessary. This may be made by
- erecting mud walls (against big animals)
- high brick walls with tops lined with glass pieces (permanent)
- barbed wire fencing (best one)

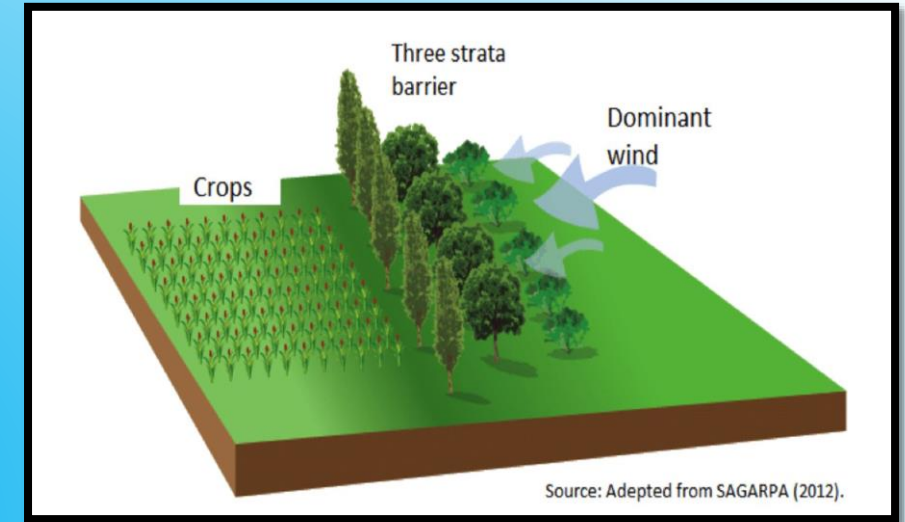


The **live hedge** must have the following qualities:

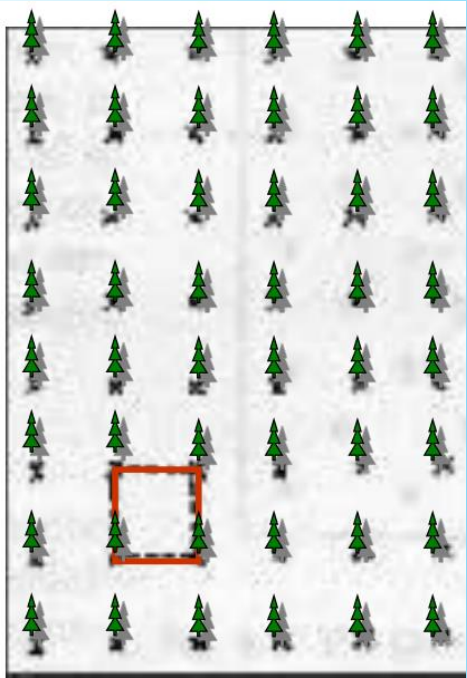
- (a) It should be quick growing
 - (b) Easy to raise by seeds or cuttings of vegetative parts
 - (c) Should be drought resistant
 - (d) Should have dense foliage
 - (e) Should preferably be thorny
 - (f) Should stand pruning to develop thick and compact growth
- *Inga dulcis*, *Carissa carandas*, *Casuarina equisetifolia*, *Duranta plumeri*, *Sesbania aegyptiaca*, *Acacia sp.*, *Zizyphus sp.*, *Lawsonia alba*, *Gliricidia*, *Bahunia sp.*, *Polyalthia longifolia*, etc.
 - To establish a live hedge, the soil along the fence is dug 2 feet wide and 2 feet deep at the commencement of the rainy season. After sowing the seeds or planting the cutting along the boundary of the orchard, the plants are allowed to grow.

WINDBREAKS

- Reduces the velocity of wind
- Checks evaporation loss of soil moisture prevents cold wind
- Reduces frost damage to a great extent.
- The first row of fruit trees should be about away from the windbreak row.
- *Polyalihia longifolla*, *Casurina equisdilfolla*, *Erythrlna indica*, *Eucalyptus globules*, *Grevillia robusta*, *Dalbergia sissoo*, *Putranjiva roxburghii*, *Syzygium sp.*, *Mangsfera indica*, *Averrhoa carambola*, *Bambusa sp.*, etc.



PLANTING SYSTEMS



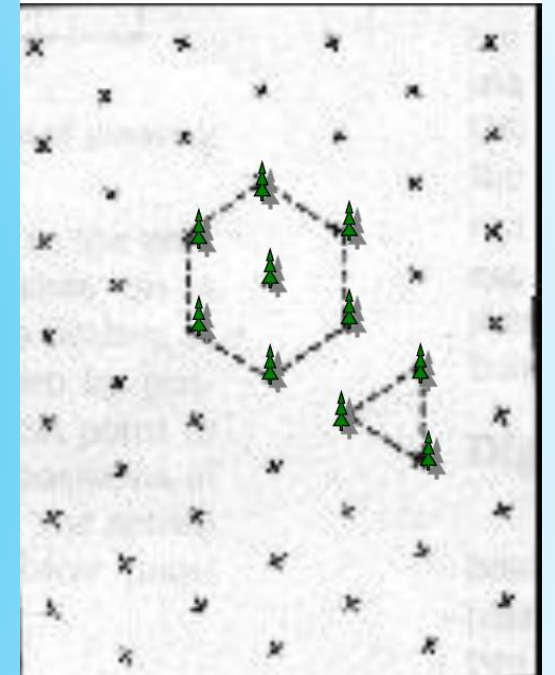
SQUARE SYSTEM



QUINCUNX SYSTEM



RECTANGULAR SYSTEM



HEXAGONAL SYSTEM

Importance of planting system

- Allow easy orchard operations like cultivation, intercropping, irrigation, spraying of plant protection chemicals and growth regulators, harvesting etc.
- Proper utilization of orchard space
- Proper supervision of the orchard.



CONTOUR PLANTING SYSTEM

Crop	Planting distance (in m)	No. of trees per hectare		
		Square system	Hexagonal system	Triangular system
Mango	10 x 10	100	115	89
Sapota	8 x 8	156	118	139
Acid lime	5 x 5	400	461	357



Double hedge row planting system in pineapple
90 cm x 60 cm x 30 cm

CROPPING SYSTEM



PLANTING DISTANCE

- To provide adequate space to the plant for normal development
- To permit proper intercultural operation
- easy passage of air and sunlight
- proper maintenance or orchard sanitation.

Planting distance depends on

- ✓ Nature of soil,
- ✓ Type of plant (whether grafted or seedling)
- ✓ Variety

Fruit	Planting distance (meter)	Plants/ha (Square system)
Tropical Fruits		
Banana (i) Tall varieties	2.7×3.0	1210
Banana (ii) Dwarf varieties	1.8×1.8	3052
Cashewnut	7-8	202-140
Custard apple	5	390
Guava	5-7	350-330
Jaman	10-12	105-75
Mango	8-10	130-120
Papaya	1.5	4400
Pineapple	$30 \times 60 \times 90$ cm	43500
Sapota	7-9	120-180
Sub-Tropical Fruits		
Avocado	10	105
Ber	7-9	180-120
Citrus, pomegranate	5-7	285-275
Date palm	6-7	275-202
Falsa	1.5	4400
Grapes (i) Head system	2×1.5	3300
Grapes (ii) Kniffin system	3×3	1100
Grapes (iii) Bower system	3×6	550
Litchi	7-9	180-120
Loquat	6-7	535-525
Pomegranate	5-7	285-275
Temperate Fruits		
Apple	3-7.5	1100-180
Cherry	9-12	123-75
Peach	6-7	535-525
Pear	7.5	180
Plum, apricot	5-7	285-275

HIGH DENSITY PLANTING

- Planting of more number of plants than optimum through manipulation of tree size.
- Pioneered for temperate fruits in Europe at the end of 1960.
- In India -Pineapple, banana, mango, apple and citrus

Advantages of HDP

- Induces precocity, increases yield and improves fruit quality.
- Reduces labor cost resulting in low cost of production.
- Enables the mechanization of fruit crop production.
- Facilitates more efficient use of fertilizers, water, solar radiation, fungicides, weedicides and pesticides.

Constraints in HDP

- Lack of standardization of production technology and extension of technical-know how to the farmers.
- High initial establishment cost.
- Lack of promising dwarfing rootstock in mango, guava, sapota, peach, sweet cherry etc.
- High incidence of some diseases in HDP





Planting distance: 2.0 x 1.0m



Heading back at height of 30 to 40 cm



New growths after pruning



Growth after 2nd pruning



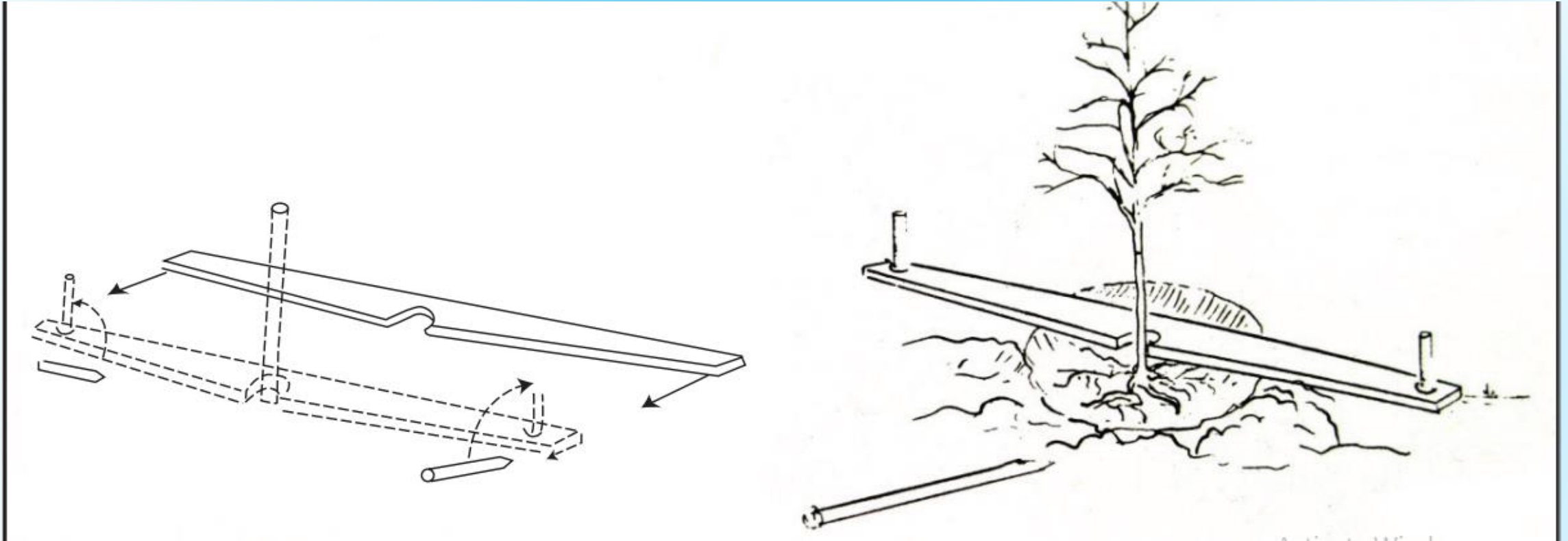
Growth after 3rd pruning



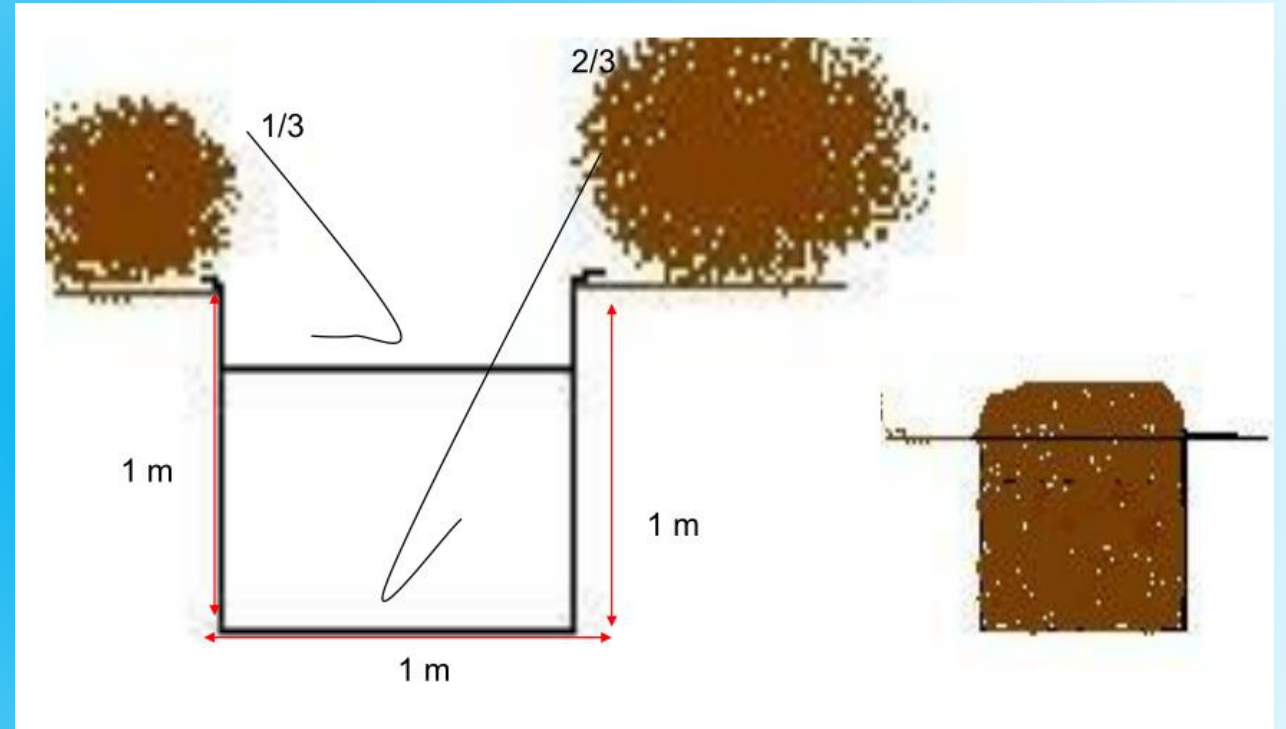
Flowering after 3rd pruning

Ultra High Density Planting (UHDP) in guava at 2m x 1m spacing

DIGGING OF PIT



- Before digging the pits, two outer pegs are fixed with the help of planting board.
- Already fixed peg is kept in the central notch to mark the right point to plant each tree.
- During digging of actual pit, the central peg is removed and 2 outer pegs remain undisturbed.
- These outer pegs help in locating the point where the plant is to be put in.





Digging of pits with manually and by using posthole digger (up),
spray of fungicide/insecticide and
exposure to sunlight (down)

FILLING OF PITS

- Keep the soil from upper half on one side and from lower half on other side.
- Allowed to weather for 2-4 weeks for disinfection by sunlight.
- Mix a mixture of well - decomposed FYM (50 kg), superphosphate (100 gm) and chloropyriphos (10 ml/10 litre water) in upper as well as lower soil of the pit.
- Press the soil well to remove air pockets inside the pit.
- Upper level of pit is kept 15cm above from the field level.
- After filling, irrigate the pits to settle down the soil.

PLANTING

Time of planting

- Ever green plants- rainy season (July to August) and if irrigation facilities are available the even in spring season (February to March) in North India.
- Plant in **evening** when the high humidity prevails in the atmosphere.
- Deciduous plants -Winter season (December – February).
- Irrigate just after planting.



Plantation and staking of newly planted crop



PROTECTION OF YOUNG PLANTS

- Provide staking
- Save the plants from frost by covering them
- Cover on all sides except North-West and South- East so that the sunlight may enter in morning and evening times.
- Thatching -dried grasses or of polyethylene sheet. Used in winter months (frost) and in summer (hot winds)
- Irrigate frequently (at 7days interval) in hot weather
- Regular weeding of plant basin
- White washing the stems, paper/gunny bag wrapping, Biofencing.



White latex paint and straw thatch to protects young plants from sunburn damage



Mulching in young fruit plant



Fig. 5.7. Orchard floor management system of weed-free berms and cultivated middles.



Fig. 5.8. Weed-free berms with a cover crop maintained between the rows is another semi-noncultivation system variation.

