

**PRACTICAL MANUAL**

# **TEMPERATE FRUIT CROPS**

Course No. HFS 201 Credit Hrs. 2(1+1)

For Undergraduate Horticulture Students

**Dr. Ranjit Pal  
Dr. Anjana Kholia**



2020

**College of Horticulture & Forestry  
Rani Lakshmi Bai Central Agricultural University  
Jhansi - 284003**

## SYLLABUS

**Practical:** Nursery management practices, description and identification of varieties of above crops, manuring and fertilization, planting systems, preparation and use of growth regulators, training and pruning in apple, pear, plum, peach and nut crops. Visit to private orchards to diagnose maladies. Working out economics for apple, pear, plum and peach.

Name of Student: .....

Roll No. .... Batch .....

Session .....Semester .....

Course Name: .....

Course No: .....

Credit: .....

## CERTIFICATE

This is to certify that Shri/Km .....

ID No ..... has completed the practical course  
..... Course No ..... as per the syllabus of  
B. Sc (Hons) Agriculture/Horticulture .....  
semester in the year ..... in the respective lab/field of college.

Date:

Course Teacher

## INDEX

S. No.	Date	Exercise	Page No.
1		Identification of temperate fruits and Nuts	
2		Preparation of seed and nursery beds	
3		Propagation of temperate fruits – Rootstock propagation	
4		Propagation of scion cultivars and Nursery management	
5		Identification and description of varieties of apple and pear	
6		Identification and description of varieties of stone fruits	
7		Identification and description of varieties of strawberry and persimmon	
8		Identification and description of varieties of nut crops	
9		Identification and description of varieties of kiwifruit	
10		Prepare Layout of different planting systems of orchard	
11		Training and pruning of pome (apple and pear) fruit trees	
12		Training and pruning of stone fruits	
13		Training and pruning of kiwifruit	
14		Preparation and uses of plant growth regulators in temperate fruits	
15		Manuring and fertilizer application of temperate fruit crops	
16		Production economics for commercial cultivation of temperate fruit crops	
17		Visit to commercial orchards to diagnose nutrient deficiency and other maladies	

**Exercise No. 1**

**Objective: Identification of temperate fruits and Nuts**

<b>S. No</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Family</b>	<b>Types of Fruit</b>	<b>Edible part</b>	<b>Bearing habit</b>
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						

**Exercise No. 2**

**Objective: Preparation of seed and nursery beds**

**Materials required:** .....

**Seed**                      **bed**                                      **preparation**                                      **procedure:**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**Nursery beds preparation procedure:** .....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**Assignment:** Practices different steps of seed and nursery beds

**Exercise No. 3**

**Objective:** Propagation of temperate fruits – Rootstock propagation

**Materials required:** .....

**Rootstock propagation procedure:** .....

**Assignment:** Practices different steps of rootstock propagation.

**Objective: Propagation of scion cultivars and Nursery management**

**Materials required:** .....

.....

**Procedure:** .....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**Assignment:** Practices different steps of propagation of scion cultivars



















**Objective: Prepare Layout of Different Planting Systems of Orchard**

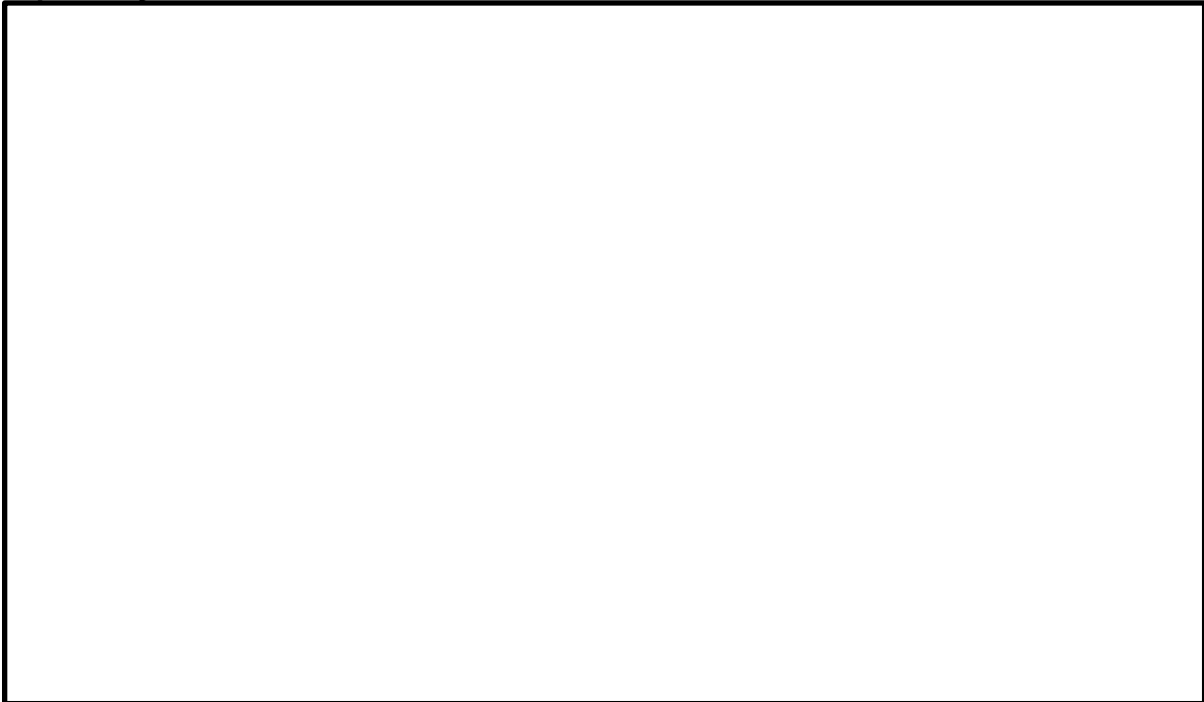
**Materials Required:** .....

.....

.....

**Planting system: Vertical row planting pattern**

**1. Square System:**



**2. Rectangular system:**

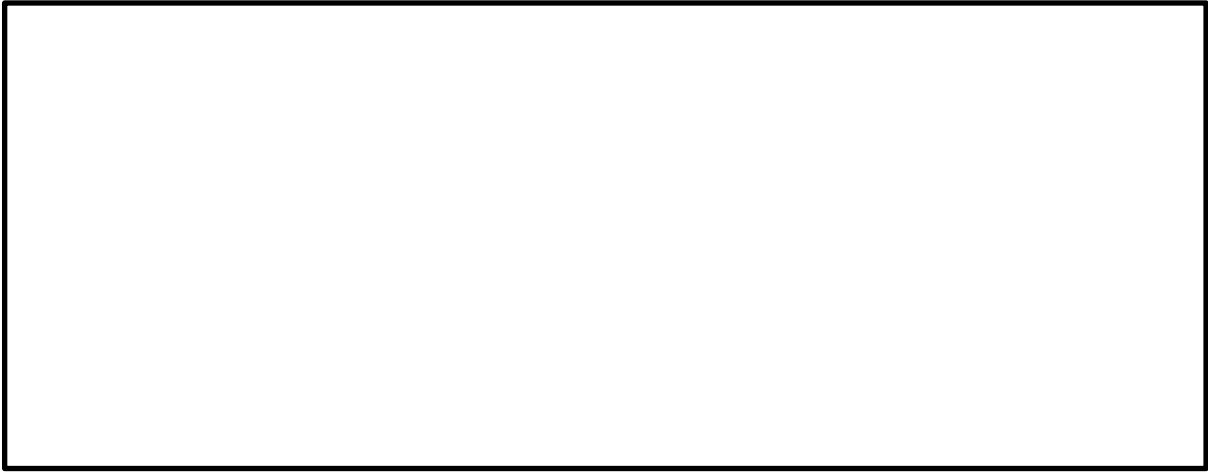




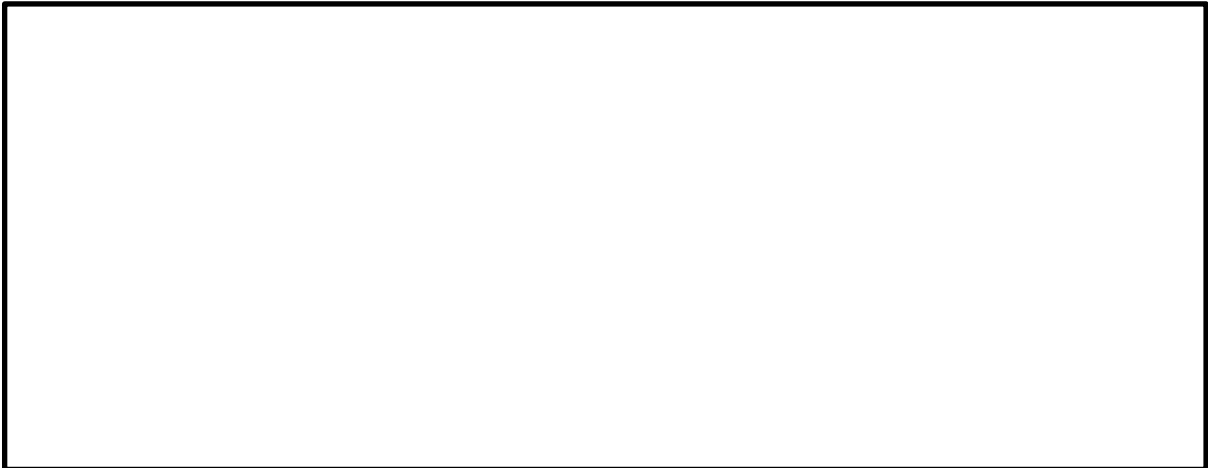


**Alternate row planting pattern:**

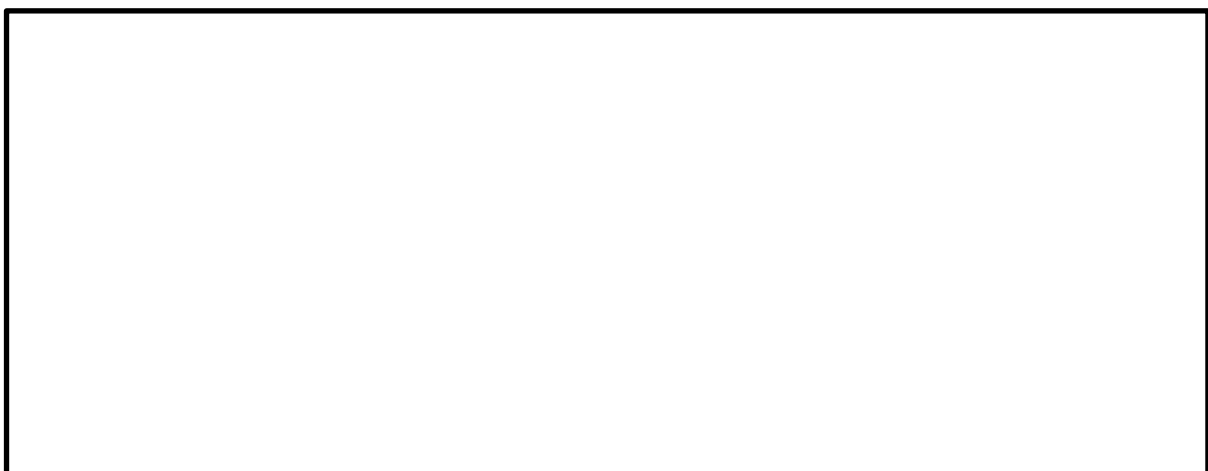
**1. Diagonal or Quincunx system:**



**2. Hexagonal system:**



**3. Triangular system:**



#### 4. Double Row System:



#### 5. Contour system



#### Calculation of number of trees required per unit area

##### Quincunx system

$$\text{No of plants / ha} = \frac{\text{Total Area}}{(\text{Row to row distance}) \times (\text{Plant to plant distance})}$$

If Row to Row distance and Plant to Plant distance is 10m, then

$$\text{No of plants / ha} = \frac{10,000}{10 \times 10}$$

$$\text{No of plants / ha} = 100$$

Additional plants planted in centre of square = (No. of rows length wise - 1) × (No. of rows width wise - 1)

$$\begin{aligned} &= (10 - 1) \times (10 - 1) \\ &= 9 \times 9 \\ &= 81 \end{aligned}$$

Therefore, total no. of plants = 100 + 81 = 181

### Hexagonal system:

$$\text{No of plants / ha} = \frac{\text{Total Area}}{(\text{Row to row distance}) \times (\text{Plant to plant distance})}$$

$$\text{No of plants / ha} = \frac{10,000}{10 \times 8.65}$$

$$\text{No of plants / ha} = 115$$

If plant to plant distance = 10 m, then as per equilateral triangles;

$$\text{The row to row distance} = AD = \sqrt{AB^2 - BD^2}$$

$$= \sqrt{100 - 25}$$

$$= 8.65 \text{ m}$$

### Triangular system:

$$P = \frac{S}{d^2}$$

Where,

P= Plant population

S= Total Area

d= length of the triangle arm

### Double Row System:

$$\text{No of plants / ha} = \frac{\text{Number of the Rows} \times \text{Total area cropped}}{(\text{Plant to plant distance}) \times (\text{Row to Row}) + (\text{Bed to Bed distance})}$$

If, the plant to plant distance is 25 cm, row to row distance is 35 cm and bed to bed distance is 90 cm.)

$$\text{No of plants / ha} = \frac{2 \times 10000}{0.25 \times (0.35 + 0.90)}$$

$$\text{No of plants / ha} = 64000$$

### **Observations to be performed:**

Calculate of number of different fruit crops per hectare under different planting system.

### **Problem:**

Practice the planting system on the field and draw neat sketches

**Exercise No. 11**

**Objective: Training and pruning of pome (apple and pear) fruit trees**

**Materials required:** .....

.....

.....

.....

**Training methods and its procedure with diagram:**

.....

.....

.....

.....

.....

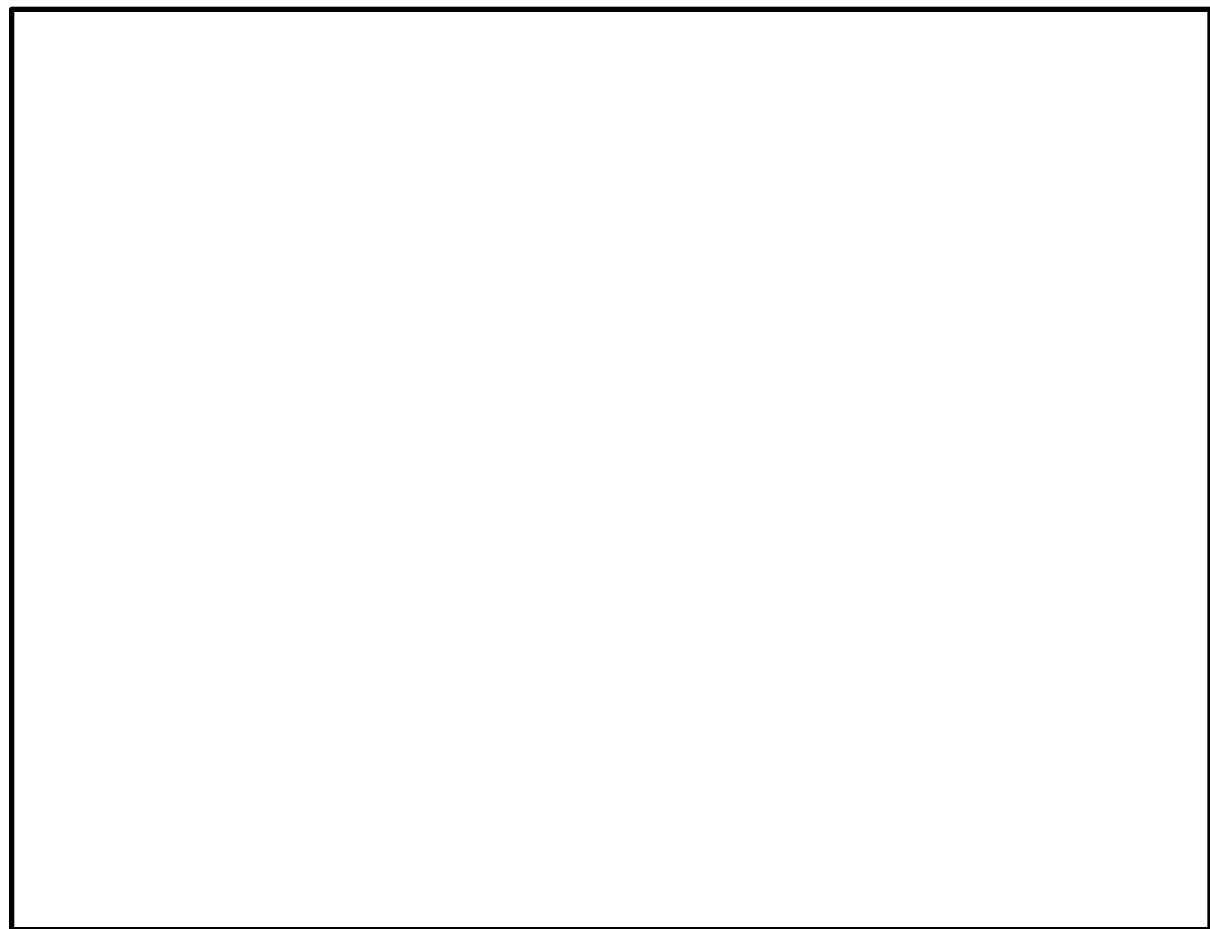
.....

.....

.....

.....

.....



**Pruning of apple and pear tree and its procedure:**

.....

.....

.....

.....

.....

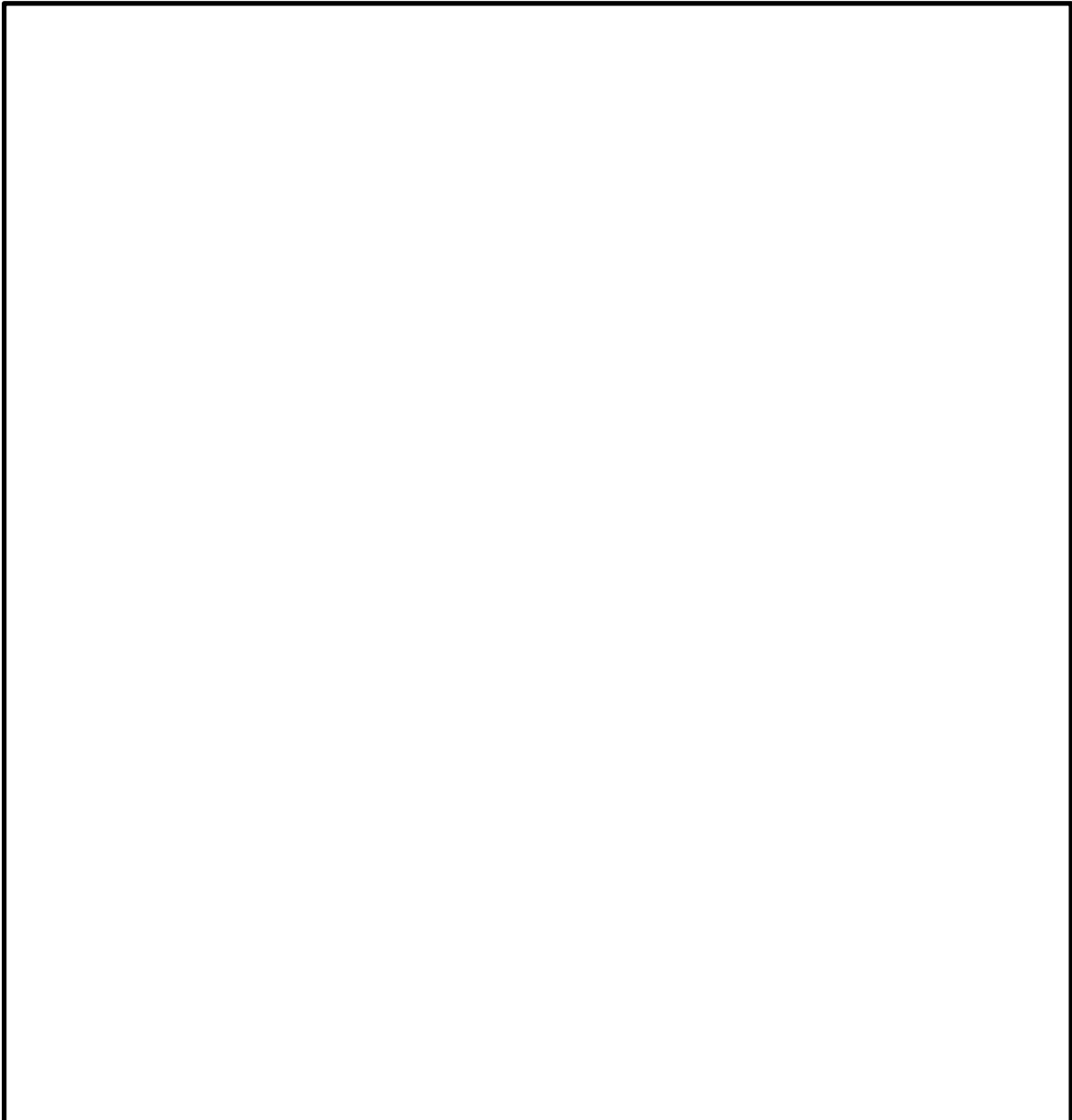
.....

.....

.....

.....

.....



**Objective: Training and pruning of stone fruits**

**Materials required:** .....

.....

.....

.....

.....

**Training methods and its Procedure with diagram:**

.....

.....

.....

.....

.....

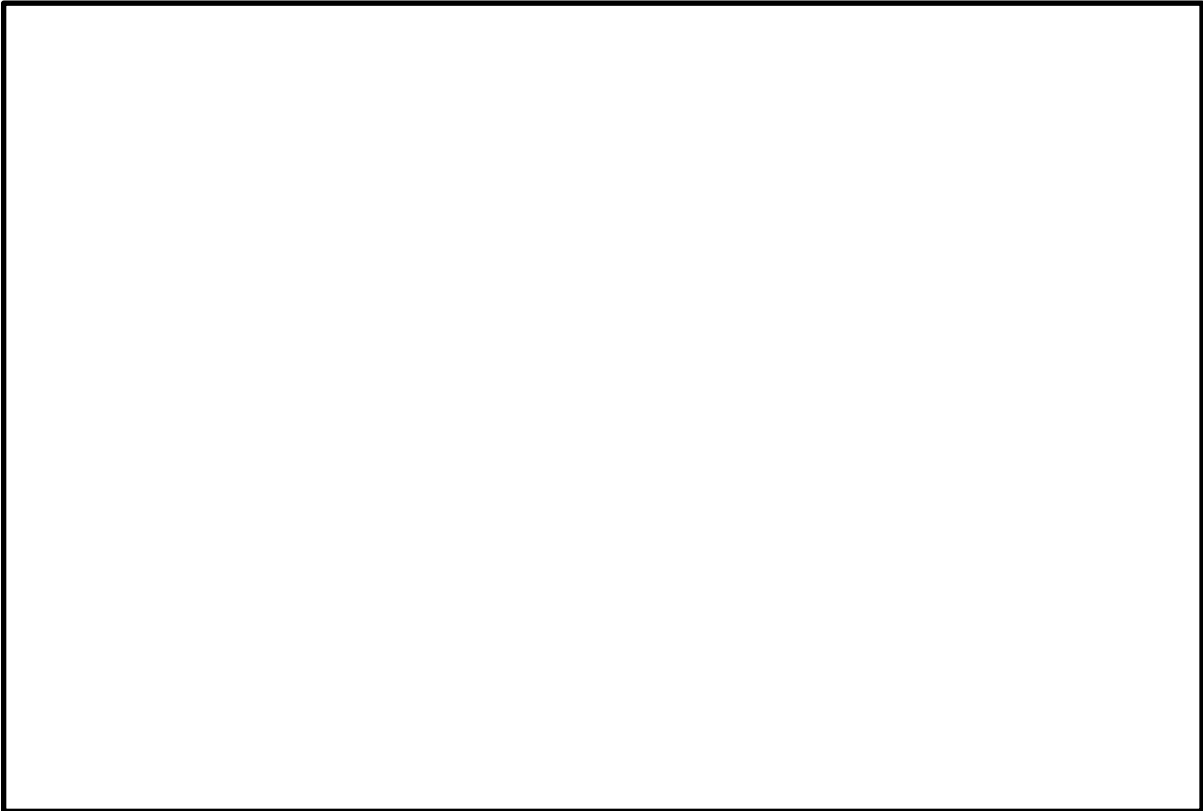
.....

.....

.....

.....

.....



**Training methods and its Procedure with diagram:**

.....

.....

.....

.....

.....

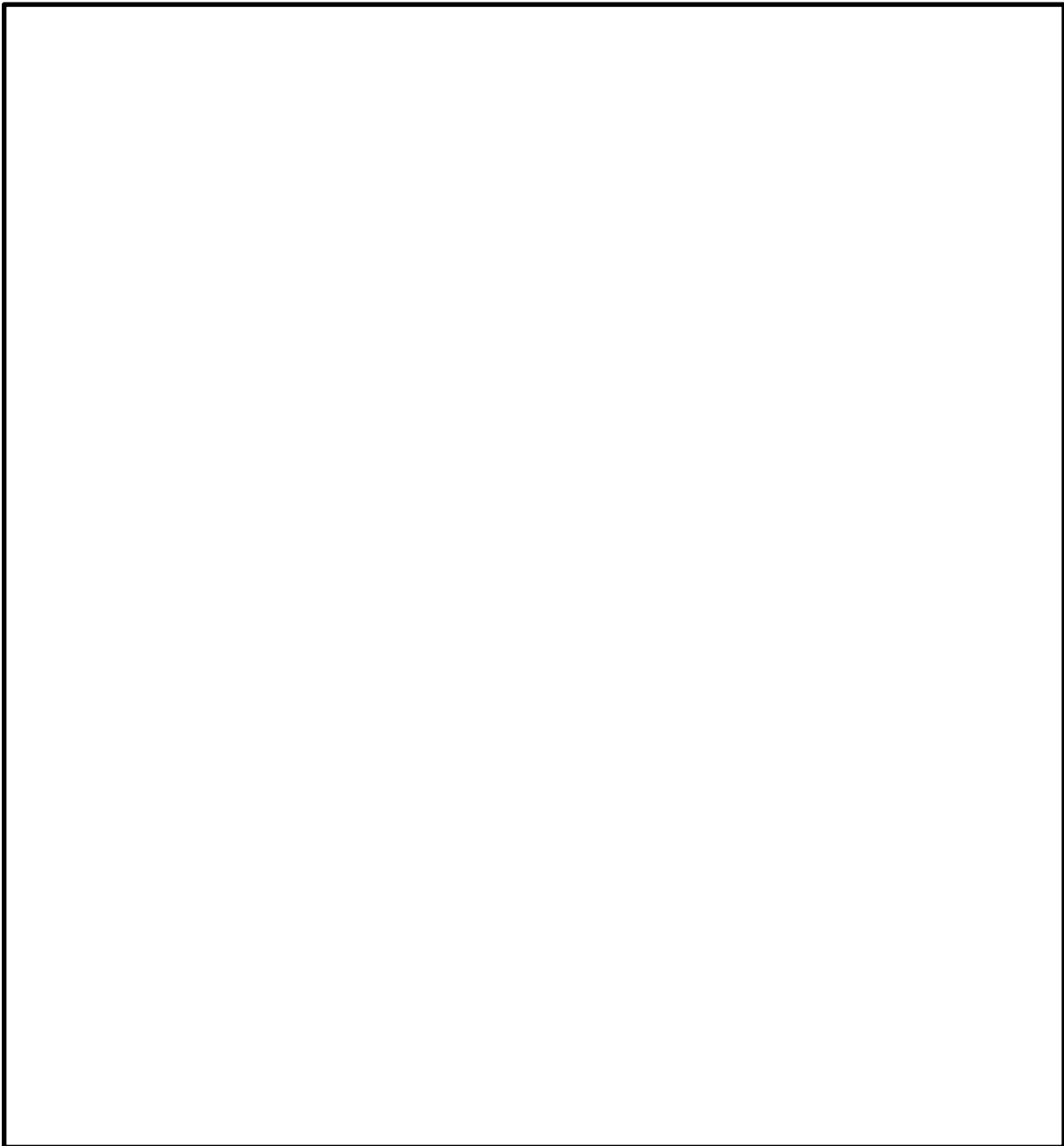
.....

.....

.....

.....

.....





**Objective: Training and pruning of kiwifruit**

**Materials required:** .....

.....

.....

.....

.....

**Training methods and its Procedure with diagram:**

.....

.....

.....

.....

.....

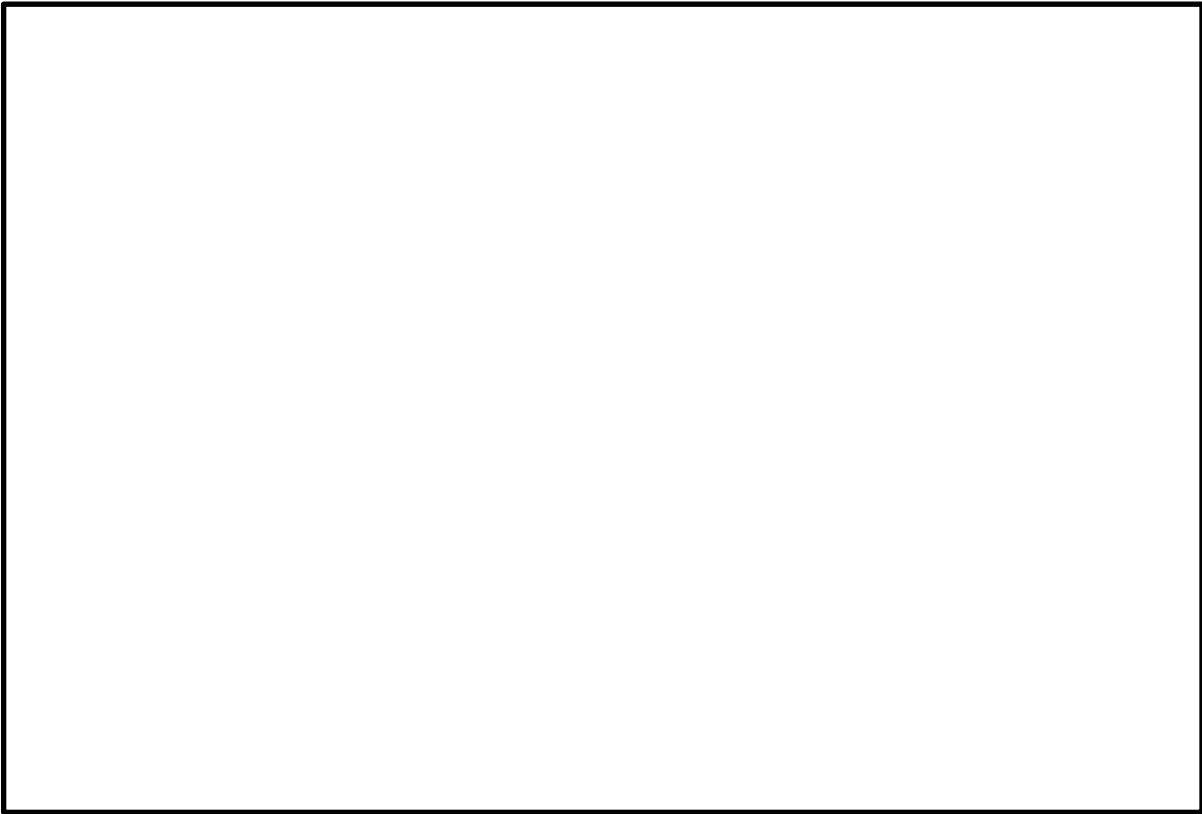
.....

.....

.....

.....

.....



**Pruning methods and its Procedure with diagram:**

.....

.....

.....

.....

.....

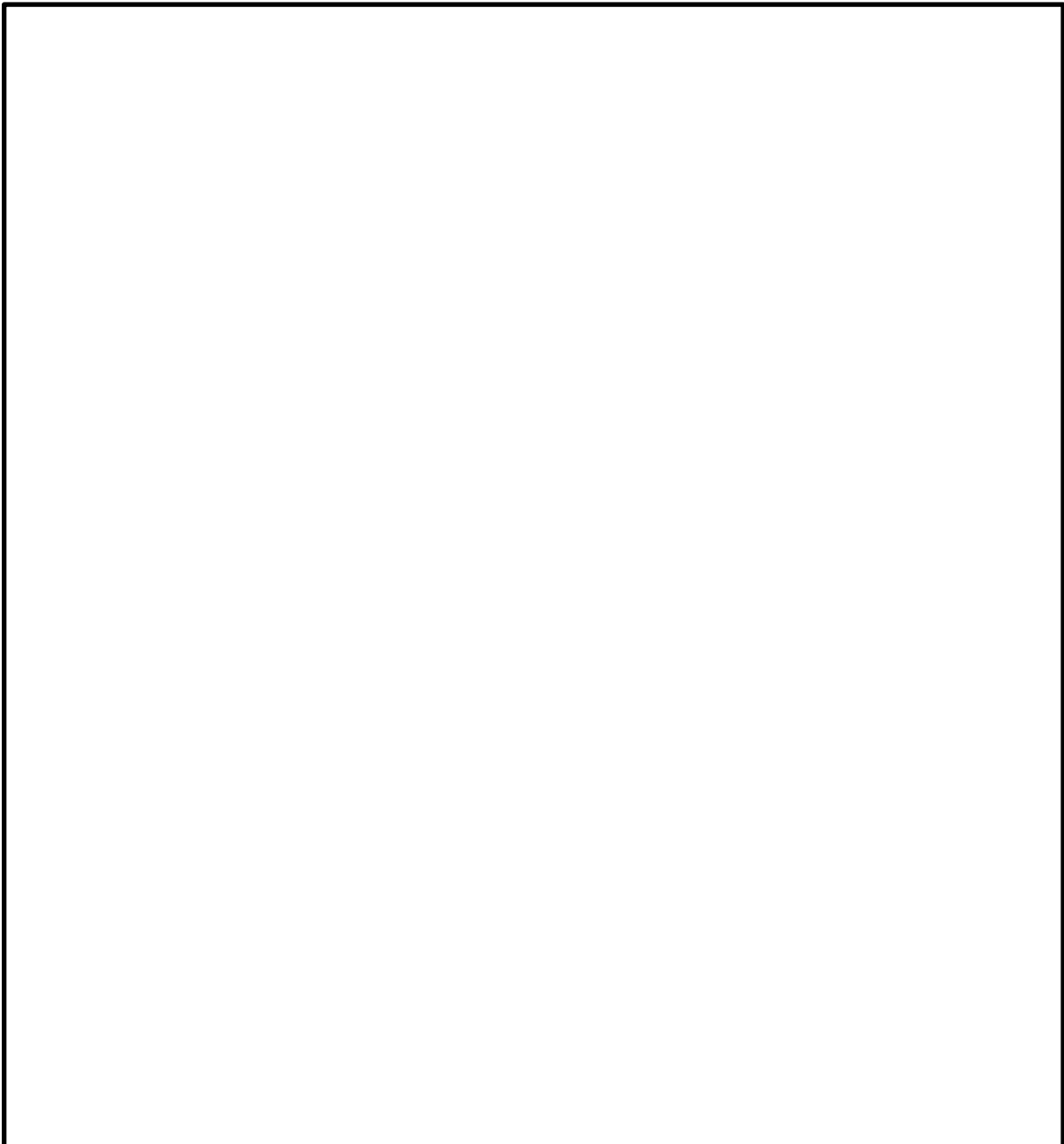
.....

.....

.....

.....

.....









Lined writing area consisting of 28 horizontal dotted lines.

**Problems:** Practice the job on the field.

## Exercise No. 16

### Objective: Production economics for commercial cultivation of temperate fruit crops

#### Items for calculating the cost of cultivation for 1 ha. area

Sl. No.	Component	Proposed Expenditure
	<b>Plantation Expenses</b>	
	Cost Field preparation	
	Cost of planting material	
	Cost of Manures & fertilizers	
	FYM	
	Nitrogen	
	Phosphorus	
	Potassium	
	FeSO <sub>4</sub>	
	CuSO <sub>4</sub>	
	FeSO <sub>4</sub>	
	Cost of any others nutrients and plant growth regulators	
	Cost of Insecticides & pesticides	
	Cost of labour for application of manures, fertilizers and pesticides. Weeding and harvesting	
	Others, if any, (Power)	
	<b>Irrigation</b>	
	Tube-well/submersible pump	
	Cost of Pipeline	
	Others, if any, please specify	
	<b>Cost of Drip/Sprinkler</b>	
	<b>Infrastructure</b>	
	Store	
	Labour shed & Pump house	
	Farm Equipment	
	<b>Land Development</b>	
	Soil Leveling	
	Digging	
	Fencing	
	Others, if any, please specify	
<b>Grand Total</b>		

**Total expenditure**

Total yield of .....  
Sold @ .....

**Net income = gross income – expenditure**

Net income growing one ha. will be .....

**Benefit cost ratio: Net income / total cost**

**Conclusion:**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**The major components of the model are:**

- **Land Development:** This is the labour cost of shaping and dressing the land site.
- **Fencing:** It is necessary to safeguard the orchard by a barbed wire fencing.
- **Irrigation Infra-structure:** For effective working with drip irrigation system, it is necessary to install a bore well with diesel/electric pump set and motor. This is post cost of tube-well.
- **Drip Irrigation:** This is average cost of one-acre drip system for apple inclusive of the cost of fertigation equipment. The actual cost will vary depending on location, plant population and plot geometry.
- **Implements:** For investment on improved manually operated essential implements a provision of another Rs.15 thousand is included.
- **Building and Storage:** A one-acre orchard would require minimally a labour shed and a store-cum grading/packing room & pump house.



**Objective: Visit to commercial orchards to diagnose nutrient deficiency and other maladies**

**Materials required:** .....

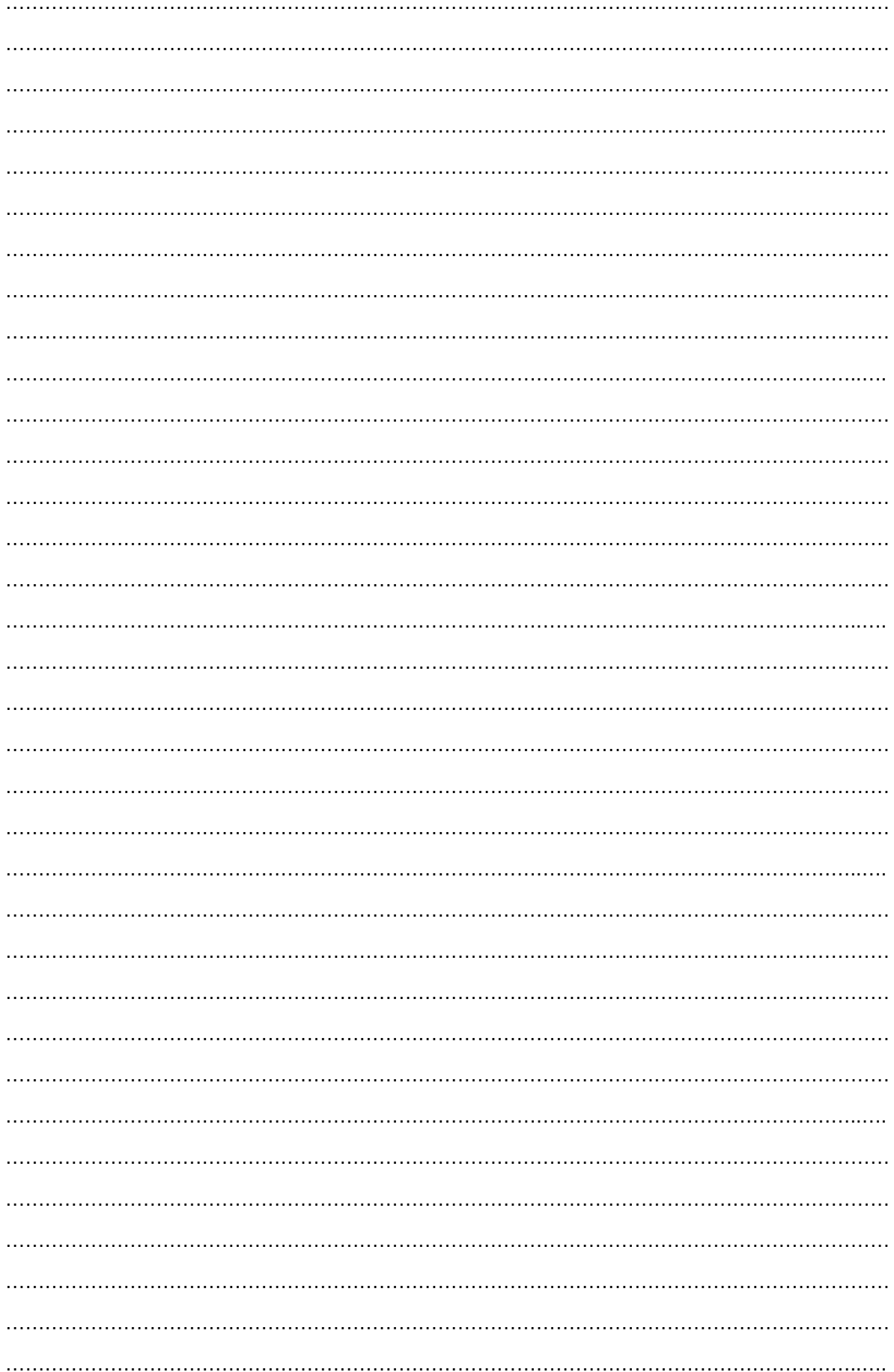
.....  
.....

**Observations:** .....

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

**Report of visit:** .....

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

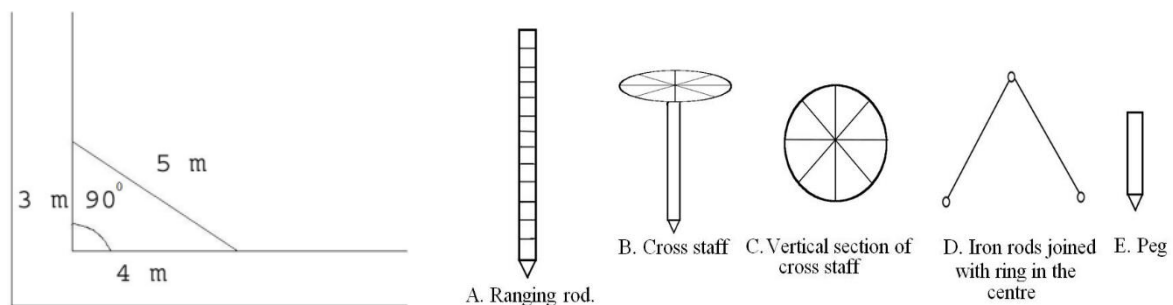


## APPENDICES

### TIME AND METHOD FOR COMMERCIAL PROPAGATION OF DIFFERENT TEMPERATE FRUITS

Kind of fruit	Recommended propagation method	Time of operation
Almond	1. Tongue Grafting 2. Chip budding	February Mid-March
Apricot	Tongue Grafting T- budding	February May-June
Cherry	1. Tongue Grafting	February- March
Peach	1. Tongue Grafting 2.T-budding	February May-June
Plum	1. Tongue Grafting 2. Chip budding	February February
Apple	Tongue grafting Chip budding	February – March March and July
Pear	Tongue grafting	February- March
Kiwifruit	Tongue grafting and chip budding Hard wood cuttings	February February
Walnut	Chip budding  Tongue grafting Patch budding	Mid May to first week of June March July
Pecan nut	Patch and Annular Budding	July

### TOOLS USED FOR LAYOUT OF FRUITS ORCHARD



### SPACING OF TEMPERATE FRUIT PLANTS

The planting distance for a particular fruit tree is determined by various factors like kind of fruit tree and its growth habit, rootstock used, pruning and training needs, rainfall of the area and soil conditions etc., but the common distance for most of the fruit trees is given here under:

- The best time of planting of temperate fruits are January and February.
- Before planting, orchard site is properly laid out After layout of an orchard, the pits of 1x1x1 m size are dug one month before the planting.
- The pits are filled with soils in which 40-50 kg well rotten FYM and 1 kg single super phosphate are mixed.

**RECOMMENDED FERTILIZERS SCHEDULE FOR POME FRUITS IN INDIA**

Age of the tree(year)	FYM (kg)	N (g)	CAN (g)	P <sub>2</sub> O <sub>5</sub> (g)	SSP (g)	K <sub>2</sub> O (g)	MoP (g)
1	10	70	280	35	220	70	115
2	20	140	560	70	440	140	230
3	30	210	840	195	660	210	350
4	40	280	1120	140	880	280	470
5	50	350	1400	175	1100	350	585
6	60	420	1680	210	1320	420	700
7	70	500	1960	245	1540	500	820
8	80	560	2240	280	1760	560	935
9	90	630	2520	315	1980	630	1050
10 and above	100	700	2800	350	2000	700	1170
Off year	100	500	2000	250	1560	400	670

**THE MANURE AND FERTILIZER SCHEDULE FOR STONE FRUITS IN INDIA**

Age of tree (yr.)	FYM (kg)	N (g)	P <sub>2</sub> O <sub>5</sub> (g)	K <sub>2</sub> O (g)
1	10	70	35	100
2	15	140	70	200
3	20	210	105	300
4	25	280	140	400
5	30	350	175	500
6	35	420	210	600
7 & above	40	500	250	700

**DOSES OF MANURES AND FERTILIZERS AND THEIR TIME OF APPLICATION**

Fruit plant	Age of plant (years)	FYM (kg / plant)	Doses of fertilizers (g/plant)		
			CAN (25% N)	SSP (16%P <sub>2</sub> O <sub>5</sub> )	MOP (60% K <sub>2</sub> O)
Pome fruits (apple and pear)	Per year of age	10	280	220	115
	10 years and above	100	2800	2200	1150
Stone fruits (peach, plum, apricot) almond and cherry	Per year of age with increment of five years	10	280	220	165
	7 years and above	40	2000	1560	1200
Kiwifruit	Per year of age with increment of 8 FYM	10	400	450	350
	8 and above	80	3200	3600	2800
Nuts	Per year of age with increment of 5 FYM	10	2 Kg NPK mixture fertilizer (15:15:15)		
	16 and above	100	8 kg NPK mixture fertilizer		

CAN = Calcium Ammonium Nitrate, SSP = Single Super Phosphate, MOP = Muriate of Potash