PRACTICAL MANUAL

TEMPERATE FRUIT CROPS

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

For Undergraduate Horticulture Students

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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

Exercise No. 1

Objective: Identification of temperate fruits and Nuts

S. No	Common Name	Scientific Name	Family	Types of Fruit	Edible part	Bearing habit
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Exercise No. 2

Objective: Preparation of seed and nursery beds

Materials required: ……

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Seed bed preparation procedure:

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Nursery beds preparation procedure: ……

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Assignment: Practices different steps of seed and nursery beds

Exercise No. 3

Objective: Propagation of temperate fruits – Rootstock propagation

Materials required: ……………………………………………………………………………………………………

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Rootstock propagation procedure: ……………………………………………………………………………………

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Assignment: Practices different steps of rootstock propagation.

Exercise No. 4

Objective: Propagation of scion cultivars and Nursery management

Materials required: ……………………………………………..………………………………………………………

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Procedure: ………………...………………………………………………………………………………………

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Assignment: Practices different steps of propagation of scion cultivars

Exercise No. 5

Objective: Identification and description of varieties of apple and pear

Describe of important varieties of Apple: ……

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Describe of important varieties of Pear:

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Exercise No. 6

Objective: Identification and description of varieties of stone fruits

Description of Peach varieties: ……………………………………………………………………….………..

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Description of Plum varieties: ………..………………………………………………………………...……..…

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Description of Apricot varieties: ……..

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Description of Cherry varieties: ……..…

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Exercise No. 7

Objective: Identification and description of varieties of strawberry and persimmon

Description of Strawberry varieties: .....

Description of Persimmon varieties: .....

Exercise No. 8

Objective: Identification and description of varieties of nut crops

Description of Pecan Nut varieties: .....

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Description of Walnut varieties: .....

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Description of Almond varieties: .....

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Exercise No. 9

Objective: Identification and description of varieties of kiwifruit

Description of Kiwifruit varieties: .....

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Exercise No. 10

Objective: Prepare Layout of Different Planting Systems of Orchard

Materials Required: ……

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Planting system: Vertical row planting pattern

1. **Square System:**

2. **Rectangular system:**

Calculation of number of trees required per unit area

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

Square and rectangular systems:

No. of plants required for 1 ha = 10, 000 sq. m
Row to row distance (m) × plant to plant distance (m)

No of plants / ha

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

Problem:

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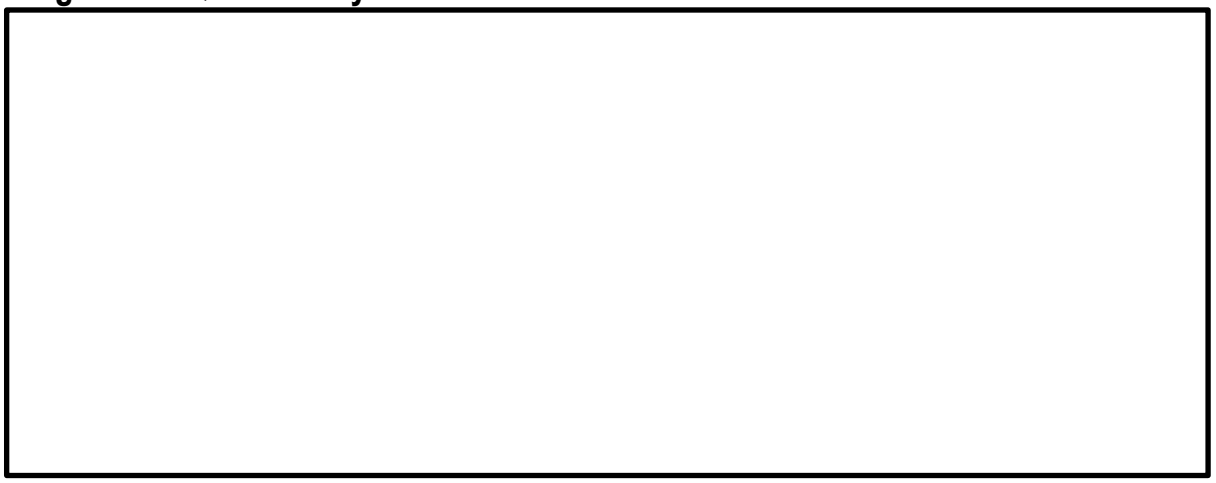
Alternate row planting pattern:

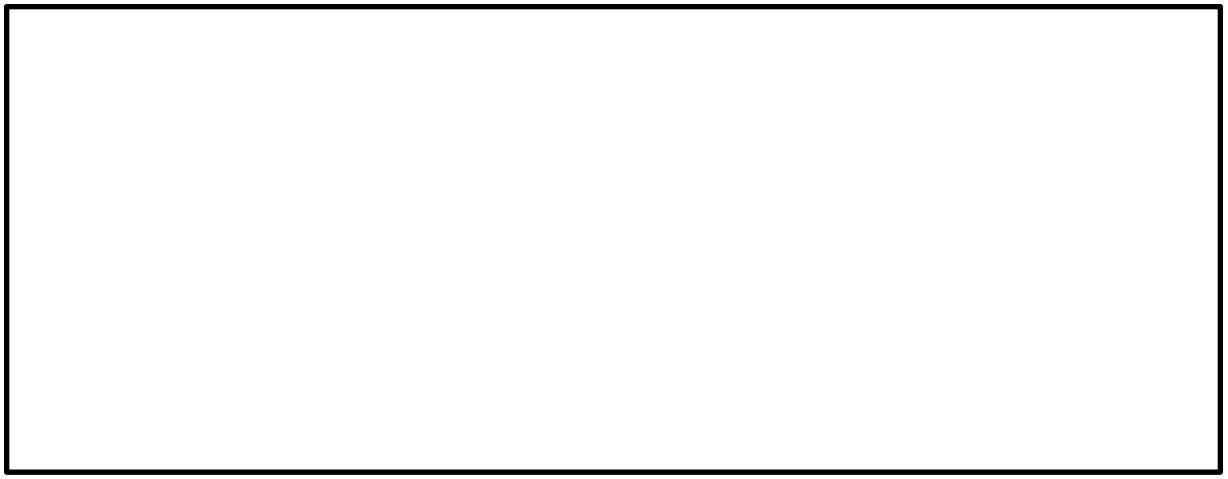
1. **Diagonal or Quincunx system:**



2. **Hexagonal system:**

3. **Triangular system:**

4. Double Row System:



5. Contour system

Calculation of number of trees required per unit area

Quincunx system

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

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

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

No of plants / ha = 100

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

= (10– 1) × (10 – 1)
= 9 × 9
= 81

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

Hexagonal system:

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

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

No of plants / ha = 115

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

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

= $\sqrt{100 - 25}$

= 8.65 m

Triangular system:

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

Where,

P= Plant population

S= Total Area

d= length of the triangle arm

Double Row System:

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

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

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

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: .....

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Training methods and its procedure with diagram:

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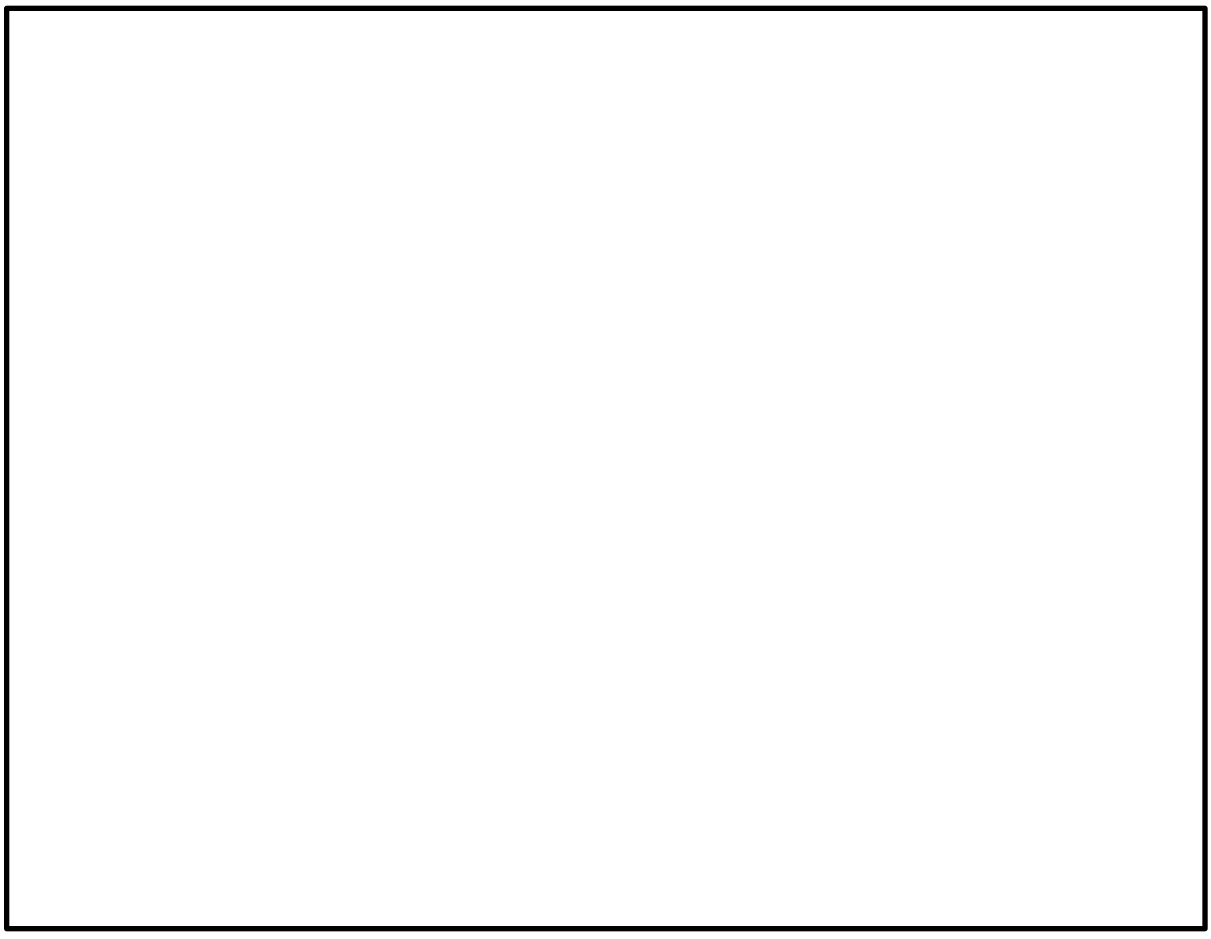

Pruning of apple and pear tree and its procedure:

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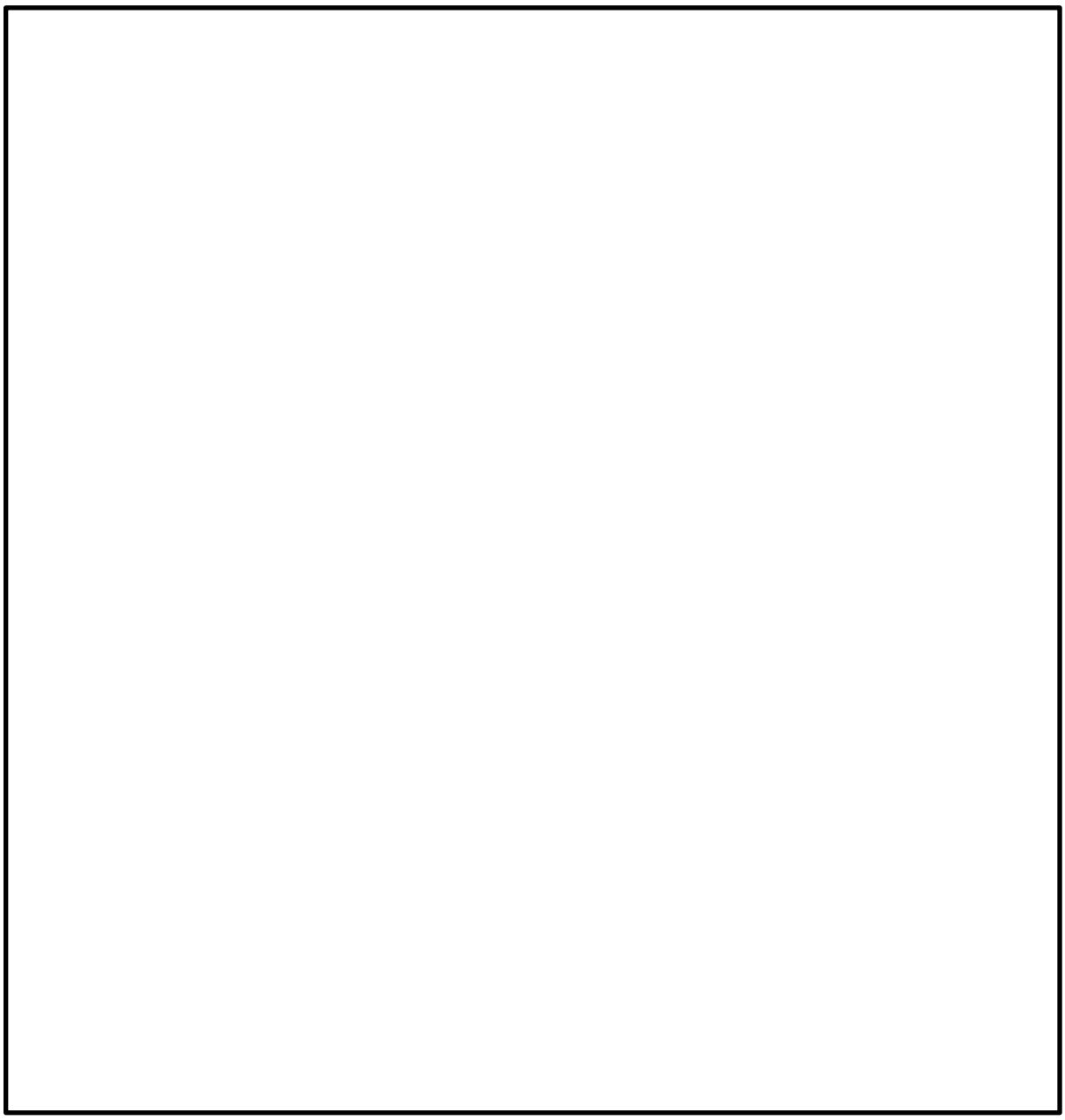

Exercise No. 12

Objective: Training and pruning of stone fruits

Materials required: .....

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Training methods and its Procedure with diagram:

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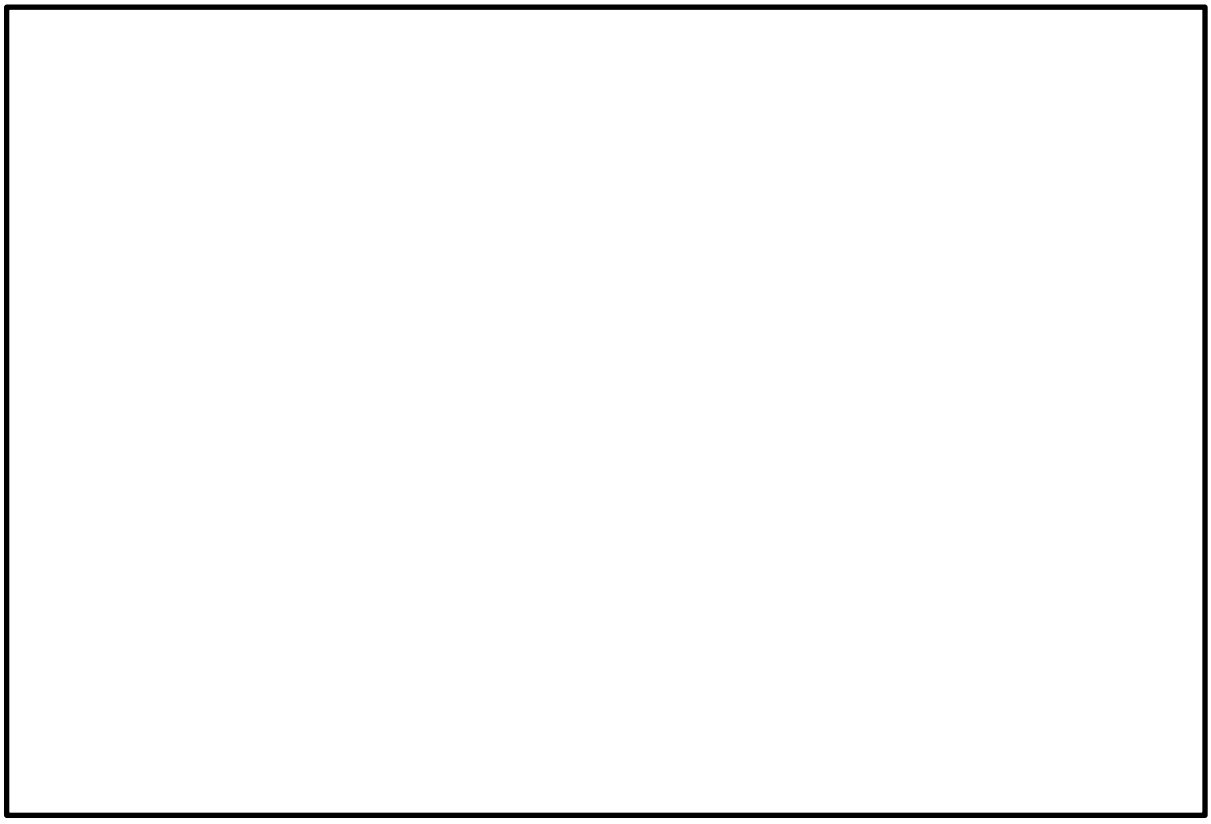

Training methods and its Procedure with diagram:

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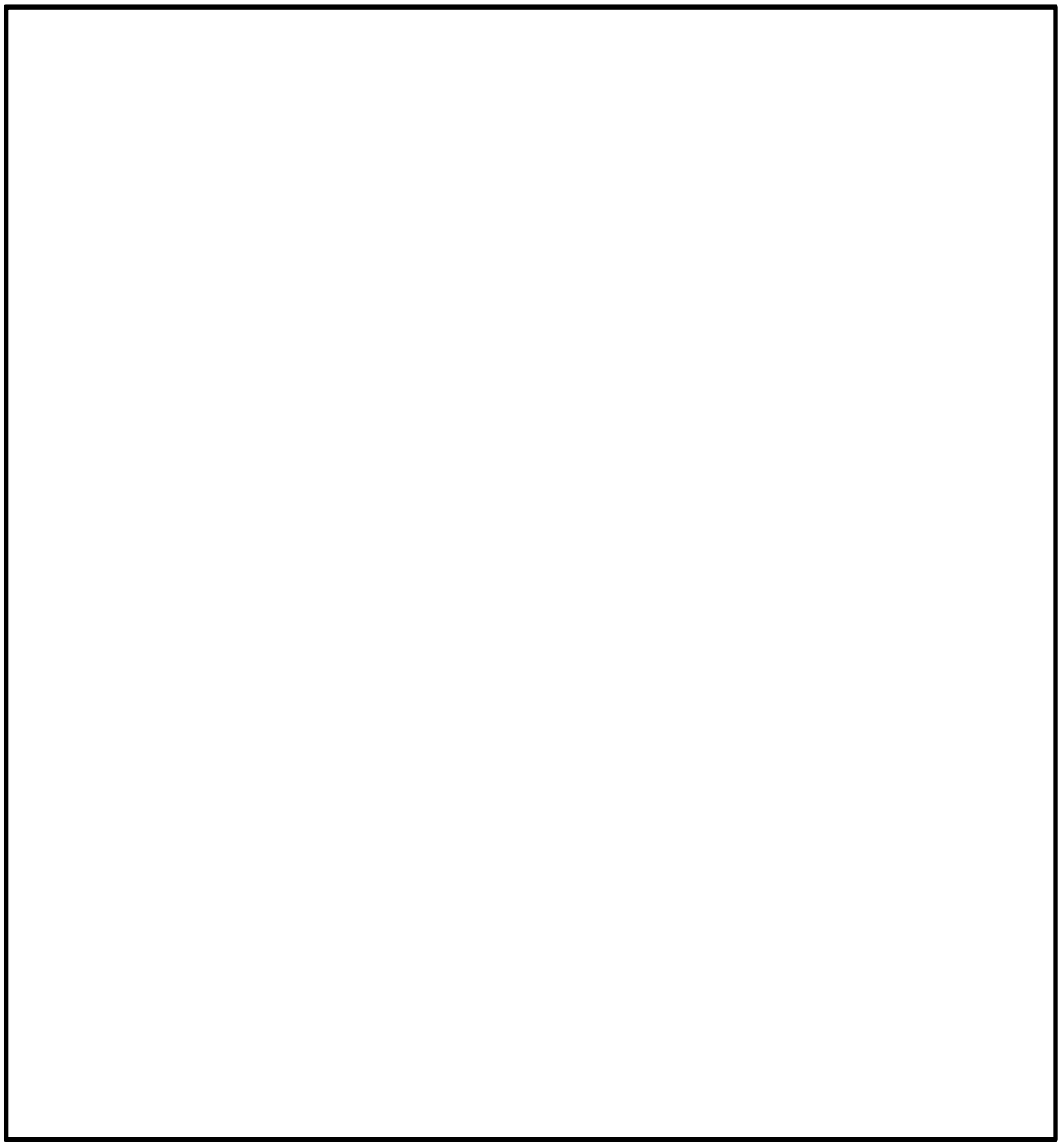

Exercise No. 13

Objective: Training and pruning of kiwifruit

Materials required: .....

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Training methods and its Procedure with diagram:

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Pruning methods and its Procedure with diagram:

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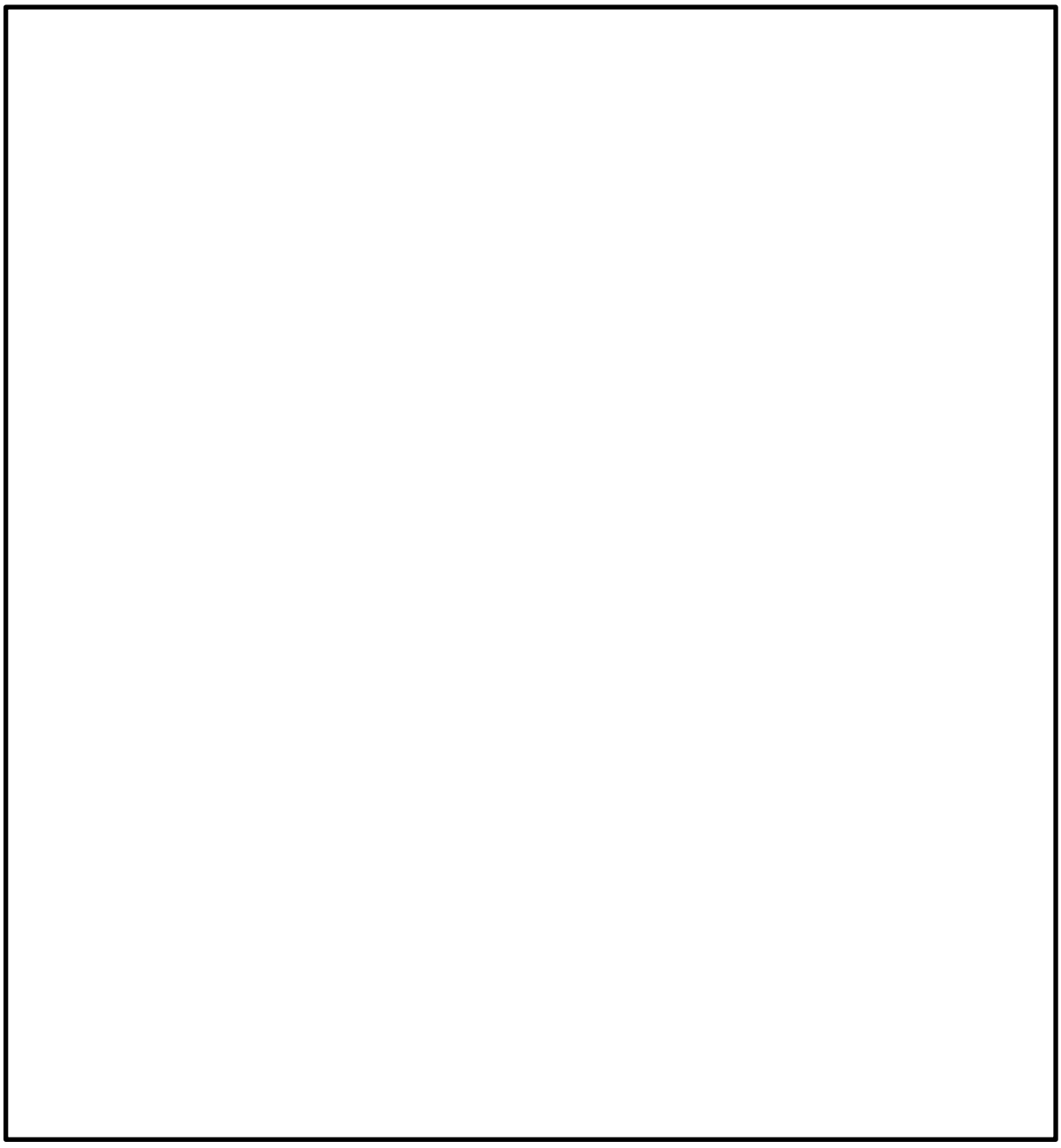

Exercise No. 14

Objective: Preparation and uses of plant growth regulators in temperate fruits

Materials required: ……………………………………………………………………………

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The common uses of PGRs in temperate fruit crops: ……………………………………………

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Preparation of growth regulator solution:

Exercise No. 15

Objective: Manuring and fertilizer application of temperate fruit crops

Materials required: ……

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Methods of application: ……

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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
	Plantation Expenses	
	Cost Field preparation	
	Cost of planting material	
	Cost of Manures & fertilizers	
	FYM	
	Nitrogen	
	Phosphorus	
	Potassium	
	$FeSO_4$	
	$CuSO_4$	
	$FeSO_4$	
	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)	
	Irrigation	
	Tube-well/submersible pump	
	Cost of Pipeline	
	Others, if any, please specify	
	Cost of Drip/Sprinkler	
	Infrastructure	
	Store	
	Labour shed & Pump house	
	Farm Equipment	
	Land Development	
	Soil Leveling	
	Digging	
	Fencing	
	Others, if any, please specify	
Grand Total		

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:

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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.

Exercise No. 17

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

Materials required: ……

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Observations: ……

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Report of visit: ……

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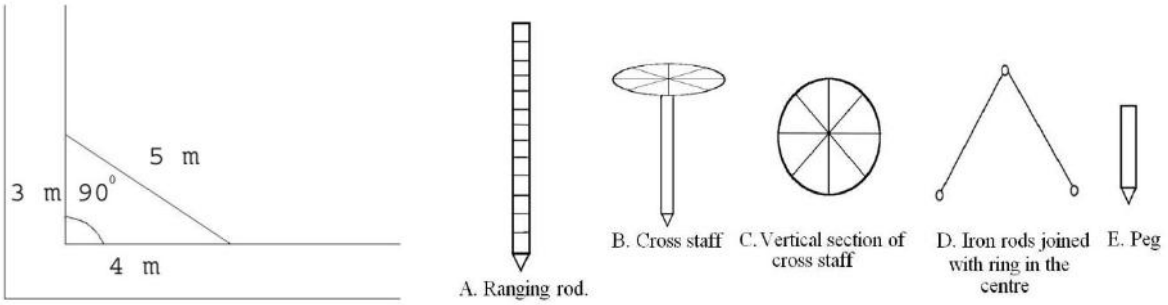
APPENDICES

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_2O_5 (g)	SSP (g)	K_2O (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_2O_5 (g)	K_2O (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_2O_5)	MOP (60% K_2O)
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