

PRACTICAL MANUAL
ON
Introduction to Forestry
APF 179 2(1+1)
For B.Sc. Agriculture I Semester students



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2020

College of Horticulture & Forestry
RANI LAKSHMI BAI CENTRAL AGRICULTURAL
UNIVERSITY, JHANSI

Introduction to Forestry APF 179 2(1+1)

Practical: Identification of tree-species. Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees. Height measurement of standing trees by shadow method, single pole method and hypsometer. Volume measurement of logs using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.

Name of Students

Roll No.

Batch

Session

Semester

Course Name :

Course No. : **Credit**

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CERTIFICATE

This is to certify that Shri./Km.ID No.....has completed the practical of course.....course No. as per the syllabus of B.Sc. (Hons.) Agriculture/ Horticulture/ Forestry semester in the year.....in the respective lab/field of College.

Date:

Course Teacher

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Practical Exercise No. 1

Objective: To identify different multipurpose tree species

- Since the beginning, trees have furnished us with two of life's essentials, food and oxygen. As we evolved, they provided additional necessities such as shelter, medicine, and tools. Today, their value continues to increase and more benefits of trees are being discovered as their role expands to satisfy the needs created by our modern lifestyles.
- They occupy prime importance for having potential and vital role in sustainable agricultural development.
- Trees extremely vary for their natural distribution and variation, methods of exploration, collection and evaluation of their germplasm.

Advantages:

- **Community & Social Value:** Trees are an important part of every community. Our streets, parks, playgrounds and backyards.
- **Ecological & Environmental Value:** Trees contribute to their environment by providing oxygen, improving air quality etc.
- **Personal & Spiritual Value:** The main reason we like trees is because they are both beautiful and majestic.
- **Practical & Commercial Value:** Trees have supported and sustained life throughout our existence. They have a wide variety

Purpose: It is important to select the most suitable trees since it is not easy to replace them once they have been planted. The following factors should be kept in mind when selecting tree species

- | | |
|----------------------------|-------------------------------------|
| • Environmental adaptation | • Ease of maintenance |
| • Needs of farmers | • Availability of genetic materials |

How to Identify Different Types of Trees:

- | | |
|------------------------------|---------------------------|
| • By leaf identification | • By flower |
| • By leaf shape | • By fruit type |
| • By bark colour | • By seed comparison |
| • By bark texture | • By leaf bud arrangement |
| • By bark variation with age | • By leaf bud appearance |
| • By tree shape | |

Field Exercise: Identification of some important MPTs

S. No.	Tree species		Image/Characteristics
1.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....
2.	Common name		
	Scientific name		
	Family		
	Description	..... .....

		
	Uses	
3.	Common name		
	Scientific name		
	Family		
	Description	
	Uses	
4.	Common name		
	Scientific name		
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5.	Common name		
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	Scientific name		
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	Description	
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7.	Common name		

	Scientific name		
	Family		
	Description	
	Uses	
8.	Common name		
	Scientific name		
	Family		
	Description	
	Uses	
9.	Common name		
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	Family		
	Description	
	Uses	
10.	Common name		
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	Family		
	Description	
	Uses	
11.	Common name		
	Scientific name		
	Family		
	Description	

		
	Uses	..... .....
12.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....
13.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	
14.	Common name		
	Scientific name		
	Family		
	Description	
	Uses	
15.	Common name		
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	Description	
	Uses	
16.	Common name		

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	Description	
	Uses	
17.	Common name		
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	Description	
	Uses	
18.	Common name		
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	Description	
	Uses	
19.	Common name		
	Scientific name		
	Family		
	Description	
	Uses	
20.	Common name		
	Scientific name		
	Family		
	Description	
	Uses	

		
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Practical Exercise No. 2

Objective: To identify different multipurpose tree species

Field Exercise: Identification of some important MPTs

S. No.	Tree species		Image/Characteristics
1.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....
2.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	
3.	Common name		
	Scientific name		
	Family		
	Description	
	Uses	
4.	Common name		
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5.	Common name		
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10.	Common name		
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14.	Common name		
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15.	Common name		
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	Uses	
16.	Common name		
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17.	Common name		
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18.	Common name		
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19.	Common name		
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	Description	
	Uses	
20.	Common name		
	Scientific name		
	Family		
	Description	
	Uses	

Practical Exercise No. 3

Objective: To identify different multipurpose tree species

Field Exercise: Identification of some important MPTs

S. No.	Tree species		Image/Characteristics
1.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....
2.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....
3.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....
4.	Common name		
	Scientific name		
	Family		
	Description	

		
	Uses	
5.	Common name		
	Scientific name		
	Family		
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	Uses	
6.	Common name		
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	Family		
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7.	Common name		
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8.	Common name		
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9.	Common name		
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10.	Common name		
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	Family		
	Description	
	Uses	
11.	Common name		
	Scientific name		
	Family		
	Description	
	Uses	
12.	Common name		
	Scientific name		
	Family		
	Description	
	Uses	

		
13.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....
14.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....
15.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....
16.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....

17.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....
18.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....
19.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....
20.	Common name		
	Scientific name		
	Family		
	Description	..... ..... .....
	Uses	..... .....

Observation:

S. No.	Species	Condition of tree	Measuring Side	DBH (OB) in cm			Remarks (if any)
				Major axis	Minor axis	Average	
1							
2							
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Calculation:.....

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Results:.....

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Conclusion:.....

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Observation:

S. No.	Species	Condition of tree	Measuring Side	DBH (OB) in cm			Remarks (if any)
				Major axis	Minor axis	Average	
1							
2							
3							
4							
5							
6							
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10							

Calculation:.....

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Results:.....

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Conclusion:.....

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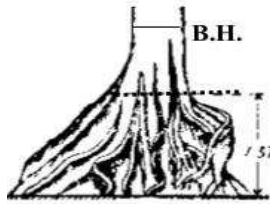
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Practical Exercise No. 7

Objective: To study diameter measurements of buttressed and fluted trees

Buttressed trees: In case of buttressed tree, if the height of the buttress is more than 1m, then the breast height is measured from the point where buttress ends. In this case, reduction models are sometimes be applied with which the would-be diameter at breast height is estimated from the measurement of a diameter at another height.



DBH measured at the lowest point above which the abnormal formation is not likely to extend

Fluting stem: In the case of fluting:

Measure the diameter over the fluting; and

1. If the fluting occurs at various points around the bole and extends vertically to the top of the bole: Deduct: 2 x average depth of fluting, from the measured dbh.
2. If the fluting extends all the way round the bole and half way up the bole: Deduct: 1/2 x (2 x average depth of fluting), from the measured dbh.
3. If the fluting extends half way round the bole and half way up the bole: Deduct: 1/2 x (average depth of fluting), from the measured dbh.



Notes: Mark the depth of fluting and measure with a straight tape or ruler. If a diameter tape is used, ensure the correct side of the tape is used.

Procedure: :

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Observation:

S. No.	Species	Condition of tree	Measuring Side	DBH (OB) in cm			Remarks (if any)
				Major axis	Minor axis	Average	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Procedure:.....

Observation:

S. No.	Species Name	Observer distance (m)	Height of tree (m)		
			Height above eye level (m) A	Height below eye level (m) B	Total height (m) A+B
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Calculation:.....

Results:.....

Conclusion:.....

Observation:

S. No.	Species Name	Observer distance (m)	Height of tree (m)		
			Height above eye level (m) A	Height below eye level (m) B	Total height (m) A+B
1					
2					
3					
4					
5					
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8					
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10					

Calculation:.....

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Results:.....

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Conclusion:.....

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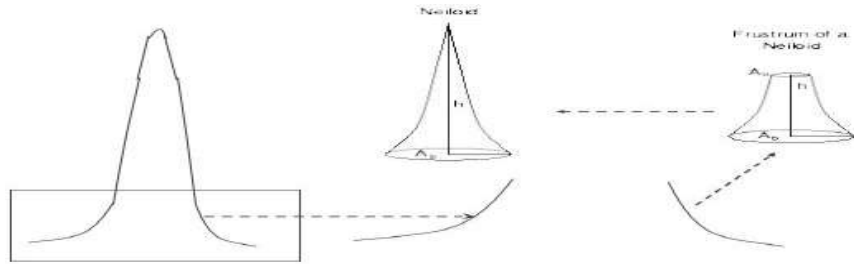
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Practical Exercise No. 12

Objective: To study volume measurement of logs using various formulae

- The ultimate object of all mensuration activity in forest is to calculate or estimate quantity of wood contained in trees and consequently in crops not only for sale but also for research, predicting future yields, estimating increment to assess return on capital etc.
- Measurement of felled trees are to determine the quantity of merchantable volume to obtain statistical data that could be applied to standing trees for the purpose of estimation the yield, to estimate the growing stock and to estimate the increment of woods and forests.
- Volume estimation may be made most accurately when the logs are separated and accessible to the measurer



By General formula:

- A) If the tree is in conical shape: $V = S \times H/3$
 $= (\pi D^2/4) \times H/3$
 $= \pi D^2 H/12$

Where, V= Volume of tree (m³); S= Basal Area of tree (i.e. $S = \pi D^2/4$ & unit is m²); H= Commercial bole height or height of tree (m).

B) If the tree is in cylindrical shape: $V = S \times H$

where V= Volume of tree (m³); S= Basal Area of tree (i.e. $S = \pi D^2/4$ & $= (\pi D^2/4) \times H$ unit is m²) and
H= Commercial bole height or height of tree (m)

By Quarter Girth formula: $V = (G/4)^2 \times H$

Where, G= Girth at mid-point ($G = \pi d$ & unit is m; d is mid-point diameter);
H= Commercial bole height or height of tree (m)

Volume calculation by Quarter Girth formula:

Sl No	Species Name	Mid-point diameter (d) in cm	Commercial Bole height/ height of tree(H) in m	Mid-point girth in m ($G = \pi d$)	Volume (m ³) $V = (G/4)^2 \times H$
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

By Huber's formula:

$$V = S_m * l$$

Where,

V = Volume of Logs

S_m = the sectional area at the middle

l = the length or height of the solid

Volume calculation by Huber's formula

SI No	Species Name	Sectional area at the middle	Height of tree	Volume (m ³) V= $S_m \times l$
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Prismoidal or Newton's formula

$$V = \frac{S_1 + 4S_m + S_2}{6} * l$$

Where,

V = Volume of Logs

S_1 = the sectional area at the thick end

S_m = the sectional area at the middle

S_2 = the sectional area at the thin end

l = the length or height of the solid

- It is the best and accurate method for volume calculation
- It gives particularly the volume of frustum of Neiloid (as well as other sections)
- It is only used to calculate the error in volume calculated by other formula
- It is difficult to apply particularly when the logs are stacked

Volume calculation by Prismoidal formula

S. No	Species Name	Sectional area at the thick end	Sectional area at the middle end	Sectional area at the thin end	The length of the tree	$V = \frac{S_1 + 4S_m + S_2}{6} * l$
1						
2						
3						
4						

5						
6						
7						
8						
9						
10						

Smalian's formula

$$V = \frac{S_1 + S_2}{2} * l$$

Where,

V = Volume of Logs

S₁ = the sectional area at the thick end

S₂ = the sectional area at the thin end

l = the length or height of the solid

- It gives the volume of frustum of paraboloid (also cylinder)
- It over estimates the volume
- It is used when the logs are stacked or lying on the ground

Volume calculation by Smalian's formula

SI No	Species Name	Sectional area at the thick end	Sectional area at the thin end	The length of the tree	$V = \frac{S_1 + S_2}{2} * l$
1					
2					
3					
4					
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10					

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Practical Exercise No. 13

Objective: To study nursery lay out techniques.

Trees are essential to our lives and are an integral part of our landscape. They play many roles and confer a multitude of benefits to society such as food, shelter, shade, timber, natural beauty to the countryside, conservation of our soil and water resources and improved air quality

Purpose:

- The aim of this study is to provide basic about nursery and the steps involved in growing quality tree seedlings for survival under the often dry, nutrient deficient conditions in which the seedlings are sometimes planted.
- This study also useful to foresters, horticulturists and those involved in planning and managing the production and use of tree seedlings for any of the above-mentioned roles and benefits.

Choosing the nursery site:

Types of nurseries

The criteria for choosing the nursery site will be affected by the type of nursery to be established. For the purpose of this manual, two broad types of nurseries are recognised, namely:

- Small-scale nurseries
- Permanent nurseries

Some benefits of small-scale nurseries are:

- Nearness to planting site improves survival because transit time between nursery and plantation is short and plants suffer less from overheating, windburn, soil loss and vibration caused by long journeys
- Better provision for the range of species and numbers of seedlings required by different farmers
- Transport cost is less and capital investment is low
- Isolation of disease is much easier

The main advantages of permanent nurseries are:

- High production levels and high seedling survival rates resulting in a more efficient, reliable operation and consequently lower unit cost per plant
- The availability of permanent installations, propagation techniques and suitable modern equipment favouring higher quality seedlings and the production of a wide range of difficult species
- Risk of damage and theft minimised due to better on-site supervision Although the contents of this manual deal mainly with permanent nurseries, much of what is written applies equally to small-scale nurseries.

Important factors

Water.....

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Location.....

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Topography.....

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Size of the nursery.....

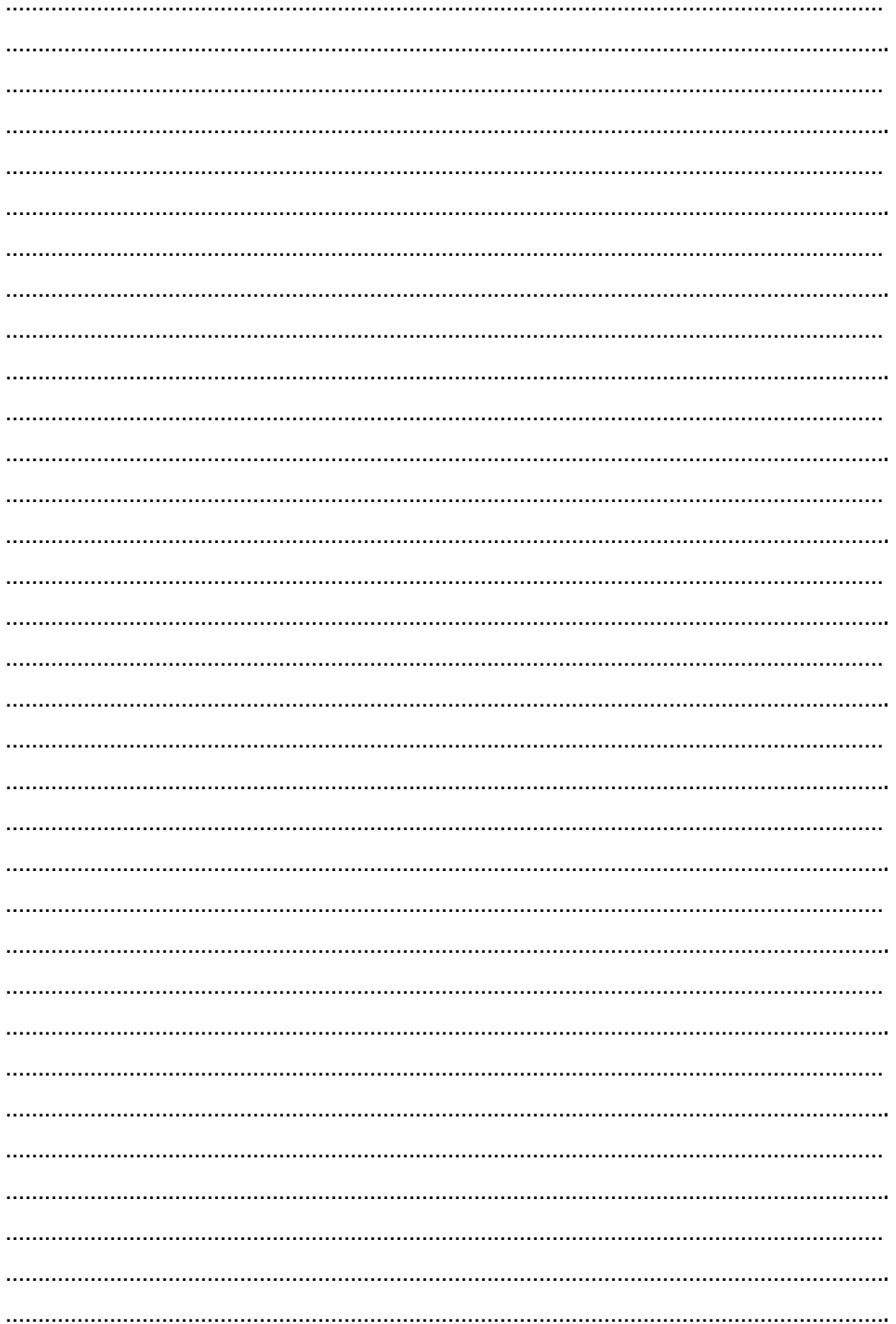
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Preparation of the site:.....
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Design and layout of nursery.....
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Producing plants from seed:

The production of seedlings in the nursery is best described under the following stages of development and growth:

- Stage 1: Seed Handling
 - Stage 2: The Germination Process
 - Stage 3: Transplanting the Young Seedlings
 - Stage 4: Tending the Seedlings
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Practical Exercise No. 15

Objective: To study the vegetative propagation techniques

Vegetative reproduction is the method of producing plants without the use of seed. Otherwise called asexual reproduction, the methods most often used to produce trees are cuttings, air layering, grafting and micro propagation.

Cuttings:.....
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Diagram:



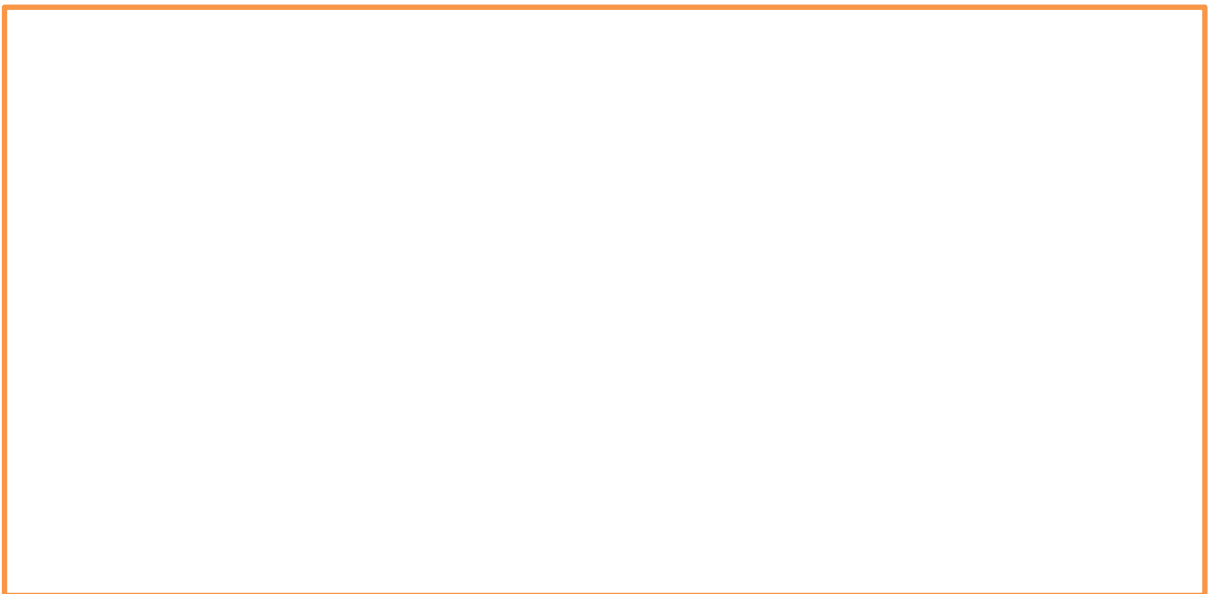
Air layering:.....
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Diagram:



Micro propagation:.....
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Diagram:



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Species selection.....

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Preparation of the planting site.....

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Practical Exercise No. 18

Objective: To visit nearby forest based industries.

- Forest based industry in India was initially confined to produce building materials, agriculture implements, bullock carts, and railway sleepers.
- Forest based industries were encouraged because of its rural identity and its ability to solve the problem of unemployment and poverty.
- In addition, the policy makers had also perceived that natural resource based industrial development is a pre-requisite for the economic development of less developed countries like India. Hence, the Government, both at the Centre and State encouraged establishment of small, medium, and large-scale forest based industries in the region. Due to this policy, the country witnessed heavy pressure of industries on forests for raw material purpose.

Policy directions:

National forest policy, 1988: Directed all the wood based industrial in the country to generate their own raw material needs without depending on the forest depart supply. It also facilitating quality seedling supply technological support, credit and insurance facility and promote agro-forestry plantations.

The national agro-forestry policy, 2014: Intensified the promotion of industrial agro-forestry plantations. It directed the government to liberalize the timber transit rules and attract farmers towards agro-forestry. It also directed to extend credit and insurance facilities to agro-forestry plantations besides establishing necessary market mechanism.

Field Exercise:

1. Name of the visiting forest based industry:

2. Date of visit:

3. Locality:

4. Area (m²):

5. Observations:

Resource and energy efficiency.....

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Raw materials.....

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Logistics.....
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Workforce.....
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Competition, trade and cooperation.....
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Information, communications and image.....
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