PRACTICAL MANUAL

ON

Introduction to Forestry

APF 179 2(1+1)

For B.Sc. Agriculture I Semester students



Dr. Prabhat Tiwari Dr. Manmohan J. Dobriyal

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	
Published: 2020	
No. of copies:	
Price: Rs.	
CERTIFICATE	
This is to certify that Shri./KmID No	has
completed the practical of course	course No.
as per the syllabus of B.Sc. (Hons.) Agriculture/ Horticulture/ Forestry	semester in
the yearin the respective lab/field of College.	
Date:	Course Teacher
Date.	Course reaction

INDEX

No.	Title	Page No.
1.	To identify different multipurpose tree species	
2.	To identify different multipurpose tree species	
3.	To identify different multipurpose tree species	
4.	To study the diameter measurement of trees using calipers	
5.	To study the diameter measurement of trees using tape	
6.	To study diameter measurements of forked trees	
7.	To study diameter measurements of buttressed and flutted trees	
8.	To study diameter measurements of leaning trees	
9.	To study height measurement of standing trees by shadow method	
10.	To study height measurement of standing trees by single pole method	
11.	To study height measurement of standing trees by hypsometer	
12.	To study volume measurement of logs using various formulae	
13.	To study nursery lay out techniques	
14.	To study nursery seed sowing techniques	
15.	To study vegetative propagation techniques	
16.	To study forest plantation and their management techniques	
17.	To study forest plantations and their management techniques	
18.	To visit nearby forest-based industries	

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
- Needs of farmers

How to Identify Different Types of Trees:

- By leaf identification
- By leaf shape
- By bark colour
- By bark texture
- By bark variation with age
- By tree shape

Field Exercise: Identification of some important MPTs

- Ease of maintenance
- Availability of genetic materials
- By flower
- By fruit type
- By seed comparison
- By leaf bud arrangement
- By leaf bud appearance

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	
	Description	
	Uses	
6.	Common name	
	Scientific name	
	Family	
	Description	
	Uses	
7.	Common name	

	Scientific name	
	Family	
	Description	
	Uses	
8.	Common name	
	Scientific name	
	Family	
	Description	
	Uses	
9.	Common name	
	Scientific name	
	Family	
	Description	
	Uses	
10		
10.	Common name	
	Scientific name	
	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	
10		
19.	Common name	
	Scientific name	
	Family	
	Description	
	Uses	
20.	Common name	
	Scientific name	
	Family	
	Description	
	Uses	

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	
	Description	
	'	
	Uses	
6.	Common name	
	Scientific name	
	Family	
	Description	
	2 330	
	Uses	
	0303	
7.	Common name	
\	Scientific name	
	Family	
	Description	
	Hees	
	Uses	
0		
8.	Common name	
	Scientific name	
	Family	
	Description	
	Uses	
9.	Common name	
	Scientific name	

	Family	
	Description	
	Uses	
10.	Common name	
	Scientific name	
	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		
10.	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		
		1	

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

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	
	Description	
	Uses	
6.	Common name	
	Scientific name	
	Family	
	Description	
	Uses	
7.	Common name	
	Scientific name	
	Family	
	Description	
	Uses	
8.	Common name	
	Scientific name	
	Family	
	Description	

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

Objective: To study the diameter measurement of trees using calipers

- Diameter at breast height, or DBH, is a standard method of expressing the diameter of the trunk or bole of a standing tree. DBH is one of the most common dendrometric measurements.
- Tree diameter measurements (along with heights of trees using hypsometers) when determining usable wood volume in standing trees.
- The tree's diameter is important to determine volume when trees are sold for pulp, lumber or hundreds of other volume determinations

Calipers:

- Calipers are comprised of a fixed arm, scale and moveable arm. The fixed arm is
 placed along one side of the tree at the desired height. The moveable arm is then
 placed flush against the other side of the tree and the scale is read directly.
- The calipers must be located perpendicular to the stem axis.
- The length of the caliper arms must be at least half the diameter of the tree. Biased estimates (underestimates) of the diameter will result if the arms are less than half the tree diameter. This limitation may restrict the use of calipers to smaller trees the large diameter trees often found in natural eucalypt forests would require calipers arms in excess of 1 m which would be inconvenient.
- There are a wide variety of calipers available. The most widely used type is the light, hardwearing, metal alloy caliper.

Specification of calipers for measuring tree diameter:
Procedure: :



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

Calculation:		 	 	
	•••••	 •••••	 •	
•••••		 	 	
		 	 	·
•••••	•••••	 	 	
Results:		 	 	
	•••••	 •	 •	
Conclusion:				
Conclusion		 	 	
•••••		 	 	

Objective: To study the diameter measurement of trees using tape

- Diameter at breast height, or DBH, is a standard method of expressing the diameter of the trunk or bole of a standing tree. DBH is one of the most common dendrometric measurements.
- Tree diameter measurements (along with heights of trees using hypsometers) when determining usable wood volume in standing trees.
- The tree's diameter is important to determine volume when trees are sold for pulp, lumber or hundreds of other volume determinations

Measuring tape:

- A diameter tape, or d-tape, is the most common tool for measurement of tree diameter.
- The tape is wrapped around the tree, measuring its circumference. The
 tape is graduated to reflect a conversion from tree circumference to tree
 diameter. Thus, circumference is measured, but diameter can be
 recorded to the nearest 0.1 inch. Most trees are not perfect circles, so
 there is some error in this method.



 However, except on extremely irregular trees, this method seems to "average out" the tree's shape to an acceptable estimate.

Specification of diameter tape for measuring tree diameter:
Procedure: :

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

Calculation:			 	
			 	 · · · · · · · · · · · · · · · · · · ·
	• • • • • • • • • • • • • • • • • • • •		 	
			 	 · · · · · · · · · · · · · · · · · · ·
Results:			 	
•••••		•••••	 	 •
Conclusion:			 	
	•••••	•••••	 •••••	
		•••••	 	

Objective: To study diameter measurements of forked trees

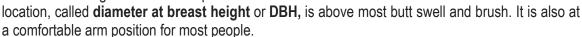
Trees do not grow like cylinders, but rather taper upward; a tree's diameter gets smaller as one gets closer to the top of the tree. Trees also have butt swell.

a thickening of the wood and bark at the base of the tree to

support the tree's mass.

Butt swell can create a very large diameter on trees exposed to heavy wind, on steep slopes and in sparsely populated stands. Thus, to obtain truly useful diameter data, the question becomes, "Where on the tree should I measure?"

To make tree diameter measurements meaningful and easy to perform, a standard location and protocol have been developed. Diameters are measured outside the bark at 4.5 feet above the ground on the uphill side of the tree. This

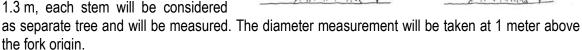


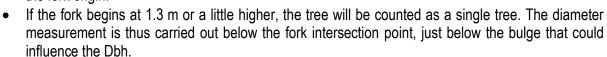
Fork tree: Several cases exist, according to the point where the fork divides the stem.

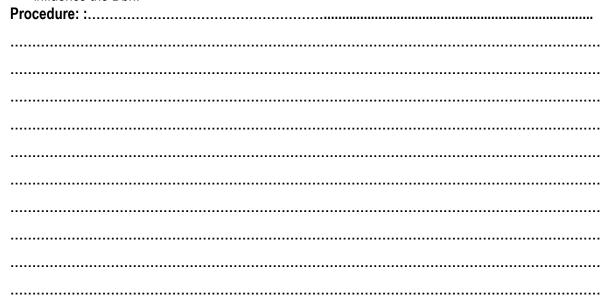
If the fork begins (the point where the core is divided) below 1.3 m height, each stem having the

diameter required (≥20 cm in the whole plot, ≥10 cm for rectangular subplots) will be considered as a tree and will be measured. Diameter measurement of each stem will be taken at 1.3 m height.

If the fork begins between 30 cm and 1.3 m, each stem will be considered







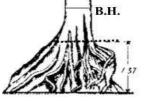
S.	Species	Condition of	Measuring	DBH (OB) in cm		Remarks	
No.		tree	Side	Major axis	Minor axis	Average	(if any)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
Cala	ulation				•		

Calculation:		 			
		 	•••••	•••••	
	•••••	 •••••		•••••	
	•••••	 		•••••	
Results:		 			
	•••••	 		•••••	
		 	•••••	•••••	
Conclusion:					
	•••••	 		•••••	
•••••	•••••	 •••••		•••••	

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



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

measurement of a diameter at another height.

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	(1) 1941年
	ruler. If a diameter tape is used, ensure the correct side of the	tape is used.
Proced	lure: :	

Proced	dure: :	 	 	 	 	

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

Calculation:
Results:
Conclusion:

.....

Objective: To study diameter measurements of leaning trees

Leaning tree: On leaning trees, the tape is held perpendicular to the tree bole, and is measured on the uphill side of the tree if on a slope (left); on the short side of the lean if on flat ground (right).

* HHH-DBH
4.5 FT

				de la companya de la	<u> </u>	- 4 /1/	Marin
Proce	dure:						
			•••••			•••••	•••••
			•••••				
Obser	vation:						
S.	Species	Condition of		DE	3H (OB) in cr	n	Remarks
No.		tree	Side	Major axis	Minor axis	Average	(if any)
1							
2							
3							
2 3 4 5 6							
5							
7							
		+					
9							
10							
	lation:						
			•••••				
			•••••	•••••	• • • • • • • • • • • • • • • • • • • •		······································

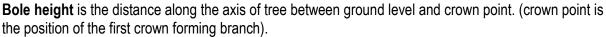
	 	 •••••
	 	 •••••
Results:	 	
Conclusion:	 	
Conclusion:	 	
Conclusion:	 	
Conclusion:		

.....

Objective: To study height measurement of standing trees by shadow method

- Tree height is the vertical distance between the base of the tree and the tip of the highest branch on the tree, and is difficult to measure accurately.
- Tree height is the vertical distance measured from the ground surface
- Height of standing tree is measured to find out its volume. Height
 of selected trees in a forest is also required to read volume tables,
 form factor tables, yield tables etc.
- Lastly, heights of trees are required to find out productive capacity
 of site. Height is generally considered as an index of fertility and
 with the knowledge of age it gives a reliable measure of the site
 quality of a locality.

Total height of a standing tree is the distance along the axis of the tree stem between the ground and the tip of the tree.



Commercial bole height is the height of bole that is usually fit for utilization as timber.

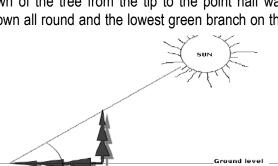
Height of standard timber bole is the height of the bole from the ground level up to the point where average diameter over bark is 20cm.

Stump height is the distance between the ground and basal position on the main stem where a tree is cut

Crown length-The vertical measurement of the crown of the tree from the tip to the point half way between the lowest green branches forming green crown all round and the lowest green branch on the hole

Crown height - The height of the crown as a measured vertically from the ground level to the point half way between the lowest green the lowest green branches forming green crown all round.

Shadow method: In this method, a pole of convenient length is fixed upright in the ground and its height above the ground is measured



rinciple:	

Proce	dure:				
Obse	rvation:				
S.	Species Name	Observer distance		Height of tree (m)	
No.		(m)	Height above eye level (m) A	Height below eye level (m) B	Total height (m) A+B
1					
2					
4					
5					
6					
7					
8					
9 10					
	lation:				
Calcu	iation				
•••••					······································
D	4				•••••
Resui	ts:				······································
Concl	usion:				

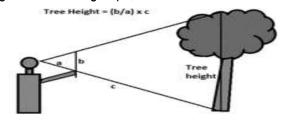
.....

Objective: To study height measurement of standing trees by single pole method

- The ability to obtain accurate tree heights creates an opportunity for some interesting forest studies. One of these is the construction of a forest profile, in which all the tree species, large and small, are included.
- By including information on topography, exposure and soils for the tallest example of each tree species, those specimens may be arranged by height into habitat groups, which show the need for

trees to find a niche in which they are height competitive, and can receive enough sunlight to survive.

Single pole method: Pole of about 1.5 m length vertically at arm's length in one hand in such a way that portion of the pole above the hand is equal in length to the distance of the pole from eye.



Principle:
Procedure:

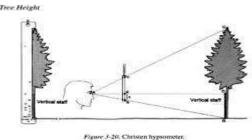
S.	Species Name	Observer distance (m)	Height of tree (m)					
No.			Height above eye level (m) A	Height below eye level (m) B	Total height (m) A+B			
1			eye level (III) A	eye level (III) B	(III) A+D			
2								
3								
4								
5								
6								
8								
9								
10								
	ılation:							
					······································			
•••••								
Dogu	Ita							
Resu	Results:							
Conc	lusion:							

Objective: To study height measurement of standing trees by hypsometer

- There are various instruments to measure height of the tree.
- Height measuring instruments are called hypsometer.
- Those instruments based on trigonometric principles are more accurate than the ones employing geometric principles.
- The Abney's level, Haga Altimeter, Blume-Leiss Altimeter and Sunto Clinometer are similar in accuracy.

Christen's Hypsometer

- It is based on the geometric relationships of similar triangles.
- Consists of a strip of metal, thin wood or card board about 2.5cm wide and 33 cm length.
- It has two flanges or protruding edges one at the top and other at the bottom.
- Each flange has a hole in it, the upper one to suspend the instrument by some thread passing through it at and the lower one to suspend a weight from it to prevent it from swinging.



Principle:

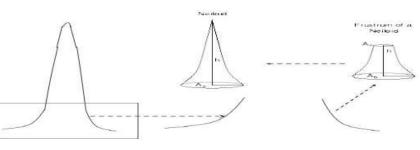
Procedure:

.....

No.	Species Name	(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							
Calcu	ılation:						
•••••				•••••			
•••••							
•••••							
				•••••			
Resul	lts:						
Conc	lusion:						

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 = π D²/4 &

= $(\pi D^2/4)$ x 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 = πd & unit is m; d is mid-point diameter); H= Commercial bole height or height of tree (m)

Volume calculation by Quarter Girth formula:

SI	Species Name	Mid-point diameter (d) in	Commercial Bole	Mid-point girth	Volume (m3) V= (G/4)2 x H
No		cm	height/ height of	in m (G = πd)	
			tree(H) in m		
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

By Huber's formula:

$$V = S_m * l$$

Where,

V = Volume of Logs

Sm =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 (m³) V= g _m x I
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

 $\boldsymbol{S}_{\mathrm{m}}$ = 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	area at the	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

$$V = \frac{S_1 + S_2}{\text{Where,}} * l$$

V = Volume of Logs

 \mathbf{S}_1 = the sectional area at the thick end

 \mathbf{S}_2 = 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					
5					
6					
7					
8					
9					
10					

 	-											
 	•••											
 	•											
 	•											
 	•											

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

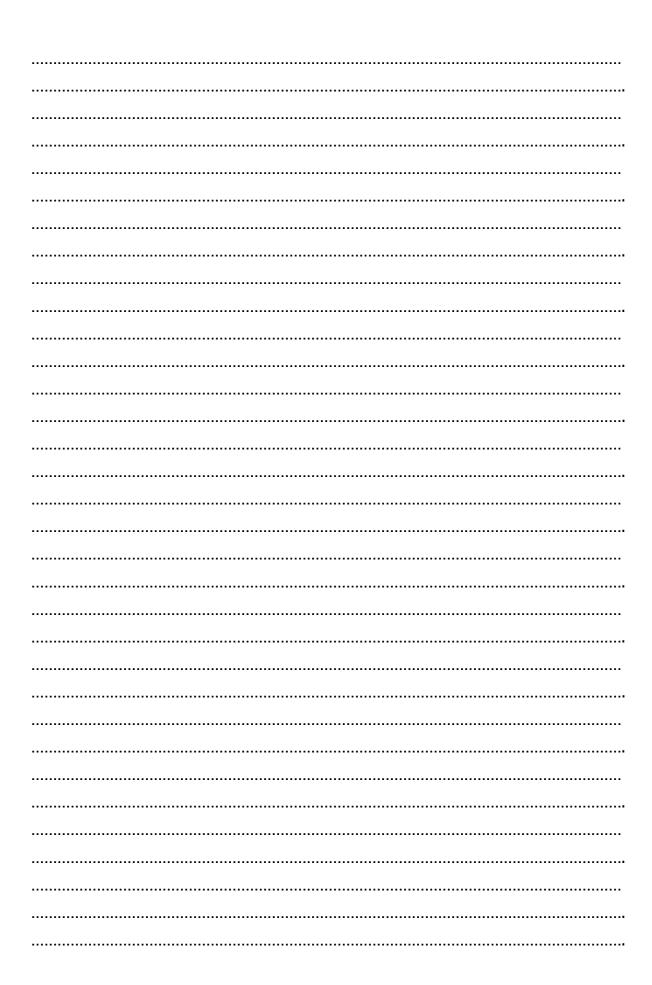
The main advantages of permanent nurseries are:

- 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 smallscale nurseries.

Important factors

Water	 	
Location		
Topography	 	
Size of the nursery		

Preparation of the site:
·
Design and layout of nursery
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



Objective: To study the nursery seed sowing techniques

Method of Sowing: The two basic methods of sowing seed for container or bare root production are broadcast and direct sowing. The choice of method will depend on the local conditions and experience. It should be noted that:

- The yield of plantable seedlings from a given seed lot is usually much greater with broadcast sowing
- Development of transplants are sometimes slow compared with undisturbed direct sown seedlings
- There is a risk of root distortion during transplanting with broadcast sowing
- When seed is plentiful, of good quality and its cost is only a small proportion of total nursery costs, direct sowing is sometimes preferred.
- Direct sowing is also easier if the seed is large enough in size to be handled individually and the risk of root distortion is reduced with this method.

Broadcast methods
Divert acquire methods
Direct sowing methods

Time of sowing
Depth of sowing
Depth of sowing
Depth of sowing.
Management practices

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:
Diagram:
Air layering:

Diagram:
Grafting:

.....

Diagram:
Micro propagation:
Diagram:

Objective: To study the forest plantations and their management

- Plantation of forests can provide most goods and services that are provided by natural forests. These include timber, non timber forest products, protection of clean water and clean air, soil erosion control, biodiversity, esthetics, carbon sequestration, and climate control.
- Nonetheless, as the value of environmental services from natural forests is higher than that from forest plantations, the demand for conservation of natural forests is stronger. It is possible that a division of land, with some land specialized in timber production and other land in providing environmental services, would produce more forest-related goods and services to society.
- Because forest plantations grow much faster than natural forests, forest plantations are seen as an increasingly important source of timber supply. Should more forest plantations be developed, more natural forests might be saved.

To appreciate the need for forest plantations, the roles played by these plantations must be defined. Quite often, there are a number of roles (such as fuelwood or fodder production) which, through careful planning, can be combined to achieve multiple benefits.

Establishment and management techniques of	forest plantations:
 Site reconnaissance Selection of the planting site Species selection Preparation of the planting site Time of planting Site reconnaissance 	 Planting of containerized stock Spacing of plantings Maintenance of plantations Harvesting operation
Selection of the planting site	

Species selection
Preparation of the planting site
Preparation of the planting site.
Preparation of the planting site.
Preparation of the planting site.

Objective: To study the forest plantations and their management

Establishment and management techniques of forest plantations:			
Time of planting			
Planting of containerized stock			

Spacing of plantings
Maintenance of plantations
Harvesting operation

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:

Name of the visiting forest based industry:
Date of visit:
Locality:
Area (m²):
Observations:
source and energy efficiency
w materials
w materials

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

.....
