PRACTICAL MANUAL

Logging and Ergonomics

FPU 227 Credit Hrs. 3(2+1)
B.Sc. (Hons.) Forestry V Semester

Dr. Amey S Kale
Dr. Jahangeer A. BHAT

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

Syllabus: Logging and Ergonomics: FPU 227 Credit Hrs. 3(2+1)

Equipments and tools used in logging operations and their uses. Instructions regarding maintenance of various records and registers in logging operations; Conversion of felled trees into logs, poles, firewood, pulpwood. Visit to local saw mills to study the equipments used and process of conversion. Measurement of logs, poles and firewood in forests and maintenance of records in relevant registers. Visit to local dumping yard (timber depot) to trace the logs delivered from different forest sites. Sorting of logs, poles and firewood in the depots according to species, quality, length and girth classes. Stacking and stock checking of different logs, poles and firewood in the depots so as to confirm that all the converted materials in the forests have reached their destination. Stacking of the lots for display and final disposal; recording of the lots for auction sale. Final disposal of the material. Visit during the auction sale in the government timber depots; Preparation of ergonomic check lists. Familiarize the e-auctioning procedure of State Forest Department. Safety rules and first aids in forestry operations

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Session .....

Semester .....

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Date: Signature

Index

Practical No. 1

Objective: To familiarize with tools and equipment used in logging operations

Logging: ……

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Logging tools:

Axe: ..……

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Saw:

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Bill Hook:

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Cant Hook: ……..

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Pickroons: ……...

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Debarking spade: ……...

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Stem tightener: ……..

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Wedges: ……

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Log hook:

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Draw diagram of harvesting tools

Practical No. 2

Objective: To study about different types of axes and their uses

Parts of the axe

Axe Head: ……

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Axe Handle: ……

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Types of the Axes:

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Diagram

Practical No. 3

Objective: To study about different types of saws and saw blade geometry

Hand saws: ……

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Bow Saw:

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Based on the shape of cutting tooth:

A. Peg Toothed saw: ……..

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B. Raker toothed saw:

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Cross cut saw:

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Pruning saw: ……

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Power Chain Saw:

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Advantages of Power Chain Saw:

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Disadvantage of Power Chain Saw:

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Maintenance of the Saws:

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Saw Blade Geometry:

Face:

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Back: ……...

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Space: ……

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Gullet: ……

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Pitch:

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Set: ……..

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Kerf:

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Guage: ……

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Draw diagram of types of saws

Practical No. 4

Objective: To study about felling rules

Felling operation: ……

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Felling Rules:

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Practical No. 5

Objective: To study about kinds of felling methods

1. Felling with axe alone: ……

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2. Felling with axe and saw: ……

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3. Felling with saw alone: ……

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Methods of Felling

Practical No. 6

Objective: To estimate volume of felled logs

Materials required:

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Procedure: ……...……

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Formula:

Diameter Under Bark (DUB) = …….. then, Convert the DUB into GUB by using formula

Girth Under Bark (GUB) = ……..

A) Volume calculation of logs of cylindrical form (under bark)

1. General formula (Measure the diameter at any point of log) V= S x L Where, S= Basal Area; L= Length of log
2. Quarter Girth formula (Measure the diameter at middle of log $V= (G/4)^2 \times L$
   Where, G= Girth at mid-point of log; L= Length of log

B) Volume calculation of logs of taper form (under bark)

1. Smalian"s formula, (Measure the diameter at thick end and thin end of log) $V = (S_1 + S_2)/2 \times L$
   Where, S_1 = Basal Area of thick end cross section; S_2 = Basal Area of thin end cross section and L = Length of log
2. Huber"s formula (Measure the diameter at middle of log) V = Sm x L
   Where, Sm = Basal Area at middle of log and L = Length of log
3. Newton"s formula (Measure the diameter at thick end, middle and thin end of log)
   $V = (S_1 + 4\ Sm + S_2)/6 \times L$
   Where, S_1 = Basal Area of thick end cross section; S_2 = Basal Area of thin end cross section; Sm = Basal Area at mid-point and L = Length of log
4. Quarter Girth formula (Measure the diameter at middle of log)
   $V= (G/4)^2 \times L$, Where, G= Girth at mid-point of log and L= Length of log

Observation and Calculation:

Observation table

S No	Species Name	Length of log (L) in m	Dia (OB) at any point (d) in cm (for cylindrical logs)	Mid-Dia (OB) (D) in cm	Dia (OB) at thick end (D_1) in cm	Dia (OB) at thin end (D_2) in cm
1						

2						
3						
4						
5						
6						
7						
8						
9						
10						

Calculation Table- (Volume of log(s) over bark by different formulae)

S No	**Vol. by General Formula (m^3) (for cylindrical logs)** [V= S x L]	**Vol. by Quarter girth formula (m^3)** [V= $(G/4)^2$ x L]	**Vol. by Smalian's formula(m^3)** [V=$(S_1+S_2)/2$ x L]	**Vol. by Huber's formula (m^3)** [V = Sm x L]	**Vol. by Newton's formula(m^3)** [V=$(S_1+4Sm+S_2)$ /6 x L]
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Practical No. 7

Objective: To study about saw mills and their layout

1. Permanent Saw mill: ……

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2. Portable saw mill: ……

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Chief operations in sawmills:

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Layout of the saw mill:

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Layout of the saw mill

Practical No. 8

Objective: To study about conversion of wood into various dimensions

Squares: .....

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Baulk: .....

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Waney baulks: .....

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Half baulks: .....

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Plank: .....

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Batten: .....

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Scantling: .....

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Board: .....

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Strip: .....

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Slantling: .....

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Hakries: .....

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Poles: .....

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Practical No. 9

Objective: To study about the timber depot/log yard layout.

Introduction: ……...……

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Types of Log yard: ..……...

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Practical No. 10

Objective: To study about system of disposal of logs/ timber

Practical No. 11

Objective: To understand the escape route during logging operations

Practical No. 12

Objective: To know about the safety and safety rules in harvesting/logging.

Practical No. 13

Objective: To study about the ergonomic checklist/ergonomic needs in forestry work.

Practical No. 14

Objective: To study about the personal protective equipment (PPEs).

Practical No. 15

Objective: To know about the first aid kits and its contents.

Practical No. 16

Objective: To visit saw mill

Name of the Saw Mill:

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Address: ……

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Owners Name: ……

Type of saw mill: ……

Purpose of the visit: ……

In-charge sawmill:

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Total Area of the Saw mill:

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No. of skilled and Unskilled workers:

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Source of the raw material: ……

Method of measuring the logs: ……

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Method of grading of wood: ……

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Available wood cutting equipment: ……

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Available wood working instruments……

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Market Timber demand:

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Types of Buyers: ……

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Cost of Production: ……

Turnover per Annum:

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Facilities, security and training for the staff and workers: ……

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Observations: ……

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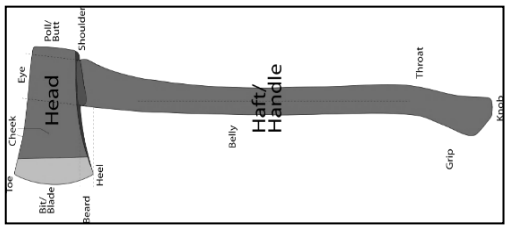
Draw Process flow diagram for sawmill operation

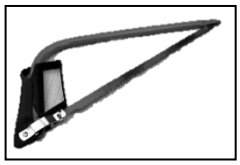
Practical No. 17

Objective: To visit Log yard/ Timber Depot

TOOLS USED IN LOGGING OPERATIONS

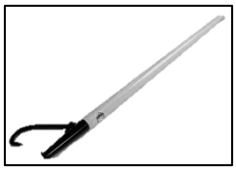
Axe - An axe comprises of axe head and axe handle. The axe head is made up of a solid piece of iron with a sharp steel cutting edge or blade. The top corner of the blade where the cutting edge begins is called the toe, and the bottom corner is known as the heel. Either side of the head is called the cheek. There is a hole at the back of the head which is called an eye. Axe handle or shaft which is made up of wood is mounted or inserted here. Axe handles are of two types-straight and oval. They have their own advantage and disadvantage.





Saw - A saw consists of a thin, comparatively broad blade or plate of steel, one edge of which is toothed and is provided with one or two handles attached to one or both the ends. They are used for felling, cross cutting, conversion into logs and also if needed for shaping of the wood.

Billhook - The use of a billhook is between that of a knife and an axe. It is often used for cutting woody plants such as saplings and small branches, for hedging and for snedding (stripping the side shoots from a branch).

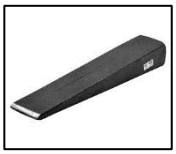


Cant Hook- A cant hook or cant dog is a traditional logging tool consisting of a wooden lever handle and turning logs and with a movable metal hook called a dog at one end, used for handling cants, especially in sawmills.

Pickroons - A pickaroon is a wood-handled, metal-topped log handling tool. It is a short pole, 85-100 cm long, with a recurved pike or hook for drawing or pulling small logs.

Debarking Spade - It is fitted with a bent blade which is used for debarking logs.

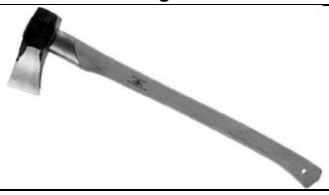
Stem tightener – Its function is to prevent the stems from splitting at butt ends. It consists of 13mm wire rope having a steel core. It is laid round the stem just above the felling cut and tightened with the help of a lever mechanism. The wire rope is held fast with the help of a clamping device which consists of a guide groove for the rope, a movable support and a wedge.



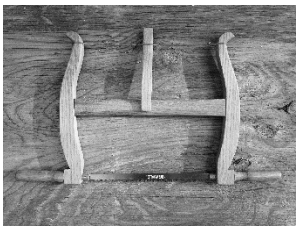
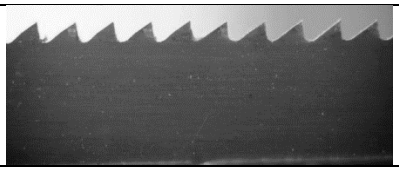
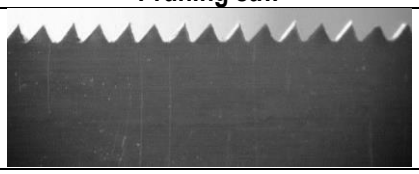
Wedges - Wedges are used in felling trees and to prevent jamming of the saw in crosscutting or longitudinal splitting. Wedges are of various types in terms of size, shape and material. Metal wedges are made of steel or iron. Wood wedges with iron band are also used.

Log hook - It is used for dragging, lifting and rolling.

TYPES OF AXES

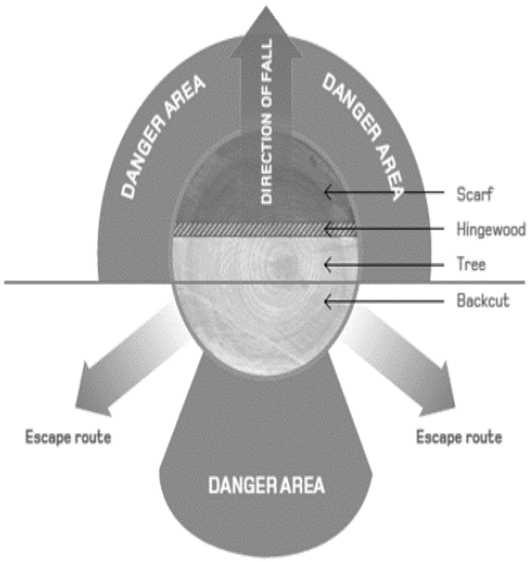
	
Felling Axe	**Trimming Axe**
	
Splitting Axe	**Grubbing Axe**

TYPES OF SAWS

	
Hand Saw	**Frame Saw**
	
Bow Saw	**Pruning saw**
	
Ripping Saw	**Crosscut Saw**
	
Circular Saw	**Power Chain Saw**

TO UNDERSTAND THE ESCAPE ROUTE DURING LOGGING OPERATIONS.

Identification of escape route is one of the most important parts of any felling plan. Statistics show that a well-planned and utilized escape plan has a significant impact on your personal safety. It is important to understand felling procedures to avoid accident and fatalities caused by tree falling. Loggers/harvesters have learned over the years that the area directly on either side or directly behind the tree is very dangerous. This is because branches, tops and trunk sections often fall near the base of a falling tree. In falling, a barber chair occurs when using conventional back-cuts where the hinge is formed by cutting the wood from the back of the tree towards the hinge.



The importance of using an escape route. Review of where tree falling accidents and fatalities occurred revealed that 90% of all accidents and fatalities happen within the first 15 seconds of the tree falling and within 5 feet of the base of the felled tree. Therefore, if you identify, plan and use an escape route you can increase your chance of survival or escaping injury by 90% and that the best escape route is at an angle away from the falling tree. The most advisable angle of escape is away from the direction of the falling tree at an angle approximately 135 degrees from the direction of fall or 45 degrees from the opposite of the direction of fall. Many times obstacles or terrain influence the escape route plan,

therefore it is not an exact science but rather the escape zone is at an angle away from the direction of fall, as illustrated in the diagram.

Steps of tree felling plan

1. **Site assessment**
2. **Individual tree assessment**
3. **Preparation of the work area and escape route**
4. **Fell the tree using safe felling techniques**
5. **Retreat and observe**

TO KNOW ABOUT THE SAFETY AND SAFETY RULES IN HARVESTING/LOGGING

The principal sources of accident in forest work are: tree felling, wood collection and wood transportation- loading and off-loading etc. The most important way of eliminating accident at work is to take adequate steps to prevent it. As a rule, all new workers must undergo accident prevention training before physically participating in forestry works. The workers must use the appropriate equipments provided by employers. All organization must set up a monitoring unit to enforce the use of safety equipment.

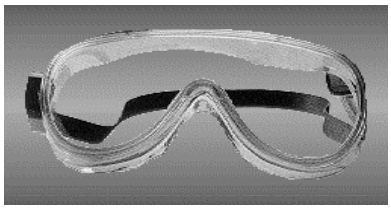
The responsibility for safety: The employer shall provide a safe work environment and enforce safe work practices. Each employee shall be held responsible for performing all work in a safe manner so that injuries to that person and to others will be avoided. Employer, supervisor, employee, or designated person shall instruct new employees in safe practices. Employees shall be familiar with the location and use of all safety, emergency care, and equipment's located at the jobsite. An employee shall notify his employer or supervisor before attempting any work which appears hazardous above and beyond normal operating conditions. An employee shall report all injuries to his employer or supervisor without delay, regardless of the nature of the injury. Good housekeeping of all work areas and equipment shall be practiced

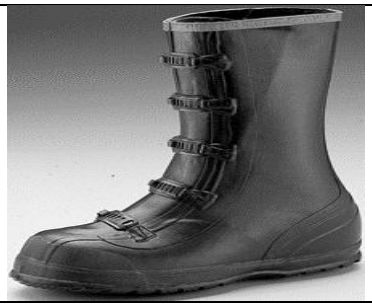
TO STUDY ABOUT THE ERGONOMIC CHECKLIST/ERGONOMIC NEEDS IN FORESTRY WORK

There are series of needs that must be satisfied before man can produce optimally. These demands are referred to as ergonomic needs. These are: Nutrition, Resting time & heat prevention, Acclimatization, Clothing, Physical Health, Training, Motivation and Safety.

TO STUDY ABOUT THE PERSONAL PROTECTIVE EQUIPMENT (PPES)

Personal protective equipment (PPE) refers to protective clothing, helmets, goggles, shoes or equipment designed to protect the wearer's body from injury. The purpose of PPE is to reduce employee exposure to hazards. The different types of personal protective equipment are for eye & face protection, head protection, hand protection, foot protection and body protection.

	
Safety earmufs	**Head Protection**
	
Eye Protection	**Face Protection**

	
Hand Protection	**Foot Protection**
	
Body Protection	

FIRST AID KITS AND ITS CONTENTS

First-aid is the immediate treatment given to someone who is injured or has suddenly become seriously ill when there is no qualified medical assistance available (e.g., physician, nurse or ambulance crew). The first-aid includes not only physical treatment of the injury or illness but also psychological encouragement of the victim. The first-aider deals with the whole situation including both the injury and the victim. Knowledge and skill of how to give first-aid treatment will increase the chances of survival in cases of serious injury, or it may mean a temporary disability only instead of a permanent one, or a speedy recovery instead of lengthy hospitalization.

First aid list for cuts, sprains and breaks

- tubes saline solution
- adhesive dressing strips
- adhesive strapping tape 75 mm
- 3 x 75 mm gauze swabs
- wound dressing (20 cm x 30 cm)
- wound dressing (10 cm x 10 cm)
- wound dressing
- triangular bandage (110 cm – cotton)
- crepe bandage (10 cm)
- constrictive bandage (50 mm x 1 m)
- scissors – blunt/sharp
- Sting relief spray or ointment