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E-PRACTICAL CUM TEACHING MANUAL

FP3105

Logging and Ergonomics

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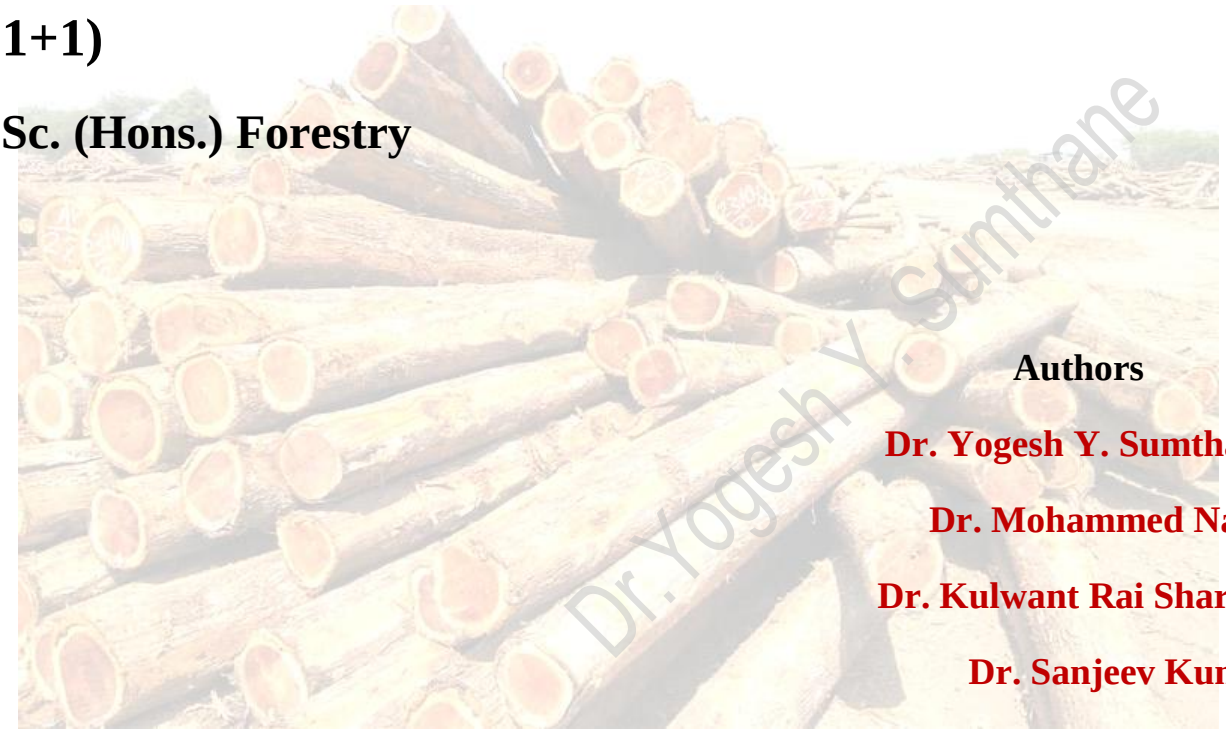
B.Sc. (Hons.) Forestry



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E-Practical cum Teaching Manual

Logging and Ergonomics

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Forward

Logging and Ergonomics which is the study of the efficiency of person in their working environment, has been relatively neglected so far in developing countries. The reasons for this low priority are many and relate not only to the lack of human and financial resources but also in the case of logging and ergonomics to the low status enjoyed by Forestry work and the general belief that training in this field is a liability rather than a profitable investment.

This is regrettable as ergonomics is one of the essential elements in strategies aimed at reducing the costs associated with equipment downtime, suboptimal processing capacity, and the underutilization as well as overexploitation of Forest Resources and the attendant problems.

This e-Practical Cum Teaching Manual on **"Logging and Ergonomics"** has been prepared as a help to undergraduate students of forestry to give information related to the vast uses of wood and wood based industries with the hope that it will prove its worth to meet their needs and motivate them in understanding different aspects of the subject.

I am confident that this basic manual will not only meet the requirements of the students, but will also prove to be useful for researchers, professionals and other interested readers a handy material. I appreciate the efforts of the authors in preparing this manual and hope that it will provide necessary impetus in positive direction.

College of Forestry

Dr. Kulwant Rai Sharma

Banda University of Agriculture and Technology Banda Ex. Dean UHF, Nauni, Solan H.P.

April, 2023

PREFACE AND ACKNOWLEDGEMENTS

Ever since the dawn of civilization wood, the world's most valuable resource has served mankind in multitudinal ways. It is an important structural and more importantly a renewable natural material with high strength per unit weight. In most of the countries, wood is the primary constructional material. In its simplest application, the energy stored in wood is used to produce heat for cocking or for industrial process. Wood is also a major potential feed stock for synthesis of more complex material. Wood can also represent a large volume of waste material generated by industrialized societies. Cellulose and lignin are the two most abundant polymers on the earth. Lignin is practically problematic because of its resistance to degradation and development of method of degradation of this resource in to more readily utilizable material has received extensive study.

Since long time need was being felt to have well compiled information on the teaching and practical aspects of wood products utilization. This teaching cum practical manual on **"Logging and Ergonomics"** cover the different type of wood products and their manufacturing processes from practical point if view and in a systematic manner to cater to the needs of under graduate forestry students.

In developing the material for this manual authors have relied mainly upon the help of literature from several sources which is highly acknowledged. Some of the help came from discussion, field visit and various other sources. Authors extends their gratitude to all those who even in small way helped in preparation of this manual. We would like to record our sincere thanks to Dr. (Prof.) Narendra Pratap Singh Hon'ble Vice Chancellor, Dr. A.C.Mishra Director of Research Banda University of Agriculture & Technology Banda. Dr. A.K Shrivastva Director PMEC, Dr. Sanjeev Kumar Dean CoF, Dr. Mohammed Nasir In-charge FPU. Escaped our attention, authors would be grateful if they are brought to notice.

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April, 2023

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Technical Term Used in the Course

Annual growth

The yearly increase in wood volume, usually expressed in terms of board feet or tons per acre.

Annual growth ring

Concentric bands that show tree growth for a one-year period, as viewed on the cross-section of a trunk, stem, and branch or root that can be counted to determine age. Variations in ring width records show how a tree responded to growing.

Chain

A unit for measuring land distance. A chain is 66 feet. An acre contains an area equal to 10 square chains.

Chip-n-saw

A process, normally with conifers, where small logs are cut in such a way that the outside of the log is converted directly into chips, leaving the inside, square-edged cant (which can be used as a post or sawn into lumber).

Bole

The main tree trunk.

Buffer

A strip of trees or other vegetation that is intentionally left undisturbed (or disturbed lightly) in order to mitigate the visual impacts of logging or to minimize pollutants that result from logging from entering adjacent water bodies.

Butt

The base of the tree Once felled, the butt log is the one that was attached to the stump.

Cord

A stack of wood that has a gross volume of 128 cubic feet. A cord measures 4 feet by 4 feet by 8 feet and contains approximately 80 cubic feet of solid wood, with the remainder being air space.

Crook

An abrupt bend in a log, considered a defect.

Diameter-limit cutting (DLC)

A harvest based on cutting all trees in a stand over a specified DBH, regardless of tree vigor, species or spatial distribution. DLC usually results in the long-term degradation of the stand.

Diameter tape

A measuring tape calibrated to determine tree diameter when stretched around the circumference of a tree bole or log.

DIB (diameter inside bark)

Diameter inside the bark, often measured at the small end of a log and used to estimate board foot volume in logs.

Dibble bar

A flat or round metal tool used to make a hole for planting bare root seedlings.

Density

The quantity of trees per unit of area, usually expressed as trees per acre.

Early wood

Part of the annual wood growth ring formed early in the growing season that is differentiated from latewood in that the wood is often less dense and lighter in color.

Hardwood

A term describing broad leaf trees, usually deciduous, such as oaks, maples, hickories, ashes, cherry, poplar, elms, etc.

Heartwood

The inner core of a woody stem composed of nonliving cells and sometimes differentiated from the sapwood by darker color.

Juvenile wood

The first 10 to 15 years of wood growth surrounding the center (pith) of a tree. This wood generally has poor properties compared with the “mature wood” formed subsequently.

Increment borer

A hollow, auger instrument used to bore into a tree to remove a sample of wood (core) that is used to evaluate growth rate and age.

Log rule

A formula that is used to estimate lumber volume (in board feet) based on log diameter and length.

Log scale

The lumber content (in board feet) of a log as determined by using the log rule.

Lop

The cutting up of tree tops that have been left following a timber harvest, generally for the purpose of improved aesthetics or for site preparation.

Punky

A soft, weak, often spongy condition in wood that is caused by decay fungi.

Regeneration cutting

A harvest technique that provides for stand regeneration, such as clear cutting or forest openings.

Release cutting

Improving the composition in young stands by cutting inferior trees, thereby releasing the desired trees from competition.

Roundwood

Wood products that are round, such as pulpwood, posts, pilings, utility poles and fencing material.

Sapwood

The light-colored section of the tree between the heartwood and the bark also known as xylem. Contains some living cells and conducts water to the crown for photosynthesis.

Scaling

Estimating the usable wood volume in a log or standing tree that follows fundamental rules.

Poles

A tree generally 3 to 12 inches DBH.

Softwood

A term describing trees with needles or scales-the conifers, such as pine, cedar, spruce, fir, etc

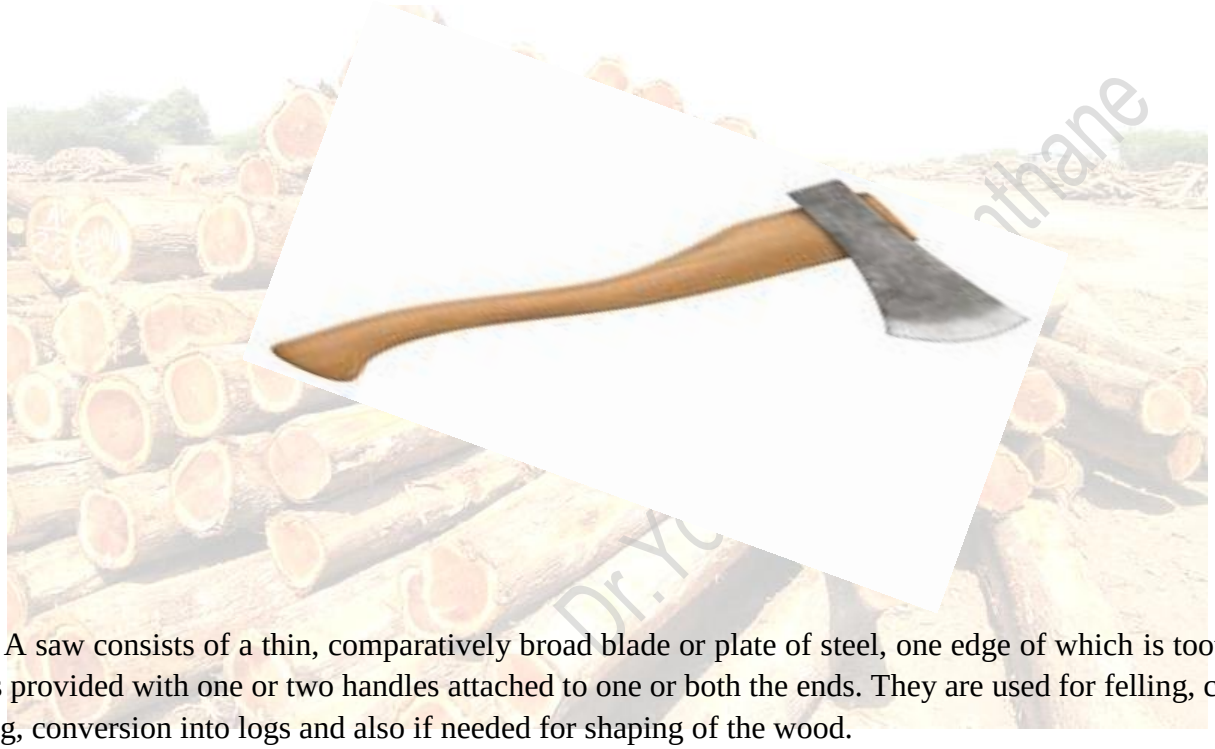
Stocking

A relative term indicating the amount of growing space being occupied by trees and the amount of growing space that is available or unoccupied. Although stocking cannot be directly measured, collective factors contributing to stocking guides include basal area per acre, number of trees per acre and average tree diameter. Relative terms, such as overstocked, fully stocked or understocked, are descriptive terms to describe stocking. For best stand growth, stocking should be maintained in the fully stocked range.

To Study about Equipment and Tools Used In Logging Operation and Their Uses

TOOLS USED IN LOGGING OPERATIONS

Axe- An axe comprises of axe head and axe handle. The axe head is made up of a solid place 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.

Bilhook- 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 shedding (stripping the side shots from a branch).

Cant Hook -A cant hook or cant dog is a traditional logging tool consisting of a wooden lever handle and tuming 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 puling small log.

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 spiting at butt ends. t 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 damping 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 cross cutting 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, lighting and roiling.

To Study about Maintenance of Equipment and Logs

Equipment maintenance log

An equipment maintenance log is a document that records activities that have been performed on an asset. It takes at least a handful of key equipment to keep a plant operational. It is unimaginable how much time and effort goes into maintenance activities for each asset annually. Compounded by the total number of equipment and combined years of operation, documentation of maintenance tasks can easily get out of hand without a systematic process for tracking activities.

Three types of maintenance logs

1. Maintenance schedule logs

Maintenance schedule logs are a timetable for all the projects in progress within an organization. These logs provide a holistic overview of everything the company is working on at any given time, as well as an expected timeline for completion.

2. Machinery maintenance logs

Machinery maintenance logs contain information about scheduled maintenance for all of the machines used by the organization. These logs ensure that teams service their machinery within the specified interval to keep it operating efficiently.

3. Project logs

Project logs track the company's current projects. Similar to maintenance schedule logs, they help organizations look at ongoing work and expected completion timelines. Project logs may include maintenance schedule logs, as well as projects from other departments. They also cover completed projects.

Maintenance activities are invaluable in maximizing an assets life span. To help make sure that maintenance tasks are done diligently, records in the form of maintenance logs need to be created and updated.

By keeping maintenance activities well-documented, the whole organization is kept up to speed on the status of an asset. Being aware of the current condition of the assets is a step towards improving the overall plant performance and ensuring safe working conditions.

Benefits of using equipment maintenance logs

Companies use equipment maintenance logs to monitor the conditions of their equipment. Their business operations depend on the functionality of their assets, so it is important to have high-quality equipment maintenance logs. The benefits of keeping good logs include creating more cost-effective decisions, increasing the resale value of equipment, and developing specialized equipment maintenance programs.

To Study about Conversion of felled trees into logs, poles, Firewood, Plywood

Seasons for Felling

The season for felling is determined by climatic conditions and the growing season of trees. India has both tropical and temperate climates each characterized with well marked seasons. In areas above 2000 m altitude in the Himalayas, snowfall is heavy during winter, felling is usually done from April onwards and is generally completed before the rainy season. In the plains and sub montane tract, felling is done in winter between October and March. Winter felling in general is advisable, as tree growth during this season is minimal. Felling in very hot weather is harmful from seasoning point of view, as the logs dry rapidly resulting in splitting and cracking.

Procedure of Felling

Operation, and unless don causes considerable loss of proper Felling of trees is a skilled timber. It is advisable that the wood cutter has the efficiency and experience in the use and maintenance of axe, saw and other implements.

Felling Rules

The underlying principles of good felling technique are –

- Production of maximum volume of sound timber;
- Avoiding damage to the surrounding vegetation.

Based on the above principles, the following rules, in general, may be observed.

(1) Trees should be felled as close to the ground as possible. In other words, stumps of felled trees should be as low as possible,

(2) Trees should be felled in a manner and in a direction so that felling causes least damage to the trees being felled and the surrounding vegetation. Trees should not be felled across (i) other felled trees lying on the ground, (i) boulders, and (ii) spurs or depressions. On hilly terrain, trees should be felled uphill.

(3) Trees should not be felled into a place which is difficult to access.

(4) Trees should not be felled during strong wind when it is difficult to guide felling in the desired direction.

5) Felling should usually start from the top of a slope and proceed downhill.

(6) Felling should be concentrated as far as possible, restricted to sections that can be easily located, so as to facilitate supervision.

Stump Height

High stumps left upon felling results in los of considerable amount of valuable timber. When felling is done with axes alone, high stumps are usually left. With the help of saws and other mechanized implements, stumps can be cut low and loss of timber from butt logs can be minimized.

Roping

In regeneration areas and sloping grounds, it is sometimes required to use ropes or cable puller to make the trees fall in the desired direction.

Direction of fall

It is first of all necessary to decide the direction of fall. It should be so chosen that –

- The damage likely to be caused to the remaining stand and the regeneration is minimum;
- The stem is not damaged in the fall;
- The work to be done on the fallen stem becomes easy.

Clearing Work Space

Once the fall direction is decided, the working space around the tree's butt should be cleared and an escape path should be made. The weeds, shrubs and branches that hinder work should be clipped off and removed.

Felling with axe

On the trimmed stem, an undercut or notch is made on the side toward which the tree is to fall. The traditional undercut has a horizontal base and a top sloping down to it at about a 45 degree angle. Undercutting provides a fulcrum and a hinge point on which to tip the tree off its stump in the desired direction. The notch is cut up to depth of about 2/3 of the diameter of the tree.

Then a back cut is made opposite to the undercut at a height about 10-15cm above the horizontal level of the undercut. The back cut should run parallel to the undercut. As the back cut reaches close to the notch, the tree begins to fall.

Felling with Axe and Saw

On the trimmed stem, a notch or undercut with axe is made on the side toward which the tree is intended to fall. The notch is flat and not too big. The saw cut is made with the help of a crosscut saw exactly opposite to the undercut at a level about 2.5 cm above the base of the undercut. Please see Fig.2.2. As the saw penetrates about double the width of the saw blade, a wedge is inserted and sawing continued. The deviation from the intended direction of fall is corrected by driving in wedges and sawing more or

less in one or the other side. As the saw cut moves close to the undercut, the tree begins to fall.

Felling with Saw

In this case the saw cut is made and the tree is tipped by continuously pounding in the wedge. Alternatively, an undercut is made with a power saw as is done in the case of felling with axe and saw. The undercut is made deep enough to penetrate about 1/4" of the diameter of the butt. The saw cut is executed by two sawyers in the most comfortable position of standing or kneeling.

To Study about Visit to Local Saw Mill

Name of the saw mill: ……

Address: ……

Owners Name: …….

Type of saw mill: ……..

Purpose of the visit: ……

In-charge sawmill: ……..

Total area of the saw mill: ……

No. of skilled and unskilled workers: ……

Source of the raw material: ……

Method of measuring of logs: ……

Method of grading of wood: ……...

Available wood cutting equipment: ……

Available wood working instrument: …….

Market timber demand: ……..

Type of Buyers: ……

Cost of production: ……..

Turnover per Annum: …….

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

Observation:

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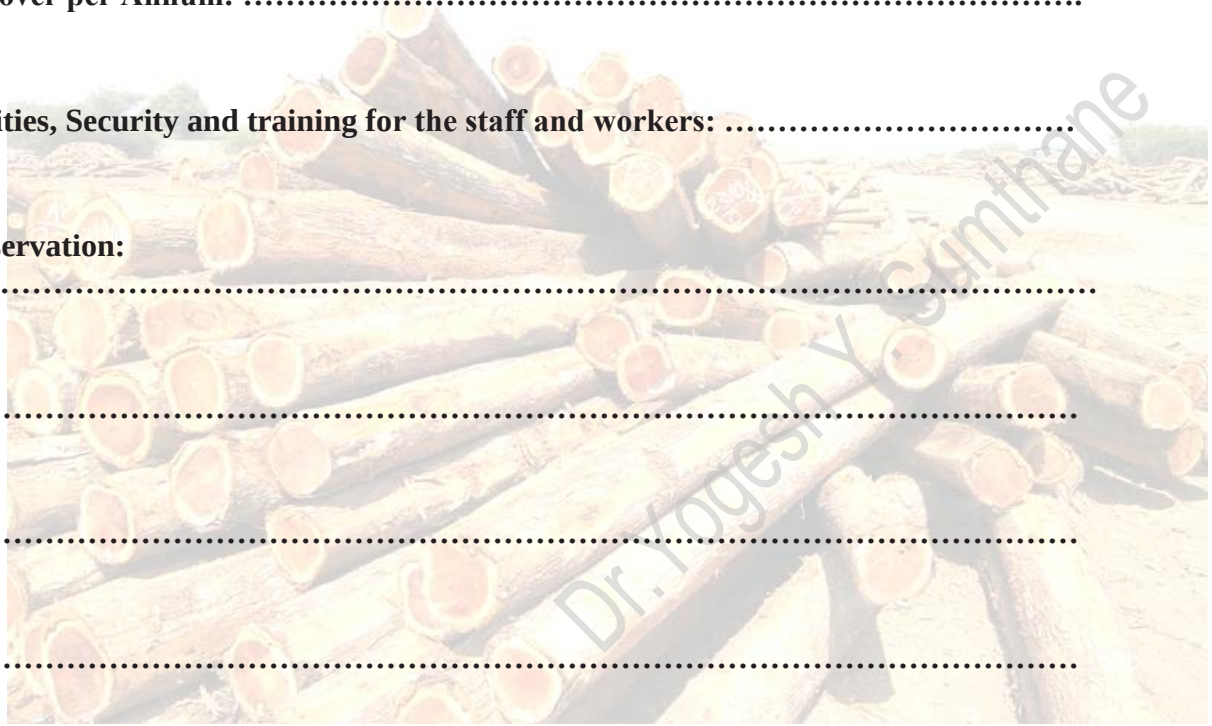


To Study about Measurement of Logs, Poles, And Firewood In Forest

When no volume tables are available, the total or merchantable volume has to be measured on felled trees, in order to estimate the volume of the mean tree within a given stand or to estimate the stem volume for each diameter class separately. Such direct measurements may also be necessary when regional volume tables tend to produce biased volume estimates. In general, however, measurements on felled trees are necessary to construct volume tables and to estimate the parameters of tree volume equations. Weight measurements are a common practice for measuring the quantity of round wood, utilized as mining timber, pulpwood and for manufacturing chipboard and other similar products. In these cases**,** the sales price expresses the price per ton as the unit of weight. In other instances, the timber is sold on the basis of its round wood volume, but the air- or oven-dry weight is measured and subsequently converted to volume.

Volume

A.Round wood volume

The xylometer, which can be used to measure the volume of logs**,** is a tank filled with water, equipped with a gauge that determines the change of the water level inside the tank. The single log is submerged, with the calibrated gauge being used to read off the volume of displaced water. Xylometer measurements produce accurate estimates of log volumes, although the estimates are not com- palely unbiased, as some water is absorbed by the log. The main drawbacks are the necessity to build a sufficiently large mobile tank and the high cost of transport.

Plan meter measurements are an acceptable alternative for these direct measurements. The cross-sectional area at a given point of measurement of *i* m above the base of the tree is plotted over the point of measurement. The area under the stem curve is determined with a plan meter and multiplied by an appropriate scale factor to obtain the tree volume.

A less accurate, but more cost-efficient method is to subdivide the stem into sections, usually of a fixed length, for example, I m for trees below 12 and 2 m for those more than 12 m high. Each of the sections is envisaged as a truncated cone with the volume being obtained by multiplying the cross-sectional area at the midpoint, by the length of the section. The stem volume is obtained by adding the volume of the top section to the sum of the volumes of the equally long sections.

$$v = \pi/4 \,.l.(d_1^2 + d_1^2 + \dots d_i^2 \dots\dots\dots + d_k^2) + \pi/4 \cdot 1_t \cdot d_t^2$$

Where di = diameter at the midpoint of the section, = section length, *dr* = diameter at the midpoint of the top section l_t= length of top section

Alternatively, the stem is subdivided into sections of equal relative lengths. Hohenadl (1936) recommended sections of one-fifth the stem length. A further subdivision may be necessary for the

lowest section, because it resembles a truncated neiloid, in which case the estimate is negatively biased. Either this subdivision, or the application of the Simony formula may be worthwhile for high-priced timber, e.g., used for veneering.

B. Volume of stacked wood

Pulpwood and firewood is either sold on a weight basis or as stacked wood. If sold as stacked wood, the volume of the pile is determined and a conversion factor applied to adjust for the free space between the round wood logs. In the USA, the standard cord has a size of 8 x 4 x 4 ft, the volume being 3.624 m3, but firewood cut to lengths less than 4 ft is sold as short cord, pulpwood with a length greater than 4 ft as long cord. In Germany, the "Raummeter" or "stere" was defined as a 1x1x1 m pile of stacked wood. The conversion factor depends upon the straightness and length of the logs and for conifers it is higher than for hardwoods. When timber is sold as pulpwood (under bark), a conversion factor of 0.80 is appropriate, in the case of firewood, which is recovered from wood not meeting the quality standards for saw logs, a conversion factor of 0.70 (over bark) is more appropriate. A factor between 0.68 and 0.70 for converting the standard cord to cubic volume is common in the USA **(**Avery et al. 1988**)**. The quality of the stacking operation has to meet certain quality specifications. In Europe, a required stack height of 4% above the prescribed height of 1 m is frequently specified.

Log rules, grades and classes

Log rules

A board foot is the equivalent of the cubic volume of a 1 in x 1 x 1 ft board. It contains 144 cu in. of timber and is the equivalent of 12 ft (broad feet). The North American log rule is a table or formula, which gives the estimated volume of logs of specified diameters and lengths (Husch et al. 1982). The majority of these rules estimate the volume in board feet of timber.

The construction of a board feet log rule is hampered by a number of factors. The dimensions of the timber recovered from the saw logs vary, different equipment is used by operators with varying skill, and sawing prescriptions differ. It is therefore necessary to distinguish between the log scale, recovered from the log rule and the mill tally, which shows the actual recovery. An over- run occurs when the mill tally exceeds the log scale, an underrun when the opposite takes place. The construction of a mill-tally log rule requires the measurement of the yield actually recovered from logs of different diameters and lengths. The resultant rule which is derived by regression analysis a specific mill or group of mills.
103 / 389 Diagram log rules assume that logs have a cylindrical drawn with a diameter equal to that at the thin end of the log. In recover- able boards are drawn within this circle, but the width of the sawkerf and the expected amount of shrinkage are taken into account. The board foot content is determined for each thin-end log diameter class and the estimates are multi- plied by the ratio of log lengths to obtain the board foot content for other log lengths.

The widely used Scribner rule belongs to the group of diagram log rules. It also assumes a cylindrical shape of the logs, is standardized for in. thick timber, with a 1/4 in. allowance for sawkerf and shrinkage. It produces an approximately 30% overrun for logs under 14 in. (Husch et al. 1982). The following equation, developed by Bruce et al. (1950) produces smoothed estimates of the board-foot

volume with saw log diameter and saw log length as predictors:

$$v = (0.79d^2 - 2d - 4).\ L/16$$

The Doyle rule

$$V = [¼(d-4)^2]$$

Is easy to apply but produces an underrun for large logs**.** The International log rule starts with a straightforward calculation of the board-foot content of a 4 ft long cylindrical log. For each 1 in. thick board, an allowance of 1/8 in. for sawkerf and 1/16 in. for shrinkage is made. The board-feet content of this log **is** then equal to 0.226d. A further allowance equal to 0.71d for slabs and edgings is also subtracted. Hence

$$v = 0.226.d^2 - 0.71.\ d$$

Allowing a taper of 1/2 in. per 4 ft log section, this formula was expanded to obtain estimates for the board-foot content of longer logs.

Log grades

General rules and guidelines for a qualitative grading of logs countries. The US Forest Products Laboratory Hardwood Log Grading Sys- tem distinguishes between factory class, construction class, local-use class and veneer class. The factory class is subdivided into the categories F1, F2 and F3, according to the diameter and length of the logs, and provides a further subdivision of the categories F1 and F2. The softwood log grading systems distinguish between veneer and saw log class. Additional grading criteria are applied, which are determined by defects, log diameter and length, sweep and cull (Husch et al. 1982).

Log classes

In Germany, there are two main systems which provide a size-related grading of long-length logs ("Langholz"), with only one system being used in a given region. The first classification is based on the mid-diameter of the logs and produces the classes LO-L6, with a further subdivision within the classes L1, L2 and L3 (Table 4-1). The Heilbronner classification is based on minimum length and diameter of the logs. In addition, the long-length timber with an under bark diameter below 14 cm at 1 m above the thick end, is subdivided into 11 size related subclasses. Stacked wood is classified into seven **s**ize-related subclasses. The timber is independently classified according to the four qualitative **c**lasses A, B, C, and D, which indicate the occurrence of wood defects.

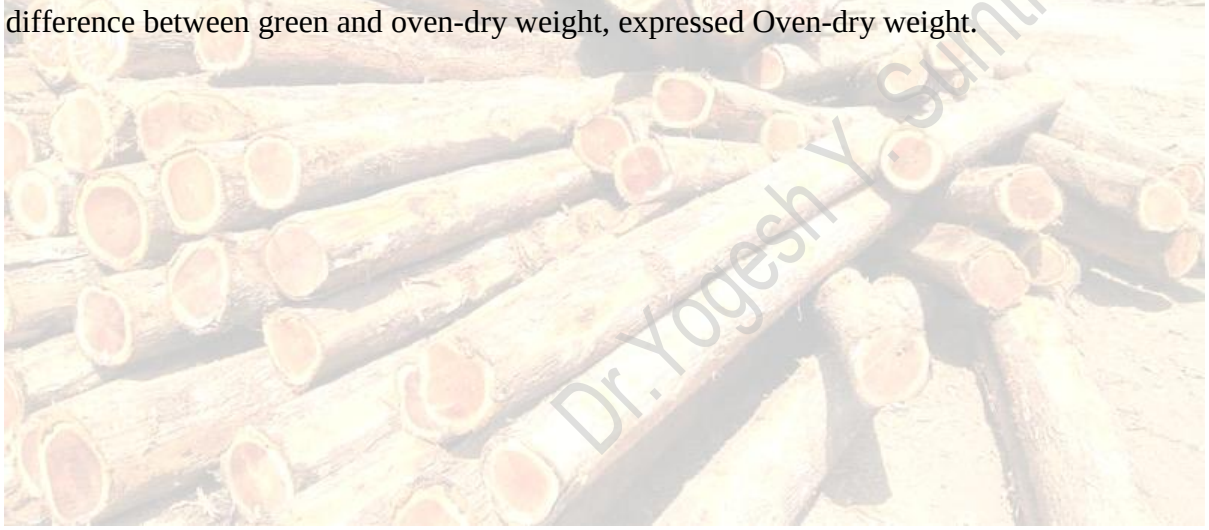
In South Africa, the timber products are classified as saw timber, poles and pulpwood. For saw logs, the

diameter and length specification based on the class midpoints is given in Table 4-2. The matrix of dimensions in the table defines the saw log classes. For veneer and construction timber, there is no formalized specification for quality-based grading of logs, but the number of knots and ring width patterns are of decisive importance for qualifying as veneer timber.

Weight

It is easier to determine the weight of a quantity of small round wood than to measure its volume. Pulp yield is a function of timber weight, rather than of timber volume. The volume over weight ratio, however, is partly dependent on the period of time between harvesting and weighing, as well as upon the weather conditions during this period. The length of this period, however, can be controlled by mutual agreement between buyer and seller. Bearing in mind that it is cheaper to determine the weight, the recorded weight can also be used to convert weight into volume. This is occasionally done for small-sized saw logs**,** which are sold on a volume basis.

The green density of the timber is the sum of basic density and moisture content. The basic density expresses the ratio weight of oven-dried timber (in grams) over green volume (in cubic centimeters), the green density is obtained as the ratio green weight over green volume. The moisture content is expressed as the difference between green and oven-dry weight, expressed Oven-dry weight.



To Study about Stacking and Stock Checking of Different Logs, Poles, and Firewood

Stacking- Following points are in general worth considering.

- For the convenience of management and control of inventory, produce of different coupes should be stored in separate plots/sections. Within a plot(s), produce of a coupe should be separated species wise and then product wise, i.e. logs, poles, firewood etc.
- Before forming final stacks, material of the same product of a species is further separated in terms of size and quality. For example, logs of Sal coming from the same coupe are differentiated in terms of girth and length class and to the extent possible, inferior and defective logs are separated from the sound ones. In a word, a stack should contain produce of comparable size and quality.
- The stacks should be as close as possible, subject to inspection facility, to economies space. The logs and poles may be stacked in multiple layers with space between the individual pieces so as to permit measurement and inspection. Preferably, the lowest tier of logs should be kept off the ground by skids which can be round or square pieces. The firewood should be piled in stacks as compact as possible.

Formation of Lots - After a coupe produce has been differentiated and stacked species wise, product wise, size and quality wise, in that order, lots are formed, which consist of one or more stacks of a particular product. To each lot a unique lot number is assigned; the number generally contains both numerical figures and words indicating some serial number, the coupe, year of extraction etc. For each lot, a marking list is prepared, which contains lot number and details of the produce forming the lot. Lots should be formed as early as possible. Lot formation should start as soon as a depot receives reasonable quantity of produce that permits grading of a product.

- Lot size depends on (1) expected price of the lot vis-a-vis buying power of the merchants and 2) carrying capacity or full load capacity of the carriage (truck, tractor, cart etc.) prevalent in the locality.

Depot Register/Forms - As during felling season timber and other produce is passed and transmitted from coupes, the depots start receiving the produce, thus adding to its stock. Again following sale of timber etc in auction or tender, the buyers of wood-lots begin lifting of lots from the depots, and the depot stock is reduced in the process. Every movement of produce coming in or going out of a depot should be recorded in depot register/ forms prescribed in this regard. The depot register should reflect

- For incoming produce - name of the coupe, ITC reference, date of receipt, description of produce including measurement received date wise, depot serial number assigned for logs, plot or section number where stacked etc.

- For outgoing produce - Lot reference, order of the competent authority, sale price, if applicable, buyer/recipient of produce, date of lifting, Transit Pass reference etc.

It is important to note that any record for influx or out flux of produce is done chronologically that is in the order of time they occur

- Stock verification or checking has broadly the following phases-

(1) To verify whether the entire produce passed from a coupe has entered the depot under ITC.
(2) To verify whether the entire produce received in the depot has been formed into depot lots identifiable by respective unique lot numbers.
(3) Whether the un lifted lots which represent the balance stock at any point of time is physically present in the depot.

Stock unit of forest produce depends on the product. It is explained below. For logs, stock unit is individual piece. That is, stock of logs in a depot is maintained and verified individual log wise. It is normally done as follows. The depot maintains a running serial number for logs. As and when logs arrive in the depot, each log is assigned a unique running serial number chronologically. The said serial number and

The description as well as the measurements of the corresponding log are entered date wise (date of receipt) in the depot register of prescribed format. Thus each serial number corresponds to a particular log of species and dimensions recorded in the register and verifiable by physical measurement in the depot.

As Depot serial numbers of log are assigned chronologically, that is, in the order of arrival of logs in the depot, it is more likely that logs bearing successive serial numbers are of varying class and size and may also be of different species. Therefore, they get dispersed into different lots. The process of stock verification then turns into (1) locating the depot serial numbers assigned to the logs of a coupe in the lot marking lists as well as physically in the lots so as to ensure that all logs of the coupe are accommodated in the lots formed of such coupe logs, and (2) physically checking the measurement of logs ¯a certain percentage chosen at random, if cent per cent checking is not feasible - in the lots formed.

For poles and posts, the stock unit for verification is the number belonging to a species and to a size class. For example, while passing Eucalyptus poles from a coupe, species, and the number of poles including their height and butt-end girth class are recoded. As the poles arrive at the depot, the number of poles of the

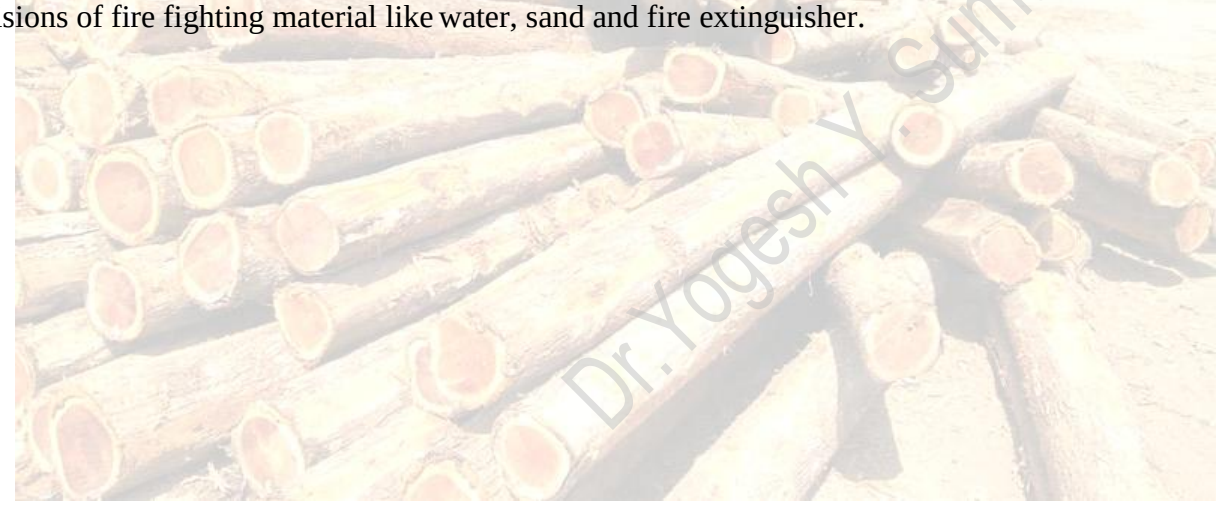
Specified size class and the species is immediately recorded in the depot register. Such record of incoming poles is done chronologically. Later during the process of stacking and formation of lots, poles are graded in terms of species, size etc and get distributed into various lots. The process of verification

then constitutes (i) adding up of number of poles of same size class and species from different lots and matching the number with what has been recorded as incoming produce in the depot register, and (2) physical verification of dimensions of the poles.

The stock unit of firewood is the stack volume belonging to a species. Firewood is passed in terms of species and stack volume. The said parameters are also recorded in the Depot register as incoming produce. Normally a firewood lot consists of several stacks. Here the procedure of stock verification is to measure the stack volume; species wise, of all firewood formed into lots and match the figure with records of incoming firewood in the depot register.

Stock verification of permanent depots should be done periodically, or at least once year.

Protection - The two most important factors against which protection of depot is absolutely essential are fire and theft. Depots should be fenced with barbed wire. Every permanent depot should have arrangement for round-the-clock watch and ward. Big depots should be provided with watch tower located suitably in the depot so as to command good view of the entire depot area. Besides, there should be arrangement of electric lights for good visibility at night. The depot area should be kept clean from weeds and grasses, particularly in dry season. On the outside around the depot, a clear strip free from grass and shrubs may be maintained by occasional controlled burning. The depots should have provisions of fire fighting material like water, sand and fire extinguisher.



To Study about Auction and e-action

The word "auction" is derived from Latin word “augeo" is meaning is increase. The auction is containing very long history. It has been recorded first time in the year 193 AD, when praetorian guards had an entire empire of "Rome" to sell after that in year of 500 BC the auction was held to sell women was noted and after that is common for to sell good by auctioning.

Types of auction:

The days passed now and with passing time the new methods are used to do auction. These methods of auctions are divided into number of types. That is based on their working and way it held.

English auction

These auctions are carried out by real time interaction. That means bidders present either physically or virtually in auction. The seller gradually raises the price, bidders drop out until finally only one bidder remains, and that bidder wins the object at this final price. Oral auctions in which bidders shout out prices, or submit them electronically**,** are forms of ascending-bid auctions.

Dutch auction

This is also an interactive auction format, in which the seller gradually lowers the price from high initial value to low until the first moment when some bidder accepts and pays the current price. That bidder wins the object. In this process the seller or auctioneer shouts out price gradually reducing. These auctions are called Dutch auctions because flowers have long beans old in the Netherlands using this procedure.

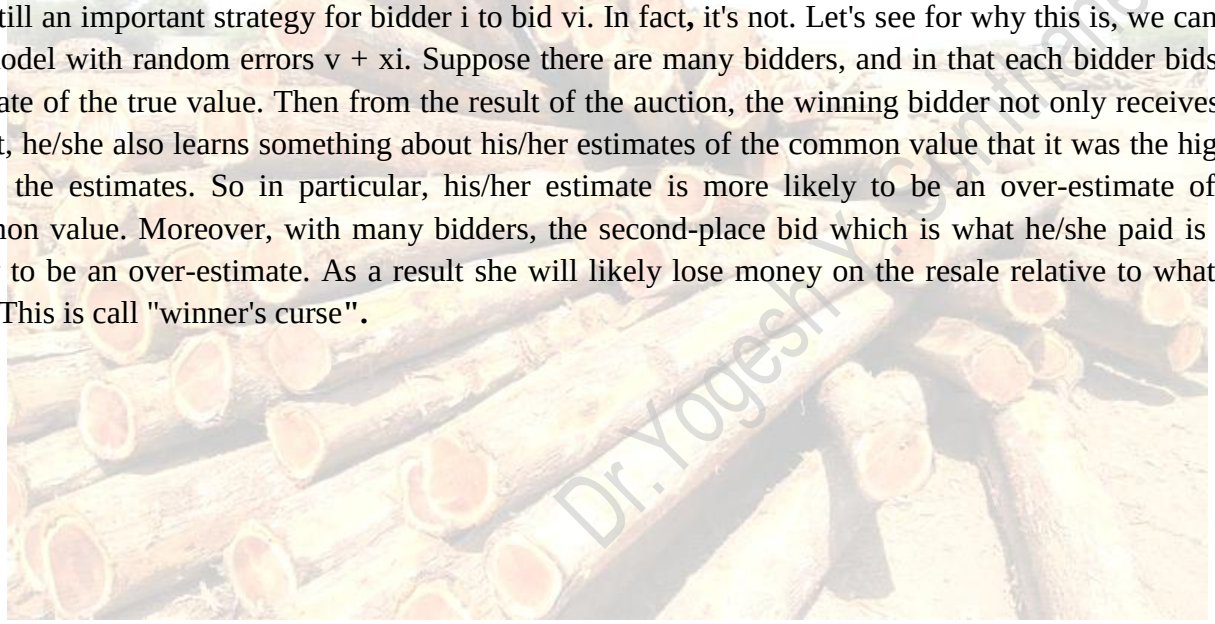
First prices sealed bid auction:

In this kind of auction, bidders submit simultaneous "sealed bids" to the seller. The termino by comes from the original format for such auctions, in which bids were written down and provided in sealed envelopes to the seller, who would then open them all together. The highest bidder wins the object and

pays the value of that bid.

Second price sealed bid auction

Bidders submit simultaneous sealed bids to the sellers. The highest bidder wins the object. But difference between fist bid and second bid is that winner of highest bid have to pay the value of the second-highest bid. These auctions are called Vickrey auctions in honors of William Vickey, who wrote the first game-theoretic analysis of auctions. Vickery won the Nobel Memorial Prize in Economics in 1996 for this body of work. Auctions with common values introduce new sources of complexity. As example, let's start by supposing that an item with a common value is sold using a second-price auction. Is it still an important strategy for bidder i to bid vi. In fact**,** it's not. Let's see for why this is, we can use the model with random errors v + xi. Suppose there are many bidders, and in that each bidder bids her estimate of the true value. Then from the result of the auction, the winning bidder not only receives the object, he/she also learns something about his/her estimates of the common value that it was the highest of all the estimates. So in particular, his/her estimate is more likely to be an over-estimate of the common value. Moreover, with many bidders, the second-place bid which is what he/she paid is also likely to be an over-estimate. As a result she will likely lose money on the resale relative to what she paid. This is call "winner's curse"**.**



To Study about Safety Rules and First Aids in Forestry Operations

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 equipment's 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.

First aid kits and its contents

Fist 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
- 3X75 mm gauze swabs
- Wound dressing (20 cm *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

Assigned Practical Work

Q.1. Conversion of felled logs help of axe, double handed saw for storage in wood workshop.

Q.2. Use of power chain saw for tree cutting and timber conversion into logs.

Q.3. Write down an importance of wedge during conversion.

Q.4. Draw a well labelled diagram of different axe used for logging and conversion.

Q.5 what is mean by Delhi saw write down its importance and use?