**Level and degree of harvesting operations (losses in harvesting operations)**

When cutting wood for the purpose of harvesting and turn it into the final shape of different industries, the large proportion of wood in every tree been cut will be regarded as losses. In spite of the progress in the methods of harvesting and technology are conducted every way, there is still a large amount of harvested wood be regarded as losses, either leave to decay or to combustible.

And the losses in the woods during the harvesting operations could be occur inside the forest named as **forest losses** or it occur during the industries process then named as **manufacturing losses.**

**losses classified into two classes: -**

**1- Excluded losses:** - which can be avoided with precision planning and execution of investment operations and the use of advanced technologies.

**2- Non Excluded losses:** - it is that part of the wood, which has to be lost or to lose in spite of all the measures that would reduce the total of waste and this part, is a bigger part of harvesting losses. In the case of sophisticated harvesting constitutes 70-80% of the total wood wasted.

The table below show the result of studies conducted in different regions of the United States, when the trees are harvesting for the purpose of get the sawlogs were the wastes of wood was as follow:

**Forest losses**

|  |  |
| --- | --- |
| **Type of losses** | **Its Rate for total tree size (%)** |
| Stump  Top, and branches  The break, decay, damage log  Other Losses as(unsuitable length, transport Loss, decay during the  Storage, etc…) | 2-3  10-12.5  4- 5.5  1-2 |
| Total 17-23 | |

**Manufacturing losses**

|  |  |
| --- | --- |
| Bark  Eroded wood during saw  Thin sections not suitable for lumber  The edges and ending  Losses during drying  Losses during remanufacturing  others | 7-8  8-10  8-9  6-8  3-4  2-3  1 |
| Total 35- 43 | |

According to previous table the total of forest and manufacturing losses reached 52% -66 %, and based on this, the percentage of user size of the tree ranges from 34-48 % depending on the type of wood and the conditions of the region

***Factors that lead to increase the proportion of wood lost and the forest waste***

1. Lack of precision in the measurement of lengths of logs, as well as the lack of mastering the bucking operations in order to avoid the fork, bends, and large knots and other defects.

2-follow the style of bucking logs double lengths just like 10,12,14,16 feet instead of bucking lengths odd and even together like 12,13,14,15,16 feet.

3-leave high stump during fall and neglect part of the wood (the tope) may be of commercial value.

4-Make the extra length lonely for the purpose of bucking (trim allow) larger than necessary.

5- The break of tree during falling process which causing shattered log, broken the top and splitting the trunk.

6- Losses during the transportation process (either it was at land or at river).

7-losses resulting from insect and fungi infections when you leave the timber in the forests for a long time during the summer.

8- The damage caused to the stand tree as in the case of the use of cable crane.

9- Fires, that caused remnants of harvesting operations that are difficult to control, causing losses and lost a large timber.

**Factors that lead to leave the large quantities of wood without harvesting**

1- The demand for the material and its price.

1. The commercial business provides possibilities.

3- Transportation costs.

4 - The form of material and its size and condition.

5 - The costs of collecting logs.

6- The traditions of the population and their natures.

7- Laws and regulations.

**Labor payment**

Foremen and supervisory personnel usually are paid a monthly salary, but for those actually engaged in doing the harvesting work means woods workers (labor) either: -

**1- Piecework wages 2- Hourly wages**

1- Piecework wages

Certain operations in harvesting are more adaptable to piece rates than hourly wages and it is preferred in those cases: -

1- When the workers output is largely due to their energy and skills, the piece rate is preferred, since it rewards the more productive and hence offers an incentive to the more reliable and experience workers.

2- Where close supervision cannot readily be given.

3- Where product value is low.

4- Where lack of judgment does not affect product value, as in pulpwood.

Thus the piece – rate basis for labor is usual for felling and bucking of both saw logs and pulp wood because :-

1- Because the fallers and buckers usually work as one-man crews in separate cutting areas or strips for safety and cannot be closely supervised.

2- Because their output is almost directly related to their energies and skills for a given size of timber.

1. The workers output is not difficult to ascertain, as scalers or foremen can credit timber fallers and buckers with their production from their marks on log ends and stump or from separation of logs as they are skidded to roadside.

2- Hourly wages

1- Most loggers other than fellers and buckers are paid hourly wages based on working time and in some cases all part of the travel time to and from their work

2- Where quality of workmanship is a requisite as in the production of hardwood sawlogs and veneer logs, felling and bucking to log lengths is usually paid for on daily or hourly rates.

Notes/ increasing wages rate have stimulated mechanization, and this in turn has made hourly rates for all but fallers and buckers more suitable to both management and labor.

Falling of forest trees

The actual harvesting operation begins with the selection of trees to be felled, which may be either in fully mature stands ready for final harvest or in immature stands in need of thinning or other intermediate cutting requiring the removal of trees with commercial value.

The term "harvesting" implies the cutting of some product that can be used to supply the needs of people.

Whenever any trees are cut in a forest and sold or used, then timber harvesting is occurring. Cutting operations in unmerchantable immature stands and the cutting of unmerchantable trees in order stands which does not yield usable timber products of merchantable value in excess of the cost of cutting are not harvesting operations.

Factors affecting selection of trees for harvesting

**1-Product desired**

The selection of trees to cut in harvesting depends on the kind of product and the forest policy of the owner. Industrial harvesting operations are conducted primarily to obtain certain products, such as sawlogs or pulpwood. The trees are selected for harvest on the basis of their suitability for the products wanted.

Harvesting operations in forests owned and managed as a forestry enterprise not connected with any particular industry, on the other hand, are conducted to obtain the variety of products that will yield the greatest income. In such cases the market exists for poles or veneer bolts, for example, trees are selected that will yield these products, since they are usually more valuable. Similarly trees of sawtimber quality are selected for cutting into sawlogs instead of pulpwood, as sawlogs normally bring greater returns than pulpwood, which generally is the lowest priced timber in terms of stumpage.

However, pulpwood is cut according to the purchaser’s specification, as shown in the following list issued by a southern pulp mill:

**Specification for Unpeeled Pine Pulpwood: -**

1-All wood must be from sound, living pine trees, sawed five feet three inches (5.3 inch) length.

2- Sticks must be no less than four inches in diameter, outside bark, at the small end, and not over 24 in diameter, outside bark, at large end.

3- All knots and limbs must be closely trimmed to the surface of the stick

4- All wood must be free from nails, and other metal.

5- Crooked, wormy, or rotten wood will not be accepted.

6- Wood must be clean.

7- No burned or charred wood will be accepted.

8- All wood is subject to our inspection and weighing.

**2-Management policy**

The choice of trees selected for cutting in managed forests is largely based on the silvicultural system called for in the management plan. While the selection of trees to be cut is the first step in the harvesting operation, so many technical forestry considerations affect the selection that it cannot logically be considered as a harvesting operation alone except from a purely economic aspect. Therefore, considerations affecting the choice of trees to be cut, other than those dealing with the economic aspects and those having a bearing on the harvesting operation itself, are not treated here.

Forests owned by individuals or companies which are liquidating their timber assets and are not planning on cutting the area again, are generally cut to remove all merchantable timber. This does not mean that the area is necessarily lost to forestry; it may reproduce well and grow another crop of trees if enough healthy undersized trees are left standing or enough seed-bearing trees are reserved and protection against fire is provided, or the area may be planted with seedlings.

**3-legal requirements**

A number of states and provinces have forest practice laws designed to regenerate cutover areas. In 15 states commercial timber cutting on privately owned lands, must, by law, be done in accordance with minimum specification for the purpose of maintaining forest productivity.

In other states, control over cutting varies widely in their specific requirements. The regulations generally provide for minimum cutting standards or leaving suitable seed sources of desirable species or both.

Where clear-cutting is the desirable silvicultural method of harvesting, suitably stocked blocks or strips of uncut timber must be left, aggregating not less than 5 per cent of each legal subdivision cut. Such areas must be dispersed so that seed fall will cover all clear-cut areas.

**4- Economic considerations**

Trees are cut for sale or for conversion into salable products; thus it is essential that only those be cut which will return more than their cost. Since timber grows over such a wide range of topographic and ground conditions that greatly influence harvesting costs, since trees vary so much in species, size, and quality, and since product selling prices and harvesting costs fluctuate so greatly from time to time, constant attention must be given to the selection of trees for harvesting to avoid cutting trees too small or too defective to return their conversion cost. This is particularly true in the case of sawlogs because, on the average, with decreasing tree size the cost of harvesting and milling increases, while the value of the lumber obtained decreases. In one typical case with southern pine timber, the per 1000-ft value of lumber obtained was greater the larger the tree diameter. Compared to 10- in. trees, the per 1000-ft value for 14-in. trees was 7 %per cent greater, for 18-in. trees 44 % per cent greater, and for 24-in. trees 64 %per cent greater.

Fig. 1: Typical cost –value relationship by tree size. The point of intersection is the diameter of the marginal tree.

Whereas: series 1 it means value, Series2 it mean cost