**Extraction (primary transportation)**

***Extraction*** is the movement of logs or tree lengths, one or several at a time, over unimproved terrain from the woods to the loading point on the primary transportation system.

**Extraction methods or system**

Extraction of trees is varying within world countries and this variation play a big role to determining the suitable extraction method, this is due to the following reasons:-

1- The level of technology which used for handling trees especially those with huge size and low price

2- The forest area in each country and it is role in national economy.

3- Rather than it is ecology and geography with regarding the importance of topographical factors.

**Generally the extraction could be done by the following methods**

**1-** **Human labor**

Used in the work of the extraction of small wood and for transfer of fuel wood produced in forests for short distances in order to justify their use economically

The primary transport could be useful if the distance of transportation not exceed than 90 meters.

**2- Animals**

Animals are still one of the basic methods for primary transportation of timber, in which usually horses, mules, donkeys, oxen, elephants and dogs are used.

Horses are one of the most important animals in the timber transfer process is distinct from the rest of the animals speed

**3-Agricultural tractors**

Agricultural tractors can be divided into two basic:-

1- Rubber Tired Tractors

2- Trucked Tractors.

**4- Skidders**

The skidders are classified into three categories depending on the horse power

**1-Small skidders**: which weight is between 3-5 tons with the horse capacity reach to 50 HP

**2. Medium skidders**: which weight between 5-12 ton with capacity ranged between 50-160 HP

**3. Large skidders**: which weight 14 tons, more and increase their capacity to 160 HP.

**Types of skidders**

**1- Tracked skidders**

A- Flexible track

B- Rigid track

**2- Wheeled tired skidders**

A- Non articulated

B-articulated

**5-Forwarders**

Forwarders are used for primary transportation of short logs and long lengths as well as wood chips without touching the ground along extraction distance.

Forwarders are to raise the product and loaded and moved outside the forest and works to reduce the production costs because of its speed.

The productivity of extraction that used the forwarders is affected by:-

1- Size of load in one session of the primary transportation.

2- Distance of primary transportation

3-forwarders operator skill and team work

**6- Cable Crane: -**

the first wire transportation system was appear at 1881 and still since that time are used more than 100 years in many countries of the world that have rich forests such as: Austria and Switzerlandand The first form of this system was Ground lead skidding system

**Definition of cable crane: -** it’s a process of collecting and moving falling logs from places of falling to the stacking yards and the movement done through machine equipped with a number of Drum Winch working in a fixed position in stacking yard.

There are types which are suitable for small lumber and other larger wood.

**In which** **circumstances cable cranes are used?**

In conditions of the topographies and the slops mountain as well as across regions where it is difficult to use the mechanisms or other means of transport**.**

**The use of cable cranes is very limited because of the high costs associated with its uses are** **restricted to the following factors:-**

1- The quality and quantity (intensity) of produced timber

2- The costs of installing, operating and dismantling and transfer system of cable crane in comparing with the costs of road construction.

3- Costs of other methods of extraction possible after providing terms of use

**7- Shutes (قنوات الجاذبية)**

Is the **Natural** or **Artificial** path on the slopes of mountain or (the steep slopes) to move wood logs, from the upper slopes to the bottom depending on the base of earth gravity and as well as the necessity to provide appropriate conditions sliding logs.

**The main conditions that should be available to sliding logs: -**

1- Provide a means to transport logs from the original site location to channel.

2- The length of the slope distance No more than of 900 feet

3- Provide ice conditions

4- Low slope angle ranging from 18-28°

5- Slope distance to be a rugged and winding (zigzag).

**8- Water transport**

Movement of logs of the water path it done in three ways: -

1- Throwing logs in the river and it is suitable for large logs.

2- Collection of logs in the form of rafts and then withdrawn.

3- Load logs on ships or boats used to transport pulp wood.

**9- Air transport: -**

1- Balloons 2- Helicopter

**Features of this method: -**

1- Reduce soil damage

2- Insisted broken and damage trees.

3- Reduce the need for forest roads.

4- Reduce the leaves of twigs and the remnants of trees at the forest land.

**10-Highly mechanized equipment**

Multifunctional machines and equipment started to appear through the ongoing evolution in the mechanization of forest harvesting business **and such machines can do more than one job when dealing with single tree.**

**The objective of using these advanced machines or equipment's are:**

1-Reduce the dependence on labor

2-Keep up with the growing demands for wood

3-Reduce of the production costs per unit through simplification and business continuity and minimize the effort and time lost.

**The disadvantage of highly mechanized equipment's are**:

1-It is complicated and need the skills to run

2-High cost and need maintenance, sustainability constant (continual)

3-Valid for use to specific sizes, species of trees.

**Important types of highly mechanized equipment: -**

**1- feller- forwarder**: - it's one of the sophisticated equipment with the scissors-like header for logging trees and then loaded them to itself, Can cut 2-3 trees per minute at productivity time and move quickly to 35 meters per minute and unloaded in one minute

**2- Short wood harvester: -**

Used in the production of pulp wood in length 63In. or 100 In., and performing functions of logging operations, remove branches and tops, bucking, collecting the loge, then loaded and unloaded.

3- Other harvesters which used for tree length log including: -

a- feller- Buncher (قاطعة مجمعة)

b- Processor ((محضرة

c- Slasher (مقطعة)

d-Feller- Skidder (قاطعة ساحبة)

**Loading: -**

**It's a process of loaded logs on any means of transportation after the process of collecting with the methods of extraction.**

Sometimes may need to reloading from means of transport to another if the wood need it until it reaches the market or mill.

**The importance of loading process**

The loading process is very important because its regard as connecting ring between what is been cut and ready to be transported and the quantity that been transported outside the forest.

**The main loading methods are: -**

1- Sleigh loads (الدحرجة اليدوية)

2- Skid or pull (السحب, الجر)

3- Outstanding rollers (البكرات المعلقة)

4- self – propelled loaders (شاحنات ذاتية التحميل)

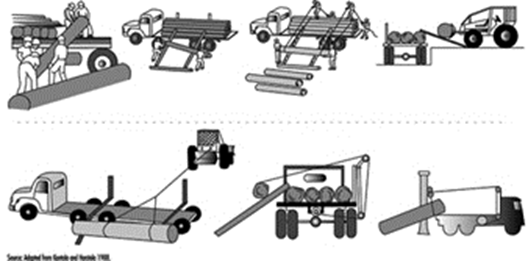
5-boom loader (اليات امامية التحميل)

6- Crane (الرافعات)

7- Belt or girdle (التحميل بأستخدام الاحزمة)

8- Bowfard loader (تحميل الجذوع بأستخدام محمل بوفارد)

9- Railroad loader (محملات عربات الخط الحديدي)



**Land Transportation (secondary transportation)**

**Land Transportation*: -*** logs transfer process from collecting areas inside the forest to specific locations in the factory or market where stored in this location until the manufacture or marketing done.

The most important ways used to transport logs

**First**/ Transportation using trucks and trailers (النقل بأستخدام الشاحنات والمقطورات)

**Second**/ Transportation by railroads (النقل بعربات السكك الحديدية)

There are three types of railroads: -

1- Flat cars (العربات المسطحة)

2- Various Skeleton- type cars (عربات بهياكل مختلفة)

3- Disconnected trucks ( (عربات منفصلة

**Third/ Water transportation** Including: -

1- River driving ((القيادة النهرية

2- Transport using rafting (النقل بأستخدام الطوافات)

3- Transport by using barges (barging) (النقل بأستخدام النقالات المائية)

4- Transport by cargo vessel

The wood floating on water has relation with the specific weight of the trees and its effect of hygroscopic nature, also the woods are different from each other from their ability to float on water, the soft wood floats easier than hard wood also the wood that have high specific weight is difficult to float on water or may even some times sink on the bottom of river or stream

**The table below shows the abilities of some important types of wood to float on water in a percentage form**

