

STEEP TERRAINS AND HARVESTING OPERATIONS IN THE HYRCANIAN FORESTS OF IRAN

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Abstract: *The natural broadleaf forests of Iran (i.e. the Hyrcanian Forests) is situated in north of Iran near the Caspian Sea. These forests have an uneven topography and very steep slopes. The regions with slopes greater than 100% have been designated as protected areas, where harvesting operations are prohibited. For many reasons, mechanized harvesting operations have been slowly introduced to these forestlands during last decades. Recently years, mechanized harvesting operations are growing nearly fast in such manner that it has increased to 100 percent versus last decade.*

In this paper, mechanized forest harvesting operations processes in the Hyrcainan Forests of Iran during last 40 years will be discussed.

1. Introduction

The northern forests of Iran, suited between Tehran and the Caspian Sea, (i.e. the Hyrcanian Forest, see Figure 1) are mixed broadleaf deciduous forests. These forests are completely natural and many of the trees are old. There are many species in these forests (Table 1).

Table 1: species and their percentage forest cover in the Hyrcanian Forests of Iran.

Species	Beech ¹	Birch ²	Oak ³	Alder ⁴	Maple ⁵	Persia ⁶	Lime ⁷	Other ⁸
Cover	33%	31%	8%	8%	7%	4%	3%	6%

Presently, the Hyrcanian Forest covers 1.8 million hectares of land. For reasons of population growth in the last few years, the forest land area has decreased and parts were changed into farm land.

The first forestry development and regeneration planning began nearly 40 years ago with the introduction of the shelter wood and selection systems in the central part of the Hyrcanian Forest. Forest harvesting systems slowly were introduced in these forestlands. Since 1995, forest harvesting operations are carrying out by mechanized logging systems while before that mostly were carried out as non-mechanized logging systems.

1- *Fagus orientalis*

2- *Carpinus betuls*

3- *Quercus castaneifolia*

4- *Alnus sp.*

5- *Acer sp.*

6- *Parrotia persica*

7- *Tillia begonifolia*

8- *E.g. Ulmus, Zelcova, Betula sp.*



Figure 1: Map of Iran

2. Silviculture systems

The two systems that are used in most of these forests are:

2.1. The shelter wood system

Approximately 80% of the Fageto-Carpinetum vegetation association was regenerated according to the shelter wood system. In this system the generation period was determined for the Fageto-Carpinetum vegetation association as 15-25 years and for the Querco-Carpinetum as 15 years, with five cuttings. The timber between each cutting was 3-5 years. In the area where the shelter wood system is not successful, natural regeneration is supported by planting.

An important point to make is that there were many small areas with regeneration present in most of the compartments before the shelter wood system were introduced. These small regeneration areas were of pre-ticket stage and they were not cut. At the moment these small stands are more than 50 years old and must be thinned.

2.2. The selection system

This system is used in uneven-aged mixed stands and requires a lot of work and experienced engineering. This system was introduced in many forest plans and now there are many young high density stands.

3. Harvesting systems

Harvesting operations in the Hyrcanian Forests of Iran have following characteristics:

- Timber products are not concentrated in a special area or line, but are spread out in the compartments

- the economic value of all species are not the same, some of them are not high value, while others are only used for fuel and charcoal.
- The topographic characteristics of the Hyrcanian Forests are not constant. Eastern regions have gentle slopes, central regions have medium slopes and western regions have steep terrain.
- Climate situations are different. In the eastern regions the climate is hot because of greater distance between the Caspian Sea and the Alborz Mountains. The central regions have amore moderate climate, while the western regions have a cool climate, due to the vicinity of the Caspian Sea. The tree line in the Hyrcanian Forest is at 3200m above sea level. Thus climate conditions vary according to the elevation in with the forest regions.

Harvesting systems in the Hyrcanian Forests of Iran can be divided to two sections:

3.1. Non mechanized harvesting system



Figure2: Extracting of sawlogs by animals

Animal are very important in this systems, especially in very steep terrains regions where machine can not be used. In this situation, logs are cut to 2.8 m in length and diameter between 7-30 cm. These timber products are extracted through animals like horses and mules to out of forest stand. Each animal can carry two logs per load. One end of saw logs is dragged along the ground (Figure 2). Loading operations in the forests and unloading at the landing are carried out by workers.

3.2. Mechanized harvesting system

Mechanized logging operations in the Hyrcanian Forests of Iran usually are used by skidders. The skidders which are used in these forestlands are both wheeled and tracked machines. The widths of these machines are 2-3 meters and the maximum slope is approximately $\pm 30\%$ (Figure 3). On some very steep terrains, the logs are extracted first by winch which is connected to skidders and then by skidders.



Figure 3: skidding operations

4. Conclusion

Harvesting operation systems in the Hyrcanian Forests of Iran are divided to mechanized and non-mechanized logging systems. For many reasons, mechanized logging systems were slowly developed during last three decades while during last decade it strongly developed about more than 100% (Figure 4).

Non-mechanize systems not removed from these forestlands yet, but it gradually is limited only for very steep terrains. Figure 4 shows the process of forest harvesting mechanize progressing in the Hyrcanian Forests of Iran.

In recently years, many forest contactors are interested to use the mechanized logging systems instead of non-mechanized systems. The state forest organization also encourages and supports them in order to change their non-mechanized logging operations to mechanized ones.

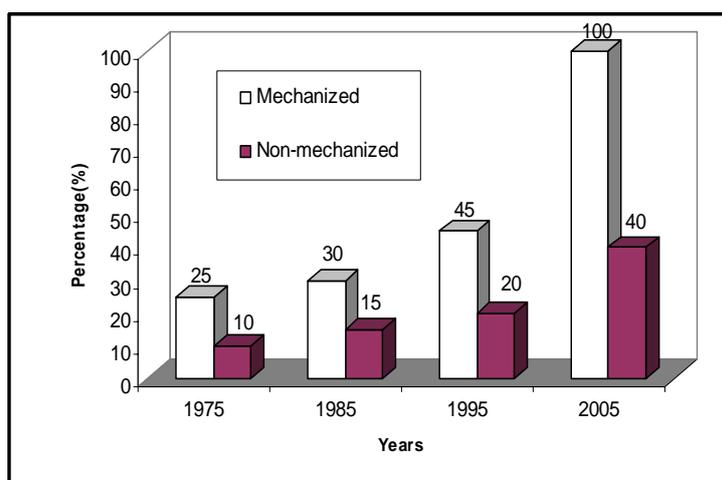


Figure 4: Developing of Mechanized and decreasing of non-mechanized logging systems process in the Hyrcanian Forests of Iran versus previous decade.