Forest harvesting in Estonia during the transition period

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Abstract. During the last 15 years the transition from socialist to market economy took place in Estonia. In forestry the most drastic changes were the restitution process of forest ownership and the privatization of forest industry. These changes have had an impact to the forest harvesting technologies also. The distinctive feature of 1990ies was the rapid growth of harvesting volumes and the transition from tree-length method to cut-to-length method in harvesting. Also the share of mechanized harvesting started to grow. When in 1995 there were only approx. 20 modern forwarders and 10 harvesters in Estonian forests, then in nowadays it is estimated that there are approx. 150 harvesters and 350...400 forwarders in use. According to the expert opinion today the share of mechanized harvesting has achieved the level of 70% in regeneration cuttings and 30% in thinnings. Harvesting residues are not used today in wide scale in Estonia, because there is still wood processing residues available for production of wood chips. In next years the situation will probably change and therefore more attention should be given to the harvesting residues. One of the main measures for the reduction of the production cost of the wood chips from the harvesting residues is the further increase of the level of mechanization of the forest harvesting. Among the main factors interfering the further growth can be mentioned small felling areas causing problems in logistics. Also the harvesting technologies have to be changed so, that the usable resource of residues should be set aside for extraction during the harvesting.

In the current paper the analysis of the present situation in the harvesting technologies and the expected trends for the coming years will be presented.

Key words: forest harvesting, wood for energy, impact of transition period

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Introduction

During the last 15 years the transition from socialist to market economy took place in Estonia. In forestry the most drastic changes were the restitution process of forest ownership and the privatization of forest industry. These changes have had an impact to the forest harvesting technologies. The distinctive feature of 1990ies was the rapid growth of harvesting volumes and the transition from tree-length method to cut-to-length method in harvesting. Also the share of mechanized harvesting started to grow. In the following analysis of the present situation in the harvesting technologies and the expected trends for the coming years will be presented.
Material and methods

The analysis of the wood harvesting technologies was based on the data collected from the interviews in the wood harvesting companies, the State Forest Management Centre and own observations. The background information about forestry, wood processing and export-import statistics was collected from official sources (Yearbook Forest, 2005; Statistical Yearbook of Estonia, 2005 etc.) and also from different other sources (Estonian Forest Industries Association; State Forest Management Centre; Estonian Forest Owners Association etc.). Estonian forest inventory data, estimates of growth, algorithms of assortments and economical decisions were used for forecasting the potential yield of wood for the coming 20-30 years period (Padari & Muiste, 2003; Muiste et al., 2004).

Results

Forest policy

After the Second World War, during the period of Soviet occupation the state became the sole owner of forests. In that period about 60% of forests were managed by state forest enterprises, 37% by collective and state agricultural farms and 3% by the military forest enterprise. After re-establishment of independence in 1991 the restitution and privatisation process started in Estonia. The land and forest nationalized by the state in 1940 is now being returned to the owners or their inheritors or privatised by selling pursuant to law. (Viilup & Asi, 2003) Though the process is not finished yet, today more than half of the forests belong to private owners – private forests 38%, state forest 36% and forests subject to privatization 26% (Yearbook…, 2005). Today only 3% of forest owners are members of Forest Owners Organizations. Together with the land privatization also the same process was started in different industries. In the beginning of 1990ies a political decision was made to privatize the forest industry. As a result of the process all forest enterprises and all wood processing factories (pulp and paper, furniture, particle- and fibreboard, plywood etc.) were private companies by the end of 1990ies. By the end of 1995 almost all of the state owned forests were

![Figure 1. Share of forest industry from gross domestic product (GDP) by current prices in 1993–2004. (Source Yearbook Forest 2005).](image-url)
privatized. The only exception is State Forest Management Centre, which is mainly outsourcing the logging services from privately owned contractors, but also operates some units of logging machinery.

The share of forestry in GDP has decreased in recent years (Figure 1), whereas wood-processing industry has increased. Some reasons of the changes are related with the problems of roundwood supply and are described later in the article. The latest data of investments is also (Figure 2) showing that there are no very big changes in forestry.

Forest Acts
The first Forest Act after collapse of Soviet System in Estonia was approved by the Parliament in 1993. First time the forest was described as an ecosystem. Probably first time in Europe the term of forest use was expanded: the environment or nature protection with the help of forest was considered to be a forest use – so all the forests were in use. Notifications of forest owners activities was introduced. In 1993 it was not foreseen the tremendous increase in cutting of wood, so somehow some illegal activities became possible in the forest. (Etverk, 2005)

Considering the mistakes in legislation and local developments in economy and forestry, the next Forest Act was approved in 09.12.1998. Even this was not a perfect version – since that time the Act was changed 12 times, the last change was from 08.12.2005.

New Forest Act was approved by Parliament in June 2006 and it will become valid on the 1st of January 2007. One of the main changes for the current Forest Act is to make a deposit of money before clear-cutting from the three fertile spruce site types, which are bigger than 2 hectares. All private forest owners have to pay a deposit of not less than 3000 EEK (192 EUR) and no more than 20 000 EEK (1278 EUR) per hectare. Generally one could say that the aim of the new act is to reduce the harvesting volumes. In general political terms the aim of the act is to turn the Estonian forestry more towards multiple use and sustainable management.

Supply-demand balance of wood raw material
According to the latest forest surveys (Yearbook, 2005), the forest land area in Estonia is 2.28 Mha (50.5% of total land area) and the calculated growing stock is 453 m$^3$ and average growing stock per hectare is 200 m$^3$. During the last decades the forest area
has increased through natural regeneration of former agricultural lands. This process is expected to continue, as the agricultural market is shrinking. The allowable level of utilization of forest resources has been fixed by the Forestry Development Programmes. For the period 1996–2001 it was stated to be 7.8 Mm$^3$. The calculated optimum annual cutting volume for the Estonian forests (taking into account tree species composition, age structure, site quality and environmental restrictions) for the years 2001–2010 is 12.6 Mm$^3$ over bark (Estonian Forestry Development Programme until 2010).

It was stated to be relatively high due to the overbalance of middle-aged and mature stands in private forests. So, majority of the available resources is located in private forests. However, the long-term prognosis indicate, that if the age distribution of Estonian forests will become normal during the next decades, the sustainable annual harvesting will be less than 8 Mm$^3$ (Padari & Muiste, 2003).

Available big forest resources created favourable preconditions for development of forest industry. The cutting volumes started to grow (Figure 3). In the beginning of 1990-ies the capacity and processing quality of sawmills was low, for example, in 1993 only 180 000 m$^3$ of sawn timber was produced. Therefore most of the harvested wood was exported as roundwood during the first years after re-establishment of independence. The situation changed in 1995, when modern Imavere and Toftan sawmills started. Since that time the investments to sawmills continued and correspondingly the wood processing capacity also grew (Figure 4).
By now the capacity of sawmills exceeds the supply of local raw material and today Estonia has become a net importer of roundwood (Figure 5).

A new trend is to increase the importance of wood fuels, the resources of which are located in private forests. As the potential supply of wood fuel in long-run will be decreasing (Padari & Muiste, 2003; Muiste et al., 2004), the biggest potential for the future have the harvesting residues, which are seldom used today. In general we can draw the conclusion, that in the situation of sortage of sawlogs and other wooden raw material the suppliers should give the main attention to private forests. The average area of the cadastrial unit owned by a private person is relatively small, only 7.8 ha (Yearbook, 2005), which logistically complicates the organization of harvesting in these forests. It is a big challenge to find the suitable technologies and machines for this situation.

**Forest harvesting technologies**

Modernization of wood processing industry created demand for bigger volumes of high quality raw material. As a result, the forest harvesting technologies started to change. During the Soviet period the prevailing technology for final felling was whole-stem method (Figure 6). First cut-to-length machines were imported in the end of 1980-ies.

Based on the transportation limits in some of the EU countries, since May 1st, 1996, in Estonia were set up the limitations for lorries (total mass 40 t and length 18.35 m). Firstly changes in forest and sawmilling technology, later transportation limits made the use of tree-length method impossible and cut-to-length method was implemented.

Parallel to modernization of wood processing industry big investments were made to harvesting technologies and the share of modern machines started to grow (Figure 7).

According to expert opinion today the share of mechanized harvesting is about 70% (close to 100% in state forest) of final fellings and 20–30% of thinnings. On 17.09.2005 424 forest machines were registered in the Estonian Motor Vehicle Registration Centre (henceforth EMVRC), incl. 147 harvesters, 271 forwarders, 1 harwarder/dual/combi
machine and 5 skidders (used for scarification and pulling jobs). Not all machines are
registered, estimated total number of forest machines is following: harvesters 200–250,
forwarders 350–400, farm tractors with logging trailers approx. 1000.

According to EMVRC statistics 63% of harvesters and 53% forwarders are older
than five years. The questionnaire among the contractors and forest companies gave
the similar result (Figure 8). Probably certain amount of old machines work with low
productivity or are idle. Considerable amount of modern machines has since 2005
been used abroad (especially in cleaning/liquidation of storm damages in Sweden,
also in Russia and central Europe).

During last few years instead of harvesters for regeneration cuttings the most
favourable types have become universal middle size harvesters for thinning opera-
tions. Until 2003 only every 5th harvester sold was middle or small size, now it is vice
versa. In addition sale of small size thinning harvesters has remarkably increased.

One of the driving forces to change the technologies in forest harvesting is the
increasing living standard. Due to relatively low salaries and severe working condi-
tions it is not possible to find manual loggers. The only promising solution is the
transition from manual cutting to mechanized technologies. The employment rate
in forestry is reflected in the following figure (Figure 9).
Future trends
In case logging volumes will stay at the current level, following negative consequences will affect Estonian wood industry:
- decrease of foreign investments
- bankrupts of smaller companies
- decrease of interest and leaving of international companies / investors
Due to stable raise of living standards mechanization goes on rapidly, especially in intermediate cuttings where mechanization level is lower today. Hence demand for small size and universal middle size intermediate timber harvesters persist.
Regrettably new stagnant trend seems to be an investment in used equipment. Main reasons are: short term and small volume logging contracts; low logging volumes and tight competition; short logging season due to climate and so called “bird peace”; unstable and negative forest policy.

Discussion and conclusions

- Since the beginning of 1990ies transition from tree-length technology to cut-to-length technology has taken place
- Due to lack of skilled workers in forestry and rapidly growing salaries it is expected, that the level of mechanization will continue to grow
- The role of Forest Owners Association will increase in organising of the management and harvesting of private forests

For the growth of forest industry it is important:

- to accelerate the privatization process
- to stabilize the economy environment via new forest law
- to implement new technologies
- to subsidise bio-energy projects

References


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