Practical ways to minimize under-utilization of forest resources: a case study

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Abstract

In northern areas one of the basic resources is wood in different utilizable forms. The forest environment also represents values of nature and recreation; however, the present paper is concentrated on material values of wood resources, such as traditional pulp and saw wood and new possibilities to utilize wood as energy. Also some newer possibilities to utilize wood resources are shortly discussed.

As a background for the paper is a recent study from Ii District, close to Oulu, northern Finland. In this study the sustainable utilization of forest resources in five communities is first estimated. The degree of apparent underutilization is estimated.

The practical ways of improving the degree of utilization of forest resources is considered: the pulp and saw wood, energy wood for different kinds of boilers and mechanical processing of wood.

At every stage of minimizing underutilization of forest resources, the information concerning local forest resources has been utilized. The role of available information sources will be discussed separately.

The question of quantitatively and qualitatively well-developed forest utilization is a general question, concerning all forest utilizing areas. In northern areas, however, the relative role of forest resources for the local well-being is the more evident. The present paper discusses this general question utilizing a regional case study.

1 A short research description: a regional case study

Wood resources represent a natural resource which has a widespread utilization both in industrialized and developing countries. For some areas there is a risk for overutilization, for tropical forests for example. On the other hand there are areas where forest resources are underutilized for one reason or another; the actual reason may be the long term development of the capasity of wood utiliz-

ing industry or the the general development of population localization, to mention some basic factors.

Set against this background we have carried out a case study concerning the underutilization question of wood resources in Ii District, northern Finland. This area consists of five communities in close proximity to the city of Oulu and the Gulf of Bothnia. The population of the five communities is altogether about 18.000 people and the area is 4 987 km^2. The number of employed people in the area is about 5 200. About one fouth of the population will get its incomes from the agriculture and forestry and three fourths from industry and different services related sectors.

The forests on the area are 69 % privately owned and the rest is owned by State and different companies. Typical for the forests in the example area is the high percentage of bog areas, about 55–60 % of the forest land area. Ditching has been carried out intensively on these areas and therefore there is relatively high share of young pine and birch forests in the area.

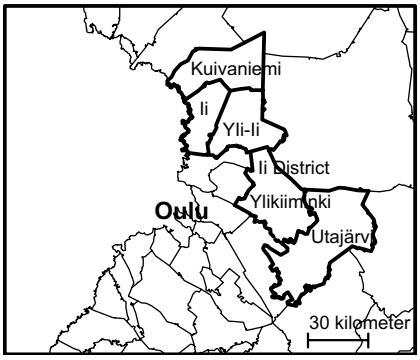

Figure 1. The map of the case area.

In the case of the Ii District the hypothesis of the research was that it is possible to estimate the economic value of the wood material underutilization and also to point out those practical actions which may substantially decrease the amount of wood material underutilization. In other words there is a certain set of subtasks which has to be analyzed, in order to seek ways to decrease the underutilization of wood resources.

2 Degree of underutilization of wood resources

When discussing the term 'underutilization' we must first define the sustainable level of wood resource utilization. A practical measure for sustainable forest resource utilization is the regional cutting plans which are based on actual cutting needs. The degree of underutilization is the ratio of actual cuttings to planned cutting needs.

Another measure for underutilization could be the qualitative term expressing for example the average refining degree of regional wood based products. Because the majority of the wood material from the case area goes to pulp wood and saw wood, this measure does not offer very clear possibilities of utilization. Thus we restrict ourselves here to refer to previously defined underutilization measures.

Technically the degree of underutilization can be estimated from the

data obtained from local forest center. Basically this data is based on forest inventory which has been carried out over the whole country.

In the case of Ii District the above defined underutilization degree is about 40 % as can be seen from Fig.2.

The actual reason for underutilization is the realized cutting level which in turn is determined by the raw material requirements of the industry, both for pulp and sawing industry. The cuttings of course have been selective in the sense that final cutting areas are more economic for the cutting entrepreneurs than for example first thinning forest stands. Therefore the underutilization of wood resources is weighted mostly to the younger forests. Consequently, there is a trend in the case area that first thinnings are delayed.

3 Decreases in the wood underutilization through pulp and saw wood, energy wood and mechanical wood refining industry

In the case area the main ways to decrease the underutilization were investigated. The practical firms and operators of wood utilization were communicated to clear out ways to decrease the estimated underutilization in:

- pulp and paper wood and saw wood material
- energy wood material
- material for further mechanical wood processing

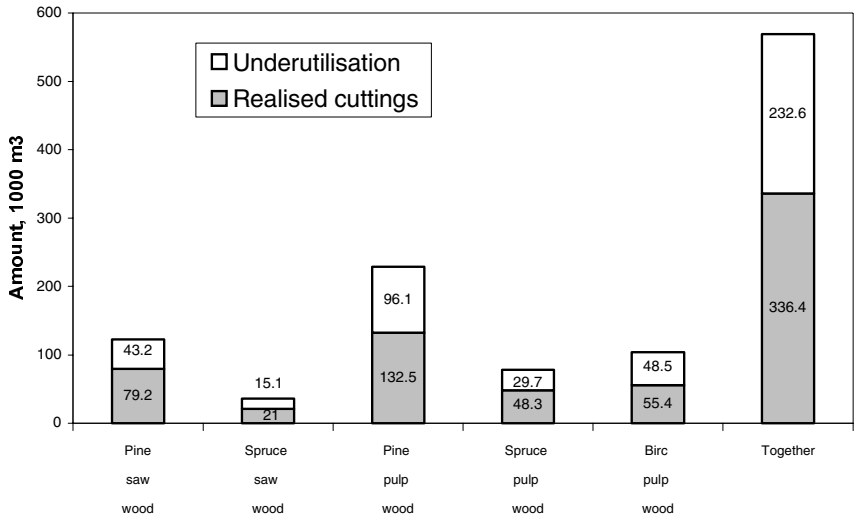

Figure 2. The underutilization of forest resources in the Ii District municipalities.

For the chemical wood processing industry there were three main wood utilizing firms active in the case area. All wood purchasers pointed out that their material purchases were clearly market controlled. Some addition might be found by intensifying the local forestry planning. In practice this means that the number of forestry plans for farms should be increased to activate wood selling of private forest owners.

The activation of energy wood production can be divided into several subtasks each one of which has its own economic terms or threshold factors:

1. development of large boilers fuel supply systems
2. district heating fuelling systems
3. large households fuelling systems
4. farm and family house fuelling systems

Each one of the above systems have their own possibilities to use energy wood as fuel. Essential for the energy wood utilization for each one of the above applications is the reference fuel price or reference energy price. For example, in Toppila heat and power plant there is chance to mix energy wood chips with milled peat so that about 700.000 cubis metres of wood chips could be utilized as fuel. The price of energy in wood chips should be approximately at the same level as the price of energy in peat, about 45 FIM/MWh (Mikkonen 1997).

Presently there is going on investigation how much energy wood actually can be produced at that price level within the fuel peat production radius of the power plant. The peat production network is planned to be utilized simultaneously for energy wood transport from final cuttings and partly also from thinning areas close to peat terminals and transport routes, as seen in Fig.3.

This application is considered to be a quite potential chance to decrease the obvious underutilization of energy wood in large scale. The price-availability ratio will be decisive for this application.

In smaller boilers the use of energy wood is also possible, again depending on the reference fuel price. In medium size boilers, size 1–10 MW, the reference fuels are mostly heavy fuel oil, 104 FIM/MWh, and sod peat, 45.8 FIM/MWh. In a fluidized bed or grate type sod peat boiler wood chips can be easily used as an additional or alternative fuel.

In small households energy wood can be used as wood chips or piece like fuel. In the sample area, Utajärvi municipality there is a district heating plant and numerous larger and family households where energy wood is a real fuel alternative; the fuel selection is practically always done on economic basis, comparing with the economically closest fuel or energy alternative.

A systematic search for finding the most advantageous energy wood boilers in the case area will be carried out.

The estimate of energy wood resources in the case area is calculated based on certain average energy wood amounts per final cuttings and thinnings. The results show that there would be available energy wood for household use, district heating and

some excess also for uses in the larger power plant in Toppila. The actual future use will finally depend on the price development of the energy wood and the alternative fuels. In any case it is expected that utilization of energy wood will gradually increase by the efficiency improvements in the harvesting methods. Cutting residue is the most potential method to produce larger amounts of energy wood for larger boilers. The harvesting can be quite effective in this case, resulting in fuel price of about 50 FIM/MWh (Mikkonen 1997).

For smaller boilers the price for energy wood is 'allowed' to be slightly higher because of the higher reference fuel prices.

The important mechanical wood processing type in the area is wood plate industry for domestic purposes and exports. For mechanical wood processing of the example area wood is transported partly from outside of the area. Simultaneously there is an excess of young pine growing forests which is not fully utilized. Therefore sawing of small diameter wood would be very appealing development target in order to decrease the

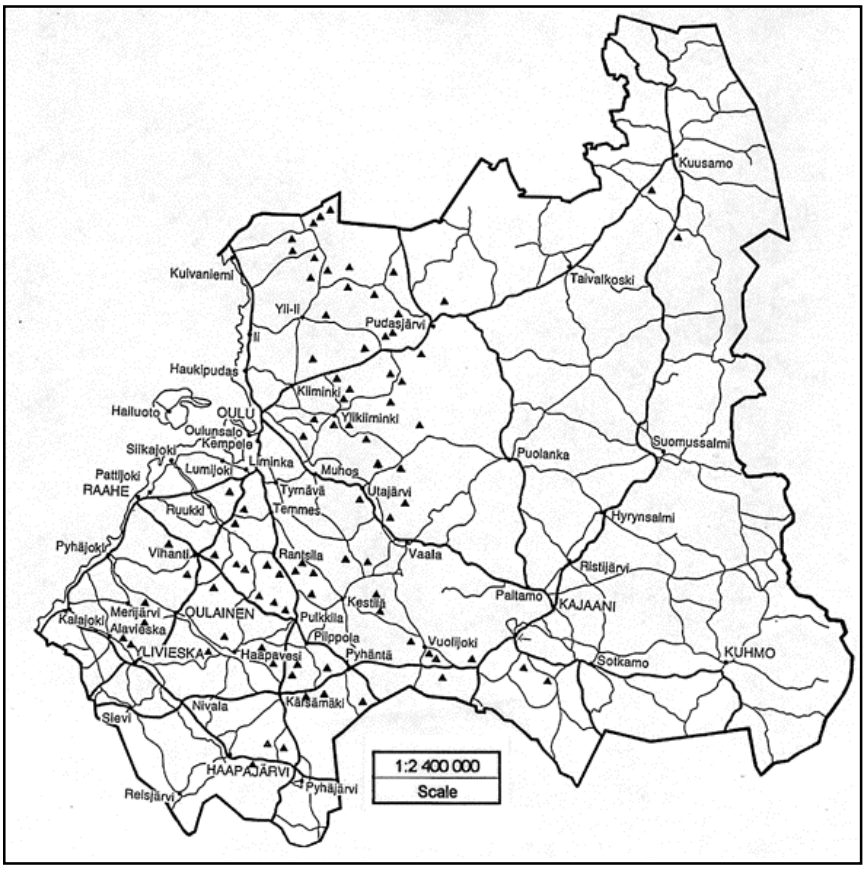

Figure 3. Peat and energy wood supply network.

local underutilization of wood in this way. The production of wooden plate elements for further refining industry is already an operating branch of industry in the case area.

As can be seen the represented methods for decrease of underutilization of wood resources are all dependent on many factors:

- market of pulp and paper
- fuel prices of alternative fuels
- development of the efficiency of energy wood harvesting
- development of small wood utilization technology
- the availability of exact wood resource information on local level

The actual expectations of the decrease in underutilization wood are in practice quite low and develop also slowly because of quite stiff development factors involved. However, the economic effects of the increased wood resource utilization are very valuable for the society. In the case area the theoretical total elimination of wood resource underutilization would result in about 300 man years addition in annual employment and in corresponding incomes in the area. Therefore even a slow positive development will be worth of efforts.

4 Role of information and technology in the utilization of wood resources

As can be seen from the above discussion the phenomenon underutilization of wood resources is apparent in the case area. The same situation is valid, more or less, also elsewhere in northern Finland. In order to decrease the underutilization information about true resources should be available, as exact as possible. This concerns pulp and paper wood, wood for mechanical wood processing and different forms of energy wood.

Important from the information point of view is that, for each geographical area, we can obtain the information about the actual cutting possibilities for industry wood and energy wood. In practice this information is available in Finland in the regional forestry organizations and the Finnish Forest Research Institute. This information is based on periodical inventories of forests which is in turn based on test area methods.

The role of harvesting technology is essential both for industrial wood and energy wood production. Therefore it has a clear link into the underutilization problem: the more efficiently wood can be harvested the more competitive wood material can be offered to the market. This concerns both wood for refining industry and energy.

5 General conclusions

Based on the case study in Ii District, northern Finland, it has been shown that the underutilization of wood resources is annually about 40 % of the sustainable cutting level. Even partial reduction of this number would result in important effects in local

employment and income flows. This raises the question of ways to decrease the underutilization.

Underutilization of forest resources, qualitatively or quantitatively, is obviously a more general question. Therefore the discussion of underutilization can be understood as methodical one, applicable also on other forests utilizing regions.

The clearest ways to decrease the underutilization of wood in the example area are to further effectivize the forestry planning and wood marketing, to develop energy wood utilization chains as fuel in different sizes of boilers, and to develop the utilization of even small diameter wood use in mechanical wood industry.

The technology and information required in actual decrease of wood underutilization are partly those already utilized in conventional forestry but especially in energy wood utilization some new production concepts should be developed. The same concerns small diameter wood utilization technologies.

In northern sparsely populated areas, like Ii District is, the full utilization of forest resources is very valuable for the local population, adding labour opportunities in rural areas where there is generally difficult to create new working places. It is expected that in the case area some tens of annual working places can be created by time when the underutilization of wood is decreased. To achieve this goal a systematic re-evaluation of wood utilizing systems will be necessary.

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