

**ANALYSIS OF THE SOCIO-ECONOMIC VALUE OF FORESTS OWNED BY THE
STATE AND OTHER OWNERS IN KURZEME AND VIDZEME STATISTICAL
REGIONS**

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Abstract. Latvia is divided into six statistical regions. The total area of this country is 64.6 thousand km². The most important natural resource for the economy of Latvia is forests. According to the data of the Central Statistical Bureau of Latvia, the total forested area is 3.5 million hectares, covering 56.9% of Latvia's territory. Vidzeme region and Kurzeme region are the most forested regions in Latvia. Forests cover 871.5 thousand ha in Vidzeme region and 752.3 thousand ha in Kurzeme region. Therefore, the authors of the paper decided to study those regions deeper. The socio-economic value of forests in Vidzeme region is EUR 1.27 billion, while in Kurzeme region – EUR 1.11 billion. Of all Latvia's forests, 50.3% are state-owned and the remaining 49.7% are under different ownership.

Key words: regional analysis, forest socio-economic value, National Forest Inventory.

JEL code: Q23

Introduction

Latvia is the fourth most forested country in Europe. Forests for Latvia's economy are a very important resource; thus, a calculation of forest value is needed. Nowadays, a social and ecological evaluation of forest resources takes as important place as an economic evaluation. The authors used the socio-economic evaluation method for calculating the forest value in Latvia.

Latvia is divided into six statistical regions. The authors decided to study deeper two regions, which are the most forested – Vidzeme region and Kurzeme region. Kurzeme region is located in the Western part of Latvia, the size of territory – 13.6 thousand km² but Vidzeme region – in the North-eastern part of Latvia, the size of territory – 15.2 thousand km² (Statistics of Regions..., 2013). These regions are ones of the largest regions by size in Latvia. The total area of Latvia is 64.6 thousand km².

Of all Latvia's forests, 50.3% are state-owned. The joint stock company "Latvia's State Forests" is the manager of these forests. It is an enterprise entirely owned by the state of Latvia. The remaining 49.7% are under different ownership, like private and legal forest owners, municipalities and scientific forests (Latvia's State Forests..., 2011).

The aim of this study is to calculate the socio-economic value of forests owned by the state and other owners in the most forested statistical regions – Kurzeme and Vidzeme and to compare them. To accomplish it, the following tasks were proposed:

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- 1) to explore a forest socio-economic evaluation methodology;
- 2) to calculate the socio-economic value of forests owned by the state and other owners in Kurzeme and Vidzeme regions;
- 3) to compare the forests' socio-economic value in Kurzeme region and Vidzeme regions.

The monographic descriptive method and the analysis and synthesis methods are used in the research to calculate the socio-economic value of forests owned by the state and other owners in the most forested statistical regions – Kurzeme and Vidzeme – as well as theory aspects and problem elements. The empirical research method is used to develop general statements from separate facts or to determine regularities. The logical construction and interpretation methods are used for developing conclusions. Legislative acts of the Republic of Latvia, scientific publications, other relevant literature, and internet resources were used in the study.

Research results and discussion

Materials and methods

The authors used a methodology developed by Dr.hab.silv. Peteris Zalitis for calculating the forest socio-economic value in regions. The authors adapted this methodology for using the National Forest Inventory (NFI) data. The NFI data have a very high scientific value, as they provide in-depth information on **Latvia's forest resources**.

The two most important components of forest ecosystem regarding the forest socio-economic value are forest land and forest stand values: $MV=ZV+KV$, where MV – forest value, ZV – forest land value, and KV – forest stand value.

To calculate the forest land value, the following variables are used: $ZV_{ekon} \times K_{ekol} \times K_{soc}$, where ZV_{ekon} – forest land economic value, K_{ekol} – ecological value of forest land, and K_{soc} – social value of forest land. ZV_{ekon} – **the forest type's quality assessment has been used for calculating the forest land economic value**. It has been taken from the Cadastral Valuation Regulations in Latvia. Forest stand growth in different forest types has been used as a forest land evaluation indicator. K_{ekol} – a correction coefficient; it characterises **the forest dominant ecological function**. **Environmental experts' evaluation has been used** as well. K_{soc} – the social value of forest land illustrates anthropogenic load and it is connected with forest localisation relative to villages and traffic lanes. The Cadastral Valuation Regulations were also used in the study.

The current standing volume, the target standing volume, the ratio of the values of wood-produced oxygen and timber products and the correction coefficient are used to calculate the forest stand value. The standing volume is taken from the National Forest Inventory, the target standing volume – from a scientific publication by the methodology developer. The ratio of the values of wood-produced oxygen and timber products is calculated by multiplying the forest stand value by the oxygen market value and one cubic metre of volume of wood-produced oxygen.

Overall, the following equation is used to calculate the forest value:

(Eq. 1)

$$\begin{aligned} MV (\text{points}) &= ZV_{\text{ekon}} \times K_{\text{ekol}} \times K_{\text{soc}} + \frac{V_{\text{fakt}}}{V_m} \times ZV_{\text{ekon}} (1 + R \times i_v) \\ &= ZV_{\text{ekon}} \left[K_{\text{ekol}} \times K_{\text{soc}} + \frac{V_{\text{fakt}}}{V_m} (1 + R \times i_v) \right] \end{aligned}$$

where:

ZV_{ekon} – economic value of forest land;

K_{ekol} – ecological value of forest land;

K_{soc} – social value of forest land;

V_{fakt} – current standing volume;

V_m – target standing volume;

R – ratio of the values of wood-produced oxygen and timber products;

i_v – correction coefficient.

Firstly, the forest land value and afterwards the forest stand value were calculated for the estimation of the forest socio-economic value. Both values were expressed in points per 1 ha. For transforming points to euro, the following equation is used:

(Eq. 2)

$$MV (\text{EUR}) = (KV_{\text{vid}} + MV_{\text{vid}}) \times 5.28 \times 3742 \times 345$$

where:

KV_{vid} – forest stand average value;

MV_{vid} – forest land average value;

5.28 – value of one hectare points in EUR set by the Cabinet Regulations;

3742 – total amount of sample plots;

345 – ha, the area which represents 1 sample plot (Zalitis P., 2001).

Data from the NFI were used because it is a new way for obtaining information about forests in Latvia. One can obtain two types of information there: first, statistical reports on state forest resources, and second, a large database for a more in-depth research on forest stand or tree level. The first cycle of the NFI was scheduled for 2004-2008, with the second cycle consisting of repeated measurements scheduled for 2009-2013. The second cycle of measurements started in 2009, providing information about the dynamics of development, deadwood structure and cuttings at stand, and even at tree level.

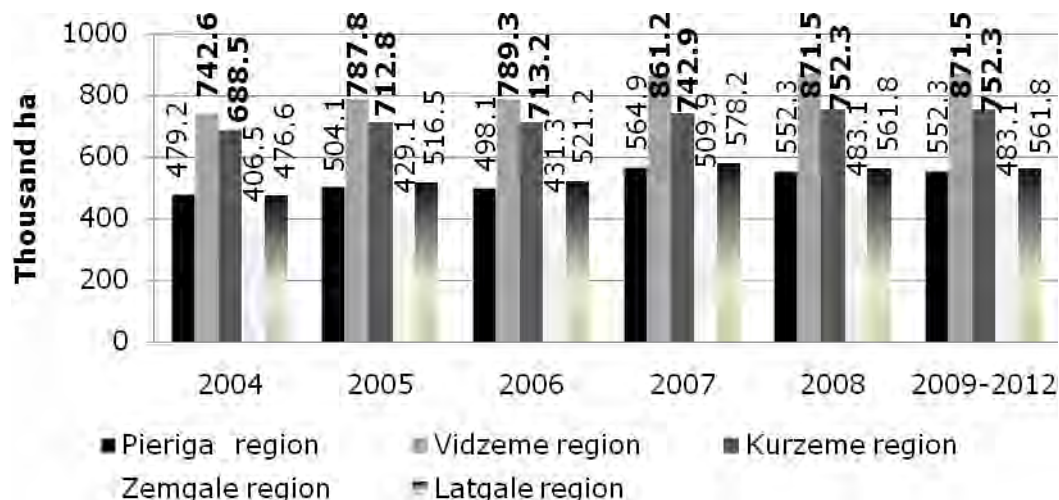
Only data from 2005, 2006 and 2007 have been used, since the second cycle of measurements has not been finished yet (National Forest Inventory ..., 2009). The first year was excluded, because not all sample plots were measured and it is not a representative one. Also the last year of the first

measurement cycle was excluded. Sample plots with different data discrepancies have been excluded from the study as well.

The authors used correlation analysis to define how indicators and values are influencing each other.

Research results and discussion

Fifty point three percent of all Latvia's forests are state-owned and the remaining 49.7% are under different ownership – municipalities, private forest owners, protected forests, and others. Historically, this percentage distribution has changed with the political situation and the powers. The percentage of forest land owned by the state has decreased by 34%, while the share of other forests has increased because of historical events. The total area of forested land has grown by 53%. According to the Forest Fund, in 1921 Latvia had 1.8 million hectares of forest, while, accounting to the forest statistical inventory data for 2011, forests cover 3.5 million hectares of the country's territory. It means that there are 1.5 hectares of forest per inhabitant in Latvia, almost twice as much as at the time of the first Republic of Latvia. The total area of forests in Latvia has increased from 0.9 hectares to 1.5 hectares per capita (Zalite Z., Auzina A. 2013).



Source: authors' construction based on the Central Statistical Bureau of Latvia, 2004 - 2012

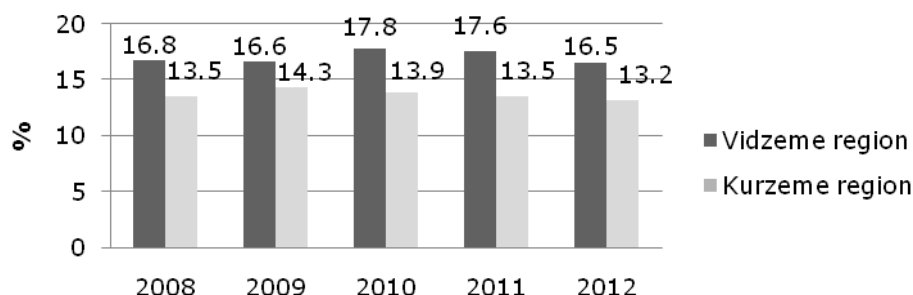
Fig. 1. Forest area in statistical regions from 2004 to 2012, thousand ha

The forest area was increasing almost in all the regions from 2004 to 2012 (Figure 1). Vidzeme region is one of the most forested regions in Latvia. Year by year, the forest area was increasing, from 742.6 thousand ha in 2004 to 871.5 thousand ha in the year 2012. Zemgale region is a region with less forests. The forest area in Zemgale region was almost twice lower than in Vidzeme region in 2012. Latgale region is the region where its forest area was a little bit decreasing, i.e. the forest area decreased by 16.4 thousands ha from 2007 to 2012. From all the regions, the most forested regions are Kurzeme region and Vidzeme region. In 2012, the forest area covered 817.5 thousand ha in Vidzeme region and 752.3 thousand ha in Kurzeme region (Forest Area..., 2013).

Forests for Latvians provide many important things – firstly, forest is the most important natural resource for the economy of Latvia. In 2012, the export value was EUR 1.7 billion; the forest sector's export contribution to the total export balance was 17%; the forest sector's share of gross domestic product stood at 6.1% (Forest Sector Export..., 2013). The export value is increasing together with the forest area, respectively. It was EUR 1.1 billion in 2005. The export share in the country's export was 35%, it dropped for 18 percentage points in 2005. The export share of gross domestic products increased by 1.9 percentage points. In 2005, the export share of gross domestic product stood at 4.2% (Klauss K., 2011). A very good tendency can be observed – the forest sector export value and its share of gross domestic product have been increasing from 2005.

In 2012, 73.3 thousand or 8.4% of employees were working in forestry, agriculture, and fishery. This number has dropped by 14.6 thousand since 2008; despite that the employment rate is an important indicator for sustainable forest management. For comparison, 18.7% of all Latvia's employees work in the trade, accommodation, and food service sectors, which is in the first place among all sectors. The forest sector takes the fifth place in 2012.

More employees are working in Vidzeme statistical region (Figure 2). In 2012, 16.5% of employees were working in forestry, agriculture and fishery in Vidzeme region. The year with the highest employee number was 2010, when 17.8% were employed. The largest difference between employee numbers in the statistical regions was in 2011. In Vidzeme statistical region, 17.6% were working in forestry, agriculture and fishery, while in Kurzeme statistical region – 13.5% (Employees in Forestry..., 2013).



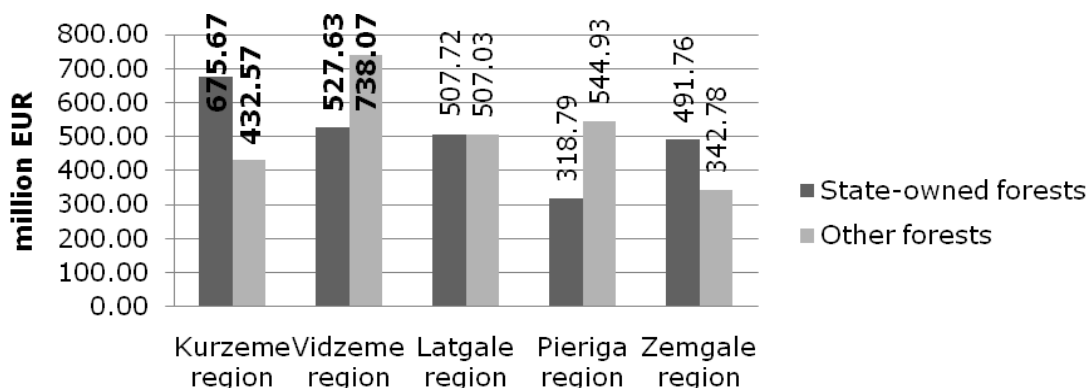
Source: authors' construction based on the Central Statistical Bureau of Latvia, 2004 - 2012

Fig. 2. Share of employees in forestry, agriculture and fishery in Vidzeme and Kurzeme statistical regions, 2008 - 2012, %

Secondly, among other European countries, Latvia is mentioned as a country with high natural diversity; endangered plants and animal species are maintained in a reasonable and sustainable way. None of tree species have perished from Latvia's forests in recent centuries due to the economic activity. In Latvia's forests, the diversity of tree species mixture is very high within the stands and also soil structure. Biodiversity is higher than in the temperate climate zone in the Central part of Europe and the Southern part of the Scandinavian Peninsula (Environment Plan..., 2011). The area covered with forests, their qualities and geographical localisation defines Latvia belonging to the regions where the forest sector gives a significant input into the country's economy.

Thirdly, Latvia is one of those rare countries in the world where forestry's CO₂ sequestration is much higher than the overall amount of harmful emissions. Fourth, the forest recreational territory takes 293 000 ha or 8% of the total forest area in Latvia. Bird-watchtowers, paths, cultural nature objects, places for picnics, and many other infrastructural objects are available in Latvia's forests. The joint stock company "Latvia's State Forests" pays special attention to the establishment of that type of objects in their managed forests. Every Latvian resident can use all these objects for free. A price cannot be determined for emotional satisfaction for time spent in forest. Also, non-timber forest product picking for most of Latvian citizens is just a hobby not a source of income. Theoretically, it is possible to evaluate the value of non-timber forest products. The Ministry of Agriculture has evaluated the value of picked non-timber forest products in Latvia's forests and the value was EUR 130 million in 2010. A very small amount of products was sold on the market and it is wrong to say that they were incomes from forest management. This value of non-timber forest products is just a visualisation and one more time confirms the social significance of Latvia's forests (Forest Sector in Numbers, 2013).

The previously mentioned facts confirm the economic, social, and ecological importance of Latvia's forests which ensures sustainable regional development. According to calculations done by the authors, the socio-economic value of Latvia's forests was EUR 5.1 billion in the first national forest inventory cycle. State-owned forests' socio-economic value is EUR 2.52 billion and the value of forests owned by other owners is EUR 2.58 billion during the first measurement cycle.



Source: authors' construction

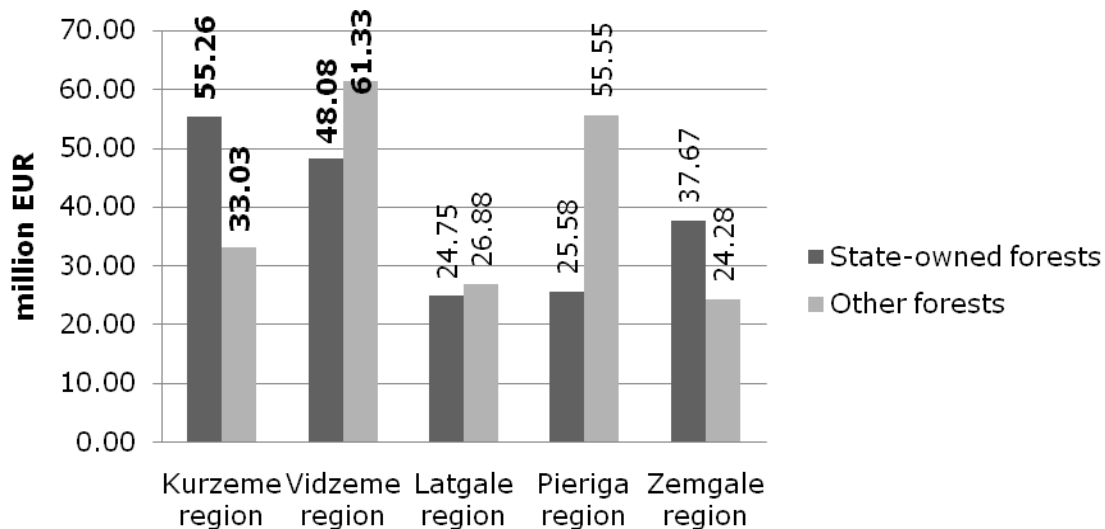
Fig.3. Socio-economic value of state-owned forests and other forests in the regions, from 2005 to 2007, EUR million

Among all the statistical regions in Latvia, the most valuable forests are located in Vidzeme region, the North-eastern part of Latvia in the first national forest inventory cycle (Figure 3). The total forest value is EUR 1.27 billion. State-owned forests' value is EUR 527.63 million, while other forests' value is EUR 210.44 million greater. The total forest value in Kurzeme region, the Western part of Latvia, is EUR 1.1 billion. State-owned forests' value is EUR 675.67 million, while other forests' value is EUR 4263.57 million. High forest value is calculated in Latgale region, the Eastern part of Latvia. Other forests' value is EUR 507.03 million, while state-owned forests' value is EUR 507.72 million. Most valueless state-owned forests are located in Pieriga region, the central part of Latvia but most valueless other forests are

located in Zemgale region, the South-western part of Latvia. Riga region has been excluded, because no state-owned forests are located in this region.

The fact that the most valuable forests are located in Kurzeme and Vidzeme regions is logical, because forests cover large areas of the region's lands. Their share of all lands are 51.7%, agricultural land takes 34% of the total area. Forests cover 29.2% of all area in Kurzeme region but agricultural lands - 63.3% (Latvijas reģionu ekonomikas..., 2010-2011).

A forest stand value and a forest land value are two important components in the socio-economic value equation; thus, they will be analysed separately for Kurzeme region and Vidzeme region.



Source: authors' construction

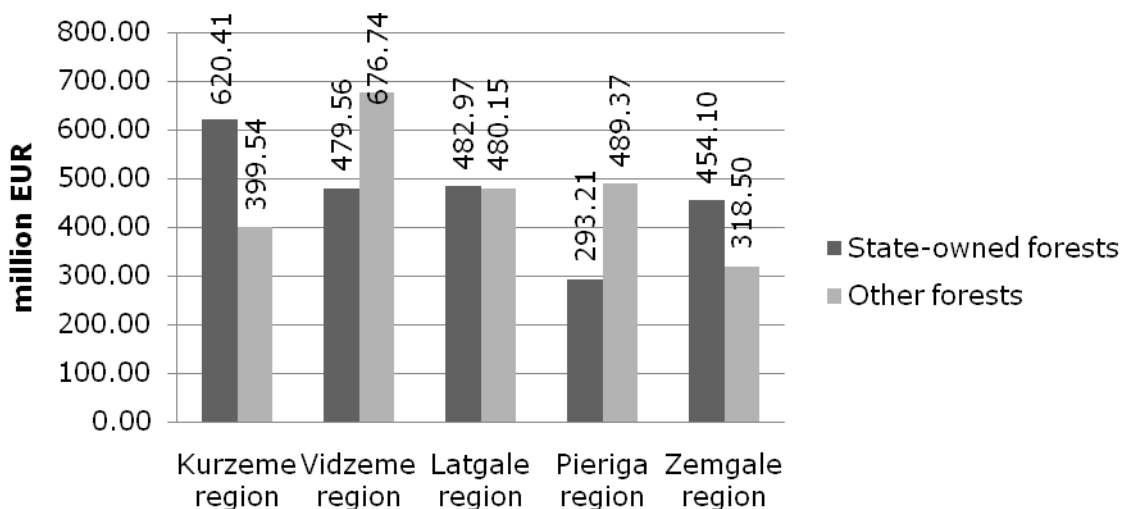
Fig. 4. The highest forest land values in the regions, 2005 – 2007, EUR million

The most valuable forest land, worth of EUR 109.51 million, is in Vidzeme region (Figure 4). The state-owned forest land value is EUR 48.08 million. Other forests' value is greater by EUR 13.26 million. An opposite situation is in Kurzeme region. State-owned forests are more valuable than other forests. Other forests' value is EUR 33.03 million. State-owned forest's value is 40% greater.

A correlation analysis confirms the assumption that the ecological value affects the forest land value more than other values and indicators ($r=0.885$ with $\alpha = 0.000$). An ecological value represents the dominant function of forest - either it is a protected forest, a forest in a town, or an economically managed forest. The ecological value is higher for protected forests but economically managed forests have the lowest evaluation. Protected forests ensure high biodiversity, endangered tree species are growing there, and they can be used for recreational purposes as well. Forest felling in protected areas is prohibited for commercial purposes, thereby, no economic benefit can be expected from these territories.

According to the data analysis, the most valuable forest stands are in Vidzeme region, i.e. EUR 1.16 billion, state-owned forests' stands are worth of EUR 479.56 million, while other forest stands are worth of EUR 676.74 million (Figure 5). The second most valuable forest stands are located in Kurzeme region.

Forest stands there are worth EUR of 1.02 billion. State-owned forest stands are more valuable than other forest stands. The same situation was for forest land. The state-owned forest value is EUR 620.41 million but other forests' value is EUR 399.54 million.



Source: authors' construction

Fig. 5. **The highest forest stand values in the regions, 2005 – 2007, EUR million**

Out of all the constituent indicators, the current standing volume correlates most with the forest stand value. There is a strong positive correlation between the forest stand value and the current standing volume ($r=0.911$ with $\alpha = 0.000$). A higher current standing volume ensures a higher forest stand value. Quality forest stands bring a higher economic benefit to the forest owner. Economically valuable trees should be planted as dominant species and species of no significant value should be replaced to get the highest economic benefit from the forest. Valuable species are: common Norway spruce (*Picea abies Karst.*), Scots pine (*Pinus sylvestris L.*), Silver birch (*Betula pendula Roth*), Aspen (*Populus tremula L.*), Common alder (*Alnus glutinosa Gaerth*), Common oak (*Quercus robur L.*), and European ash (*Fraxinus excelsior L.*). As species of no significant value the authors mention species that cannot be sold for profit, for example, Goat willow (*Salix caprea*).

Overall, the most valuable forests are located in Vidzeme region. The second most valuable forests are located in Kurzeme region. Great forest values are also observed in the other statistical regions in Latvia. The forest socio-economic evaluation method could be used for evaluating a forest value and defining the lowest and the highest indicators. It is a good method for having an overall view of forest condition and one of the conditions for sustainable regional development.

Conclusions

1. Forests are the most important natural resource for the economy of Latvia. In 2012, the export value was EUR 1.7 billion and 8.4% of employees were working in forestry, agriculture and fishery sectors.

2. The forest socio-economic value represents the forest social, ecological, and economic value of forest. Latvia's forests' socio-economic value is EUR 5.1 billion.

3. The most valuable forests are located in Vidzeme region. The forest socio-economic value is EUR 1.27 billion. The forest stand value and the forest land value are the highest as well. In Vidzeme region, 16.5% of employees are working in forestry, fishery, and agriculture.

4. Out of all the constituent indicators, the current standing volume correlates most with the forest stand value. There is a strong positive correlation between the forest stand value and the current standing volume ($r=0.911$ with $\alpha = 0.000$).

5. Out of all the constituent indicators, the ecological value of the forest affects forest land most. There is a strong positive correlation between the value of forest land and the ecological value of forest land ($r=0.885$ with $\alpha = 0.000$).

Proposals

1. Forest owners should use the method for forest socio-economic evaluation. It helps evaluate all basic forest functions and distinguish the strengths and weaknesses in forest property. The forest can be used not only for forest felling but also for recreational purposes. Economic benefit could be gained from forests for recreational purposes with a good business plan.

2. The method for evaluating the socio-economic value could be the basis for developing a programme for modelling and estimating the highest socio-economic value of a forest stand and the most profitable level based on certain indicators to be included into the programme, taking into consideration the ecological and social functions of the forest.

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