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Conference on Land Economy and Rural Studies Essentials**NON-TIMBER RESOURCES OF THE KRASNOYARSK
TERRITORY**

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Abstract

One of the problems reducing the use of non-timber forest resources is the lack of statistical data on their amounts (especially medicinal resources). The available potential of non-timber forest resources in Krasnoyarsk Territory is only 36% of the total potential and is estimated at 7.8 billion roubles. According to the purpose (to study the potential possibility of harvesting these resources by forestry units in Krasnoyarsk Territory), the researchers obtained the following results. The forests of the Krasnoyarsk Territory have a potential stock of non-timber resources of all possible species found in the Russian Federation. The means allow structuring the forest areas into groups according to the harvesting of non-timber resources. On this basis, it is possible to identify forest areas with potential harvesting above the average and close to the average resource within each forest area. Among all the territories, the maximum potential for logging belongs to Bolshemurtinskoye, Bolsheuluyskoye, Gremuchenskoye, Kuraginskoye and Bogotolskoye forest districts. Non-timber resources are not evenly distributed across Krasnoyarsk Territory, which complicates the logistics and consumption opportunities of this resource. Non-timber resources require urgent renewal, as their inventory is outdated and does not reflect modern types of products.

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1. Introduction

Krasnoyarsk Territory has established almost all types of non-timber resources found in the Russian Federation.

The development of harvesting volumes is hindered by an outdated list and insufficient demand for non-timber resources.

Nevertheless, the forestry regulations for the forest districts of Krasnoyarsk Territory allow for an analysis of the potential harvesting of non-timber resources.

The first is the establishment of a legal and regulatory framework for the assessment of different resource types. Currently, there is a lack of development and a need for expansion and harmonisation. The second direction is to improve the regulatory and methodological framework for lease relations in terms of differentiation of terms and mechanisms for improving procurement (Telishevsky, 1986). For reference, the leasing of forest land has not been widespread to date. Thus, the data for 2012 shows that there were 59 agreements concluded for the use of non-timber forest resources (area – 457 thousand million hectares).

Currently, Russia has less and less forest land without a forest lease. The possibility of increasing revenue from timber sales alone by increasing the area of leased plots is almost exhausted, so there is a need to learn how to get a higher return from each forest land. Multi-purpose forestry is a major opportunity to solve this problem. The harvesting of timber and non-timber forest resources in the same forest area is not only possible but necessary. There is no doubt that timber harvesting, which is an essential material for construction, a raw material for the pulp and paper industry and many other industries, occupies a crucial place in the Russian economy. But apart from timber, forests are also a major resource for a variety of products used for food and as raw materials for industrial processing. The 2006 Russian Federation Forest Code divides these forest uses into four groups: harvesting of oleoresin; harvesting and gathering of non-timber forest resources, including stumps, birch bark, tree and shrub bark, brushwood, woody forage, spruce, fir, pine paws of fir or other coniferous trees for New Year holidays, moss, forest litter, rushes, reeds etc. Scientific research and past practice show that income from the exploitation of non-timber resources in certain forest types is several times higher than income from timber harvesting where 1 ha is 11.5 times the value of income from timber harvesting (Kurlovich et al., 2016; Resolution of Russian Federation, 2007). A number of territories of the Russian Federation have examples of studied assessments of various non-timber resources (Leningrad region, Far East, Bashkortostan, Komi Republic) (Chang Chung et al., 2020; Dmitrieva et al., 2009; Khisamov et al., 2014).

Not all the totality of a natural resource may be available for use. It is not possible to extract resources in areas that do not have the necessary transport networks, despite the availability of resources. Therefore, the economic valuation of non-timber forest resources took into account their transport accessibility (Kurlovich, 2003; Kurlovich & Kositsyn, 2018).

According to Ilyichev (2014), the low profitability of forest plots is due to deficiencies in the Forest Code; an insufficient methodological basis for the comprehensive assessment of forest lands; and the absence of a state programme for the use of all types of forest resources (Shevelev et al., 2011) point

to legal, field and methodological shortcomings in the assessment of non-timber resources (Safonov, 2013) showed that for all types of bioresources there are two approaches: economic valuation, based on consideration of the real or potential profit from the use of the resource, and ecological valuation, which considers the characteristics of the environment of the resource and their mutual influence on each other. Filippova (2010) suggests organising the reception and processing of forest products on an industrial scale to ensure employment in rural areas. Kurlovich et al. (2019) believe that one of the ways to improve methods of accounting and assessment of non-timber resources is to apply a system of state forest inventory. It is important to note that non-timber resources are affected by various factors, including forest fires (Ostroshenko, 2012).

The available potential of non-timber forest resources in Krasnoyarsk Territory is only 36% of the total potential and is estimated at 7.8 billion roubles. The Yenisei region has the greatest potential for available non-timber forest resources. The species distribution of available resources is characterised as follows. Turukhansky district is the richest in mushroom resources, its potential is estimated at 734.6 million roubles, the poorest one is Krasnoturansky district (2.7 million roubles). The leading regions in terms of pine nut potential are Yenisei (368.6 million roubles) and Turukhanskiy (203 million roubles). Yermakovsky district has the biggest amount of berries, with an estimated potential of 20.4 million roubles. Only 10 districts in the region have oleoresin potential. The largest potential of oleoresin is concentrated in Boguchansky district (17 million roubles), the smallest - in Biriliusky district (1.8 thousand roubles). However, only a fraction (0.6%) of the available potential of non-timber forest resources is actually used. The highest percentage of actual use of non-timber forest resources is in Ilansky (6.5%) and Achinsky (5.9%) districts, the lowest in Kezhemsky (0.03%) and North-Yeniseisky (0.05%) districts (Telishevsky, 1986).

2. Problem Statement

The distribution of reserves of these resources across the federal districts of the Russian Federation is not uniform, with most of them concentrated in the Asian part (over 80%). One of the problems reducing the use of non-timber forest resources is the lack of statistical data on their amounts (especially medicinal resources). A large part of the raw materials collected is used by the population to meet their personal needs, while another part is purchased for industrial processing. The forests of Krasnoyarsk Territory have potentially significant amounts of non-timber resources.

3. Research Questions

Currently, Russia has less and less forest land without a forest lease. has less and less forest land without a forest lease. The possibility of increasing revenue from timber sales alone by increasing the area of leased plots is almost exhausted, so there is a need to learn how to get a higher return from each forest land. Multi-purpose forestry is a major opportunity to solve this problem. The harvesting of timber and non-timber forest resources in the same forest area is not only possible but necessary. There is no doubt that timber harvesting, which is an essential material for construction, a raw material for the pulp and paper industry and many other industries, occupies a crucial place in the Russian economy. But apart

from timber, forests are also a major resource for a variety of products used for food and as raw materials for industrial processing. The amount of potential annual use (exploitable stock) of non-timber forest resources was determined on the basis of the biological stock, with consideration of the need to conserve biodiversity.

4. Purpose of the Study

According to the purpose (to study the potential possibility of harvesting these resources by forestry units in Krasnoyarsk Territory), the research set the following tasks:

- study the resource structure of the Krasnoyarsk Territory;
- perform a statistical estimation for each type of non-timber resource;
- investigate the distribution of resources across the forest districts of Krasnoyarsk Territory.

5. Research Methods

The forests of Krasnoyarsk Territory have a potential stock of non-timber resources of a significant number of species found in the Russian Federation. The types of non-timber resources depend on the natural composition of the forest reserve potential of these forest units.

The development of harvesting volumes is hindered by an outdated list and insufficient demand for non-timber resources. Nevertheless, the data from the forestry regulations allowed for an analysis of the potential harvesting of resources by forestry units in Krasnoyarsk Territory. Stocks were processed using analytical and statistical methods of analysis.

6. Findings

To estimate the volume and structure of resources, we performed statistical analysis with the Excel Analysis Package. Volumes have very high variability, which makes it difficult to interpret the material further on the basis of averages, but an average estimate provides a structure for the potential volumes of non-timber resources. The main statistics used include: mean, standard error, median, mode, standard deviation, dispersion, excess, asymmetry, interval, minimum, maximum and total number of forest units (example Table 1 for coniferous paw).

Table 1. Statistical indicators of potential coniferous paws resources in the forest districts of Krasnoyarsk Territory

Statistics	Value
Mean	7969
Standard error	6938.6
Median	0.04
Mode	0
Standard deviation	53745.9
Sampling dispersion	2888627150
Excess	59.44
Asymmetry	7.69

Interval	416428
Minimum	0
Maximum	416428
Total	60

The data shows that the average volumes of non-timber resources harvested were as follows:

Stumpwood – 66 thousand m³. Pine, fir, spruce paw – 7965 t. Birch bark– 707 t. Woody forage (birch, aspen) –1078 t. Moss – 828 t. Bath besom – 655 thousand pcs. Yernik or broom – 861 thousand pcs. Christmas trees – 229 thousand pcs. Woody greens – 2,139 t. Brushwood – 92 m³. Forest litter – 123 tons. Spruce bark – 247 t. Lightwood at resin tapping – 9 thousand m³. Fir paw – 15t.

The means allow structuring the forestry units into groups according to the harvesting of non-timber resources. Based on this, the forest areas with above-average and near-average resource potential are identified within each appellation.

Stumpwood. Areas with above-average logging (Gremuchinskoye, Kodinskoye, Motyginskoye, Chunskoye forestry areas). Areas with logging close to the average value (Bolshemurtinskoye, Bolsheuluyetskoye forestries).

Spruce, fir, pine paw. Areas with above-average logging (Bolshemurtinskoye, Irbeyskoye, Kuraginskoye, Sayano-Shushenskoye forestry areas). Areas with logging close to the average value (Baikitskoye, Bolsheuluyetskoye, Idrinskoye forestries).

Birch bark. Areas with above-average logging (Baikitskoye, Bolshemurtinskoye, Bolsheuluyetskoye Kuraginskoye, Tungusko-Chunskoye forestries). Areas with logging close to average (Abanskoye, Borskoye, Idrinskoye, Irbeyskoye, Manzenskoye, Manskoye, Novoselovskoye, Tinskoye, Usolskoye forestries).

Woody forage (birch, aspen). Areas with above-average logging (Bolshemyrtinskoye, Bolsheuluyetskoye, Borskoye, Idrinskoye, Irbeyskoye, Kuraginskoye, Sayano-Shushenskoye forestries). Areas with logging close to the average value (Tinskoye, Usinskoye forestries).

Moss (sphagnum). Areas with above-average logging (Bolshemurtinskoye, Bolsheuluyetskoye, Borskoye, Usinskoye forestries). Areas with logging close to the average value (Bogotolskoye, Gremuchinskoye, Kodinskoye, Motyginskoe forestries).

Besoms Areas with above-average logging (Bogolskoye, Sukhobuzimskoye forestries). Areas with logging close to the average value (Kizirskoye, Kodinskoye, Motyginskoye, Severo-Yeniseyskoye, Uzhurskoye, Khrebtovskoye, Chunskoye, Sharypovskoye forestries).

Yernik. Areas with above-average logging (Bogolskoye, Sukhobuzimskoye, Nizhne-Yeniseiskoye forestries). Areas with logging close to the average value (Achinskoye, Boguchanskoye, Daurskoye, Ermakovskoye, Kazachinskoye, Nevonskoye, Uzhurskoye, Khrebtovskoye, Sharypovskoye, Evenkinskoye forestries).

Spruce and other conifers. Areas with above-average logging (Bostogolskoye, Bolsheomrtinskoye, Bolsheuluyetskoye forestries). Areas with logging close to the average value (Gremuchinskoye, Emelyanovskoye, Kodinskoye, Teryanskoye, Chunskoye forestries).

Woody greens – 2,139 t. Areas with above-average logging (Bostogolskoye, Bolsheomrtinskoye, Bolsheuluyskoye forestries). Areas with logging close to the average value (Gremuchinskoye, Emelyanovskoye, Kodinskoye, Teryanskoye, Chunskoye forestries).

Brushwood Areas with above average logging (Bogolskoye, Gremuchinskoye, Kodinskoye, Motyginskoye, Nizhne-Yeniseyskoye, Usinskoye forestries). Areas with logging close to average (Achinsk, Kizirskoye, Kozulskoye, Teryanskoye, Chunskoye forestries).

Forest litter. Areas with above-average logging (Bogolskoye, Kodinskoye, Motyginskoye, Usolskoye forestries). Areas with logging close to average (Gremuchenskoye, Chunskoye forestries).

Spruce bark. Areas with above-average logging (Baikitskoye, Sayanskoye forestries). Areas with logging close to the average value (Emelyanovskoye, Sukhobuzimskoye forestries).

Lightwood. Areas with above-average logging (Gremuchinskoye, Motyginskoye, Khrebtovskoye forestries).

Fir paw. Areas with above-average logging (Idrinskoye, Irbeyskoye, Karatuzskoye, Kuragino forestries). Areas with logging close to average (Kozulskoye, Motyginskoye, Novoselovskoye forestries).

Analysis of all resources shows that of all territories, the maximum potential for non-timber resources harvesting belongs to Bolshemyrtinskoye, Bolsheuluyskoye, Gremuchenskoye, Kuraginskoye and Bogotolskoye forestries.

We examined the percentage distribution data for further analysis. The data shows that the structure of non-timber resources in the Krasnoyarsk Territory is not uniform.

Distribution analysis has shown that non-timber resources are not evenly distributed across Krasnoyarsk Territory, which complicates logistics and opportunities for consumption of this resource.

7. Conclusion

The analysis has led to the following conclusions:

- The literature allowed establishing the following. The Yenisei region has the greatest potential for non-timber forest resources. Only a fraction (0.6%) of the available potential of non-timber forest resources is actually used. The highest percentage of actual use of non-timber forest resources is in Ilanskiy (6.5%) and Achinskiy (5.9%) districts, the lowest being in Kezhemskiy (0.03%) and North-Yeniseiskiy (0.05%) districts;

- the forests of Krasnoyarsk Territory have a potential stock of non-timber resources of all possible species found in the Russian Federation. The types of non-timber resources depend on the natural composition of the forest fund, the species composition of the plantations and the area of the forest fund of the forestries;

- the volumes of non-timber resources have very high variability, which makes it difficult to interpret the material further on the basis of averages. Nevertheless, an average estimate provides an opportunity to structure the potential volume of non-timber resources;

- means allow structuring the forest areas into groups according to the harvesting of non-timber resources, on this basis forest areas with potential harvesting above the average and close to the average resource are identified within each denomination;

- an analysis of resource distribution shows that of all territories, there is the maximum potential for harvesting in the following areas: Bolshemyrtinskoye, Bolsheuluykoye, Gremuchenskoye, Kuraginskoye and Bogotolskoye forestries;

- percentage distribution showed that non-timber resources are not evenly distributed across Krasnoyarsk Territory, which complicates the logistics and opportunities for consumption of this resource;

- stumpwood (Kodinskoye - 41.3 %, Gremuchinskoye - 34.5 %). Coniferous paw (Sayano-Shushenskoye Forestry – 87.1%). Birch bark (Baikitskoye forestry - 59.2 %, Bolsheomrtinskoye forestry - 9.8 %, Bolsheuluykoye forestry - 9.8 %). Woody forage (Sayano-Shushenskoye - 21.1 %, Kuraginskoe - 20.4 %, Bolsheomrtinskoye - 14.9 %, Bolsheuluykoye - 14.9 %). Moss (sphagnum) (Usinskoye - 62.5 %, Bolsheomrtinskoye - 15.2 %, Bolsheuluykoye - 15.2 %). Brooms (Bogotolskoye – 50.9%, Sukhobuzimskoye – 38.1%). Yernik (Bogotolskoye – 80.1 %, Sukhobuzimskoye - 10.0 %). Spruce and conifers (Bolshemurtinskoye - 44.5%, Bolsheuluykoye - 44.5%). Woody greens (Baikitskoye - 29.6%, Tungusko-Chunskoye - 32.2%). Brushwood (Bogotolskoye – 59.0%, Usinskoye – 7.9%). Forest litter (Kodinskoye - 36.4%, Motyginskoye - 19.7%, Bogotolskoye - 19.0%). Spruce bark (Baikitskoye - 96.4%). Lightwood (Gremuchinskoye - 53.5%, Motyginskoye - 42.7%). Fir paw (Kuragiskoye - 44.6%, Idrinskoye - 24.8%, Irbeyskoye - 24.8%).

Non-timber resources require urgent renewal, as their inventory is outdated and does not reflect modern types of products.

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