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Terminological basis and perspectives of the use of non-timber products of the forests of Ukraine

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Abstract. In the forests of Ukraine, forestry should be carried out on the principles of continuous and rational use of forests through integrated usage of their resources. Thus, there is a need to distinguish and correctly understand the forestry terms. To harmonize terminology, relevant regulations, as well as Ukrainian and foreign literature, were examined. General scientific theoretical methods – analysis and synthesis – were applied to work with information sources. The paper substantiates the employment and understanding of terminology related to the usage of forest resources. The definition and interpretation of the terms “secondary forest use”, “non-tree forest resources”, “non-timber forest resources” in current legislative and regulatory acts, the explanatory dictionary of the Ukrainian language, the state standard of Ukraine, the Ukrainian encyclopedia of forestry, Ukrainian and foreign forestry literature were summarized. The authors proposes to divide forest resources into woody, non-tree, and non-timber ones, followed by coordination of such classification among forestry scientists and practitioners. The largest volumes of harvesting

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among secondary forest materials and secondary forest uses for 2010-2020 were established. The distribution of income received according to types of non-timber products of the forest and in the context of regional departments of forestry and hunting for 2021 was analysed. The paper presents the types of wild fruit, medicinal plants and mushrooms common in Ukraine. Promising species for plantation cultivation were proposed. Areas of obtaining added income from the sale of non-timber products of forests were generalized. The analysis and prospects of using non-timber forest products, which can serve as a theoretical and practical basis for sustainable management of multifunctional forestry in Ukraine, were presented. The obtained results can be used for harvesting non-timber products of forests, considering the regional characteristics of the country

Keywords: wild fruits; medicinal plants; mushrooms; birch sap; legislative and regulatory documents

Introduction

The forest resources of Ukraine are extremely diverse in their species composition and nature of use. Apart from timber, other products are also harvested in the forests. People have used forests as a source of food and medicinal products for a long time. The beginning of primitive people's usage of forest resources was the gathering of fruits, mushrooms, medicinal herbs, etc. Subsequently, forest resources were used for the construction of housing, fences, making household utensils and tools. Resin was extracted and processed by people as early as the 3rd century BC, and tree sap was produced on an industrial scale at the beginning of the 20th century (Tokarieva *et al.*, 2022).

At the end of the 19th century, the term "resources (products) of secondary forest use" appeared in the scientific literature in Ukraine. The term "non-tree forest products" is now a commonly adopted in Ukraine. According to C.M. Shackleton & A. de Vos (2022), wild forest products have currently various names, but the most common in the world literature is non-timber forest products.

A system of terms and definitions specified by current regulations, standards, instructions in Ukraine is covered in encyclopaedic publications. The terminology concerning the

harvesting of secondary forest materials and the implementation of secondary forest uses, that has been translated from Soviet literature is inaccurate and requires clarification. Therefore, it is often difficult to understand their essence, since there are different approaches to describing the resource system, and the definitions of the terms "non-tree" and "non-timber" forest resources have no scientific substantiation.

T.S. Delgado *et al.* (2016) noted that traditionally forest resources were interpreted only as timber stock, and forest policy focused on the use of forests mainly as suppliers of timber. I. Grammatikopoulou & D. Vačkářová (2021) emphasized the social significance of non-timber products in forests. According to A.V. Myhal & V.V. Bokoch (2017), with the increasing importance of other useful products and functions of the forest, its resources began to include secondary forest products and materials.

Multifunctional forestry is a relevant and modern area of forestry development and one of the main concepts that guide the European community (Pohjanmies *et al.*, 2021; Romabai *et al.*, 2022). Despite of widespread acceptance of the general concept, there is a lack of consistency in terminology definitions, forest policies in this area, and communication

between practitioners. M.A. Hoogstra-Klein *et al.* (2017) concluded that it was important to match different practical approaches to local needs and conditions.

In the study of Y.O. Adam *et al.* (2013) the discussion on the most effective forest management systems, specifically the systems for managing the non-timber resources, continues. Anthropogenic impact on the environment damages basic environmental functions, prompting a shift towards more sustainable management models. The sustainability of forest ecosystems is understood as the ability to maintain resources for a long time (Wezel *et al.*, 2020; Copena *et al.*, 2022).

C. Schulp *et al.* (2014) argue that, non-timber forest resources are currently a separate ecosystem service that is understudied due to what is often considered less important or because lack of data. Non-timber forest products provide numerous benefits to local communities, regional and national economies in many countries. However, they are rarely used in shaping forest policies and forest development strategies (Shackleton & Pandey, 2014). A. Gianotti & P. Hurley (2016) noted that there is a need for research on the non-timber resource base not only at the regional, but also at the local level, which will contribute to the best management of natural resources. This study was aimed at investigating the general trends and national characteristics of Ukraine regarding the harvesting of non-timber forest resources, coordinating terminology with international standards and identifying prospects for the development of this area in Ukraine.

Materials and Methods

Sources of information were processed by general scientific theoretical methods – analysis and synthesis. Using the method of analysis, the subject of this study – non-timber forest resources – was divided into components: sec-

ondary forest materials (harvesting of resin, bark, stumps, tree greens, tree sap), and secondary forest uses (hay harvesting, livestock grazing, apiary placement, wild fruit harvesting, mushrooms, medicinal plants, collection of forest litter, harvest of reeds). The synthesis method combined the components dissected during the analysis (secondary forest materials, secondary forest uses), establishing links between them, into a single whole – non-timber forest resources.

The factual material of the study included legislative and regulatory documents: Forest Code of Ukraine (Forest Code of Ukraine..., 1994), Laws of Ukraine: “On Plant Life” (Law of Ukraine No. 591-XIV..., 1999), “On Nature Reserve Fund of Ukraine” (Law of Ukraine No. 2456-XII..., 1992), “On Environmental Protection” (Law of Ukraine No. 1264-XII..., 1991), “On the Legal Regime of the Territory Exposed to Radioactive Contamination as a Result of the Chernobyl Disaster” (Law of Ukraine No. 791a-XII..., 1991), “Procedure for Special Use of Forest Resources” (Decree of the Cabinet of Ministers of Ukraine No. 761..., 2007), “Procedure for Harvesting Secondary Forest Materials and Implementation of Secondary Forest Uses in Forests of Ukraine” (Decree of the Cabinet of Ministers of Ukraine No. 449..., 1996), “Rules for Harvesting Resin in the Forests of Ukraine” (Decree of the Cabinet of Ministers of Ukraine No. 185..., 1996), “Rules for the Use of Beneficial Properties of Forests” (Order of the Ministry of Environmental No. 502..., 2012), “Regulations for the Special Use of Natural Plant Resources” (Order of the Ministry of Ecology and Natural Resources of Ukraine No. 61..., 2002). The list of legislative and regulatory documents covers the implementation of mechanisms for harvesting secondary forest materials and the implementation of secondary forest uses in the forests of Ukraine.

The study analysed the reporting materials of the State Agency for Forest Resources of Ukraine regarding the volume of harvesting of non-timber forest products for 2010-2020, as well as the distribution of income received according to types of non-timber forest products and in the context of regional departments of forestry and hunting for 2021.

Results

The legal framework for carrying out any activity in the forests of Ukraine is established by regulations (Tokarieva *et al.*, 2022). In the legislative and regulatory documents governing the harvesting of secondary forest materials, the implementation of secondary forest uses and the beneficial properties of forests, there is no explanation of the terms “non-tree” and “non-timber” forest resources. Therefore, there is a need for a clear understanding and distinction between these terms.

According to Forest Code of Ukraine No. 3852-XII (1994), forest resources are wood, technical, medicinal, and other forest products used to meet the needs of the population and

production and reproduced in the forming of forest natural complexes.

For Ukraine, the practices of the European Union (EU) countries, which have formed a forestry sector with a full cycle of forest resources use, are important. The Food and Agriculture Organization (FAO) interprets non-timber forest products as raw materials, material and physical objects of biological origin, the source of which is forests, except for timber (Global Forest Resources Assessment, 2020). Thus, the English-language literature uses a term “Non-timber forest products”. (Emery & Mclain, 2001; Kilchling, 2009). In German, there is an analogue of this term, “Nichtholzprodukte” – forest resources that are different from timber (Wolfslehner & Vacik, 2009).

Most languages adopted the term “non-timber forest products”: Produkty niedrewniane (Polish), Ne medienos miško produktai (Lithuanian), Produse forestiere nelemnoase (Romanian), Nedřevěné lesní produkty (Czech), Produits forestiers non ligneux (French). Forest products obtained in the forestry production can be of wood origin, non-wood origin and animal (Fig. 1).

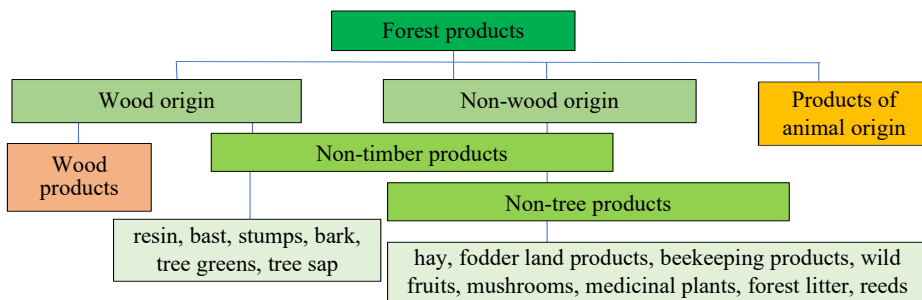


Figure 1. Classification of forest products

Source: developed by the authors based on the Forest Code of Ukraine No. 3852-XII (1994)

During 2015-2020, the forestry sector of Ukraine experienced a decrease in the volume of harvesting of non-timber forest resources (Tokareva *et al.*, 2022). In rural areas, the livelihood benefits of forests were more important to the

local population than the value of the timber (Wahlén, 2017). Among the non-timber products in the forests of Ukraine, wild fruits, medicinal plants, mushrooms, tree sap, hay, and reeds were most often harvested (Fig. 2).

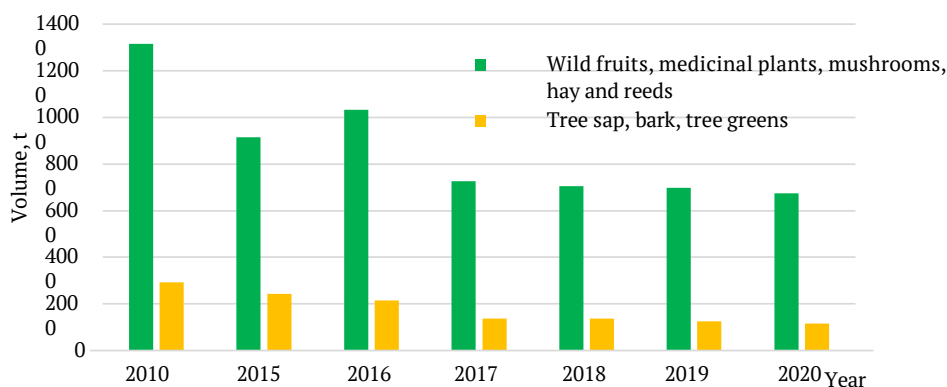


Figure 2. Harvesting of non-timber forest products in the forests of Ukraine

Source: developed by the authors, based on the Official website of the State Statistics Service of Ukraine (n.d.)

Currently, the main object of farming in the forests of Ukraine is harvesting the trunk part of a tree. Tree greens, bark, branches and stumps are conventional waste, for the liquidation of which considerable funds are spent, and secondary forest uses are carried out in small volumes. These are signs of poor management in forests. Therefore, it is relevant to use all wood and non-timber products of the forest.

According to V.P. Ryabchuk (1996) from 1 ha of a forest plot in Ukraine, on average, you can get: mushrooms – 65-70 kg; birch sap – 10 tons; honey – 100-200 kg; resin – 650 kg; wild fruits – 170-450 kg; coniferous extract – 5 kg; coniferous-vitamin flour – 6 tons; birch bark for tar – 6 tons; branch feed – up to 2 tons; herbal mass – 10-12 kg; other medicinal, technical, food raw materials – 30 kg.

The period of intensive harvesting of non-timber forest resources dates back to the 1960s–1980s, when in some regions of Ukraine, the comprehensive waste-free use of forests and their products yielded an average of 2.8 times more profit from 1 ha of forest than from realization of trunk part of the tree (Ryabchuk, 1996).

A classic example of the integrated use of forest resources in Ukraine was the management of forestry in the 1960-1980s by the Volyn

Regional Department of Forestry and Hunting, where apart from timber, forestry enterprises harvested wild fruits, mushrooms, birch sap, medicinal plants, and honey resources, and the profit from non-timber forest products was several times higher than the profit from timber on the same forest plot. During the period, forestry enterprises harvested hundreds of tonnes of wild berries, mushrooms, birch sap, and even salted young shoots of common bracken and exported them to Japan. According to D.A. Telishevsky (1986), in the Volyn region in 1960, the production of the trunk part of the tree in the total volume of production was 94%, and in 1984 – 19.8%.

In Ukraine, the volume of harvesting of non-timber forest resources differs substantially (Fig. 3). This is explained by historical events (including the Chernobyl disaster), socio-cultural and national features.

Since Ukraine is one of the world's largest producers and exporters of honey, beekeeping at forestry enterprises is the most profitable. The geography of sales of Ukrainian honey covers over 50 countries in the world, including Germany, Poland, the USA, etc.

Harvesting of birch sap also has significant volumes, although it is carried out mainly in the

Volyn region. Until recently, 75% of birch sap was exported outside of Ukraine. Among the importing countries were Poland, Germany, Israel,

Panama, USA, Czech Republic, Canada, Lithuania, Latvia, Estonia (Official website of the State Forest Resources Agency of Ukraine, n.d.).

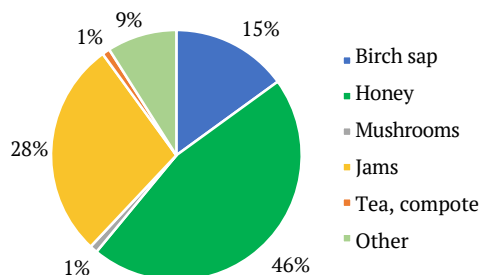


Figure 3. Distribution of income received by types of non-timber forest products for 2021

Source: developed by the authors based on reporting materials from the Official website of the State Forest Resources Agency of Ukraine (n.d.)

Berry species are recognized as the most important category of non-timber forest resources with the most profitable indicators in some countries (Romabai *et al.*, 2022). The most common berries in the forests of Ukraine are *Vaccinium myrtillus* L., *Rubus idaeus* L., *Rubus caesius* L., *Oxycoccus palustris* Pers., *Rhodococcus vitis-idaea* (L.) Avror., *Vaccinium uliginosum* L. Among wild berry plants, *Vaccinium myrtillus* L. is of the greatest industrial importance.

An increase the harvest of forest fruit and berry plants through plantation cultivation is possible. The promising species for plantation cultivation of berries in the conditions of Ukraine are as follows: *Aronia melanocarpa* (Michx.) Elliott, *Berberis vulgaris* L., *Juglans regia* L., *Vaccinium oxycoccus* (Hill) A. Gray, *Hippophae rhamnoides* L., *Rubus caesius* L., *Cornus mas* L., *Corylus avellana* (L.) H. Karst., *Vaccinium uliginosum* L., *Rubus idaeus* L., *Rosa canina* L.

Thus, *Vaccinium corymbosum* L. is successfully cultivated in the “Manevytsia forestry” branch of the SE “Lisy Ukrainy”.

Each country has its own list of wild medicinal plants. Using a critical literature and inventory review, it is possible to identify the vast ma-

jority of medicinal plants (Soelberg *et al.*, 2015, Pohjanmies *et al.*, 2021). The most common forest medicinal plants of Ukraine are *Ledum palustre* L., *Vinca minor* L., *Menyanthes trifoliata* L., *Valeriana officinalis* L., *Persicaria hydropiper* (L.) Delarbre, *Rhamnus cathartica* L., *Convallaria majalis* L., *Pinus sylvestris* L., *Vaccinium myrtillus* L., *Juniperus communis* L., *Rubus idaeus* L., *Tilia cordata* Mill., *Viburnum opulus* L., *Melampyrum nemorosum* L., *Lycopodium clavatum* L., *Tanacetum vulgare* L., *Leonurus quinquelobatus* Gilib., *Fragaria vesca* L., *Helichrysum arenarium* L., *Betula pendula* Roth., *Vaccinium vitis-idaea* L., *Sambucus nigra* L., *Crataegus sanguinea* Pall., *Sorbus aucuparia* L., *Frangula alnus* Mill.

A promising area for generating additional income for forestry is the creation of tea plantations and medicinal plant plantations. In the Khmelnytskyi region, such an enterprise is the “Yarmolynets Forestry” branch of the State Enterprise “Forest of Ukraine”.

Wild edible mushrooms are of socio-economic interest (Frutos, 2019). The mushroom resource trade is increasingly providing rural communities with additional income opportunities (Cai *et al.*, 2011). Industrial harvesting

of mushrooms in Ukraine is limited to the following species: *Boletus edulis* Bull., *Suillus* spp., *Leccinum aurantiacum* (Bull.) Gray, *Leccinum scabrum* (Bull.) Gray, *Imleria badia* (Fr.) Wizzini, *Armillaria mellea* (Vahl) P. Kumm., *Cantharellus cibarius* Fr.

Territorial and regional features of the distribution of non-timber products differ substantially even within the same country. Hab-

itat characteristics, namely soil fertility and plant density, are the most decisive factors in overall plant provision (Gianotti *et al.*, 2016).

Analysis of revenues received from the sale of non-timber products in 2021 in Ukraine shows that only four regional forestry and hunting departments (RFHD) are leaders: Volyn, Odesa, Poltava, and Khmelnytskyi RFHDs (Fig. 4).

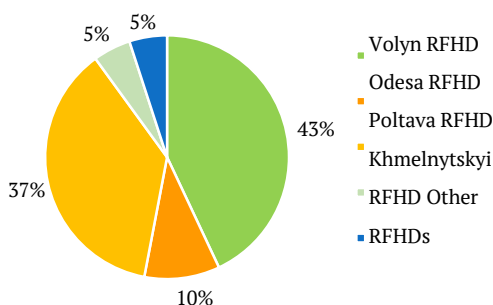


Figure 4. Distribution of income received from sales of non-timber products of RFHDs for 2021

Source: developed by the authors based on reporting materials from the Official website of the State Forest Resources Agency of Ukraine (n.d.)

Vinnytsia, Dnipropetrovsk, Zhytomyr, Zaporizhzhia, Ivano-Frankivsk, Kirovohrad, Luhansk, Mykolaiv, Sumy, Kharkiv, and Kher-son RFHDs engaged in much smaller volumes of non-timber forest products harvesting.

Discussion

Studies of non-timber forest resources are usually devoted to certain types of products (mushrooms, berries, medicinal plants). M. Cai *et al.* (2011), P. Frutos *et al.* (2019), D. Copena *et al.* (2022) cover potentially possible reserves of individual resources. An analysis that covers all possibilities of integrated use of forests is covered by Y.O. Adam *et al.* (2013), T.S. Delgado *et al.* (2016), A.G.S. Gianotti & P.T. Hurley (2016).

Terminological clarifications of vocabulary about the harvesting of secondary forest materials and the implementation of secondary forest uses turned out to be relevant only for

Ukraine, other countries apply the standardized, widely accepted term “non-timber forest products”. An important stage in the development of science is the coordination of terminology not only within the country, but also at the international level. Based on the analysis of literary sources, the interpretation of words in Ukrainian and foreign languages, current legislative and regulatory documents, the authors of this study support classification of timber harvesting as timber resources of the forest, secondary forest materials and incidental forest uses as non-timber forest resources, and non-tree forest resources as secondary forest uses.

The division of forest resources proposed by the authors for implementing in forestry practice requires coordination among scientists and practitioners and consolidation in legislative and regulatory documents. Notably, to clearly understand the terms and avoid their

misinterpretation, the theory and practice of forestry requires the development of a separate state standard for non-timber forest resources, as well as detailed instructions on their harvesting and usage.

V.P. Ryabchuk (1996) showed that in multi-functional forest management, the main indicator is profit, regardless of its source, whether it was from timber harvesting, or from the sale of fruits, mushrooms, or from beneficial properties of the forest. Integrated forest management is one of the promising areas of development of forestry enterprises (Emery & Mclain, 2001). The latter can receive both direct economic effects as a result of economic diversification (focusing on the use of wood and other forest resources) and social effects that are important for the socio-economic development of local regions (Grammatikopoulou & Vačkářová, 2021; Helseth, 2022). A comparative analysis of the problematic issues of forestry activities in the countries of the world and Ukraine in studies (Kilchling *et al.*, 2009; Delgado *et al.*, 2016; Sisak *et al.*, 2016) confirms the need for the development of industrial harvesting of non-timber forest resources. In particular the historical and cultural background of each country determines the priority and promising non-timber forest resources for specific conditions, and the economic component allows substantiating the advantages and disadvantages of economic activity in the area.

In EU countries in 2018, the volume of sales of non-timber forest resources included (Global Forest Resources Assessment, 2020): Christmas trees (28%), mushrooms (20%), fruits (18%), game meat (9%), wild plants (8%), honey (5%), resin (1%), bark (1%) and other products (10%). The comparison with the data obtained in Ukraine indicates that such products of non-timber resources as honey (46%), birch sap (15%) and jams (28%) have a larger share in the general list of non-timber resources of Ukraine

compared to the data provided by FAO (Global Forest Resources Assessment, 2020). Unlike in EU the profit received from the sale of Christmas trees and hunting belongs to a separate category of forestry activities in Ukraine.

Although the distribution of wild non-timber forest plant species can vary substantially even within a country, there are certain trends and consumption needs (Cai *et al.*, 2011; Pohjanmies *et al.*; 2021; Romabai *et al.*, 2022). Thus, among the wild berry plants, *Vaccinium myrtillus* L. is of industrial importance both in the world and in Ukraine. The most common berry species in the world grown in plantations is *Vaccinium corymbosum* L., and the industrial harvest of wild mushrooms in the European part of the continent is represented by *Boletus edulis* Bull., *Suillus* spp., *Cantharellus cibarius* Fr.

According to European countries, the material value of non-timber forest products corresponds to 1/6 of the value of timber, and the gathering of non-timber products by local residents for their personal needs (mainly mushrooms and berries) is on average 4 kg per person (Sisak *et al.*, 2016). From the conducted research, it is clear that the branches of the State Enterprise “Forest of Ukraine” harvest non-timber products in various volumes, and the facts of obtaining a substantially higher profit from the harvesting of non-timber products than from the sale of commercial timber took place in Ukraine in the middle of the last century. The importance of integrated use of non-timber forest products is important at the level of countries and even local communities both around the world (Gianotti & Hurley, 2016) and in Ukraine.

The studies of L. Osadchuk *et al.* (2016) and O.Tokarieva *et al.* (2022) proved that the gathering of wild non-timber forest products will improve the standard living of communities. Reserves of non-timber products of the forest substantially exceed the need for them. Therefore, considering

the current economic situation at forestry enterprises, it is advisable to increase the volume of harvesting of secondary forest materials and the implementation of secondary forest uses.

According to G. Mujawamariya & A.A. Karimov (2014), products made from non-timber raw materials must usually compete with cheaper, less environmentally friendly analogues. Expanding the market for non-timber forest products requires organizational, innovation, and considerable marketing efforts and sales promotion. Thus, marketing is a vital component of the successful implementation of non-timber forest products.

Prospects for the development of harvesting non-timber forest products in Ukraine include improving the methods of their accounting, stock assessment, environmental monitoring and crop forecasting; working out ways to implement sustainable use of non-timber forest resources; economic assessment of non-timber forest resources as ecosystem services.

Conclusions

Establishing of the interpretation of the term “non-timber forest resources” in the theory and practice of forestry management, that covers resources of non-timber origin, was considered as necessary by the authors of this paper. Considering the division of forest resources into their types according to the Forest Code of Ukraine, non-tree forest resources should include incidental forest uses – hay harvesting, grazing, placing apiaries, harvesting wild fruits, mushrooms, medicinal plants, collecting forest floor and harvesting reeds. The term “non-timber forest resources” should be used in a broader sense as including types of forest resources besides timber harvesting, usage of secondary forest materials (resin, bast, stumps, bark, tree

greens, tree sap) and incidental forest benefits. The above-mentioned terminology should be implemented in current legislative and regulatory documents. A state standard should be developed to clearly cover the interpretation of terms related to non-timber forest products, including instructions for harvesting them. The use of the terms “non-wood forest resources” and “non-tree forest resources” in the proposed interpretation will contribute to their clear understanding and help avoid ambiguities.

The possibility of harvesting secondary forest materials, implementing incidental forest purposes and using the beneficial properties of forests contributes to comprehensive farming in the forests of Ukraine. The use of forest resources of wood and non-timber origin increases the complex productivity of forests, increases the economic effect of each hectare of forest plot, meets the industry’s demand for raw materials, and also contributes to increasing revenues to local budgets and generating employment.

Reserves of non-timber products of the forest substantially exceed the need for them. Therefore, considering the current economic situation at forestry enterprises, it is advisable to increase the volume of harvesting of secondary forest materials and the implementation of secondary forest uses.

Among the promising areas of scientific research of non-timber products of Ukrainian forests are the improvement of methods of its accounting, inventory assessment, environmental monitoring, and crop forecasting.

Conflict of Interest

The authors declare no conflict of interest.

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None.

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Термінологічні засади та перспективи використання недеревинної продукції лісів України

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Анотація. Ведення господарства у лісах України повинно здійснюватися на принципах безперервного та раціонального лісокористування шляхом комплексного застосування лісових ресурсів. Разом із тим існує потреба у розрізненні та правильному розумінні термінів, які використовуються у теорії та практиці ведення лісового господарства. Тому з метою узгодження термінології проведено аналіз відповідних нормативних актів, а також української та зарубіжної літератури. Для роботи з джерелами інформації були використані загальнонаукові теоретичні методи – аналіз та синтез. Обґрунтовано вживання та розуміння термінології, яка пов'язана з використанням лісових ресурсів. Узагальнено визначення і тлумачення термінів «побічні користування лісом», «недеревні ресурси лісу», «недеревинні ресурси лісу» у діючих законодавчо-нормативних актах, тлумачному словнику української мови, державному стандарті України, українській енциклопедії лісівництва, українській та іноземній лісівницькій літературі. Запропоновано поділ лісових ресурсів на деревні, недеревні та недеревинні з подальшим узгодженням такої класифікації серед науковців та практиків лісового господарства. Встановлено найбільші обсяги заготівлі серед другорядних лісових матеріалів та побічних лісових користувань за 2010–2020 рр. Проаналізовано розподіл отриманого доходу за видами недеревинної продукції лісу та у розрізі обласних управлінь лісового і мисливського господарства за 2021 рік. Наведені поширені в Україні види дикорослих плодових та лікарських рослин, грибів. Запропоновані перспективні види для плантаційного вирощування. Узагальнені напрямки отримання додаткового доходу від реалізації недеревинної продукції лісів. Представлено аналіз та перспективи використання недеревинної лісової продукції, що може слугувати теоретичною та практичною основою для комплексного ведення господарства у лісах України. Отримані результати можуть бути використані при заготівлі недеревинної продукції лісів з урахуванням регіональних особливостей країни

Ключові слова: дикорослі плоди; лікарські рослини; гриби; березовий сік; законодавчо-нормативні документи