

# **Non-Wood Forest Products: History and State in Circular-Bioeconomy of Bulgaria**

## **ABSTRACT**

This work examines the inclusion of NWFP and their role in the country's economy.

Data from the annual reports of the Ministry of Agriculture and Food (MAF) and the Forestry Executive Agency (FEA), from the National Statistical Institute (NSI), statistics from the UN (Comtrade), from Eurostat and other sources of information (scientific studies, FAO publications, etc.) are used.

In Bulgaria, the organized collection and use of NWFP has been a livelihood for many people for more than a century. The paper analyzed utilization of the most important NWFP harvested from the forests in the period 2001-2022 and their participation in the national and international trades.

The brief review of the state and trends in the use of NWFP shows that in Bulgaria there is a tendency of a permanent decrease in the use and income from NWFP in forestry during the period 2001 - 2022.

At the same time there are significant reserves of unused NWFP, which indicates that there is a great opportunity to expand the use of NWFP and to increase the income of the forestry enterprises.

Considering the potential and problems of the forest sector in Bulgaria, it is clear that the domestic demand and international markets of some NWFP (medicinal plants, wild mushrooms, some kinds of forest fruits, etc.) represent a significant opportunity for the forest bioeconomy and offer a chance for improving the supply of NWFP and supporting income generation in rural areas.

The production of advanced products and materials on a biological basis with high value and the utilization of the hidden potential of NWFP represent key opportunities for the development of the bioeconomy in Bulgaria.

**Key words:** *Non wood forest products, economy, bioeconomy, income, forestry, livelihood.*

## **INTRODUCTION**

The societal and environmental challenges posed by global change require major changes in the way society produces and consumes goods and services. Ensuring prosperity for the population, addressing resource scarcity, mitigating climate change and environmental degradation require solutions based on the use of natural resources. The circular bioeconomy helps to integrate renewable energy sources and the use of highly efficient and innovative production cycles into production.

Bioeconomy refers to the use of renewable biological resources from land and sea, such as agricultural and forest products, fish, animals and microorganisms to produce raw materials for industry, food and energy as opposed to the linear economy, which is based on the extensive use of fossil and mineral resources (1).

The circular bioeconomy is a new economic model that increases reliance on renewable, biological resources with increased resource efficiency and circular material cycles. It replaces fossil-based, non-renewable materials with renewable, reusable, recyclable and biodegradable products.

Through the application of the circular bioeconomy, a sustainable use of different types of biomass is achieved, which is transformed into products with added value.

The inclusion of renewable natural resources in the economy is a leading principle in the bioeconomy, which leads to ensuring food security, sustainable management of natural resources, reducing dependence on non-renewable resources and creating new jobs. In this regard, forests offer biotechnology, bioenergy, wood utilization, non-wood forest resources (NWFR) and forest services. This work will examine the inclusion of NWFR and their role in the country's economy.

The aim of the current development is to assess and improve the key value chains of NWFR in order to increase food and nutrition security, household incomes, regional development and biodiversity conservation.

Non-wood forest products are widely used products obtained from forests. The difficulties in defining and classifying them on a global scale is due to the fact that they include products of different nature - from plants, animals, mushrooms, etc. The development of human society requires resources for the production of food and clothing, for heating and other needs, and some of these products are forest's.

Very often, especially in poorer areas of the world, they are the main livelihood of the local population and are vital to their survival.

There are a large number of NTFPs in the world such as edible mushrooms and truffles, berries, medicinal plants, nuts, maple syrup, bamboo and rattan, cork, latexes, gums and resins, skins and trophies, game meat, edible insects, etc.

In addition, forests provide key ecosystem services to society, such as cultural services (recreation, ecotourism, hunting, health care - therapeutic-recreational services for the population), regulating services (clean air, erosion control, climate mitigation) and providing services (clean drinking water, non-wood forest products such as mushrooms and berries). Globally, the total value of ecosystem services provided by forests is estimated at trillions of dollars, which is two orders of magnitude higher than global GDP. Tourism already accounts for 10% of global GDP (2017) and in many regions nature tourism is the most dynamic segment, with forest resources being a key component there.

## **OBJECTIVE OF RESEARCH**

The object of research in this material are non-wood forest products (NWFP) - edible mushrooms, forest fruits, medicinal and aromatic plants, resins and other products of industrial importance) and their importance in the country's economy. The ecosystem services, such as cultural services (recreation, ecotourism, hunting and health care), regulating services (clean air, erosion control), providing services (supply of clean drinking water), improving biodiversity and mitigating climate change or improving microclimate and their participation hasn't object of this study.

Non-wood forest products, as defined by FAO (Food and Agriculture Organization), are: "Products of biological origin, other than wood, harvested in forests, other forested lands and trees outside forests" (4).

NWFP have been used for nutritional, health and cultural purposes for millennia, but to this day their role is underestimated due to poor reporting in national and international statistics (5) Studies show that they actively participate in the lives of large groups of the population, providing them with a livelihood and sustenance (6)

FAO indicates that globally, the approximate value of NWFP is about 10% of the value of roundwood, but they can occupy a larger share in areas where timber fellings are unprofitable (7).

In Bulgaria, the use of non-wood forest products includes the extraction of resin, kindling, hay, bark, fibre, seeds, mushrooms, medicinal and aromatic plants or their parts, lichens and mosses, berries, greenery, Christmas trees, leaf fodder, capture of non-game animals and their disposal (4) (Art. 117. (1) of the Forestry Act (S.G. No. 19/8.03.2011).

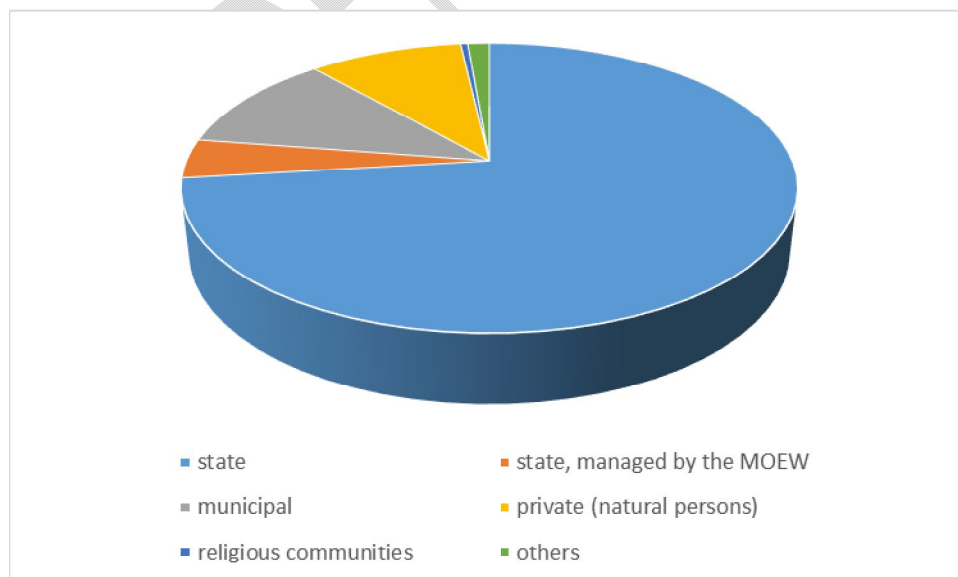
Although NWFP have not yet gained a significant place in bioeconomy strategies, they contribute to its development and are essential for the sustainability of forest ecosystems, food security, the livelihood of the population and its financial independence.

## METHOD

Data from the annual reports of the Ministry of Agriculture and Food (MAF) and the Forestry Executive Agency (FEA), from the National Statistical Institute (NSI), statistics from the UN (Comtrade)(2), from Eurostat and other sources of information (scientific studies, FAO publications, etc.) are used. A classification (Harmonized Description and Coding System (HS) Catalogue) adopted by United Nations Statistics (3) was used to determine the NWFP involved in international trade flows. The methods of comparative analysis are used in the processing of statistical data.

## RESULTS AND DISCUSSION

The total forest area of Bulgaria as of 31.12.2021 is 4,270,269 ha, of which 3,921,390 ha are forested (incl. mugo pine). State-owned forest territories managed by state-owned enterprises are 2,886,755 ha or 73,09%. State forests managed by the Ministry of Environment and Water (MoEW) – 172,537 ha or 4,36% (incl. reserves, national parks, maintained reserves, etc.) Of the non-state forest territories, 437,923 ha or 11,1% belong to municipalities, 381,271 ha or 9,65% to individuals, 17,658 ha or 0,45% to religious communities (Fig. 1).



## Fig.1. Distribution of forests by property

It is widely known that forests provide raw materials mainly for the woodworking, furniture, pulp and paper industries, as well as wood for heating, mainly for the local population. There is increasing interest in using wood species from alternative sources, especially fruit-tree woods for many purposes or suitability of wood species for landscape application. Including the use of NWFP and forest services - tourism, soil protection etc. as additional flows can be achieved higher use value of the forests (9, 10).

In Bulgaria, the organized collection and use of NWFP has been a livelihood for many people for more than a century. The organized use of NWFP in our country began after the First World War, mainly due to demand from Germany. Data show that medicinal plant exports increased from 8,244 kg in 1934 to 721,000 kg in 1939 (11). In those years, the movement to protect these resources due to excessive use led to the drafting and adoption of the first Medicinal and Aromatic Plants Act, 1941 (12). With fluctuating movements, Bulgaria has been participating in the market of non-wood forest products for over 100 years, providing a livelihood for over 300,000 families in the mountainous and semi-mountainous regions of the country.

The collection of medicinal and forest fruit plants from forest territories is carried out in compliance with the requirements of the Biodiversity Act (BDA), the Forests Act (FA), the Medicinal Plants Act (MPA) and the Nature Protection Act (NPA).

The classification of NWFP, collected in Bulgaria is as follows (13):

- Food and medicinal products - berries, medicinal plants and mushrooms (incl. truffles);
- Raw materials for industrial processing - balsamic resin, kindling, vegetable tannin materials, essential oils, etc.;
- Fodder and grazing for animals - hay, fodder from tree species (leaves), forest seeds, etc.;
- Beekeeping in forests and beekeeping - grazing of bees, creation of plantations for beekeeping, breeding of silkworms and creation of mulberry plantations;
- Others – fibre, cork, Christmas trees, willow sticks, foliage for floriculture, etc.

Table 1 shows the quantities of the most important NWFP harvested from the forests in the period 2001-2022, for which forest enterprises collect fees under the Forest Law. The data show that during this period, nuts (walnuts and hazelnuts), forest fruits (blueberries, blackberries, raspberries, blackberries, etc.), rose hips, linden flowers, herbs, mushrooms and barks were collected annually. Their quantities vary from year to year, which is related to fruiting, the condition of the habitats, the dynamics of climatic effects, the organization of work and their demand on the market.

Lime blossom and rose hips are one of the most sought after on the international and local market. According to FEA data, between 182,0 and 809,1 t of linden blossoms were collected from the forest fund in the period 2001-2022, which is indicative of the constant interest from the market in this raw material. The same applies to rose hips, whose quantities range from 11,2 t to 500,0 t per year. Bark extraction also has a constant use – from 2,7 to 88,6 t per year.

Bulgaria is one of the leading places in the world and one of the leaders in Europe in the production and export of herbs. About 15-17 thousand tons of medicinal and aromatic plants are harvested annually in our country, but only 2-3 thousand tons of them are processed or consumed in Bulgaria. Between 316,5 and 8022,9 t per year were harvested in the forests of Bulgaria in the period 2001-2022.

According to Comtrade data (2) for the period 2001-2021, Bulgaria exports between 7 and 11 thousand t of herbs per year and ranks 8-10 in the world in terms of the quantity of herbs exported.

Medicinal plants are mainly exported to Germany - 65%, Spain - 10%, Italy - 5%, France 5% and to other countries - 15%.

Table 1 : Amount of the most important NWFP harvested from forests in the period 2001-2022

Year	Tons - t						
	Nuts	Berries	Rose-hips	Lime Blossom	Herbs	Barks	Wild mushrooms
2001	14,4	1452,7	500,0	809,1	3442,3	88,6	2834
2002	10,3	1618,9	398,3	267,6	8022,9	23,7	7410
2003	12,7	2025,8	240,3	427,4	6699,8	3,3	3825
2004	8,8	1278,1	291,5	440,4	5168,8	2,7	5101
2005	20,1	1849,1	303,2	471,4	4520,7	27,9	7937
2006	22,3	2747,7	401,4	566,5	4430,3	47,5	4822
2007	14,6	826,7	186,4	626,7	837,4	10,3	573
2008	2,9	208,2	149,0	569,8	736,1	16,5	155
2009	9,1	348,2	74,5	182,0	489,6	130,2	541
2010	20,0	664,6	117,1	271,6	749,8	97,4	376
2011	24,9	427,7	83,0	268,7	534,8	54,7	-
2016	28,2	154,8	11,2	348,1	316,5	10,1	9,3
2017	37,7	122,0	72,1	364,7	406,3	10,0	10,8
2018	31,2	135,6	50,7	329,3	469,6	3,2	1,9
2019	34,9	229,9	49,7	247,8	609,0	15,0	5,5
2020	30,3	275,4	286,0	468,8	858,7	10,0	1,6
2021	32,5	96,7	167,8	447,5	801,7	31,0	2,4
2022	10,4	147,4	170,3	313,4	521,8	10,5	1,2

\*Source: (14,15)

\*\*For the period 2012-2015, there are no data in the reports of the MAF and the FEA.

Over 85% of medicinal plants harvested in Bulgaria are exported in dried form for deep processing abroad. After that, they return to the country in the form of food, cosmetics and medicinal preparations at many times inflated prices. This cause big losses of added value from herbs to Bulgarian business.

Forest fruits and nuts are also in the group of NWFP sought after in Bulgaria and abroad.

Mushrooms are the next widely used non-wood forest product. Apart from personal use, Bulgaria export mushrooms to many countries. In recent years, the collection of truffles has also increased, but for now, there is no information in the official statistics of the MAF, due to gaps in the legislation. The data from the table show a significant variation in the collected quantities of wild mushrooms during the considered period - from 1,2 t in 2022 to 7937 t in 2005. The production of mushrooms is highly dependent on their biological characteristics and on the dynamics of the environmental factors during the years as well as the organization of work. Mushroom exports ranged from 326 to 2664 t for the period 2001 – 2021 (2). The quantities of recorded mushrooms collected after 2007 decreased, because with the entry of the country into the EU, the permit regime for the EU member states was abolished, as well as due to changes in the legislation.

In the table 2 shows the quantities of other NWFP for the period 2005-2022, which are also important for the Bulgarian economy. We must note that these are quantities for which the forestry enterprises issued usage permits and for which relevant fees have been paid. Since the permits for use are issued in advance, according to the requirements of the Forestry Act, 2011 8), in most cases these quantities represent the quantities applied for use, and not actually collected. For all NWFP indicated in table 2 \ the trend for the period is towards a continuous decrease in their yield from the State Forestry Enterprises.

In the strategy for the development of the forestry sector, it is pointed out that in the current practice, many opportunities for realizing income from non-wood resources for the production of raw materials for industrial processing such as essential oils, balsamic resin, vegetable tannin materials, etc. are almost completely ignored.

For example (fig. 1), from 5 t annual yield at the beginning of production resin extraction in 1937, it reached 3250 t in the mid-seventies (16), after which it gradually decreased until it stopped completely. The use of kindling from felling in coniferous forests after 1970 was also discontinued.

Under the new market conditions, the desire for additional income from coniferous forests and the availability of free labor should stimulate the owners to renew resin extraction and the use of kindling.

In the previous forestry legislation before 1997, it was envisaged that the extraction of resin would be carried out in coniferous forests in which regeneration felling was to be carried out, according to the forestry projects, plans and programs and it was forbidden to cut down marked trees before they were extracted their resin.

Table 2 : NWFP, collected in period 2005 – 2022

Type of use	Measure	Years				
		2005	2010	2016	2020	2022
Branches and foliage	m <sup>3</sup>	15129	23841	6113	2941	2213
Christmas trees	Number	42992	45913	8895	3627	2598
Forest fruits	t	1849,1	664,6	154,9	275,4	147,4
Incl. raspberry	t	*	*	13,0	0,55	0

blackberry	t	*	*	37,3	2,1	2,3
blueberries	t	*	*	15,2	2,8	2,0
sloe	t	*	*	56,7	219,5	131,0
others	t	*	*	32,6	50,4	12,1
Forest seeds	t	40,2	7,4	66,2	11,5	11,7
Forest saplings	Th. Number	605,5	423,3	652,6	290,4	145,7
Decorative saplings	Th. Number	37,3	73,1	24,9	6,6	5,2
Honey	t	0	0	0,55	0,31	0,44

Source: (14,15)

The new Forestry Act (S.G. no. 19/2011) prohibits the extraction of resin from standing trees, except when it is foreseen in a forestry plan. In the currently prepared forestry plans, nothing is foreseen for resin extraction, and for the inclusion of this activity in the future plans, up to 10 years will be lost, depending on the time in which the previous ones were prepared. This will delay the revival of resin production and lead to lost profits. It is necessary, if desired by the users and ensured realization of the product, to find a form for carrying out this activity, and to include it again in the future forestry plans.

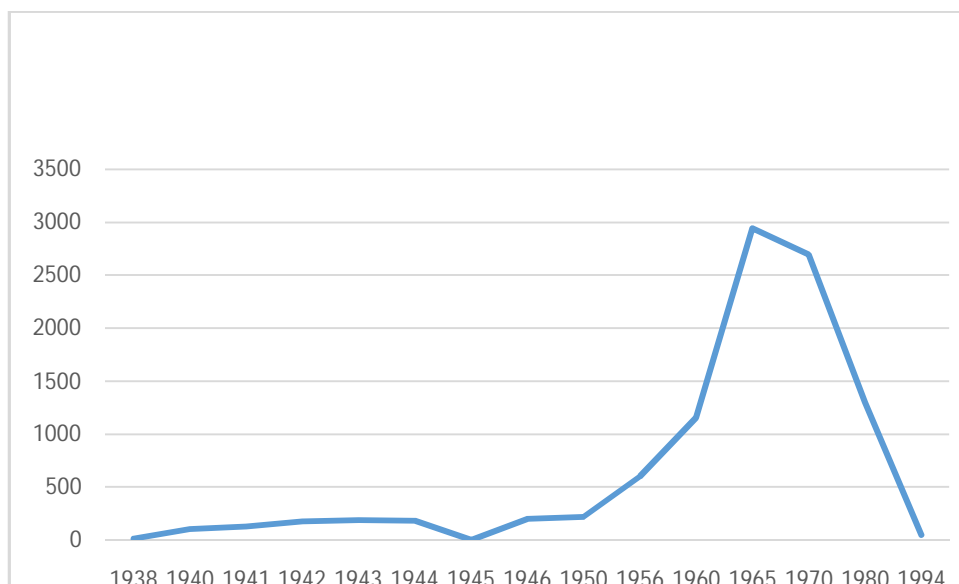


Fig.2. Collected pine resin in tons in the period 1938-1994

Source: (13)

The development of the bioeconomy, the pursuit of additional income from coniferous forests and the availability of free labor should stimulate the owners to renew this activity.

Another product that can increase the income of forest owners is tree foliage. Besides its direct use as fodder for domestic animals, it can also be used for the production of essential oils, coniferous vitamin flour, chlorophyll-carotene paste, etc. For this purpose, coniferous foliage from Scot pine (*Pinus sylvestris* L.), Austrian pine (*Pinus nigra* Arnold. ), Spruce (*Picea excelsa* L.), Juniper (*Juniperus communis* L.), Fir (*Abies alba* Miller), Douglas-fir (*Pseudotsuga menziesii* Mirbel), Balkan pine (*Pinus peuce* Griseb) and Heldreich's Pine (*Pinus heldreichii* Christ)

is used, which is obtained during thinning and regeneration cuttings and pruning of coniferous crops (17). Currently, this raw material remains as waste in the clearings.

The bark of the trees after felling can be used for the production of tannin substances, extraction of fibres, extraction of cork, extraction of thermal energy by mixing with the main fuel or briquetting and burning alone, making building materials such as fibrolite, fiber boards, sound, thermal insulation and decorative plates, fertilization, mulching in forestry, horticulture and flower production.

The use of forest grass, shrub and woody vegetation as fodder also provides an opportunity to increase income from forests. The use of these resources is carried out by harvesting hay, fruits and seeds, harvesting leaf mass and branches from tree and shrub species, grazing farm animals.

After 2016, honey production began in several state forestry enterprises, but the development of beekeeping in forestry enterprises is still at a very low level. The rich biological diversity in Bulgarian forests and the different flowering periods of trees and shrubs provide good opportunities for the development of beekeeping in the country's forest farms.

The revenue from NWFP in forestry enterprises in Bulgaria for the period 2005 – 2022 decrease constantly (Table 3). The decrease in 2022 is most that 60 % compared to 2005.

Table 3. Revenues from NWFP in Bulgaria for the period 2005 - 2022

Indicators/Years	2005	2010	2016	2020	2022

BGN	<b>3 303 285</b>	<b>2 230 306</b>	1835309	1342757	1164862
% compared to 2005	100	67,5	55,6	40,6	35,3
% compared to the previous year		67,5	82,3	73,2	86,7

The decrease in 2022 is most that 60 % compared to 2005. A major reason for this large reduction is the decline in the yield of non wood forest products.

Table 4 shows the change in the average international prices of medicinal and aromatic plants and their quantities exported from Bulgaria.

Table 4. Average price and quantity of exported from Bulgaria herbs

Years	Average price		Quantity	
	USD/t	%	Kg	%
2010	2240	100,0	10098011	100,0
2011	2583	115,3	10695051	105,9
2012	2747	122,6	10794876	106,9
2013	2921	130,4	10500281	104,0
2014	2865	127,9	10792887	106,9
2015	2523	112,6	9683524	95,9
2016	2644	118,0	9677110	95,8
2017	3098	138,3	8432601	83,5
2018	3471	155,0	9142402	90,5
2019	3553	158,6	8073770	79,9
2020	4077	182,0	7911611	78,3
2021	4358	194,6	7769259	76,9

Source: (2)

The price trend is a continuous increase to reach in 2021 196,4% compared to 2010. This shows that if the quantity of medicinal and aromatic plants exported from Bulgaria is maintained or increased, significant revenues can be generated. The data on the exported quantities during this period show the opposite trend - of a decrease.

The brief review of the state and trends in the use of NWFP shows that in Bulgaria there is a tendency of a permanent decrease in the use and income from NWFP in forestry during the period 2001 - 2022.

At the same time, it is found that there are significant reserves of unused NWFR, which indicates that there is a great opportunity to expand the use of NWFR and to increase the income of the forestry enterprises.

Increasing the value of NWFP can be achieved through certification - organic or according to FSC or PEFC standards. Organic certification, wild product certification (e.g. FairWild), sustainable forest management certification (e.g. FSC – Forest Stewardship Council and PEFC – Program for the Endorsement of Forest Certification) or certification of socio-economic aspects (e.g. FairTrade) are applicable to these products and may increase their value. Some schemes are developed by public entities, such as the European Union's schemes for origin, geographical indications and traditional specialties'. The European labels Protected Designation of Origin (PDO), Protected Geographical Indication (PGI) and Traditional Specialty Guaranteed (TSG), which protect the name of the products, come from a specific region, and follow a specific traditional production process, respectively.

New activities related to the use of NWFP can also be developed - for example, generating income from tourism (organizing trips to pick mushrooms, getting acquainted with medicinal plants, etc.), processing mushrooms and berries, producing souvenirs, other products etc.

The NWFP market is much more complex and difficult to understand and manage, as they are not a unified commodity. Their international market is regulated through a wide range of market-related instruments, such as international conventions, European Union directives, customs tariffs and requirements, international trade agreements, non-tariff measures, etc.

The most important international conventions relating to the collection, conservation and trade of NWFP are the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Biological Diversity (CBD) and the Convention on the Conservation of European Wildlife and Natural Resources habitats (Bern Convention) of the Council of Europe.

At the level of the European Union, the following are also important: the Habitats, Fauna and Flora Directive (Council Directive 92/43, amended by Council Directive 97/62), Council Regulation N 2092/91 (amended by N 1935/95) on the organic production of agricultural products, EU Regulation N 338/97 (amended by N 1808/2001) on the protection of species of wild fauna and flora by regulating the market in this respect (CITES application at EU level) and EU Directive N 91 /356, which sets the principles of "Good Manufacturing Practices" for medical products for human use.

The use of NWFP in Bulgaria, with the exception of medicinal plants, is carried out in accordance with the requirements of the Forestry Act (2011), the Law on Biological Diversity (S.G. 77/2002) and the Law on Environmental Protection environment (S.G.91/2002). Medicinal plants are used according to the requirements of the Medicinal Plants Act (S.G.91/2002). Other laws that have a direct or indirect connection with the collection, trade and conservation of NWFP are: Law on Protected Areas (S.G.133/1998; Law on Fisheries and Aquaculture (S.G.41/2001); Law on Waters (S.G.67/1999); Law on beekeeping (S.G.57/2003); Law on protection of plants (S.G.91/1997); Law on hunting and game protection (S.G. 78/2000).

## **CONCLUSION**

The forest sector in Bulgaria can play a key role in the development of a forest bioeconomy through the active inclusion of NWFP, if it manages to overcome its fragmentation and technological limitations. NWFP are important for the bioeconomy, which cannot rely on limited wood resources alone.

Compared to wood products, NWFP, as part of the forest economy in Bulgaria, are undervalued and therefore underutilized. Unfortunately, NWFP are still considered as secondary forest products that do not play a major role in forest management and as a source of additional income. This suggests that sustainable wood production is the main goal of sustainable management, as it ensures at the same time all other functions, goods and services. Few forest managers realize that in oak forests the annual production of honeydew honey or of truffles could potentially generate much more income than timber production and that forest management practices could be adapted to develop beekeeping or to optimize truffle cultivation instead of focusing on increasing the annual growth of wood. Similarly, forest management that results in increased yields of wild berries, mushrooms, and medicinal and aromatic plants has great potential to increase economic and/or social outcomes.

Considering the potential and problems of the forest sector in Bulgaria, it is clear that the domestic demand and international markets of some NWFP (medicinal plants, wild mushrooms, some kinds of forest fruits, etc.) represent a significant opportunity for the forest bioeconomy and offer a chance for improving the supply of NWFP and supporting income generation in rural areas. Increasing NWFP production could be a key aspect of future forest policy to reduce dependence on international trade and rebuild economic bridges between predominantly urban users of NWFP and producers located in remote mountainous and rural areas.

The production of advanced products and materials on a biological basis with high value and the utilization of the hidden potential of NWFP represent key opportunities for the development of the bioeconomy in Bulgaria. There is a wealth of knowledge and relevant developments in the country that can help the transition from a linear to a circular bioeconomy. The forest sector faces specific obstacles that need to be identified and systematically addressed, so the critical question is not what can be done from forest biomass, but rather what will be done, on what scale, where and with what move? While private owners and entrepreneurs must respond to market conditions, it is the responsibility of government and public actors to develop the framework.

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