NON-WOOD FOREST PRODUCTS FROM COVASNA COUNTY

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Abstract. *Of particular importance, in addition to wood, which is the main forest product in forests, non-wood forest products (NWFPs) are of major interest. These non-wood forest products represent an important food source for the population. The most common NWFPs are represented by medicinal plants, edible mushrooms, forest fruits, seeds and animals. The following NWFPs have been identified in Covasna County: Cantharellus cibarius (golden chanterelle), Macrolepiota procera (parasol), Christmas trees, cetin, Urtica dioica L. (nettle), Allium ursinum L. (ramson), Juniperus sp. and Tetrao urogallus (capercaille). Covasna County is located in the central part of the country, in south-eastern Transylvania, occupying an area of 3750 km² and is surrounded by the Eastern Carpathians. The purpose of this paper is to characterize the main NWFPs in this region. The hierarchy of these products was created with the help of an analytical hierarchy process (AHP) that aims to analyse several decisions with the help of well-established criteria. Within this hierarchy, 19 criteria were taken into account that refer to several aspects, among which: harvesting period, tools needed for harvesting, distribution range, market potential, etc. Following this analysis process, it resulted that the most important NWFPs in Covasna County are: Christmas tree, Cantharellus cibarius, Tetrao urogallus and cetin. The first two products are the most sought after and popular on the market.*

Keywords*: non-wood forest products, AHP, Covasna County, Christmas tree, Cantharellus cibarius*

INTRODUCTION

The forest offers beside its main products (wood) other non-wood forest products (NWFPs) such as forest fruits, medicinal plants, seeds, edible mushrooms, resins, game and fibres. These products have an essential purpose in the lives of humans from all around the Globe, representing an important food source in numerous cases (PAINULI, *ET AL.*, 2020; LOVRIĆ, *ET AL.*, 2020).

The last decades have shown an increased interest for NWFPs which led to a need to connect social, rural and urban groups in order to economically develop these products or their by-products. In addition, the demand for NWFP products has increased on the market so that the development of businesses specialized on this topic depends on the support of institutions, including those from the forest sector (AGUSTINO, *ET AL.*, 2011; MARÈETA AND KEÈA, 2014; WEISS, *ET AL.*, 2019; TIWARY *ET AL.*, 2020).

The most widespread NWFPs from Romania are forest fruits, medicinal plants, seeds, edible mushrooms and game. The climate and relief from Romania has led to an increased variety for edible mushrooms (FOGARASI, *ET AL.*, 2018; COROIAN, *ET AL.*, 2018; FOGARASI, *ET AL.*, 2020; DINCĂ *ET AL.*, 2016).

Numerous regions have varied NWFPs but the harvesting and processing processes are not very developed for certain products. Furthermore, the value of these products is forecast to increase when small enterprises will help in merchandising them (MAN AND FUNAR, 2011; DINCĂ *ET AL.*, 2020; VASILE *ET AL.*, 2017).

Consequently, the purpose of this paper is to present NWFPs from Covasna County (figure 1.). This County is located in the central part of the country, namely in south-eastern Transylvania, occupies an area of 3.750 km² and is surrounded by the Eastern Carpathians (KOLLÁR, *ET AL.*, 2011; BARTHA, *ET AL.*, 2015).

According to national statistical data from 2019, forests from this region occupy a surface of 168.800 ha, with 63.600 ha occupied by resinous species and 106.200 ha by broad-leaved species (http://statistici.insse.ro).

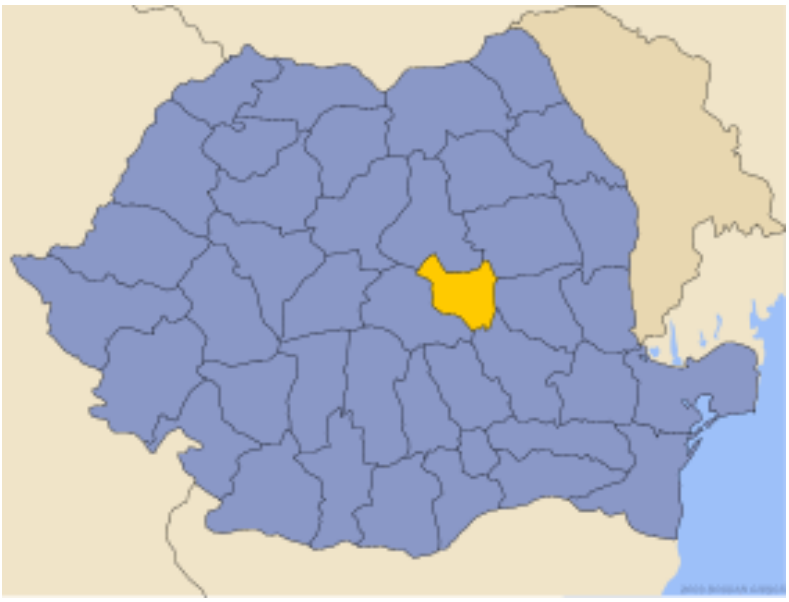

Figure 1. Location of Covasna County (source: https://ro.wikipedia.org/)

MATERIAL AND METHODS

The data regarding NWFPs from Covasna County were determined from forest management plans realized in the last decade. These works include concrete and approximate data regarding the presence of NWFTs and the harvests realized in the previous years. The most important NWFPs from this region were established with the help of an analytical hierarchy process (AHP). Saaty has created this process in order to analyse certain criteria that were established beforehand (SAATY, 2008). As such, the criteria taken into account for this paper were: harvesting, knowledge for recognition, portfolio of derived products, transport from the harvesting point to the storage centre, harvested quantity by one worker in 8 hours, harvesting cost, knowledge for harvesting, market demand, tools needed for harvesting, complexity of harvesting process, abiotic threats, distribution range, market potential, the price of raw product, the price of the derived product, perishability, "celebrity" of the product on market, biotic threats, development of the process of harvesting. The same criteria were used for similar studies realized in the following counties: Arad (ENESCU AND DINCĂ, 2020), Iasi (BLAGA *ET AL., 2018),* Vrancea (TUDOR AND DINCĂ, 2019), Bacău (BLAGA, *ET AL.*, 2019), Brăila (VECHIU, *ET AL.*, 2019), Brașov (CRIȘAN AND DINCĂ, 2020), Timiș (VECHIU AND DINCĂ, 2019), Dâmbovița (CÂNTAR AND DINCĂ, 2020), Ialomita (ENESCU, 2017) and Tulcea (DINCĂ *ET AL.*, 2018).

RESULTS AND DISCUSSIONS

The non-wood forest products that were identified in Covasna County and taken into account in this study were *Cantharellus cibarius*, *Macrolepiota procera*, Christmas trees, cetin, *Urtica dioica* L. (nettle), *Allium ursinum* L., *Juniperus* sp. and *Tetrao urogallus* (capercaille).

The products were prioritized based on the 19 criteria considered for the AHP analysis. These criteria are rendered in Table number 1.

Table 1

AHP alternative ranking

		Cantharellus cibarius	Macrolepiota procera	Christmas trees	Cetin	Urtica dioica L.	Allium ursinum L.	Juniperus sp.	Tetrao urogallus
		1	2	3	4	5	6	7	8
1	Harvesting period	3	5	2	8	7	4	6	1
2	Portfolio of derived products	6	5	1	7	4	3	8	2
3	Harvested quantity by one worker in 8 hours	5	6	3	4	7	8	2	1
4	Harvesting cost	4	5	8	6	2	1	3	7
5	Knowledge for recognition	6	7	3	2	1	4	8	5
6	Knowledge for harvesting	4	5	6	3	2	1	7	8
7	Tools needed for harvesting	3	4	8	6	2	1	5	7
8	Complexity of harvesting process	3	4	7	6	2	1	5	8
9	Distribution range	3	2	5	6	8	7	4	1
10	Market potential	8	2	7	5	6	4	3	1
11	The price of raw product	6	4	7	3	2	1	5	8
12	The price of the derived product	7	5	4	6	2	1	8	3
13	Transport from the harvesting point to the storage centre	3	4	7	6	2	1	5	8
14	Perishability	7	8	5	6	3	4	2	1
15	"Celebrity" of the product on the market	7	2	8	6	3	4	5	1
16	Market demand	6	2	8	5	7	4	3	1
17	Biotic threats	7	8	5	4	2	3	1	6
18	Abiotic threats	8	7	5	4	1	2	3	6
19	Development of the process of harvesting	3	4	8	6	1	2	5	7

Based on the AHP analysis, the NWFPs with the highest grade for 5 out of the 19 criteria is Christmas tree, followed by Tetrao urogallus (4 out of 19 criteria), while the least important from a grade perspective are savin, *Urtica dioica* L. and *Allium ursinum* L..

Figure number 2 presents the NWFP classification for Covasna County, as it resulted from the AHP analysis. As it can be seen, Christmas tree is at the top, followed by *Cantharellus cibarius* and *Tetrao urogallus.*

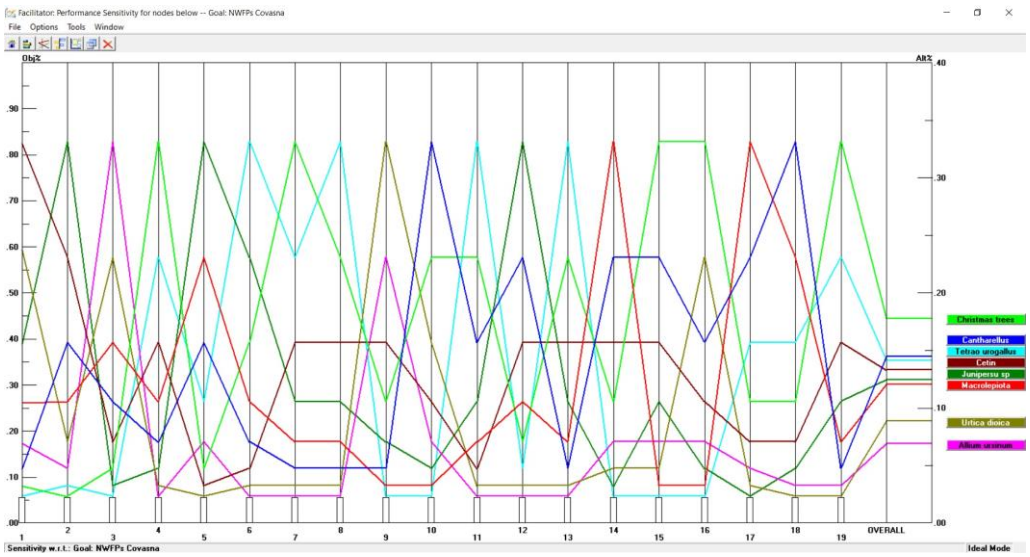

Figure 2. The ranking of the eight NWFPs

Christmas tree is the most sought and famous product on the market. The request for this product is high, especially during the winter season. However, high recognition knowledge is required for collecting Christmas tree and capercaille. Furthermore, this process is vast and well developed and involves high costs.

The next popular product on the market is *Cantharellus cibarius* (golden chanterelle), who has a high potential and request but also a high degree of perishability.

The least important products from the perspective of grades obtained for the 19 criteria are represented by *Urtica dioica* L. and *Allium ursinum* L. Even though they are the most widespread in the studied area, these products have a large harvesting period as well as a very high quantity harvested by a worker during a day.

The following paragraphs will present a short description of the most important NWFPs from Covasna County.

Abies alba Mill., or the Christmas tree, is a species with an ornamental purpose, that is used especially during the winter holiday season. Decorating the Christmas tree is a Romanian tradition that dates back to the XIX century (BALHAC, 2015). *Abies alba* Mill. is a species preferred by numerous people as it is more resistant inside than other similar resinous species. For example, the Norway spruce sheds his needles immediately after it has been cut (KOŁODZIEJSKA-DEGÓRSKA, 2012). Romsilva, the National Forest Institute offers each year Christmas trees that are harvested from specialized cultures (http://www.rosilva.ro).

Cantharellus cibarius, also known as golden chanterelle, yellow sponge and marigold, is an edible mushroom widespread in conifer and broad-leaved forests. Its harvesting period starts from summer up to the beginning of autumn. The species is widespread and very popular in Europe due to its vitamins - A, B1, B6, B9, B12 and D. Furthermore, numerous studies have proved its antibacterial, anti-inflammatory, and antiviral properties. The species

can also be used in treating cancerous cells (VAMANU AND NITA, 2014; TIȚA AND BÂRCĂ, 2017; ENESCU, *ET AL.*, 2018).

The capercaillie (*Tetrao urogallus* L.) is a bird that can be found in boreal and temperate forests from North and Central Asia and Europe. The density of its population has decreased during the XX century due to changes in forest structures, the increase density of predators, climatic changes and excessive hunting (BROOME, *ET AL.*, 2014; SEGELBACHER AND PIERTNEY, 2007; POIRAZIDIS, *ET AL.*, 2019).

CONCLUSIONS

NWFPs have shown an increased interest during the last period as many of them have numerous usages, from alimentation to medicine and the cosmetic industry. As such, the request for these products is in a continuous expansion in developed countries.

In Covasna County in particular, the diversity of these products is relatively high due to the present climatic and relief conditions. The AHP analysis realized with the help of well-established criteria has revealed that the most appreciated NWFPs from this region are: Christmas tree, *Cantharellus cibarius* and *Tetrao urogallus.*

This process that establishes the most important criteria that can be taken into account in appreciating the products and the results obtained afterwards can be used in creating sustainable management plans for this area.

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