Current Trends in Natural Sciences
Vol. 11, Issue 21, pp. 365-371, 2022
https://doi.org/10.47068/ctns.2022.v11i21.040
Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521
Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

THE MAIN NON-TIMBER FOREST PRODUCTS FROM ALBA COUNTY

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Current Trends in Natural Sciences

Abstract
Non-timber forest products have a lot of other terms which are more or less synonyms like „natural products, wild products". Non-timber forest products (NTFP) represent a category of products which are provide of wild plants and animals from the forest or from any other natural vegetation types. Around the world humans harvested NTFP from the oldest time. The most common types of NTFP at global level are forest fruits, medicinal plants, fauna of hunting interest and edible mushrooms. Romania has a high potential regarding the harvesting of these types of products due to big diversity of forest and forest site conditions. The aim of this study was to highlight the most important non-timber products from Alba county. First of all was made a selection of most common non-timber products and then were realized a ranking using a set of 19 criteria. The study conclusion was that the most important NTFP from Alba county are honey and hazelnuts follow by golden Chanterelles (Cantharellus cibarius) and Christmas tree.

Keywords: Alba county, non-timber forest products, golden Chanterelles, hazelnuts.

1. INTRODUCTION

Non timber wood products (NTWP) are considered important components of ecosystem services offered by the forest (Jenkins and Schaap, 2018). FAO provide a definition of NWFPs: "goods of biological origin other than wood derived from forests, other wooded land and trees outside forests".

Regarding the market value, Lovric et al. (2020) shows that in 2016 the value of NTWPs in Europe is equivalent with around 71% of the annual round wood production value. The potential role in the local economy increases the interest for these types of products. In the case of communities that are dependent by forest, the NTWP can represent a source of incomes being collected by locals or small merchants (Enescu and Dincă, 2019). The use of NTFPs is very common for rural population in developing countries (Van Andel, 2006).

Another aspect is related to the NTWPs and the connection with services such as recreation, local culture, wellbeing, and biodiversity conservation (Di Cori et al., 2022). The estimation of these services is difficult. The collecting of NTWPs is traditional in some countries. For examples, studies from Finland (Saastamoinen et al., 2004), Poland (Barszcz, 2004), Slovakia (Kovalcík, 2014) or Czeck Republic (Riedl, 2020) are focus on NTWPs, especially forest berries and socio-economic aspects of collecting.

The NTWPs are important from forest conservation point of view. The NTWPs can ensure the sustainable management of forests and conservation of biodiversity (Van Andel, 2006). With a

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good market of these products, the pressure on the wood products is reduce. In some cases, when the NTWPs harvesting is at large dimension can have an ecological impact on biological processes at many levels (Ticktin, 2004).
In Europe, the most collected NTWPs are wild berries are collected followed by wild mushrooms (Lovric et al., 2020). For Romania, the same study (Lovric et al., 2020) mention that the number of NTWPs collected is highest from Europe, and the value of collected NWFPs is between 80-100 € · ha^{-1} · yr^{-1}. This show that the Romanian population use a diversity of NTWPs with a medium value that indicate a market that is not well development. In Romania, the National Forest Administration (NFA) Romsilva has activity for capitalization of NWFPs from state forests. Forest fruits (e.g. raspberry, blueberry, blackberry, brier, sea buckthorn, cranberry, blackthorns) or mushrooms are the main NTWPs (http://www.rosilva.ro).
The aim of this paper is to put in the light the non-wood forest products from Alba county.

2. MATERIALS AND METHODS

The research took place in the Alba county which is located in the central-west part of Romania (Figure 1). Alba county has an area of 624.167 ha (www.wikipedia.ro). The forest fund from this county is 206.800 ha at the level of year 2018 (www.insse.ro), this represent a third of its total area.

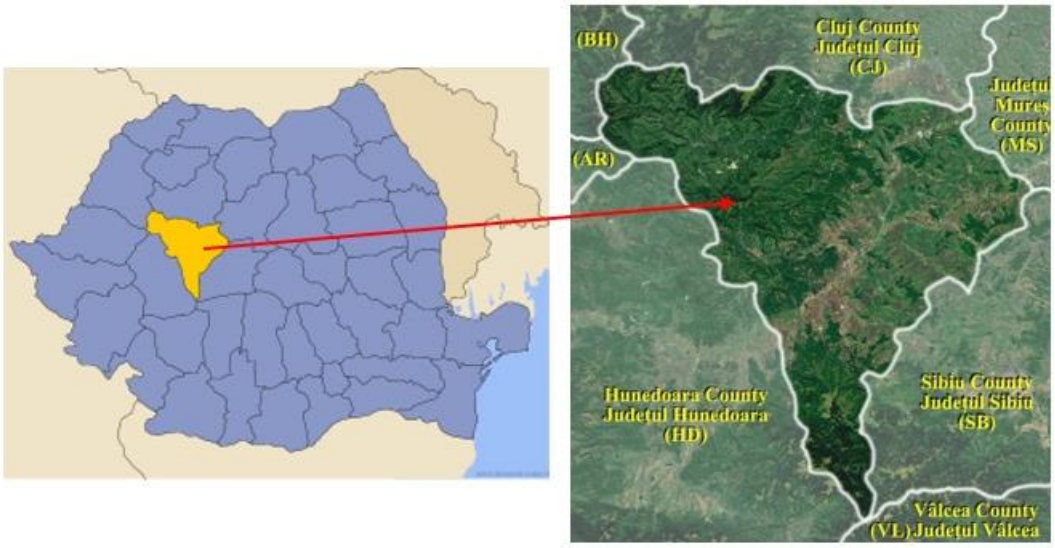

Fig.1. Location of Alba county (www.wikipedia.org)

The non-wood forest products considering from Alba county were selected using forest management plans and an Analytic Hierarchy Process (AHP). The Analytic Hierarchy Process is a multi-criteria decision analysis (Saaty, 2008). For highlight the value of each NWFP was used a set of 19 criteria: *harvesting period, portfolio of derived products, harvested quantity by one worker in 8 hours, harvesting cost, knowledge for recognition, knowledge for harvesting, tools needed for harvesting, complexity of harvesting process, distribution range, market potential, the price of raw product, the price of the derived product, transport from the harvesting point to the storage centre, perishability, "celebrity" o the product on the market, market demand, biotic threats, abiotic threats and development of the process of harvesting.* Taking into account these 19 criteria and for determine the value of each product was used the Expert Choice Desktop software package v. 11.5.1683.

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3. RESULTS AND DISCUSSIONS

The NWFP from Alba county were divided into four categories: mushrooms, tree products, understory plants and animal origin products. Thus, were selected 8 forest products namely: golden Chanterelles (*Cantharellus cibarius*), common morel (*Morchella esculenta*), Christmas tree, hazelnuts (*Corylus avellana*), peppermint (Mentha piperita), St John's wort (*Hypericum perforatum*), honey and Prussian carp (*Carassius gibelio*). The Analytic Hierarchy Process based on those 19 criteria was applied for these 8 products (Table 1).

Table 1. Analytic Hierarchy Process for NWFP from Alba county

	Criterion	***NWFP***							
		Cantarellus cibarius	***Morchella esculenta***	***Chrismas tree***	***Corylus avellana***	***Mentha piperita***	***Hypericum perforatum***	***Honey***	***Carassius gibelio***
		1	2	3	4	5	6	7	8
1	Harvesting period	2	3	1	4	6	5	7	8
2	Harvested quantity / worker / 8 hours	4	5	1	7	3	2	8	6
3	Harvesting cost	3	1	4	7	5	6	8	2
4	Knowledge for harvesting	3	4	7	6	1	2	8	5
5	Tools needed for harvesting	7	8	1	2	4	6	3	5
6	Complexity of harvesting process	5	7	4	3	1	2	8	6
7	Development of harvesting process	3	4	6	5	1	2	8	7
8	Knowledge for recognition	3	4	6	7	1	2	8	5
9	Distribution range	2	1	7	8	5	3	6	4
10	Biotic threats	4	1	6	8	3	2	7	5
11	Abiotic threats	6	4	5	7	1	2	8	3
12	Perishability	6	5	3	7	1	2	8	4
13	Market potential	5	6	8	3	1	2	7	4
14	Market demand	8	7	6	3	2	1	5	4
15	“Celebrity” of the product on market	5	1	6	7	3	2	8	4
16	The price of raw product	5	4	6	7	2	1	8	3
17	The price of the derived products	8	7	1	6	2	3	5	4
18	Portfolio of derived products	8	7	3	5	1	2	6	4
19	Transport (harvesting - storage center)	3	4	6	5	1	2	8	1

From the previous table can be observed that the most famous product on the market is honey. Also, this is the least perishable product and the easiest to recognize. From the point of view of the „celebrity” the second place is taken by hazelnuts. This forest fruit is easy to recognize too, but it market potential and market demand are not so high. Those two studied mushrooms (*Cantharellus*

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cibarius and *Morchella esculenta*) are not so well know, but the market demand is almost at maximum. The other product of animal origin is not very well appreciated by people and is not very popular too.

Based on the grades for those 19 criteria was realized a very suggestive chart the eight studied forest products (Figure 2).

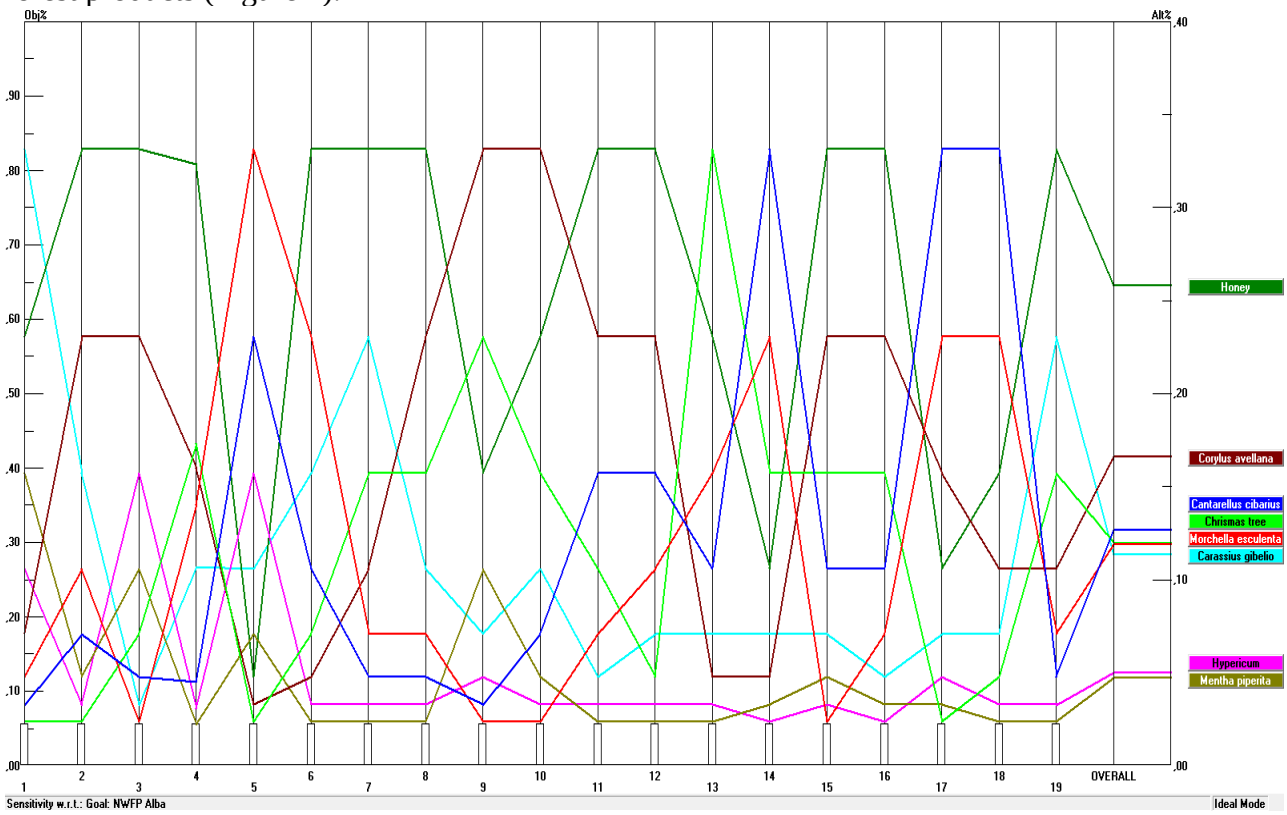

Figure 2. Ranking of NWFPs from Alba County

Based on the Analytic Hierarchy Process it can be seen from the figure 2 that the most important non-wood forest product is honey and this is followed by hazelnuts (*C. avellana*), golden Chanterelles (*C. cibarius*) and Christmas tree. The last two place are occupied by St John's wort and peppermint. The mushrooms occupy the middle places in this ranking.

In another similar study conducted for Brăila county the honey occupies the first place too and the peppermint was on the last place (Vechiu et al., 2019). Honey was not so important for Bacău county and it occupies only the third place, being downgraded by truffle and Boletus sp. (Blaga et al., 2019). The second understory plant - St John's wort was found on last place in the study carried out in Brasov and Dolj counties (Enescu et al., 2017; Cântar et al., 2019). Referring to the golden Chanterelles, in Buzău county after hierarchy process this mushroom take exactly the same third place (Tudor et al., 2020) and for Dâmbovița county was the most important NWFP (Cântar and Dincă, 2019). The Christmas tree was a product ranked at the second place in Brasov county (Enescu et al., 2017) and at the fourth place in Dâmbovița county (Cântar and Dincă, 2019). Hazelnuts (the second place in our study) was an important forest fruit together with hawthorn (*Craeugus monogyna*) and raspberry (*Rubus idaeus*) in Arad county (Enescu and Dincă, 2019).

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Honey is recognized as a popular natural food product with complex composition (Solayman et al., 2016). This product is the results of bees (*Apis* sp.) activity that collect the nectar from flowers and convert it into a food product with important benefits on human health (Vanhanen et al., 2011). The honey is mainly composed of sugars (fructose and glucose) (Solayman et al., 2016) and other constituents such as enzymes, amino acids, organic acids, carotenoids, vitamins, minerals, and aromatic substances (da Silva et al., 2016). Romania is an important source of honey for Europe with long and traditional activity in beekeeping (Albu et al., 2021). The potential of these products is huge because the products is very variate: from monofloral (acacia, linden, rape, sunflower) to multifloral (to spring and summer from mountain, meadow or grasslands) (Marghitaș et al., 2009; Kádár et al., 2010; Dobre et al., 2013; Stihi et al., 2016).

The interest for the cultivation of hazelnut (*Corylus avellana* L.) increase in last years any many plantations were established in Romania (Iordanescu et al., 2014). The hazelnut kernels have high nutritional value and rich content of B vitamins, nicotinamide, and especially vitamin E, fats, protein, carbohydrates, minerals, dietary fibber, and phenolic antioxidants (Poșta et al., 2022). The use of these products rich in phytosterols is recognize as factor in reducing blood cholesterol and having anticancer and immune system properties (Awad and Fink, 2000; Plat and Mensink, 2001). The utilization of kernels hazelnuts is mainly for food industry fresh or processed for cakes or chocolate, and the shell is use as products for feed (Amaral et al., 2006).

The golden Chanterelles (*Cantharellus cibarius*) is recognized for the taste and flavor. Romania is known as a source of wild edible mushrooms (Fogarasi et al., 2020) and Cantharelles is frequent collected. With a high nutritional value high protein, carbohydrate, vitamin, mineral content and fat in low quantities (Fogarasi et al., 2018) the edible mushrooms have also the medical use in treatment of tumors and nervous disorders (Rathore et al., 2017). With a high nutritional values Chanterelles are compared with meat, eggs and milk (Sevindik, 2019).

The use of Christmas trees is related to traditions and culture. The use of Christmas trees is spread in Europe and North America. If in the past the main source of Christmas trees was natural regeneration, now an industry of plantations on growing conifer species that have superior characteristics was development (Chastagner and Benson, 2000). Romanian are Christians Orthodox and the most important religious holidays are Christmas and Easter. The coniferous Christmas trees (fir, Norway spruce) is common use in winter holidays period.

4. CONCLUSIONS

The non-timber forest products selected for Alba county and clustered in four categories (mushrooms, tree products, understory plants and animal origin products) are: golden Chanterelles, common morel, Christmas tree, hazelnuts, peppermint, St John's wort, honey and Prussian carp. The most famous and the easiest to recognize product was honey. For the only forest fruit analysed (hazelnuts) the market potential and market demand are not so high.

Using 19 criteria and making a ranking of the products and base on the experts opinion the most important NTFP determined from Alba county were: honey, hazelnuts and Christmas tree. The less important are the understory plants: peppermint and St John's wort.

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