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THE SOCIAL AND ECONOMIC CONTRIBUTION OF THE MAIN CATEGORIES OF NON-WOOD FOREST PRODUCTS FROM BUZAU COUNTY, ROMANIA

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Abstract

The paper work was aimed to explain the main categories of non-wood forest products from Buzau County, Romania. The truly value of non-wood forest were deeply studied especially because of their contribution on marketplace, enhancing in this way the economy. It is based on the statistical data provided by different software such as Expert Choice Desktop which brought the sensivity of each species described. The main categories of non-wood forest products analysed were: mushrooms, tree products, understory plants and animal origin. Every category contains a small number of non-wood forest products and all of these were taken through an analyze based on 19 well-established criteria. As a conclusion, NWFP have a huge contribution in human wellbeing and according to FAO, several million households world-wide depend heavily on NWFP for subsistence or income. The non-wood forest products exclude the potential raw materials, the main branches of constitution being the plants/plant products and also animal/animal products. An important contribution for the human population in Buzau county, especially in human needs and demands is represented by the different types of NWFP.

Key words*: AHP, criteria, golden chanterelle NWFP, market potential, spruce seeds.*

INTRODUCTION

Non-wood forest products it's an important resource for humans, having an important social and economic contribution at global and national level and different applications in the new domain of bioeconomy.

The wood is the main element of the forest, but, beside this, the forest covers other resources, especially of vegetal nature, which are harvested and valorified of all districts. Distribution and range of NWFPs from Romania became rugged, in the most situations being dependent on environmental and ecological conditions of the forest sites. In essence, the harvesting potential is bigger in the counties situated in the mountain and hilly regions, where the forests are being well distributed than in the regions placed in the plain regions, where the difference between site conditions are not so semnificative.

The name of non-wood forest products contain itself the idea that as such a non-wood product not having in his constitution the wood as raw material (Ciuta, 1961).

In Romania, due to the fact that the variability of the environmental conditions has a high level, the potential in harvesting these is products become overestimated (Bragă and Dincă, 2019).

Since the presence of certain NWFPs is dependent on the presence of the forest stands and by taking into consideration that the distribution of the forests across the country in not uniform, there are counties with great potential in harvesting and marketing of several categories of NWFPs, such as edible mushrooms (Vasile et al., 2017). From the categories of non-wood forest products (NWFPs), the most common products spreaded worldwide are: edible mushrooms, forest berries and medicinal plants (Cântar, 2018). The aim of this paper work was to see the social and economic impacts of non-wood forest products in Buzău County from Romania and the actual contribution on the orientated-market and in human wellbeing.

The actual surface of Buzau Directorate is of 162.190 hectares, from which 159.498 hectares are represented by forests (Figure 1). The administrative surface of Buzau Directorate is done by the 7 districts, is of 84.880 hectares. Related to the surface which is occupied by

forests, this represents 25%, which the predominance of hardwood species (beech - 21.942 hectares) being followed by softwood stands (14.261 hectares) and oak stands (9.951 hectares).

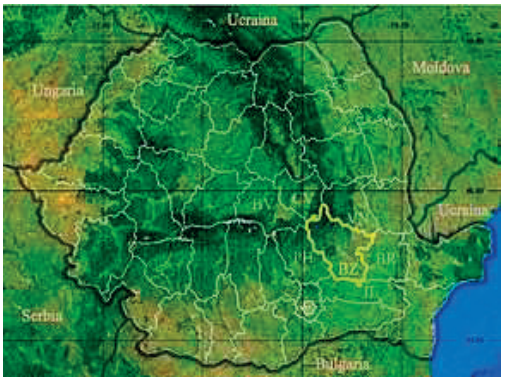

Figure 1. Location of the Buzau County, Romania

MATERIALS AND METHODS

As materials for this study it were used the projects, documents and reports which consists in activities elaborated by the Buzau Directorate. The main activities which are sustained by the directorate consisting in: hunting, fishing, game species and another services which rely on the actual regeneration of forest (forestry seedlings, ornamental seedlings and so on). The NWFPs were grouped in four categories, namely *Mushrooms*, *Understory plants*, *Tree products* and *Animal origin* and based on the above-mentioned data the most promising NWFPs were selected. These four categories were designed in the European project COST Action FP1203 and were taken also into consideration in similar studies recently conducted for Timis (Enescu et al., 2018), Bihor (Timiș-Gânsac et al., 2018), Arad (Plesca et al., 2019), Vrancea (Tudor and Dincă, 2019) and Dolj (Cântar et al., 2018). As methods, for describing the all alternatives of all of these products, it was used the AHP-analytical hierarchy process, which was based on 19-well established criteria: 1) harvesting period, 2) harvested quantity/worker/8 hours, 3) harvesting cost, 4) knowledge for harvesting, 5) tools needed for harvesting, 6) complexity of the harvesting process, 7) development of the harvesting process, 8) knowledge for recognition, 9) distribution range, 10) biotic threats, 11) abiotic threats, 12) perishability, 13) market potential, 14) market demand, 15) "celebrity" of the product on market, 16) the price of the raw product, 17) the price of the derived product, 18) portfolio of derived products and 19) transport.

Every category was evaluated with absolute numbers situated in the interval (1…8). Using this scale, once the alternatives for making decisions were set, the numbers will be distributed more or less to the criteria of the products which are more reliable in the process of attributing. This evidence will be important for all users, making an hierarchy with all NWFPs that are having alternatives which suit best for the decision making process. Also, the Expert Choice Desktop (v. 11.5.1683) software package was used for the analyses.

RESULTS AND DISCUSSIONS

For each category were analyzed a series of the most important and requested non-wood forest products (NWFPs) for Buzau County (Figure 2).

For the mushrooms category, were selected 2 types of products: *Cantharellus cibarius* (chantarelle) *and Tuber* sp. (truffles). In the understory plants were included three types of non-wood forest products such as: *Corylus avellana* (hazelnut), *Alium ursinum* (wild garlic) and *Urtica dioica* (common nettle). The third category was represented by Tree products in which were analyzed only a single product derived from the genus *Picea*, being located in the spruce cones: spruce seeds. Also, there was some particularities related to the product of animal origin derived from the hunting activity, such as *Cervus elaphus* (red-deer) and *Meles meles* (badger). Beside the results obtained and mentioned in the Table 1, it was calculated the mean of alternatives for each species (Figure 3).

The first place is taken by the *Tuber* sp. (truffles), having a consistent number of alternatives (mean = 6.74) on potential market and demand and also is declared a "Celebrity" on the market.

Table 1. Alternatives ranking

Crite-rion	Mush-rooms		Tree products	Under-story plants			Ani-mal origin	
	Cantharellus cibarius	*Tuber* sp.	Spruce seeds	*Corylus avelanna*	*Alium ursinum*	*Urtica dioica*	*Cervus elaphus*	*Meles meles*
1	5	6	7	8	1	2	3	4
2	6	7	1	8	2	3	5	4
3	5	3	4	6	7	8	1	2
4	3	8	4	6	1	2	7	5
5	7	8	5	4	1	2	6	3
6	6	8	4	3	1	2	7	5
7	3	8	4	5	1	2	7	6
8	3	7	4	5	1	2	8	6
9	3	5	4	6	7	8	2	1
10	5	8	1	7	3	4	6	2
11	6	7	4	5	1	2	8	3
12	5	7	3	8	2	1	6	4
13	8	6	3	4	2	1	7	5
14	8	7	5	1	2	3	6	4
15	7	8	1	6	3	4	5	2
16	6	8	1	7	3	4	5	2
17	7	4	1	2	6	3	8	5
18	8	7	4	5	2	1	6	3
19	5	6	7	4	1	2	8	3

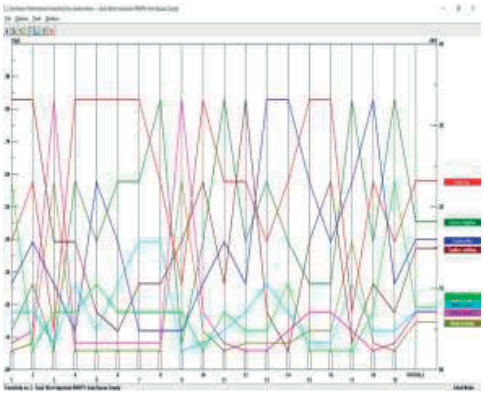

Figure 2. The diagram of sensivity of every species

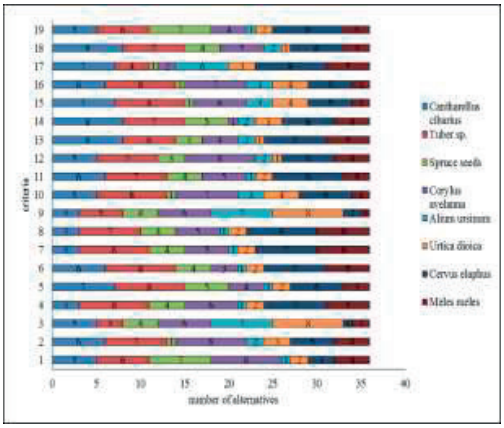

Figure 3. The alternatives of every species attributed to each criteria

The second place is occupied by the *Cervus elaphus* (red-deer) from the animal origin class, which reached the maximum number of alternatives (mean = 5.84) in 4 cases: knowledge of recognition, abiotic threats, the price of the derived products and the transport of the products. So, in this case, is essential to keep the products in safety, in special buildings, to monitor permanently the products with sensible character to avoid the possibility of installing the negative factors. Another product from the mushrooms class is *Cantharellus cibarius* (chanterelle) which scores the mean of 5.58, taking the third place. This mushroom is very appreciated in the marketplace, improving the potential and the huge demanding. Furthermore, there are a lot of derived products which can be used in many domains.

***Tuber* sp. (truffles)**

The origin of the term truffle comes for the Latin name Tuber, which meant tumor, excrescence or swelling (Simpson and Weiner, 1989). In the past, Balzac had a special passion for truffles, beside his prolific opera (Dincă and Dincă, 2012).

Truffles are micoritic mushrooms which are growing and developing underground, in the system formed by fine roots of trees (beech, hazel, oak, hornbeam and so on). In Romania, the only species of truffles which can be successfully cultivated is *Tuber aestivum*. In general, this species can be cultivated in the pastures, orchards and even in the vineyards, where the soil is still active and without the presence of another micoritic mushrooms which can consume the existing nutrients (Dincă and Dincă, 2014).

For instance, the initiation of the culture begin with the physico-chemical analyzes of the soil. The preference for this type of truffle is that the soils should be permeable, limestone, rich in organic substances and with moderate humidity (Dincă and Dincă, 2014). In order to discover and harvest them, it is needed to use a special category of trained dogs (Dincă and Dincă, 2015).

***Corylus avellana* (hazelnut)**

The experts from Poland found the important information about the composition of chemical components of hazelnuts shells, but being limited to the identification of phenolic compounds, such as flavonoid glycosides and aromatic acids (Ciemniewska-Żytkiewicz et al., 2015). At globally sense, hazelnut (*Corylus avellana* L.) is the one of the most cultivated and marketed nuts (Mencherini et al., 2017).

From the countries, the first country with the largest hazelnut production is Turkey (about 600,000 t/year) and the second is Italy (105,000 t/year) (www.fao.org).

In Romania, the hazelnut is meet starting from the plain zone reaching the high altitude of 1400 meters in the spruce stands. It has important esthetic value, being well cultivated in parks, gardens and orchards being a species which support the cuttings. Hazelnut is a resistant species at frost, but he cannot support the dryness. It prefers the fertile soils, rich in humus and in organic substances. His temperament is of light. The fruits are achenes, called "hazelnut", which have an soft pericarp in youth, becoming hard after the maturation. The hazelnuts are comestible and they are appreciating for the sweet taste.

Spruce seeds. Spruce is one of the most extended species from central and meridional yards, with a significant presence in Europe. In Romania the natural and cultural areal of spruce sum 1.43 million hectares, which means aproximatively 22% from the forest surface (Șofletea and Curtu, 2007). The particularity of the spruce seeds is that they have a high germinative power reaching 70-80% up to the 96% in good environmental conditions. Due to the fact that the seeds are winged it offers the possibility of dissemination on long distances, at 2-3 of tree height. Also, the seeds are not having resin in tegument being easy to carry them at long distances by wind. The maturation is annual, in the autumn.

There were a lot of studies regarding on the implementation of AHP for different categories of non-wood forest products in many counties in Romania. The studies in Cluj County, it was obtained a statistic with the highest rate in market potential for the mushrooms (chanterelle) and the lowest potential to the understory plants (Enescu et al., 2018). The results from Timis County were concretized by the abundance of Genus Boletus, which have a highest numbers of alternatives in market potential and a various scale of derived products (Enescu et al., 2018). In Prahova County, the rank of mushrooms was intermediate, in comparison with other counties such as Brasov or Maramures (Enescu et al., 2018). In Bacau County, based on the AHP results, the most important NWFPs were penny bun (*Boletus edulis*) and truffles (*Tuber* sp.) and less important ones was the category of understory plants (Blaga et al., 2019).

CONCLUSIONS

Non-wood forest products have a good economic and social contribution in Buzau county. The total surface covered by forest can be well managed in order to obtain good results in promoting and valorizing the NWFPs, not only the wood.

Using the AHP based on alternatives (1…8) attributed to 19-well established criteria, it was shows that the best results are achieved by the mushrooms category, such as *Tuber* sp. (truffles) and *Cantharellus cibarius* (chanterelle) both reaching maximum alternatives in the market potential and demand. Furthermore, these products have on consistent portofolio which offers a diversity of derived products. A high interest consist in the product of animal origin such as red-deer (*Cervus elaphus*) and badger (*Meles meles*), which need a good understanding in knowledge of managing well the sustainable production. Knowing the potential of Buzau County which is rich in NWFPs it is essential to implement a sustainable management for all of these resources.

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