

THE DIVERSITY OF NON-WOOD FOREST PRODUCTS FROM BRĂILA COUNTY

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ABSTRACT

*Non-wood forest products have an essential role in developing processes that help in the development of society. These products were used in human nutrition from old times due to their content in nutritive substances and vitamins, as well as in the pharmaceuticals and cosmetic industries as they hold medicinal properties. The purpose of the present article is to present the diversity of non-wood forest products from Brăila County. An analytical hierarchy process based on 19 criteria was used in order to rank them. The non-wood forest products take into consideration for this study were: *Macrolepiota procera*, *Lactarius* species, Tilia flowers, sea buckthorn (*Hippophae rhamnoides* L.), hawthorn (*Crataegus monogyna*), mint (*Mentha piperita*), honey and the duck (*Anas platyrhynchos*). Amongst them, the most sought-after products on Brăila County market are: honey, sea buckthorn and duck.*

KEY WORDS: *non-wood forest products, sea buckthorn, honey, duck, analytical hierarchy process.*

INTRODUCTION

In different areas from around the world, humans rely on the forest and its resources. Besides wood, the main forest resource, non-wood forest products (NWFPs) can be found. These products were used by humans from the earliest ages and have become recently the interest of international organizations. As such, the Food and Agriculture Organization (FAO), defines NWFP as being “goods of biological origin other than wood derived from forests, other wooded land and trees outside forests”.

The non-wood products that can be found everywhere around the globe are represented by mushrooms, aromatic plants, edible nuts, herbs, fruits, spices and condiments, resins, game, fibres, gums, plant and animal products used for medicinal, cosmetic or cultural purposes (Ros-Tonen, 2000; <http://www.fao.org>).

In our country, amongst the most important NWFPs are mushrooms, forest fruits and medicinal plants. Over 3000 species of edible mushroom exist worldwide and are used as nutrition products and remedies due to their organoleptic properties. Within the forest ecosystems, mushrooms have different functions such as decomposing organic matter and enriching soil accumulation with nutritive substances (Vasile *et al.*, 2017; Wong and Chye, 2009).

The most known forest fruits are blueberry, sea buckthorn, raspberry, brier and blackberry. They are rich in vitamins, fibres, minerals or phenols and are used for their properties both in nutrition as well as in medicine (Vasile *et al.*, 2016). There are approximately 70.000 species of plants worldwide that are used in medicinal purposes. The factors that influence their harvesting process are the soil and climatic conditions, the altitude, array or the time when they are harvested (Vasile *et al.*, 2016; Vasile *et al.*, 2018).

The purpose of the present article is to present the non-wood forest products from Brăila County (Figure 1).



FIG 1. Location of Brăila County

This county is located in the East part of Romania and covers a surface of 4765,8 km² ($\approx 2\%$ of the country's surface) (<https://ro.wikipedia.org>). The forest fund from this county has a surface of 28.000 hectares and is managed by Brăila Forest County. The main forest species are broad-leaved species (≈ 21.000 ha), especially the soft textured ones (willows, indigenous and Euro-American poplars) (<http://braila.rosilva.ro>). The non-wood products from Brăila are diverse, being classified on more categories. Their diversity is high due to the relief characteristic to this area. Even though the main area is represented by fields, difference relief forms can be found such as sand dunes, mounds, embankments, or islets.

The NWFP species that were taken into account for this study were: *Macrolepiota procera*, *Lactarius* species, *Tilia flowers Hippophae rhamnoides L.*, *Crataegus monogyna*, *Mentha piperita*, honey and *Anas platyrhynchos*.

MATERIALS AND METHODS

An analytical hierarchy process was used in order to determine the most important NWFPs from Brăila. This process was created by Saaty and analyses more decisions based on a set of criteria previously established (Saaty, 2008). The process was made possible by using the Expert Choice Desktop software (v. 11.5.1683).

The 19 criteria that were taken into consideration were: harvesting period (1: the shortest harvesting period ... 8: the longest harvesting period), harvested quantity / worker / 8 hours (1: the lowest quantity ... 8: the highest quantity), harvesting cost (1: the lowest cost ... 8: the highest cost), harvesting knowledge (1: most recognizable product ... 8: hardest recognizable product), tools needed for harvesting (1: the least ... 8: the more), complexity of harvesting process (1: lowest ... 8: highest), development of harvesting process (1: undeveloped ... 8: extremely developed), knowledge for recognition (1: the less knowledge necessary ... 8: most knowledge necessary), distribution range (1: lowest ... 8: highest), biotic threats (1: the fewest threats ... 8: the most threats), abiotic threats (1: the fewest threats ... 8: the most threats), perishability (1: lowest ... 8: highest), market potential (1: low ... 8: high), market demand (1: lowest ... 8: highest), “celebrity” of the product on market (1: the least known ... 8: the most popular), the price of raw product (1: lowest ... 8: highest), the price of the derived product (1: lowest ... 8: highest), portfolio of derived products and transport ((1: the smallest number of derived products ... 8: the highest number of derived products). These criteria were also used for similar studies realized in Maramureș (Enescu *et al.*, 2017), Prahova (Enescu *et al.*, 2018a), Timiș (Enescu *et al.*, 2018b) and Bihor (Timiș-Gânsac Voichița *et al.*, 2018). In the case of Brăila County, the NWFPs selected for the analysis were grouped in four categories: mushrooms, tree products, understory plants and animal origin. *Macrolepiota procera* and *Lactarius* species were selected for the mushroom category, while for the tree products category, the linden flowers were chosen. *Hippophae rhamnoides* L., *Crataegus monogyna* and *Mentha piperita* were chosen as understory plants, while honey and *Anas platyrhynchos* were selected for the last category, animal origin.

RESULTS AND DISCUSSIONS

Table number 2 presents the criteria and classification of NWFPs based on the opinion of specialists.

Amongst all the products chosen for this study, it can be observed that the animal origin ones have a richer portfolio of derived products (criterion 18), have a higher market potential (criterion 13) and an ample and difficult harvesting process (criterion 6) in comparison with the mushroom category.

Based on the AHP analysis, the most important non-wood forest products from Brăila County are honey, the duck and sea buckthorn, while the least important ones are hawthorn and mint (Figure 2).

TABLE 1. Alternative AHP ranking

Criterion		Mushrooms		Tree products	Understory plants			Animal origin	
		<i>Macrolepiota procera</i>	<i>Lactarius</i> spp.	<i>Tilia</i> flowers	<i>Hippophae rhamnoides</i>	<i>Crataegus monogyna</i>	<i>Mentha piperita</i>	Honey	<i>Anas platyrhynchos</i>
		1	2	3	4	5	6	7	8
1	Harvesting period	1	2	5	6	3	4	8	7
2	Harvested quantity / worker / 8 hours	3	2	4	5	6	7	8	1
3	Harvesting cost	3	2	4	6	5	1	8	7
4	Knowledge for harvesting	8	5	1	4	3	2	6	7
5	Tools needed for harvesting	3	2	5	6	4	1	8	7
6	Complexity of harvesting process	3	2	5	6	4	1	8	7
7	Development of harvesting process	2	3	6	5	4	1	8	7
8	Knowledge for recognition	8	7	1	3	4	6	2	5
9	Distribution range	1	2	3	6	4	8	7	5
10	Biotic threats	7	6	2	4	1	3	5	8
11	Abiotic threats	8	7	4	3	2	1	6	5
12	Perishability	8	7	2	6	5	3	1	4
13	Market potential	1	2	5	6	3	4	8	7
14	Market demand	1	2	6	7	5	3	8	4
15	“Celebrity” of the product on market	1	2	5	6	3	4	8	7
16	The price of raw product	1	2	4	6	3	5	7	8
17	The price of the derived product	1	3	5	7	4	2	8	6
18	Portfolio of derived products	3	2	4	7	5	1	8	6
19	Transport (harvesting - storage centre)	5	6	4	8	3	1	7	2

Anas platyrhynchos (Large Duck) is an endemic species spread out in temperate and subtropical areas from Europe, America, Asia and North Africa. In Romania, the duck is a species with a high interest for hunting, every hunter being able to hunt maximum 15 exemplars in one day (Dincă *et al.*, 2018a, Ord. 951/2016). Duck meat is renowned for its unsaturated fats and proteins and is recommended for decreasing blood pressure and cholesterol (Lee *et al.*, 2015).

Honey is a product based on plants but which has certain changes realized by bees. As such, it is usually considered an animal product. Honey is one of the oldest nutrition products. In this regard, the Greeks used it for treating sunburns, injuries and ulcer. The main advantages of honey are that it doesn't temper quickly so it can be kept at room temperature for a long time. In addition, honey is with 25% sweeter than sugar due to its high fructose content (Khan, 2007; Molan, 2006). Its colour varies on the plant from which the bees extract the nectar. As such, it can range from a bald colour to bright yellow and even dark brown. Its taste also varies based on its plant origin and can be moderately sweet or strong (FAO, 2002).

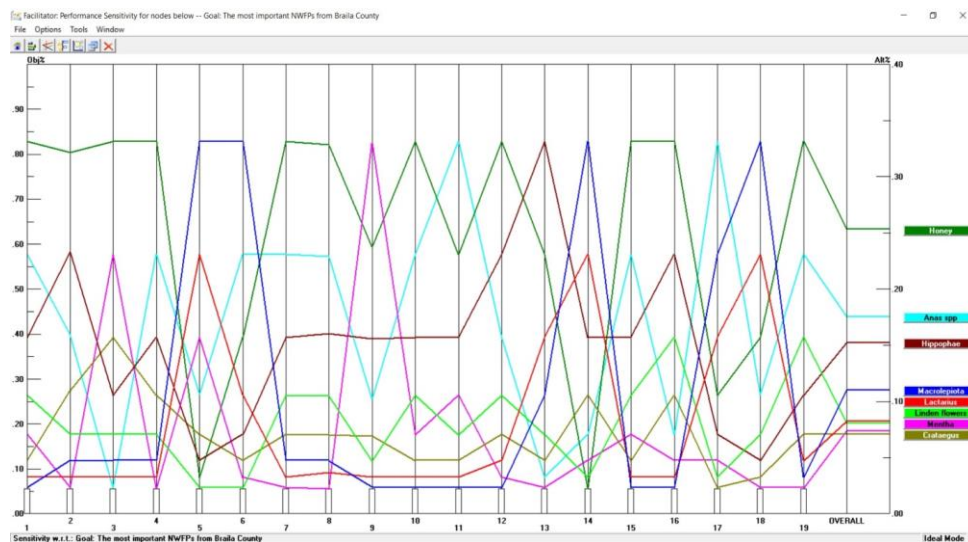


FIG 2. The ranking of the eight NWFPs

Sea buckthorn (*Hippophae rhamnoides* L.) has a high ecological adaptability, being cultivated for its role in preventing field erosion, while its fruits are used in the pharmaceuticals and food industries. Due to its high content in bioactive substances and vitamin C, the species has a vast portfolio of derived products including syrups, teas, oils, marmalade, drinks etc. (Constandache *et al.*, 2016; Dincă *et al.*, 2018b; Upadhyay *et al.*, 2010; Suryakumar and Gupta, 2011).

CONCLUSIONS

Non-wood forest products from Brăila County belong to different categories, mainly because of the diverse relief. The AHP analysis has shown the fact that the most representative products from this county are sea buckthorn, honey and the duck, with honey as the most appreciated product by specialists. The usage of the analytical hierarchic process proves to be useful in analysing the perception of specialists towards certain products (in this case towards non-wood forest species from Brăila). The obtained results can be used in creating management plans for the fields from this area, as well as marketing plans for the products resulted from these categories of forest products.

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