THE MAIN CATEGORIES OF NON-WOOD FOREST PRODUCTS FROM VRANCEA COUNTY

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Abstract: There are a lot of studies which explain the truly value of the non-wood forest products from the sphere of their benefical properties in human health and also their contribution to enhance the economy. The aim of this study was to highlight the most important non-wood forest products for Vrancea County and to see the adaptability and sensivity of every species from different utilization categories As material and methods, it was used 4 categories of non-wood forest products which were evaluated by an hierarchical analytical process which show a lot of specific characteristics of the component species, including 19 well-established criteria: harvesting cost, market demand, market potential, abiotic and biotic threats and so on. Every criteria was analyzed by 3 specialists, giving them notes between the interval [1...8] which represent the degree of demands and needs on market place, assessment of costs in harvesting period etc. In the part of results, it was described four categories of NWFPs: edible mushrooms (Cantharellus cibarius (golden chanterelle), Macrolepiota procera (parasol)), tree products (Christmas trees, Spruce seeds), understory plants (Hippophae rhamnoides (sea-buckthorn), Allium ursinum (ramson) and animal origin (Tetrao urogallus(western capercaillie), Salmo trutta-fario (brown trout))which are spreaded in the entire study zone. In the case of mushrooms, Cantharellus cibarius has maximum notes based on criteria like: "Celebrity" of the product on market, price of raw product and of the derived products and portfolio of derived products. Also, Christmas trees have a good range distribution and the market potential is increasing, especially in the winter season.. Understory plants such as sea-buckthorn and ramson, have a good distribution range, an increased harvesting cost and the consequences derived from their properties are promoted well in the market zone. The degree of novelty is represented by the unique analyze of these non-wood forest products in Vrancea County. Research limitations are the lack of collecting data from the field. Originality of research is derived from the hierarchical analytical process (AHP), which is a good method from economy to analyze the non-wood forest products using different criteria. The importance of this report comes through the demands and the needs of the population which constitute an strategic way to improve the market potential. The knowledge potential of these NWFPs is also important for development of bioeconomy, purposing to use all the parts of the products, without recycling anything.

Keywords: AHP, NWFPs, golden chanterelle, brown trout, market potential, harvesting cost, diagram of sensivity

INTRODUCTION

Long time ago, the principal source of food was represented by two principal actions: hunting and fishing. Forest products represented an important source of food for human life, giving them a lot of staffs to make life easier and better. Furthermore, they discover in time, a lot of treatments based on the medicinal plants which help them to remedy the minimal problems during the hunting. So, for Romania, non-wood forest products have a large scale, because of the different types of environmental conditions which varies with landforms.

Non-Wood Forest Products and Services had good results on the public market, becoming more attractive for people interests (JANSE and OTTITSCH, 2005). Forest Products Division of FAO, in 1991, established an important program 'promotion and development of Non-Wood Forest Products "which refers to areas priority (FAO, 1999). NWFP have an impact for the public and also for forest owners. The silvicultural code of Romania (article 58, letter 3), forest non-wood products are summarily classified in: fauna forest fruits, fish, truffles, eatable mushrooms and other products (BRAGĂ and DINCĂ, 2019). Beside food, mushrooms represents a good contribution in Romanian culture, by using some species of mushrooms as

names of some localities (DINCĂ et al., 2016). Non-wood forest products (NWFP) are defined by FAO as "products of biological origin other than wood derived from forests, other wooded land and trees outside forests". From this package, it is excluded the raw material, such as charcoal, chips and so on. Also, the products collected in agricultural and agroforestry systems are removed. This definition specifically excludes woody raw material, such as chips, charcoal, fuelwood, etc., and products collected in tree stands in agricultural or agroforestry systems. But, they includes products such as gum arabic, resin, cork, Christmas trees, rattan and bamboo (FAO, 2015). The European households report collecting NWFP close to the 25%, being an large variation through activity at national level. Some segments from marketplace, use NWFP as natural heritage product Aside from the use of NWFP for subsistence purposes by certain segments of population, their use as natural heritage product, natural foods or leisure activities (Vrancea County has a multitude of non-wood forest products, which were categorized by their nature, which means a complex biodiversity in forests ecosystems. The aim of this study was to highlight the most important and required non-wood forest products for Vrancea County. He is placed in the south-east of Romania and it's an famous historical county. The main watercourses are: Siret (between Adjud and Nămoloasa), Șușița, Putna, Milcov, Râmnicu Sărat. The highest altitudes have the peaks Lăcăuţ (1776 m) and Goru (1784 m). The county has all of the relief form (plaine, hill, montain) and an temperate climate.

The amplitude of the species is bigger in the case of pioneer species (scots pine, seabuckthorn) because the Vrancea County has many degraded lands which were well afforestated with these species. The sea buckthorn (*Hippophae rhamnoides* L.) is found in a natural way, being appied through artificial plantations in eroded fields from the Curvature Sub-Carpathians (CONSTANDACHE et al., 2016). In Vrancea County , this species brings good results in the terms of "afforestation and amelioration", reducing the specific erosion, stabilizing the degraded lands and also for allowing the succession of the valuable species (CONSTANDACHE et al., 2016).The flora comprises about 1500 species of plants having phytogeographic origins. Many species are protected by law, many of them being monuments of nature. The hunting fauna is rich and all of the species adapted to all of the environmental conditions (the eagle, the crow, the deer, the bear, the wild boar). Furthermore, the lakes and rivers carry on the species of fish, frogs, insects and a lot of aquatic plants which have the roots in the depth of the waters and give an important supply of oxygen.
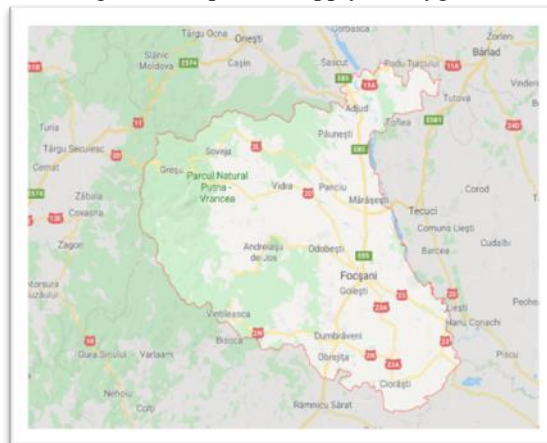

Figure 1. Location of Vrancea County (Source: Google Maps)

MATERIAL AND METHODS

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 conductedfor Maramures (ENESCU et al., 2017), Timis (ENESCU et al., 2018), Bihor (TIMIȘ-GÂNSAC et al., 2018) Prahova (ENESCU et al., 2018), Gorj (VECHIU et al., 2018) and Dolj (CÂNTAR et al., 2018). All the categories were passed through an hierarchical analytical process which show a lot of specific characteristics of the component species including: harvesting cost, market demand, market potential, abiotic and biotic threats and so on (SAATY, 2008).Expert Choice Desktop (v. 11.5.1683) software package was used for the analyses, especially for obtaining the diagram of sensivity.

RESULTS AND DISCUSSION

In the (Table 1) were presented the 19 well-established criteria for every type of category (mushrooms, tree products, understory plants, animal origin) which were noted by specialists with numbers comprised in the interval [1…8]. There were 3 specialists which evaluate every criteria and the mean of values was taken into consideration. It was analyzed 4 categories of NWFP: category 1 of edible mushrooms (*Cantharellus cibarius* (golden chanterelle)*, Macrolepiota procera* (parasol)*, category 2 of tree products (Christmas trees, Spruce seeds), category 3 of understory plants (*Hippophae rhamnoides* (white buckthorn)*, Allium ursinum* (ramson) *and* category 4 of animal origin *(Tetrao urogallus* (western capercaillie)*, Salmo trutta fario* (brown trout).
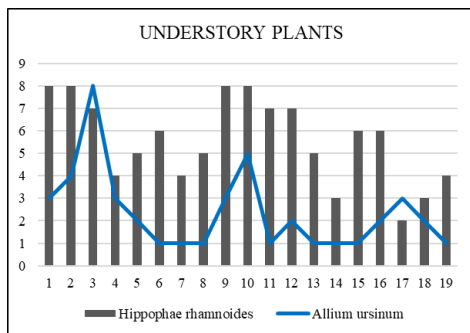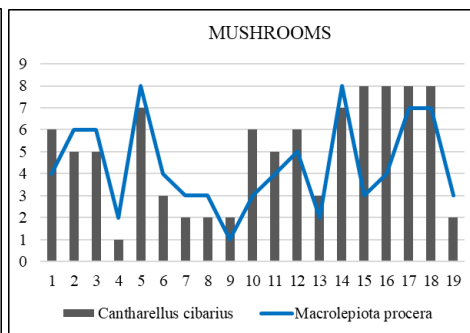

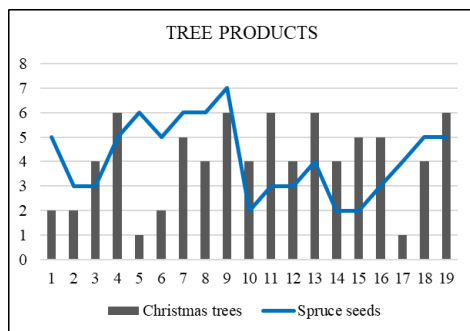Figure 2 Notes for understory plants

Figure 3 Notes for mushrooms

Figure 4 Notes for tree products
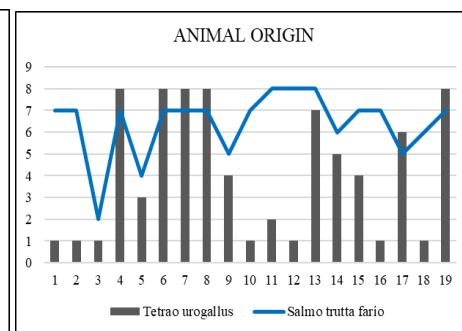
Figure 5 Notes for animal origin

AHP alternative ranking

	Criterion	Mushrooms		Tree products		Understory plants		Animal origin	
		Cantharellus cibarius	*Macrolepiota procera*	*Christmas trees*	*Spruce seeds*	*Hippophae rhamnoides*	*Allium ursinum*	*Tetrao urogallus*	*Salmo trutta fario*
1	Harvesting period	6	4	2	5	8	3	1	7
2	Harvested quantity / worker / 8 hours	5	6	2	3	8	4	1	7
3	Harvesting cost	5	6	4	3	7	8	1	2
4	Knowledge for harvesting	1	2	6	5	4	3	8	7
5	Tools needed for harvesting	7	8	1	6	5	2	3	4
6	Complexity of harvesting process	3	4	2	5	6	1	8	7
7	Development of harvesting process	2	3	5	6	4	1	8	7
8	Knowledge for recognition	2	3	4	6	5	1	8	7
9	Distribution range	2	1	6	7	8	3	4	5
10	Biotic threats	6	3	4	2	8	5	1	7
11	Abiotic threats	5	4	6	3	7	1	2	8
12	Perishability	6	5	4	3	7	2	1	8
13	Market potential	3	2	6	4	5	1	7	8
14	Market demand	7	8	4	2	3	1	5	6
15	"Celebrity" of the product on market	8	3	5	2	6	1	4	7
16	The price of raw product	8	4	5	3	6	2	1	7
17	The price of the derived products	8	7	1	4	2	3	6	5
18	Portfolio of derived products	8	7	4	5	3	2	1	6
19	Transport (harvesting - storage center)	2	3	6	5	4	1	8	7

In the case of mushrooms (Figure 3), *Cantharellus cibarius* has maximum notes based on criteria like: "Celebrity" of the product on market, price of raw product and of the derived products and portofolio of derived products. All of these criteria show the importance of this species on the market zone, because she has a lot of uses especially in gastronomy domain. It is also important to see that there are a lot of tools needed for harvesting. From the category of tree products (Fig.4), Christmas trees have a good range distribution and the market potential is increasing, especially in the winter season. For harvesting is necessary to use a good knowledge. Spruce seeds have a good distribution range which permits to harvest in a lot of provenience sites bringing qualitative seeds. However, the complexity of harvesting process refers to the mode of collecting the seeds and the way of conserving them. Understory plants such as white buckthorn and ramson, have a good distribution range, an increased harvesting cost but the consequences are promoted well in the marketzone. Both of them are medicinal plants, but *Hippophae rhamnoides* (sea-buckthorn) have a complex demands, not only for the fruits but also for afforestation of degraded lands.

Harvesting periods and importance of the species

Salmo trutta-fario L. (1758) or brown trout it's a species spreaded in most of the part of Europe as in Little Asia. It was introduced with best results in North- America, Africa and New Zeeland. In Romania, is met in the mountain rivers, lakes, being the principal "occupant" of the zone called "trout zone". He lives in the mountain waters with an content of 6-7 cubic centimetres per litre, having a low amplitude in the terms of temperature. It's a exclusively carnivore, feeding with small fish, insects, snails and shellfish. The fishing is allowed between 1 May-14 September only with rod and utilizing artificial bait. The intensive growth and exploitation it takes place in trout farm which are well-managed stations (NEGRUȚIU and IONESCU, 2012).

Figure 6 *Salmo trutta-fario* body source (Wikipedia)

The forest environment and forest related to the potential niches, like forests edge, glades, is the subject of the spreading of edible mushrooms (VASILE et al., 2017).

Cantharellus cibarius (Elias Magnus Fries, 1821) (Figure 7) or golden chanterelle, have a various distribution range in Romania. As specialists said, wild mushrooms are famous as important non-wood forest products, but, instead of be not fully evaluated because of the difficulties which were met in obtaining the reliable data, their true potential in economies cannot be expressed so much (BONET et al.,2014).Some descriptive characteristics will be illustrated forward.

Meat: is golden-yellowish at edge, whitish inside, peppery and fruity.

Fructification: harvesting period is long (May - September). Body growth of fructification is very slow.

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Ecology: The environmental conditions have to be well drained with soils poorly supplied with nitrogen. It appears in the softwood forests, in hardwood forests and mixed forests. They don't appear in the counties situated in South-East Plain (Figure 8).

Eatable: is excellent, and they are only species whose fructification bodies do not crush and which do not be attacked by the insects larvae. They can be conserved by freezing or brining.
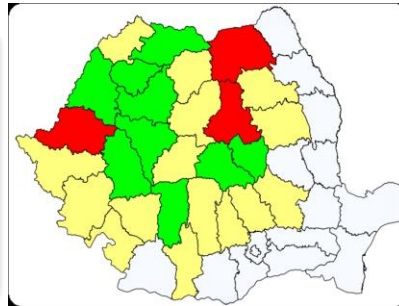

Figure 7 Fructification body
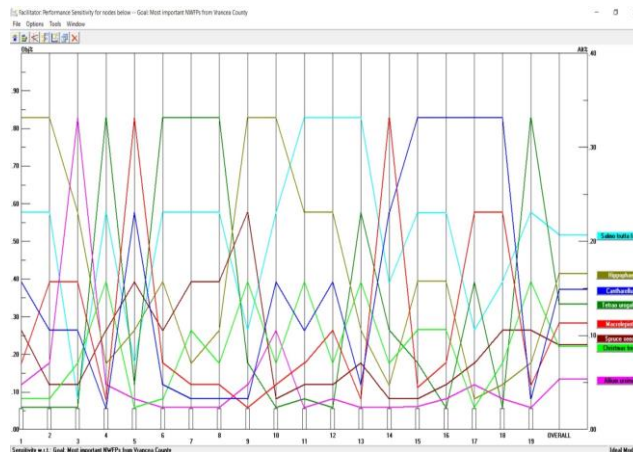

Figure 8 *Cantharellus cibarius* distribution

Figure 9 Diagram of sensivity

Spruce seeds. Spruce cone seeds have been known since ancient times. Spruce seeds contain very valuable active substances. They were harvested by hand from cones and those with seed residues were introduced into the oven, so the seeds can be easily removed. They can be eaten fried, raw, ground, and preserved very well in honey. After that, they will become slightly rancid. The cone of the spruce is pendent containing winged seeds. The seed are also resinous. Using the software program Expert Choice Desktop (v. 11.5.1683) it was obtained the diagram of sensivity for every species and products which were included in those 4 categories. The most important and demanded species are: brown trout *(Salmo trutta-fario)*, sea-buckthorn *(Hippophae rhamnoides)* and golden chanterelle *(Cantharellus cibarius)*. Intervals with higher amplitude are formed by criteria like (15, 16, 17, 18), (11, 12, 13) or only single criteria (3, 4, 5, 14, 19).

CONCLUSIONS

For present study were analysed four categories of non-wood forest products: mushrooms, tree products, understory plants and animal origin. Those have a large distribution range in Vrancea County and they have also market potential demands. For example, *Cantharellus cibarius (golden chanterelle gained good* notes based on criteria like: "Celebrity" of the product on market, price of raw product and of the derived products and portfolio of derived products. All of these products were passed through AHP (hierarchical analytical process) developed and implemented by THOMAS SAATY which consisted in 19 criteria defining every species. The diagram of sensivity show that the most important non-wood forest products were: brown trout (*Salmo trutta-fario*), sea-buckthorn (*Hippophae rhamnoides*) and golden chanterelle (*Cantharellus cibarius*). All of these products have a complexity of harvesting process and it's necessary to use a specific knowledge to be required on market demand.

BIBLIOGRAPHY

BONET J.A., GONZÁLEZ-OLABARRIA J.R., ARAGÓN J.M., 2014 - Mushroom production as an alternative for rural development in a forested mountainous area. Journal of Mountain Science, 11(2): 535–543.

BRAGĂ C., DINCĂ L., 2019 -Forest is not only wood: Evaluating non-timber products from Dambovita County. Current Trends in Natural Sciences, 8(15): 73-78, Romania.

CÂNTAR I. C., ENESCU C.M., DINCĂ L., 2018 - Application of the analytic hierarchy process in selection of the most important non-wood forest products for Dolj County, Craiova. Annals of the University of Craiova - Agriculture, Montanology, Cadastre Series, 48(2): 50-57, Romania.

DINCĂ L., ENESCU C.M.,DINCĂ M., CÂNTAR I.C., 2016 - Mushrooms in Romanian toponymy, vocabulary and literature. Journal of Horticulture, Forestry and Biotechnology, 20(3): 119- 125, Romania.

ENESCU C.M., DINCĂ L., VASILE D., 2017 - Importance of non-wood forest products for Maramureş county. Forest and Cynegetics Magazine, 40 : 92-97, Romania.

ENESCU C.M., DINCĂ L., CÂNTAR I., 2018 - Which are the most common non-wood forest products in Timis County? Research Journal of Agricutural Science, 50(1): 51-56, Romania.

FAO, 1999. Towards a harmonized definition for non-wood forest products. Unasylva, 50:63-63.

FAO, 2015 - Terms and definitions. Forest Resource Assessment,pp.180, Rome, Italy.

JANSE G., OTTITSCH A. 2005 -Factors influencing the role of Non-Wood Forest Products and Services. Forest Policy and Economics, 7(3): 309-319.

NEGRUŢIU A., IONESCU T.D, 2012 - Intensive growth of salmonizers. "Transilvania" University of Braşov, Faculty of Silviculture and Forestry.

PROKOFIEVA I., LOVRIC M., PETTENELLA D., WEIß G., WOLFSLEHNER B., WONG J., 2017 - What is the potential contribution of non-wood forest products to the European forest-based bioeconomy?. Towards a sustainable European forest-based bioeconomy, 132.

SAATY T.L., 2008 - Decision making with the analytic hierarchy process. *International Journal of Services Sciences* 1(1): 83-98.

TIMIŞ-GÂNSAC V., ENESCU C.M., DINCĂ L., ONEŢ A., 2018 - The management of non-wood forest products in Bihor county. Natural Resources and Soustainable Development, 8(1): 27-34, Romania.

VASILE D., DINCĂ L., ENESCU C.M., 2017 -Impact of collecting mushrooms from the spontaneous flora on forest ecosystems in Romania. AgroLife Scientific Journal, 6(1): 268-275, Romania.

VECHIU E., DINCĂ L., ENESCU C.M., 2018 - Which are the most important forest fruits from Gorj County?. Forest and Cynegetics Magazine, 42 :89-93, Romania.

http://www.fao.org/docrep/017/ap862e/ap862e00.pdf, https://ro.wikipedia.org/