

ECONOMIC INPUT OF NON-WOOD FOREST PRODUCTS OF ANIMAL ORIGIN TO THE TURNOVER OF FOREST DISTRICTS IN ROMANIA

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Abstract

In Romania, forest management is focused on wood harvesting and marketing, non-wood forest products (NWFPs) having a low importance. Even so, across the country there are more than three hundred fifty NWFPs of interest, forest fruits, mushrooms and truffles, forest seeds, game products, fish from the mountainous water, honey and tree saps being among the most common ones. The main aim of this study was to highlight the economic contribution of NWFPs of animal origin to the turnover of the forest districts in Romania. Secondly, the potential of these products was assessed by using an Analytical Hierarchy Process implemented in Expert Choice Desktop software. By using a set of eight criteria, game products proved to be more promising in comparison with honey and fish from the waters included in the national forest fund. On average, NWFPs of animal origin have a very low (less than 1%) contribution to the turnover of the forest districts in Romania. The brief multi-decision analysis could represent an alternative for the forest managers aimed at highlighting the best alternative in a chosen scenario.

Key words: AHP, economic contribution, forest district, NWFPs

INTRODUCTION

In Romania, forest management is made by specialized units (*i.e.* forest districts) following economic, ecological and social targets. The forest districts (470 in total) are both private and state-owned, the vast majority of them (313) belonging to National Forest Administration Romsilva, which has in total more than 16,000 employees [17].

Among others, forests are regarded as important revenues for the forest owners and managers, several wood and non-wood forest products (NWFPs) being marketed. For example, across Romania, more than three hundred fifty NWFPs (mainly forest fruits, edible mushrooms and truffles, medicinal and aromatic plants, game and fish products, honey, tree saps) are collected every year [6], [7], [8], [18], [19], [20].

The harvesting and marketing of NWFPs originating from the national forest fund are regulated by specific legislation (especially Article no. 58 of Law no. 46 from 2008 – Forest Code) and the activities are monitored by the staff of the forest districts. All these products belong to the landowners, except the

fish from mountain waters, farms and ponds included in the forest fund and wildlife species of hunting interest [9].

As regards the harvested quantities of the main categories of NWFPs, in the last decade, around 4,000 tons of forest fruits, 550 tons of edible mushrooms and around 10-20 tons of forest seeds were collected every year by the employees of the forest districts or their subcontractors [4]. The highest shares of the yearly harvested quantities of forest fruits and mushrooms are exported as raw materials in several European countries. A similar trend was also observed in the case of some game and bird species of hunting interest, such as common quail (*Coturnix coturnix* L.) and Eurasian skylark (*Alauda arvensis* L.) [3], or red deer (*Cervus elaphus* L.) and fallow deer (*Dama dama* L.) [10], which are preferred by the foreign hunters.

Other examples of NWFPs of animal origin consist in bee honey and fish from waters and farms managed by the forest districts. According to a recent report, honey production in Romania had increased in the last two decades [16]. A significant share is obtained from black locust (*Robinia pseudoacacia* L.)

and linden (*Tilia* spp.) dominated hardwood forests [5], [13], especially from the ones distributed in the southern part of the country for which the honey production could reach 320 kg/ha [12].

In the case of the fish from the waters included in the national forest fund, half of the yearly production (*i.e.* 500-600 tons) is obtained by the thirty trout farms managed by Romsilva [1], [2], the main three species of breeding interest being river trout (*Salmo trutta fario* L.), rainbow trout (*Oncorhynchus mykiss* Walbaum) and brook trout (*Salvelinus fontinalis* Mitchill.) [14], [15], [17]. An example of a trout farm is given in Figure 1.



Fig. 1. Lepșa trout farm, Focșani Forest District (Romsilva), Vrancea County
 Source: original photo.

For some forest districts, the marketing of NWFPs is regarded as an important alternative to wood selling, especially for those that are managing small areas (Figure 2) with not so valuable wood and with several harvesting restrictions caused, for example, by the network of protected areas. In this context, the chief of the forest district is very interested to diversify the sources of income and to move the pressure from wood harvesting to NWFPs picking.

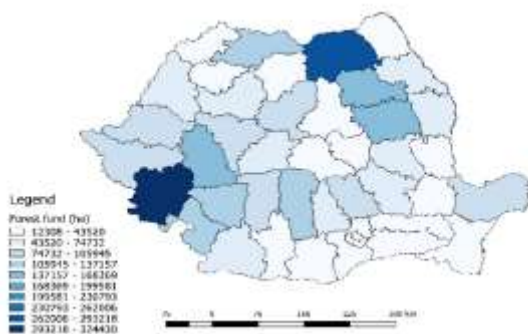


Fig. 2. State-owned forest fund managed by Romsilva
 Source: Romsilva [17].

The main aim of this research was to highlight the economic contribution of NWFPs of animal origin to the turnover of the forest districts in Romania. Secondly, the potential of selected non-wood forest products was assessed.

MATERIALS AND METHODS

Data regarding the contribution of certain non-wood forest products to the turnover of the forest units from Romania were centralized from the website of the National Institute of Statistics [11].

In order to investigate which NWFPs of animal origin could have the greatest potential for marketing, an Analytical Hierarchy Process (AHP) was conducted. The analysis was used in a similar study aimed at highlighting the most promising NWFPs across Ialomița County [6]. Within this study only three alternatives (*i.e.* game meat, fish and honey) and eight criteria were taken into consideration. The criteria consisted in: **criteria 1: portfolio of derived products** (assessed on a scale from 1-the lowest to 3-the highest), **criteria 2: price of final product** (from 1-the lowest to 3-the highest), **criteria 3: market demand** (from 1-the lowest to 3-the highest), **criteria 4: tools needed for harvesting** (from 1-the most to 3-the least), **criteria 5: harvesting costs** (from 1-the highest to 3-the lowest), **criteria 6: transportation from the harvesting place to storage center** (from 1-the most complicated to 3-the least complicated), **criteria 7: perishability** (from 1-the most to 3-the least) and **criteria 8: potential for the development of the harvesting process** (from 1-the least to 3-the highest), respectively.

The analyses were done by using Expert Choice Desktop (v. 11.5.1683) software package.

RESULTS AND DISCUSSIONS

The contribution of the NWFPs of animal origin to the overall turnover of the forest units, at national level, for the timeframe 2011-2018, is given in Table 1.

Table 1. Contribution of NWFPs of animal origin (thousands lei)

Year	Turnover	Game products	Fish products	Honey
2011	1,523,819	7,037	9,594	97
2012	1,626,799	6,377	8,302	43
2013	1,846,977	5,709	9,330	37
2014	2,017,621	6,998	10,478	29
2015	2,107,590	5,903	11,094	10
2016	2,254,830	5,229	8,993	40
2017	2,476,255	5,170	9,061	64
2018	3,002,986	5,040	8,607	97
Mean	2,107,110	5,933	9,432	52

Source: National Institute of Statistics [11].

On average, the total contribution of the NWFPs of animal origin (fish products, game products and honey) harvested from the national forest fund accounted for 0.7%, fish products having the highest share. In the considered timeframe, the overall contribution decreased from 1.1% (2011) to 0.5% (2018). AHP alternative ranking is given in Table 2.

Table 2. AHP alternative ranking

Criterion	Game products	Fish products	Honey
1	3	2	1
2	3	1	2
3	3	1	2
4	1	3	2
5	3	1	2
6	1	3	2
7	2	1	3
8	2	1	3

Source: Own data.

By using the above-mentioned eight criteria with equal shares (*i.e.* 12.5%), game products proved to be the most promising non-wood forest products, followed by honey and fish products (Figure 3).

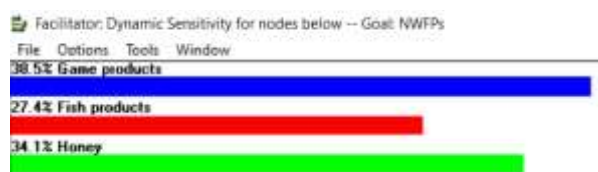


Fig. 3. The ranking of the three NWFPs
 Source: original photo.

Among the four sensitivity graphs, Expert Choice Desktop provides also the so called head-to-head graph between pairs of alternatives (*i.e.* NWFPs). An example is given in Figure 4, on the left part of the graph being highlighted the criteria for which the game products recorded higher values (with blue color) in comparison with honey, while on the right is the vice-versa situation (highlighted in green). In the bottom of the graph, the overall result of the comparison on the pairs of products is highlighted with color grey. This graph is especially useful in the case when tens of criteria are included in the same time into analysis, especially when criteria are grouped according to certain research objectives.

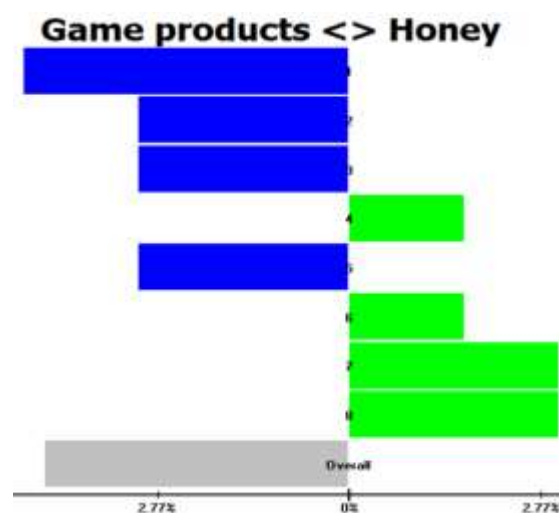


Fig. 4. Head-to-Head sensitivity graph
 Source: original photo.

CONCLUSIONS

On average, between 2011 and 2018, marketing of non-wood forest products of animal origin harvested from the national forest fund had a very low economic contribution (*i.e.* 0.7%) to the turnover of the forest districts in Romania. The contribution decreased from 1.1% (in 2011) to 0.5% (in 2018). This brief multi-decision analysis provides an alternative for the forest managers and forest owners aimed at highlighting the best alternative in a scenario when all NWFPs are equally available. The model could be developed, by providing additional criteria (with equal or unequal shares) and/or alternatives. In order to switch the focus from wood harvesting and marketing to non-wood

forest products picking and commercialization specific infrastructure aimed at storing and preparing derived products has to be developed with priority in many forest districts as possible. By doing this, the portfolio of derived products that are of great interest on national and international market will increase and, consequently, the income of the forest districts will grow.

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