
ECONOMIC ASPECTS OF THE USE OF FORESTRY PRODUCTS FOR COMMERCIAL PURPOSES

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ABSTRACT

Forestry together with the industry based on wood and non-wood forest products (NWFPs) represents an important activity and branch of the national economy. In accordance with that, the work is divided into two chapters, one of which analyzes wood, and the other of NWFPs. Therefore, the aim of the research is to examine the market trends and potential of forestry in the part of central Serbia (Central forest area). The purpose of the research is to identify trends in the categories of felling, production and sale of wood assortments of beech, oak and poplar and to analyse the commercial aspect and the way of organizing the marketing mix in companies that deal with the purchase, processing and placement of NWFPs. The Mann-Kendall test was used for the analysis of trends in wood products, while a survey was created for the analysis of companies in the field of NWFPs, which included 29 open and closed questions, with conceptual units related to the marketing mix. For the purposes of the research, primary and secondary data were used and the time period 2008-2017 was covered.

Introduction

Forests are a renewable resource, and wood and other forestry products represent a valuable and sustainably usable product, which makes an economic contribution to national economies (Kalamárová et al., 2014; Sadanandan-Nambiar, 2015; Rikalović, Molnar, 2017; Zastocki et al., 2021).

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If forestry is observed in the context of the production process, it is possible to identify significant deviations in relation to other economic areas, which shows a certain similarity with agricultural production (Shmulsky, Jones, 2019; Tsuchikawa et al., 2022). What makes a significant difference is the inability to react quickly (Sabadi, 1986) and adapt to market demands. On the other hand, if we are talking about the market of forest products, it is characterized by a number of specificities of a biological, technical and economic nature (Ranković, 2008).

Such specificities are reflected, among other things, in the spaciousness of production, the relatively large distance between the initial and final stages of work, the distance between the working surfaces and processing, which makes it different from other production branches (Stevanović, Simić, 2014).

In addition, in relation to conventional production, in forestry we are talking about long production cycles, multiple functions of forests, the impossibility to valorize many of its values on the market, natural renewal, afforestation, nurturing, cleaning up to economic effects, which exceeds the lifespan of people (Figurić, 1996; Delić, 2011; Posavec, Beljan, 2013).

The common component for all forestry products is that their production takes place simultaneously in the same production process (Kant, 2011). On the other hand, there is a pronounced difference in product characteristics, where wooden products are distinguished by pronounced voluminousness, which is accompanied by high transport costs (Olofsson, Lundmark, 2016) and homogeneity, then by occasional consumption and intended for further reproduction.

Besides, the realization takes place according to the established price list at the level of the year (Delić, 2011), while there is a limited number of suppliers of raw materials on the market, which means that the market can be characterized as oligopolistic (Kester, Zarić, 2009). Unlike wood products, with NWFPs there is a greater number of actors on the supply side (oligopoly) and demand side (oligopsony), the products are easy to manipulate, in the context of the assortment heterogeneous and intended for final consumption, while the prices are influenced by market trends.

In addition to providing various economic, social, cultural and ecological benefits for society, NWFPs also play an important role in the life of local communities, which use forest resources as one of the sources of income (Keča et al., 2015; Weiss et al., 2020; Zhu, Lo, 2021). In such areas, forest products are often the main source of income for the local population (Yadav, Kalpana, 2013; Simić et al., 2021; Pandey et al., 2016). In addition, forestry enterprises have a very important role for increasing employment, better living standards and long-term development of rural areas (Ticktin, 2004; Pantić et al., 2022; Shackleton et al., 2015).

On the other hand, the quantitative limitation of the supply of wood on the market is linked to the permitted felling volume, which is generated from the forest inventory and based on the yield calculation. In this sense, the wood market has a unique character, since the supply of this natural resource is strictly limited by the requirements of appropriate forestry practices (Adamowicz et al., 2008). Through the given types of restrictions, a

difference is manifested in relation to conventional types of production, because forestry, in addition to striving to satisfy the economic interests of the economy, takes as its starting point the principle of sustainable management (Medarević et al., 2008).

It is estimated that more than 4,500,000 m³ are cut in the territory of Serbia, which accounts for about 70% of the planned yield, i.e. 50% of the annual increase, where the representation of hardwoods is about 85%. Of the total volume of wood cut, about 45% is firewood, while 42% is technical wood, and 13% is wood residue.

Based on the importance of forestry and products that are commercialized on the market, the goal of the research was aimed at examining market trends and potential in the part of central Serbia (Central forest area). The purpose of the research was to identify trends in the categories of felling, manufacturing and sale of wood assortments and examination of the commercial aspect and ways of organizing the marketing mix in companies dealing with purchase, processing and placement of NWFPs.

Materials and methods

In the first part of the research, annual data on sales (volume of wood in m³), price of wood (in dinars) of beech, oak and poplar in the Central forest area, for the period 2008-2017, were used. These species were taken into consideration, because they are recognized as commercially important according to their distribution in the forest fund of Serbia. The analyzed forest area, according to the Law on Forests (2018), includes forests and forest lands of forest areas of Šumadija, Posavina and Podunavlje and Podrinje and Kolubara (*Figure 1*). The territory of this forest area includes the forest estates of PE “Srbijašume” Belgrade, Kragujevac, Loznica.

Figure 1. Forest areas in Serbia



Source: original

The data was collected from internal databases and reports of the company PE “Srbijašume”. The price of wood was adjusted using annual price indices, in order to achieve comparability of prices during the observed time period. In this way, the so-called the real price of wood. Also, the gross annual income for each of the three types of wood was calculated, as a product of sales and the real price of wood.

Table 1. Assortment structure of beech, oak and poplar

FOREST AREA	SPECIES	ASSORTMENTS	
CENTRAL	Beech (<i>Fagus</i>)	➤ fire wood ➤ log (1, 2, 3, K, L class)	
	Oak (<i>Quercus</i>)	Turkey oak (<i>Quercus cerris</i>)	➤ fire wood
		Sessile oak (<i>Quercus petraea</i>)	➤ fire wood
		Pedunculate oak (<i>Quercus robur</i>)	➤ log (1, 2, 3 class)
		Hungarian oak (<i>Quercus frainetto</i>)	➤ fire wood
	Poplar (<i>Populus</i>)	➤ fire wood ➤ log (1, 2, F, L class)	

Source: original

Table 1 shows the assortment structure of the analyzed wood species. A trend analysis was performed for the categories of felling, production and sale of wood assortments, with a preliminary examination of the existence of autocorrelation (Wang, 2008). Autocorrelation means the existence of correlation between observations in time or space, and in regression analysis autocorrelation refers to the existence of correlation between random errors. In regression models, it most often occurs when evaluating the dependence of time series data, where the effect of a random error from one period manifests itself in the next (Mladenović, Petrović, 2003).

In the second stage, to test the significance of the trend, the Mann-Kendall test was applied (Mann, 1945; Kendall, 1975; Kulkarni, von Storch, 1995; Yue, Wang, 2004). Research shows that the method most often used for trend detection is the non-parametric Mann-Kendall test (Hamed, Rao, 1998; Ghalharia et al., 2012; Guhathakurta et al., 2010), which assumes independence of data in the time series (Yue, Wang 2004; Pohlert, 2016). However, in many real-world situations, data are automatically correlated, which can result in misinterpretation of trend test results (Fathian et al., 2016).

In the second part of the research, 7 companies were analyzed, which deal with the purchase, processing and placement of NWFPs in the area of the Central forest area, of which 4 are from the Belgrade area and 3 from Kragujevac. The criteria for the selection of companies that were included in the analysis were based on the database of the Agency for Business Registers (APR) and the internal documentation of the Institute for Nature Protection (list of companies in the field of purchase, processing and placement of NWFPs for commercial use):

- private property
- the average annual quantity of purchased raw materials is higher than 100 t (Keča et al., 2015);
- belonging to the category of micro- and small enterprises, according to the classification given in the Law on Accounting (2021).

For the purposes of the research, a survey was created (Hanić et al., 2010), which included 29 open and closed questions, with conceptual units related to the marketing mix (Petrochilos, 2004; Barjaktarović, 2023; Lamb et al., 2013), and therefore and issues related to product, price, promotion and distribution (Kotler et al., 2007; Marčeta et al., 2014; Keča et al., 2015).

In this way, a database was created, which served as a basis for further analysis using appropriate methods and techniques. On the basis of the obtained qualitative-quantitative data, an effort was made to present the structure of the NWFPs, which is commercialized within the analyzed area (forest area). The products taken into consideration are classified as: mushrooms, medicinal herbs, forest fruits, honey (Mitchell, Hobby, 2010; Sorrenti 2017).

In the part related to the product, a bar diagram shows the representation of certain products (category of NWFPs) in the analyzed companies. Pie charts illustrate the representation of certain standards, as well as the participation of certain promotional activities. In the same way, the forms of product billing and the problems that companies face in business and on the market are presented. The prices are given schematically, where the process of price formation is presented, from the moment of the initial phase of collecting raw materials in nature, to the placement of the final or semi-final product. Distribution is also shown in the form of a scheme, starting with the purchase of raw materials, delivery to the premises of the company, storage, internal transport, warehousing and placement on the market through various types of distribution channels.

In the last part, the flows and quantities of purchase, placement on the domestic market and export of NWFPs were analyzed by determining the average annual growth rate for all three categories. The growth rate was calculated by obtaining chain indices in the first phase according to the following pattern:

$$\bar{Y}_C = \frac{Y}{Y_{-1}} * 100$$

In this way, the value of the change in occurrence in the current year compared to the previous year (expressed in %) was obtained (Krstić, Šoškić, 2016). From the values thus obtained, the geometric mean was calculated (Excel function “geomean”). The obtained value was reduced by 100, which determined the average annual growth rate for quantities, purchases, placement on the domestic market and exports.

Results

Table 2 presents the total logging, sales, gross income, as well as the average price and standard deviation of the price in the Central forest area in the period 2008-2017. In this way, an effort was made to show the dynamics in the domain of felling volume and placement of wood assortments, as well as average prices and gross income based on their realization on the market.

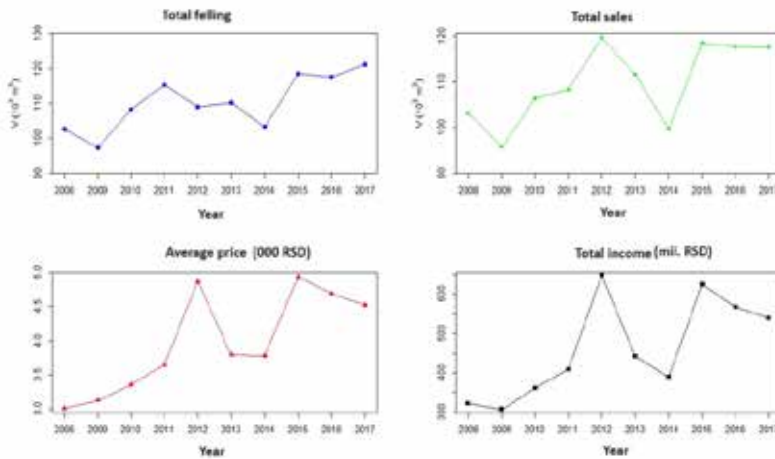
Table 2. Descriptive statistics for the Central forest area

Year	Feeling		Sale		Price		Gross income	
	Total (m ³)	%	Total (m ³)	%	Mean value (RSD)	Standard deviation	Total (RSD)	%
2008	102,628	9.1	103,129	9.5	3,005	335	322,216,650	10.7
2009	97,264	8.8	95,711	9.0	3,123	273	307,577,428	10.3
2010	108,210	9.2	106,354	9.3	3,354	149	361,532,546	10.1
2011	115,430	9.5	108,338	9.4	3,646.5	358.5	408,572,094	10.6
2012	109,089	9.0	119,651	9.7	4,868.5	1,416.5	648,750,299	13.9
2013	110,160	8.6	111,620	8.8	3,794.5	454.5	442,620,632	10.3
2014	103,298	8.1	99,587	7.9	3,782.5	401.5	389,238,181	8.5
2015	118,615	8.8	118,490	8.8	4,937.5	1,011.5	624,912,245	11.8
2016	117,568	8.7	117,588	8.8	4,690	424.0	567,581,724	10.0
2017	121,103	7.7	117,552	8.5	4,519.5	154.5	539,148,457	9.0

Source: original

The felling volume ranged from 97,264 to 121,103 m³, which is in line with the realized quantities. As for prices, the highest value was reached in 2015, which means that, compared to the other years of the analyzed time interval, more valuable assortments were realized. The highest gross income was achieved in 2012, which is the result of the ratio of prices and realized quantities (*Table 2*). In comparison to the others, the proportion of poplars is significantly higher in the Central Forest Area, where artificially raised plantations of poplar clones are dominant, with minimal participation of autochthonous communities. All this indicates that participation in sales fully follows the representation of specific species in forest areas, as well as income from their realization (Marčeta, 2023).

Graph 1 presents data for total felling (in thousands of cubic meters), total sales (in thousands of cubic meters), average price of wood (in thousands of dinars) and total gross income (in millions of dinars) in the Central forest area during the observed period.

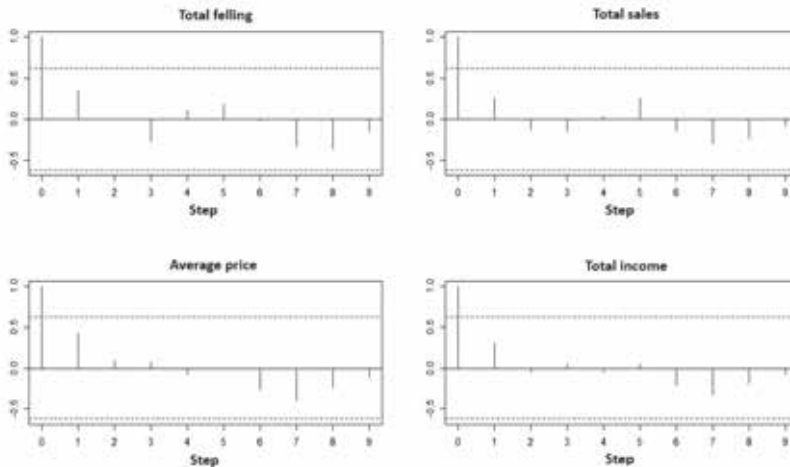
Figure 2. Trend of total cutting, total sales, average price and total income

Source: original

A slight increasing trend can be observed on the graph of total felling. Total sales have also seen growth over the years, however, there was a big jump in 2012 and a big drop in value in 2014, which deviate from the overall profile of the growing trend. An increasing trend can be observed for the average price and total income, with a big jump in 2012. That is, for total sales, average price and total income, there was a big jump in 2012, which deviates from the pattern followed by most other values, which can be linked to the realization of stocks from previous years. Unlike products whose demand depends on the disposable income of consumers, in the case of wood it can be conditioned by the volume of production of finished and semi-finished products of wood processing companies, whose demand depends on the needs of customers or further processing (Brodrechtova et al., 2014).

Accordingly, Zastocki et al. indicate that the market for wood raw materials is influenced by numerous factors (Zastocki, et al., 2021), where one group refers to the availability of raw materials, assortments, felling and the situation on the forestry services market (Malinen, Kilpeläinen, 2013; Gejdoš, Danihelová, 2015; Malinen et al., 2015; Wysocka-Fiorek, Lachowicz, 2018), while, in the second group of factors, forestry policy, nature protection or natural disasters (Sikora, 2017; Lundholm et al., 2019; Toth, et al., 2020).

Figure 3. Autocorrelation coefficients



Source: original

Figure 3 presents the autocorrelation coefficients of total felling, sales and gross income and average prices in the Central forest area. There are no statistically significant autocorrelation coefficients, so the unmodified Mann-Kendall trend test was applied in all cases.

Table 3. Mann-Kendall test results for the Central forest area

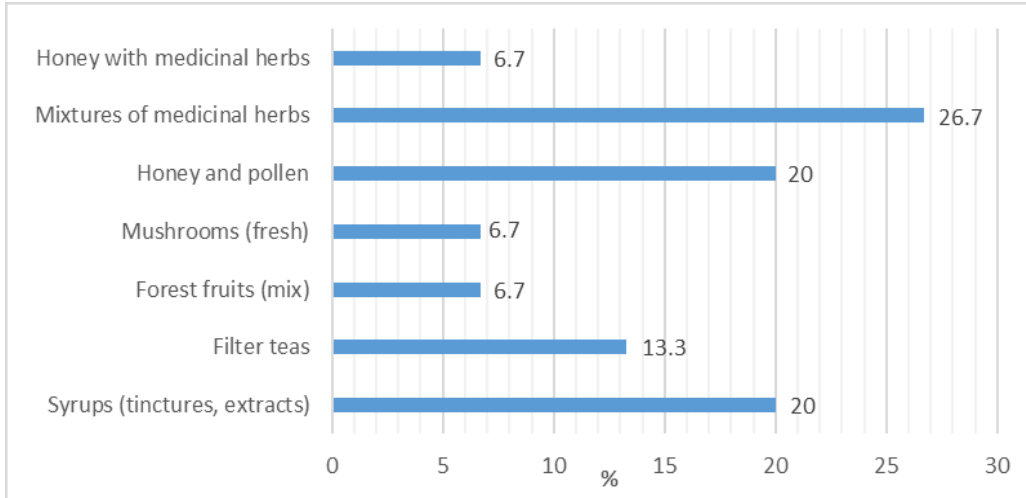
Variables	Test	Statistics	<i>p</i> -value	Trend
Total felling	Mann-Kendall	2.504	0.012	Yes
Total sales	Mann-Kendall	1.610	0.107	No
Average price	Mann-Kendall	2.504	0.012	Yes
Total gross income	Mann-Kendall	1.968	0.049	Yes

Source: original

It was determined that there is a statistically significant growing trend of total felling, average price and total income in the Central Forest Area in the period 2008-2017 (table 3). Based on this, it can be concluded that oscillations in the realized quantities of wood assortments contributed to the appearance of extreme values in certain years (under the influence, primarily of the sale of stocks from previous years), which there was no verification of the statistical significance of the trend.

Analysis of NWFPs

The survey was conducted in 7 companies, 4 in Belgrade and three companies in Kragujevac. Three of the analyzed companies are business-oriented on medicinal plants, two on the production and marketing of honey and one company each for the purchase, processing and marketing of only forest fruits, that is, combined forest fruits and mushrooms.

Figure 4. Representation of certain NWFPs in the assortment of analyzed companies

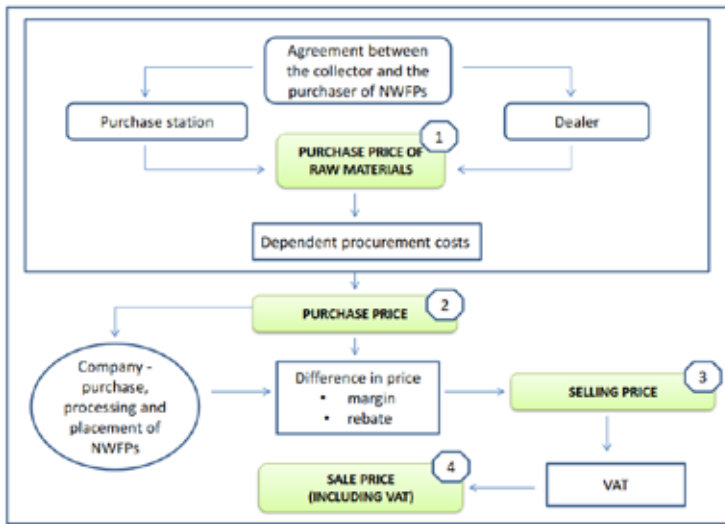
Source: original

The analyzed companies in their assortment are mostly oriented towards medicinal herbs and products based on medicinal herbs and honey. In this sense, medicinal herb mixtures (26.7%), syrups and tinctures based on medicinal herbs (20%) and honey and pollen, with the same share, stand out (*Figure 4*).

The dominant products (Milisavljević et al., 2004; Vasiljev, 2005; Gligorijević, 2007; Kotler et al., 2007; Singh, 2012; Lamb et al., 2013) marketed by the analyzed companies are mostly in raw or partially processed state (medicinal herbs, mushrooms, forest fruits, etc.), although there are also products of a higher level of processing (marmalades, syrups, extracts, etc.) (Marčeta, Keča, 2014).

Analogous to the situation in Croatia (Posavec et al., 2018), NWFPs market in Serbia is not organized, where the prices (Milisavljević et al., 2004; Kotler et al., 2007; Lamb et al., 2013) of these products depend on the buyers, supply and demand ratio, but also weather conditions and quality of raw materials (Keča, 2013; Keča et al., 2014), which, in general, creates a favorable climate for the development of the “gray” market.

Figure 5. Formation of retail price of NWFPs



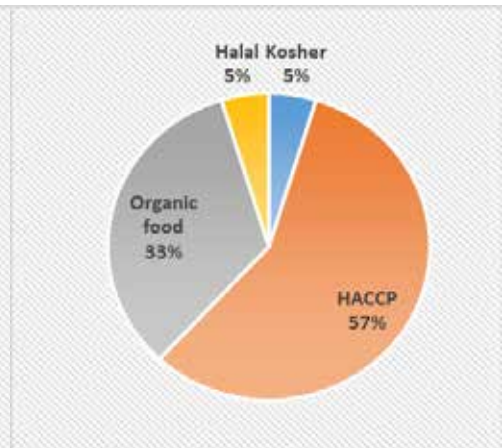
Source: original

As in previous researches (Keča et al., 2014, Marčeta et al., 2014), all analyzed companies form the price according to the “costs plus” model, which includes: purchase price, as well as costs processing, packaging, transport and promotion (Figure 5).

Figure 6. Forms of promotional activities at surveyed companies



Figure 7. Representation of certain standards in surveyed companies

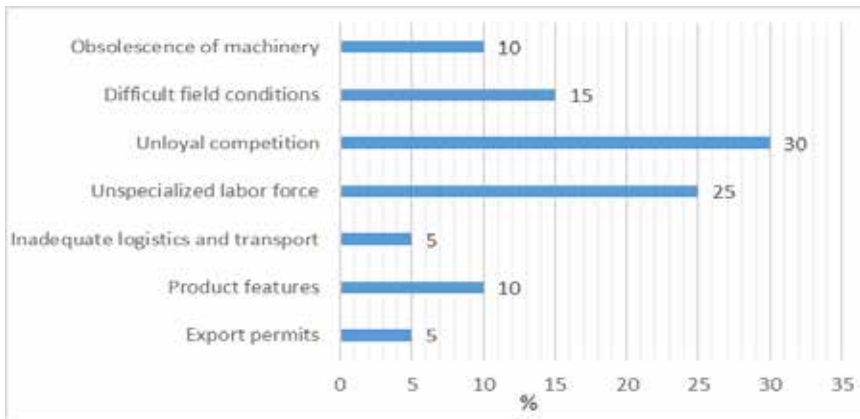


Source: original

The most represented form of promotion, among surveyed companies in the Central forest area, are fairs with 35%, followed by advertisements in the form of printed material (leaflets, posters, flyers, etc.) with a share of 31%, while other forms of promotional activities have a smaller representation (Figure 6).

Of the companies surveyed, 57% have so far adopted the HACCP standard, while the representation of the Organic food standard is 33%. Kosher and Halal standards were adopted by 5% of analyzed companies (*Figure 7*). The improvement in business after the adoption of the standard was emphasized by 81% of respondents. Fairs are one of the most common forms of promotion among the analyzed companies (Nedeljković, Keča, 2010), which is an effective way to present the product on the spot to a large number of potential consumers.

Figure 8. Problems in the business of the company



Source: original

The problem in the form of unfair competition was pointed out by 30% of the respondents, while in the case of unspecialized labor the share is slightly lower (25%) (*Figure 8*).

Figure 9. Problems on the market



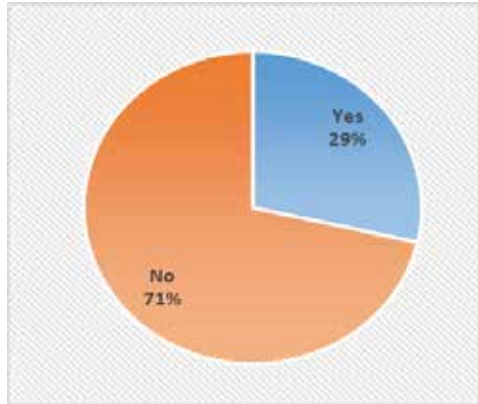
Figure 10. Forms of payment



Source: original

Billing was recognized by 65% of respondents as a problem in business, while the underdevelopment of the market was emphasized by 30% of respondents (*Figure 9*). 50% approve “postponed” payment, while “on delivery” payment is implemented by 33% of companies. Advance payment, as a form of payment, is the least represented and participates with 17% in the total payment structure (*Figure 10*).

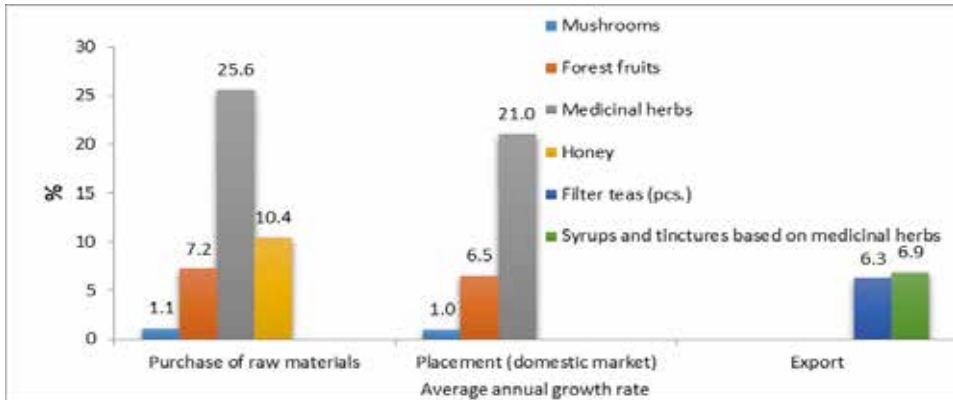
Figure 11. State support



Source: original

The largest number of companies (71%) did not use any form of state support and subsidies in their operations (*Figure 11*).

Figure 12. Average annual growth rates of purchase of raw materials, placement on the domestic market and export of NWFPs in the Central forest area

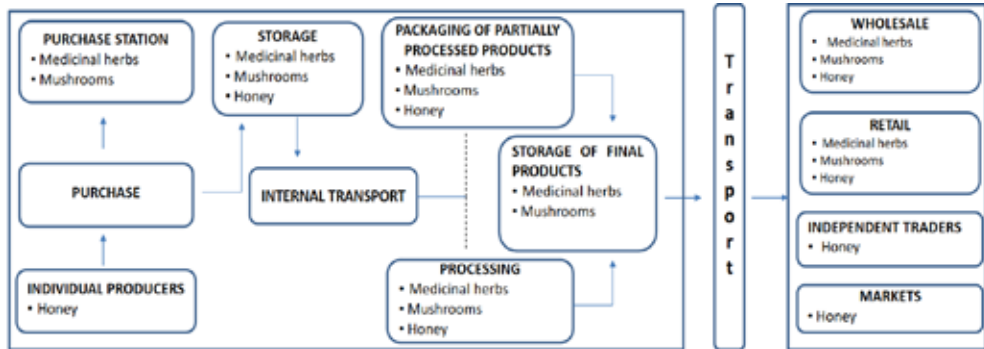


Source: original

According to the average annual growth rate, medicinal plants and products based on medicinal plants stood out, with a growth of 25.6% in purchase and placement on the domestic market of 21%. Filter teas and tinctures based on medicinal herbs achieved export growth of 6.3% and 6.9%, respectively. Forest fruits, in purchase, recorded a growth of 7.2%, while placement on the domestic market increased by 6.5%.

Mushrooms purchased and placed on the domestic market grew by 1.1% and 1% respectively (*Figure 12*). A significant increase in the dynamics of the purchase of raw materials and the placement of medicinal plants can be linked to the increasing orientation of the population towards natural products in the form of dietary supplements and for medical purposes.

Figure 13. Distribution of NWFPs



Source: Marčeta, 2023

In the specific case, the collected NWFPs are directed to purchase stations and organized points, where the purchase and sale of the raw product is carried out, where, after quantitative and qualitative control, the raw material is further distributed to companies that deal with their processing and placement.

Enterprises then store the raw material, then clean it and classify it according to certain qualitative categories. About one half of the analyzed companies, after such primary processing, place the NWFPs in the form of a semi-finished product further on the market. Other companies continue the process of creating additional value by subjecting these semi-products to various types of processing, then the final product is packed in individual, and then in collective (transport) packaging and deposited in the warehouse (*Figure 13*).

Conclusions

Based on the results of the research, it was determined that there is a statistically significant growing trend of total felling, average price and total income in the Central forest area in the period 2008-2017. Based on this, it can be concluded that oscillations in the realized quantities of wood assortments contributed to the appearance of extreme values in certain years (under the influence, primarily of the sale of stocks from previous years), which is why there was no verification of the statistical significance of the trend.

As for the NWFPs, the following conclusions stand out:

- the analyzed companies in their assortment are mostly oriented towards medicinal herbs and products based on medicinal herbs and honey, while the

final products stand out as: mixtures of medicinal herbs (26.7%), syrups and tinctures based on medicinal herbs (20%) and honey and pollen, with the same proportion;

- the most represented form of promotion, among surveyed companies, are trade fairs with 35%, followed by advertisements in the form of printed material (31%);
- of the companies surveyed, 57% have so far adopted the HACCP standard, Organic food 33%, while Kosher and Halal standards have been adopted by 5% of the analyzed companies;
- as a problem in business, respondents mostly emphasized unfair competition (30%);
- 65% of respondents recognized payment as a problem in business, while 30% of respondents emphasized the underdevelopment of the market;
- “postponed” payment is approved by 50%, while “on delivery” payment is realized by 33% of companies;
- the largest number of companies (71%) did not use any form of state support and subsidies in their business;
- according to the average annual growth rate, medicinal plants and products based on medicinal plants were singled out, with a growth of 25.6% in purchase and placement on the domestic market of 21%;
- filter teas and tinctures based on medicinal herbs achieved a growth in exports of 6.3% and 6.9%, respectively;
- forest fruits, in purchase, recorded a growth of 7.2%, while placement on the domestic market increased by 6.5%;
- mushrooms purchased and placed on the domestic market grew by 1.1% and 1%, respectively.

Based on the previously presented research, it can be concluded that the wood market is under the intense influence of the growing demand for wood as a product of certain properties. Analogous to the situation on the wood products market, growth trends are also present in the NWFPs. The reason for this is reflected in the global expansion of organic production and consumption of products of natural origin. The analyzed companies that deal with the purchase, processing and placement of natural resources are predominantly small family-owned and, as such, are to a significant extent the driving force behind the development of rural areas.

Precisely because of pronounced migrations of the population to more developed parts of the country and increasingly pronounced depopulation of rural areas, future development strategies should be directed towards the development of local entrepreneurship and sustainable use of natural resources. In such constellations, NWFPs represent a strategically important category, where through the education of the local population on the commercial importance of these products, along with

training on the method of collection and processing and the possibilities of placement, awareness of the possibilities that these products provide would be created in the future.

Conflict of interests

The authors declare no conflict of interest.

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