ECONOMIC JUSTIFICATION OF HONEY PRODUCTION IN SERBIA

Nebojša M. Nedić[1*], Marija M. Nikolić[1] and Senad E. Hopić[2]

[1]University of Belgrade, Faculty of Agriculture
Nemanjina 6, 11080 Belgrade, Serbia
[2]Ecocert Balkan, Glavna 22, 11080 Belgrade, Serbia

Abstract: Although beekeeping in Serbia has a long tradition, the interest of farmers for this branch of agricultural production depends on the expected economic benefits. Assessing the economic justification of beekeeping is based on the analysis of the revenues from honey production, as the main and often the only beekeeping product, and the expenses generated in production. The aim of the paper is to compare revenues and expenses in the production of honey and to determine the threshold of profitability. The calculation of the revenues and the expenses was made on the basis of data obtained from the survey of beekeepers and from the available secondary sources. The analysis showed that the profitability threshold was achieved with 68 colonies, or with production volume of 1,450 kg of honey. The values of the indicators of economic efficiency, productivity and profitability indicate that beekeeping was economically justified on farms with 100 and 200 colonies.

Key words: beekeeping, honey production, revenues, expenses, economic indicators.

Introduction

Beekeeping is one of the most important branches of Serbian agriculture, especially in the last few decades. The main product of beekeeping is honey, whereas the production of other products is low. Such a structure of bee products is the result of the fact that other products in beekeeping are labour-intensive and require frequent visits to the apiary. This can be achieved on the professional beekeeping farms, focused exclusively on this production, but such producers are in the minority, while more numerous are beekeepers with a smaller number of colonies.

The specialization in production defines not only the structure of assortment of final products, but also the revenues and expenses generated in production, which is reflected in the financial effects. The number of colonies determines the

[*]Corresponding author: e-mail: nedicn@agrif.bg.ac.rs

total volume of production of honey and other bee products, as well as the economic justification of beekeeping. Producers with a small number of colonies are more likely to practice stationary beekeeping and have less need for additional workers, which results in low production costs (Marinković and Nedić, 2010), and particularly in a small share of labour costs in the structure of total expenses. In addition, these farms generate lower incomes as a result of a smaller volume of honey production. Beekeepers with a large number of colonies have, as expected, higher expenses as a result of larger capacities and different production models that include mobile beekeeping, while labour costs represent the single most important cost item in the total production costs.

The financial success of the production of honey and other bee products depends on the differences in the production technology and structure of revenues and expenses. The aim of this paper is to examine the economic justification of honey production. In accordance with the aim of the research, three specific aims have been defined. The first specific aim is to realistically determine revenues and expenses in mobile beekeeping and to form the basis for calculating selected economic indicators. The second specific aim involves calculating gross margin, economic efficiency, profitability and productivity of labour, as indicators of the justification of honey production. The third specific aim is to determine the number of colonies that guarantees the covering of all costs and beyond which beekeepers can make a profit.

The beekeepers were divided into four categories (with 30, 50, 100 and 200 colonies) and total revenues and expenses were calculated for each group. Based on the obtained data, financial result, threshold of profitability and indicators of economic efficiency, profitability and productivity of production were calculated.

Worldwide, there are several researches focused on the same or similar topic. Vural and Karaman (2010) analysed economic aspects of beekeeping in Turkey within the three sub-groups of producers with 50, 51–100 and more than 101 beehives. Estimations were primarily based on the type of the beehives in use (conventional or technologically modernised). In addition, several estimations of profitability of honey production were done in Nigeria (Okpokiri et al., 2015), Ethiopia (Tarekegn et al., 2017), Iran (Vaziritabar and Esmaeilzade, 2016), and Canada (Laate, 2017).

Materials and Methods

The data used in analysis were collected from three sources. First, the data on the implemented technology and model of production in beekeeping were obtained from a survey conducted on a sample of 98 beekeepers from three regions of the Republic of Serbia (the Belgrade region, the region of southern and eastern Serbia and the region of Šumadija and western Serbia). The survey was conducted in 2017 and the face-to-face method was applied. The second group of data, which was

collected on the market, includes prices of the input used in beekeeping and the final product. The third group of data was collected through the interviews with selected producers and based on good beekeeping practices, such as expected consumption, engaged labour force, and quantities of inputs.

Using collected data, the calculation of revenues and expenses of beekeeping by groups of producers was made and several economic indicators of beekeeping were presented. These indicators comprised financial result, gross margin, profitability threshold, and indicators of economic efficiency, profitability and productivity.

The financial result is defined as a difference between total incomes and total expenses, and represents the basic indicator of economic success.

Gross margin is an indicator that is increasingly used in business analysis of farms (Pejanović, 2009). It is calculated as the difference in production value and variable costs, where production value is obtained as the product of selling price and volume of production. When the fixed costs are deducted from the gross margin, the achieved profit is obtained. Since there are several ways of calculating gross margin (Ivanović et al., 2018), it is important to emphasise that, in this paper, subsidies were not included in total revenues when calculating gross margin.

Economic efficiency shows total amount of output that can be obtained on the basis of total investments over a certain period of time. It is calculated as the ratio between total revenues and total costs.

Profitability is an indicator of business success that measures the ability of an enterprise to achieve the best (financial) result with resources invested. While profitability can be calculated in several ways, in this paper it was obtained as the ratio between the financial result and total revenues.

Productivity of labour is equal to the ratio between produced outputs and the amount of labour invested. It also shows the amount of revenue generated per one working hour invested in production. The total numbers of working hours in this analysis were calculated as the sum of hours of permanent workers (beekeepers) and seasonal workers (hired for extracting the honey and moving the beehives). Productivity was calculated as the ratio between the financial result and the total number of working hours.

In addition to these indicators, the profitability threshold was determined as the volume of production that covered total costs, or as the point at which a farm began to make a positive financial result.

Results and Discussion

The number of beehives in Serbia has been continuously increasing since 2007, from 434 to 849 thousand in 2017. According to the results of the 2012 Census of Agriculture in the Republic of Serbia, there are 31,287 beekeeping farms, or 4.95% of the total number of farms. Most of these farms are located in

the regions of Šumadija and western Serbia (48%) and southern and eastern Serbia (37%). Beekeepers in Serbia are represented by more than 230 associations.

Natural factors and the quality of bee pasture have a great influence on the production of honey. The maximum production of the most important bee product in the same period was recorded in 2015 (over 12 thousand tons), while in 2017 more than seven thousand tons were produced, which is slightly below the average in the last decade. The increased number of beehives is partly the result of support to beekeepers by the Ministry of Agriculture and local governments, as well as a good organisation of beekeepers (MAFWM, 2018). One of the important reasons for the increased interest and occupation in beekeeping is the appearance of export-oriented companies involved in purchase, processing and distribution of honey, which individually have a large market share in Serbia and guarantee to producers the access to market.

A significant part of the total production of honey (about 28%) in Serbia is produced by professional beekeepers with more than 100 beehives (Marinković and Nedić, 2010), but the fragmentation of production (characteristic for the whole Serbian agriculture) is also present in beekeeping, which means that great quantities of honey are produced by beekeepers with smaller capacities.

Honey is an important export product. The average export of honey from Sebia in the period 2012–2017 was 2,477 tons, in the value of 10,844 thousand US dollars. The most important export area is the EU that absorbs 67.7% of exports, while 18% of the exported quantities of honey were placed on the CEFTA market.

In order to examine the economic justification of beekeeping and to determine the profitability threshold, it was necessary to adopt certain assumptions. The first assumption in the analysis was that beekeepers practice conventional honey production, and all producers practice mobile beekeeping. The beekeeping farms were divided into four groups according to the number of bee colonies, with 30, 50, 100 and 200 colonies. The minimum number was defined according to the number of beehives necessary to obtain the right to subsidies in production. This classification is in accordance with previous research at the national level, related to the number of beehives and the distinction between hobby and professional beekeepers. Hobby beekeepers have 20 hives, advanced hobby beekeepers operate with 50 hives, semi-professional beekeepers have 100 hives, and professional beekeepers run a business with more than 150 hives (Zarić et al., 2013).

Revenues and expenses in the production of honey

The total revenues include revenues from sales of honey and wax and subsidies per hive. Revenues from the sales of honey are generated as a result of the number of hives, honey yield per hive and market prices. According to the research results, the average yield per beehive in the whole sample was 22.2 kg,

which is consistent with the previous studies where the average honey yield per beehive in Serbia was 21.6 kg (Panchev et al., 2014), or ranging from 11 to 23 kg (Marinković and Nedić, 2010). There were oscillations per groups of beekeepers, and the highest yield per beehive of 24.0 kg was recorded on beekeeper farms with 200 colonies.

Beekeepers in Serbia sell honey to processors or directly to consumers at green markets, fairs or on the "farm gate" (Pihler et al., 2017). The research results indicate that part of the produced honey was not sold on market, but it was retained on farms for natural consumption, gifts and promotion, and investment in production during the year, in order to reduce production costs. The quantity of produced honey kept on farms varied depending on the production volume and the number of colonies. Beekeepers in the first group (with 30 colonies) kept one fifth of production for their own needs, while the remaining 80% were sold either on the "farm gate" or on the local market, where honey was sold at retail prices. Beekeepers with 50 colonies also retained a fifth of total honey production, 55% sold in retail, and one quarter was delivered to big buyers. Beekeepers with 100 colonies had the following structure: 10% of the total quantities were retained, 20% sold in retail and 70% sold to big buyers. Finally, beekeepers with 200 colonies retained 10% of production and the same percent sold in retail, and most (80%) handed over to big buyers. Total revenues from the sale of honey were made (Table 1) based on the answers of surveyed beekeepers. The structure of the beekeepers' revenues confirms that honey was the most important product of this branch, given that revenues from sale of honey accounted for about 90% of total revenues.

In addition to revenues from sale of products, beekeepers also have the right to subsidies. The incentives in conventional production of honey in 2017 were paid to the following subjects: legal entities, entrepreneurs and physical persons – owners of commercial agricultural farms. These legal persons, in addition to the conditions prescribed by the law regulating incentives in agriculture and rural development, were supposed to have at least twenty beehives (Official Gazette of the Republic of Serbia, No. 14/2016). The amount of these incentives was 720 RSD per beehive (Official Gazette of the Republic of Serbia, No. 18/2018). Unlike in previous years, when all beekeepers with at least 20 beehives had the right to subsidies, in 2018 subsidies per beehive were paid for at least 30 and up to 200 beehives (Official Gazette of the Republic of Serbia, No. 20/2018). The worst damage caused by changes in conditions for gaining the right to subsidies was made to professional beekeepers having more than 200 beehives. The analysis showed that between 5.4% and 8.4% of total revenues came from subsidies, and the increase in the number of beehives caused the growth of the share of subsidies in total revenues (Table 1).

The effects of subsidies depended on the available capacity on beekeeping farms. The share of subsidies in the revenue structure of beekeepers with fewer

beehives was relatively modest, so the effects of these investments were limited. An increased number of beehives resulted in a higher participation of subsidies in the structure of total revenues, which indicates their importance and connection to the overall financial result. Previous research confirms these conclusions. Namely, Nikolić et al. (2018) found that subsidies have a statistically significant influence on the net profits of farms engaged in livestock production. Therefore, the reduction of subsidies has a negative impact on the amount and structure of revenues, and the overall financial result of beekeeping farms, which points to the need for consistency in the application of agricultural policy measures.

Table 1. Total revenues from beekeeping by categories of beekeeping farms.

Type of revenues		Number of colonies			
		30	50	100	200
Value of honey	RSD	372,960	493,095	759,808	1,534,080
	Participation (%)	93.1	91.5	89.3	89.1
Value of wax	RSD	5,995	9,585	19,080	43,200
	Participation (%)	1.5	1.8	2.2	2.5
Revenues from sales of products	RSD	378,954	502,680	778,888	1,577,280
	Participation (%)	94.6	93.3	91.5	91.6
Subsidies in honey production	RSD	21,600	36,000	72,000	144,000
	Participation (%)	5.4	6.7	8.5	8.4
Total revenues (RSD)		400,554	538,680	850,888	1,721,280

Source: Authors' calculation.

Changes in the conditions for gaining the right to incentives in agriculture are a serious limitation in production planning. The beekeepers in Serbia are relatively well-connected by the national organisation called Beekeeping Association of Serbia (SPOS). According to data presented on the website of this organisation, the correction of the conditions regulating the right to incentives can be expected in 2019. The lower level should be re-defined to be 20, while the maximum number of beehives should be one thousand. This is an example how lobbying of nationally representative organisations can be the basis for long-term production planning and consistency in supporting farmers, including beekeepers.

Expenses in conventional beekeeping can be divided into fixed and variable costs. Fixed costs have the same amount regardless of the intensity of capacity utilisation or the changes in production volume. Variable costs vary with the change in production volume and include costs of feeding bees, inputs per product unit, veterinary services, engagement of seasonal labour, fuel costs, lubricants and machinery maintenance, and other variable costs (Ivanović et al., 2018).

The fixed costs include depreciation, the gross wage of beekeepers, or the permanent labour costs, and other fixed costs. Depreciation includes depreciation of equipment, beehives and vehicles (only to the extent used for beekeeping

purposes). Investments in capital assets in beekeeping are high, but the useful life is relatively long and implemented rates of depreciation are low (Knaus and Milotić, 2001). The starting assumption in this analysis, when calculating the depreciation costs, is that the value of beekeeping equipment increases with the number of beehives, from 250 to 1,600 euros. The estimated useful life of the capital assets in the calculation is 12 years, and the linear depreciation rate is applied. Depreciation costs increased linearly according to the number of beehives, being the lowest with 7.1% in the case of beekeepers with 30 beehives and the highest with 14.5% in the case of beekeepers with 200 beehives. This is consistent with previous studies (Marinković and Nedić, 2010), although they can exceed 18%, depending on the available equipment (Yildirim and Agar, 2008).

Other fixed costs are those that do not fluctuate with changes in the production level. They include costs related to the sale of products, or the lease of stalls (if other marketing channels, in addition to farm gate sale, are used); membership fees in associations; and analysis of honey quality twice per year, which should be implemented regardless of the marketing channel (Figure 1).
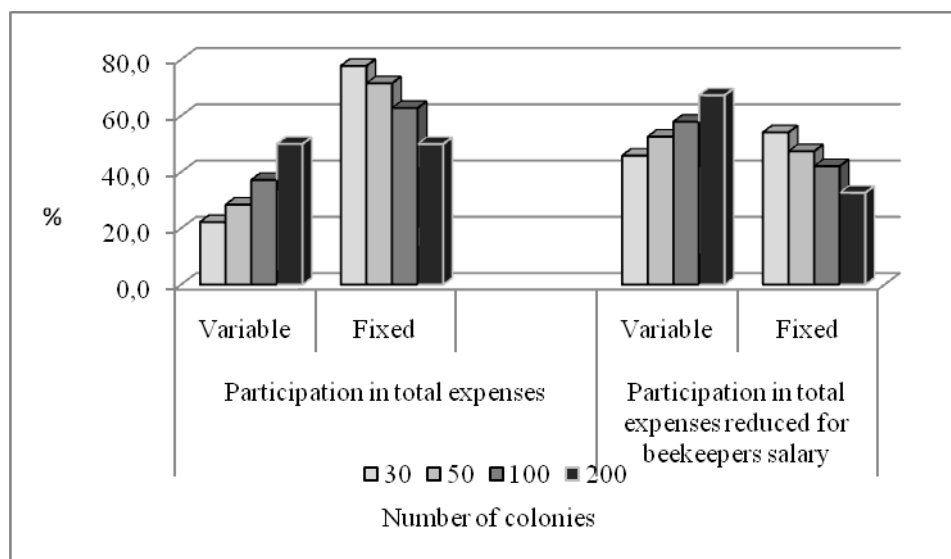

Figure 1. The share of fixed and variable costs in total revenues and revenues reduced for the salary of producers by categories of beekeeping farms.
Source: Authors' calculation.

A particularly important item in the analysis of economic justification of honey production is the costs of permanent labour. Some authors state that labour costs, depending on farm organisation, can be considered as fixed or variable

(Jeločnik et al., 2011). In this analysis, the fixed costs included the ones of engaging permanent workers (beekeepers), while the costs of seasonal workers were classified as variable costs, according to the division of costs in calculating the gross margin (Ivanović et al., 2018).

In addition to the dilemmas regarding the classification of labour costs as fixed or variable, there are also different approaches in the literature related to what items should be included in labour costs. Some authors do not include labour costs in beekeeping calculations, assuming that all the work in the apiary is performed by members of a household (Knaus and Milotić, 2001). The second approach implies that only compulsory contributions to the pension fund are included in the costs of permanent labour (Gugić et al., 2010), which means that the profit generated in the production represents the beekeeper's income.

In order to estimate revenues and expenses and calculate economic indicators at the real level, the costs of permanent labour presented in the calculation in this paper included a regular contribution for the compulsory pension fund and beekeepers' salaries. In the calculation, it was assumed that farmers allocate funds for their own salaries on the level of minimum wage in Republic of Serbia. These expenses significantly increased total costs. This relates especially to beekeepers' salaries which independently made more than a half (51.5%) of the total costs in the group of beekeepers with 30 colonies, and 24.7% of the total costs in the group of beekeepers with 200 colonies. However, this is consistent with other studies (Yildirim and Agar, 2008; Marinković and Nedić, 2010). This approach implies that the profit remaining after the payment of all variable and fixed costs represents the net profit of beekeepers.

The variable costs included the costs of purchasing inputs for production, engagement of a veterinarian, maintenance and moving beehives, packaging, seasonal workers, and other variable costs (Table 2). The calculation of these costs was based on the answers of the surveyed beekeepers.

For protection against *Varroa destructor*, beekeepers usually use conventional synthetic acaricides with different active substances during the active bee season. In the period without a brood, mainly in December, the treatment with oxalic acid is scheduled, which is relatively inexpensive and does not burden production in a financial sense. Since more than half of the interviewed beekeepers consulted a veterinarian during the production cycle (55.1% versus 44.9% who did not use this type of service), the costs of engaging veterinarians were also foreseen.

The costs of maintaining the beehives included painting, wire replacement on the frames, and possibly replacement of some worn parts. Replacement costs included replacement of queen bees, frames and wax foundation in the apiary. According to the results of the research conducted, a half of the respondents replaced up to 30% of queen bees per year, which was adopted as the basis for calculating these costs. It was also planned to replace the old honey combs at the

10% level per year, or three frames with an old honey comb, and the same principle was applied in calculating the costs of replacing wax foundation.

The costs of feeding bees were calculated on the assumption that beekeepers use 10 kg of sugar and two "sugar candies" per year, based on the results of the survey, where 77.6% of the surveyed beekeepers stated that they used sugar and 78.6% used "sugar candies" for feeding the bees.

Table 2. Calculation of the expenses of beekeeping by categories of beekeeping farms (RSD).

Type of costs	Number of colonies			
	30	50	100	200
Variable costs:				
Feeding	29.580	49.300	98.600	197.200
Drugs and veterinary service	7.320	11.400	21.600	42.000
Beehive maintenance and material replacement	25.470	42.450	84.900	169.800
Moving of beehives	12.000	12.000	12.000	24.000
Packaging costs for products sold in retail	23.177	27.477	21.624	31.680
Seasonal workers	7.200	12.600	25.200	43.200
Other variable costs	12.000	12.000	18.000	18.000
Total variable costs	116.747	167.227	281.924	525.880
Fixed costs:				
Depreciation of equipment and beehives	37.500	47.500	102.000	152.000
Compulsory contributions to pension fund for permanent labour (beekeeper)	71.991	71.991	71.991	71.991
Beekeeper's salary	270.400	270.400	270.400	270.400
Other fixed costs	28.200	31.200	31.200	31.200
Total fixed costs	408.091	421.091	475.591	525.591
Total expenses reduced for beekeeper's salary	254.438	317.918	487.115	781.071
Total expenses	524.838	588.318	757.515	1.051.471

Source: Authors' calculation.

Beekeepers with a smaller number of colonies decide more often to practice stationary beekeeping, although better financial results are achieved with mobile beekeeping, as a result of higher yields per beehive that can be achieved (Grgić et al., 2014; Pihler et al., 2017). Since this analysis included beekeepers that can be classified as medium and large producers in conditions characteristic for Serbia, it was assumed that the production process would involve one moving of beehives at a distance of up to 100 km. The additional reason for the calculation of the expenses based on mobile beekeeping is the results of the survey, according to which almost half of the beekeepers practiced this production system (49.0%), which is more than in the previous survey according to which only one third of beekeepers (32.6%) in the south of Serbia moves beehives (Panchev et al., 2014).

Depending on the number of hives, beekeepers used different marketing channels for honey. When they sold products to big buyers, they used returnable

packaging, but for the retail of honey, appropriate packaging was necessary. This practice affected the level of packaging costs. Beekeepers with 100 beehives, who sold a significant part of their production in wholesale, did not have packaging costs for that part of production, because they used returnable packaging. Opposite to this, beekeepers with 50 beehives sold larger quantities in retail, which requires the purchase of adequate packaging, so their costs in this segment were higher (Table 2).

The majority of surveyed beekeepers (53.3%) used glass jars in which they packed one kilogram of honey. Honey is a homogeneous product, so it is hard to notice the difference between two samples of honey from different producers. Therefore, it is necessary to ensure the product recognition according to the packaging. Most beekeepers packed their honey into standard glass jars that are used for a variety of different products, which additionally made it difficult to differentiate the product. Responding to the need of their members, the Beekeeping Association of Serbia created a glass jar of specific shape, which members of this organisation used to pack their products. Using such packaging could have multiple benefits. In addition to ensuring product differentiation, this packaging could also serve as quality insurance (Pihler et al., 2017).

The variable costs included costs of seasonal workers engaged in moving hives and extracting honey. Significant sources of seasonal labour on small-scale beekeeping farms were members of a household, whereby the costs of their engagement were not included in total costs. Therefore, the engagement of "family labour" is essential for the sustainability of beekeeping farms (Yildirim and Agar, 2008; Okpokiri et al., 2015). The calculation presented in this paper follows the assumption that seasonal workers are not members of the household, and the costs of their engagement include only their income per working day.

The number of workers required for moving hives depended on their number. Costs were calculated on the assumption that for moving 25 hives two workers are required, for moving 50 hives three workers, for 100 hives six workers and for 200 hives 16 workers. A similar approach was used to calculate the required number of workers for extracting honey, but this process also depended on the applied technology and the equipment that beekeepers used.

The other variable costs included fuel costs for visiting the stationary apiary, fairs, exhibitions and conducting other business activities.

Economic indicators of honey production

The revenues and expenses presented in the conducted analysis enabled calculation of a large number of economic indicators of honey production.

Based on the variable costs and revenues, it was possible to calculate the gross margin. Gross margin shows the amount of funds available for covering fixed costs

and achieving a positive financial result (Jeločnik et al., 2011). Results of the analysis showed that all farms had a positive gross margin, or that the value of production without subsidies was higher than the variable costs in all groups of beekeepers. The level of gross margin points to available funds for the payment of fixed costs and making profit. Starting from the viewpoint that a higher gross margin implies less risky business (Pejanović, 2009), it can be concluded that the increase in the number of colonies decreases the business risk.

The most important item in a structure of total costs was the permanent labour, especially beekeepers' salaries, which was classified as fixed costs. High fixed costs are a significant burden, especially for small-scale beekeeping farms. Comparing total revenues and expenses, it can be concluded that farms with 30 and 50 colonies did not generate sufficient income to cover variable and fixed costs and they had a negative financial result, while farms with 100 and 200 colonies operated with profit (Table 3). It should be pointed out, however, that if beekeepers' salaries were excluded from total expenses, all beekeeping farms would have a positive financial result, meaning that all beekeepers would generate sufficient incomes to cover all types of costs.

Table 3. Economic indicators by categories of beekeeping farms (RSD).

Economic indicators	Number of beehives			
	30	50	100	200
Revenues of sales of products	378,954	502,680	778,888	1,577,280
Total revenues	400,554	538,680	850,888	1,721,280
Variable costs	116,747	167,227	281,924	525,880
Gross margin	262,207	335,453	496,964	1,051,400
Fixed costs	408,091	421,091	475,591	525,591
Total expenses	524,838	588,318	757,515	1,051,471
Financial result	-124,284	-49,638	93,373	669,809
Economic efficiency	-	-	1.12	1.64
Profitability	-	-	10.97	38.91
Productivity of labour	-	-	71.17	302.26

Source: Authors' calculation.

The results obtained imply the necessity to determine the profitability threshold, or the production volume where revenues become equal with expenses. Production volume higher than the profitability threshold means that a farm generates profit, while a smaller production volume implies that a farm will operate at a loss. The profitability threshold in the conducted research was 68 colonies, or 1,450 kg of honey. Farms with higher number of colonies than the defined threshold generated enough revenue from the sold products and subsidies to cover all fixed and variable costs.

It is difficult to compare revenues, expenses, and financial result obtained in research with studies conducted in other countries and time periods, because these

three indicators are determined by market prices of inputs and final products that were susceptible to change. However, results of the research conducted in Croatia by Knaus and Milotić (2001) are interesting. They determined that a beekeeper should have at least 168 colonies in order to achieve compensation for the work on the level of average wage in the country. The results of conducted analysis showed that in Serbia it was necessary to have 68 colonies, or to produce at least 1,450 kg of honey in order for a producer to earn a minimum wage at the republic level. If a beekeeper in Serbia strives to earn the salary on the level of national average wage, s/he should have at least 137 colonies or to produce 2,905 kg of honey.

Economic efficiency is the principle which puts total revenues and expenses incurred in production into the ratio. It was calculated for farms with a positive financial result. According to the conducted research, the level of economic efficiency increased with farm size, being the lowest on farms with 100 colonies, where economic efficiency was 1.12 (Table 3), which means that for every dinar invested in production, 1.12 dinars of income were realised. The level of economic efficiency was the highest on farms with 200 colonies. In these farms for every invested dinar, 1.64 dinars were earned. The obtained results are consistent with the ones of previous studies (Marinković and Nedić, 2010; Gugić et al., 2010), although other studies indicate higher values of the coefficient of economic efficiency (Yildirim and Agar, 2008).

Profitability points to the business outcome whereby profitable farms are those having generated more revenues than expenses or reached a positive financial result, while farms operating with a loss are considered unprofitable (Pejanović, 2009). According to the estimation of economic efficiency, beekeepers with 30 and 50 colonies operated without profit, while farms with 100 and 200 colonies were profitable.

Labour productivity is the ratio between working hours and certain financial indicators. Based on the methodology used in this analysis, the calculated productivity shows how many units of a financial result were generated per unit of working hours. Higher productivity was achieved on farms with 200 colonies.

Continuous monitoring and evaluation of the achieved results are necessary in order to improve the economic efficiency and profitability (Todorović and Filipović, 2010). The significance of the obtained results can be confirmed through dynamic analysis, which can be conducted in future research.

Conclusion

Economic indicators of honey production in apiaries with 30, 50, 100 and 200 colonies were analysed in the paper. Total revenue was calculated as the sum of incomes generated from the sale of honey and wax and subsidies per beehive. The total expenses were divided into fixed and variable. Fixed costs included

depreciation of capital assets, gross compensation for the labour of beekeepers and other fixed costs. Variable costs included input costs, veterinary services, packaging, moving beehives, cost of seasonal workers and other variable costs.

Beekeeping farms with 30 and 50 colonies had a negative financial result, or their business operated at a loss. The profitability threshold was achieved at the production level of 1,450 kg of honey or with 68 colonies. Above this level of production, beekeepers can make a profit, or they can generate enough revenues to cover all costs, including the payment of salary on the level of minimum wage in the Republic of Serbia.

The values of economic indicators of economic efficiency, profitability and labour productivity showed that the production of honey on farms with 100 and 200 colonies was economically justified.

The obtained results are important for beekeepers in terms of assessing the expected economic effects of honey production, but also for the agrarian policy makers in order to understand the significance of subsidies in the production of honey. Therefore, further research suggests dynamic monitoring of selected indicators of honey production on a representative predefined sample of producers in order to determine the effects of subsidies and their development potential.

Acknowledgments

References

Grgić, Z., Šakić Bobić, B., Očić, V., Filipi, J., & Brajković, J. (2014). Economics of mountain meadow honey production in the Gacka River valley. In: S. Marić, Z. Lončarić (Ed.), *Zbornik radova 49. hrvatskog i 9. međunarodnog simpozija agronoma* (pp. 509-513). Dubrovnik.

Gugić, J., Par, V., Njavro, M., & Matijaš, J. (2010). Economic efficiency of the beekeeping and olive production family farm. *Agronomski glasnik: Glasilo Hrvatskog agronomskog društva*, 72 (6), 331-344.

Ivanović, S., Vasiljević, Z., & Todorović, S. (2018). Utvrđivanje marže pokrića po FADN metodologiji u ratarskoj proizvodnji. U: D. Radivojević (Ed.) *Transfer znanja od Poljoprivrednog fakulteta ka poljoprivrednim proizvođačima – zajedno do bezbednih i konkurentnih proizvoda* (pp. 81-87). Beograd – Zemun.

Jeločnik, M., Ivanović, L., & Subić, J. (2011). Analysis of variable costs coverage in apple production. *Škola biznisa, 2,* 42-49.

Knaus, K., & Milotić, A. (2001). Income of family farms from bee-keeping in Istrian county. *Stočarstvo, 55* (3), 227-234.

Laate, E.A. (2017). Economics of beekeeping in Alberta 2016, Economics Section, Economics and Competitiveness Branch, Alberta. Agriculture and Forestry, Edmonton, Canada, 81, www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/econ16542/$FILE/Beekeeping2016.pdf

Marinković, S., & Nedić, N. (2010). Analysis of production and competitiveness on small beekeeping farms in selected districts of Serbia. *Applied Studies in Agribusiness and Commerce – APSTRACT, 3-4*, 1-5.

Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia – MAFWM (2018). Izveštaj o stanju u poljoprivredi u Republici Srbiji u 2017. godini, knjiga II – Pregled po poljoprivrednim tržištima.

Nikolić Đorić, E., Vukoje, V. & Miljatović, A. (2018). Statistička analiza FADN rezultata poljoprivrednih gazdinstava Vojvodine. *Agroekonomika, 47* (79), 39-50.

Official Gazette of the Republic of Serbia (2016). *Rulebook on the conditions and manner of exercising the right to incentives in livestock breeding per beehive*. No. 14/2016.

Official Gazette of the Republic of Serbia (2018). *Regulation on the distribution of incentives in agriculture and rural development*. No. 18/2018.

Official Gazette of the Republic of Serbia (2018). *Rulebook on the conditions and manner of exercising the right to incentives in livestock breeding per beehive*. No. 20/2018.

Okpokiri, C.I., Nwachukwu, I.N., & Onwusiribe, C.N. (2015). Determinants and Profitability of honey production in Ikwuano local Government Area, Abia State, Nigeria. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, 15* (3), 211-216.

Panchev, H., Georgiev A., Vasileva, B., Georgiev M., Ševarlić, M., Nikolić, M., Nedić, N., Aćić S., Spasojević V., & Ilić N. (2014). Joint Report: Analysis of the beekeeping sector in Sofia District, Montana District, Nishava District and Pirot District. Project No. 2007CB16IPO006-2011-2-96: The beekeeping as an alternative to the unemployment and a steady base for a sustainable development in the Bulgarian-Serbian cross-border region. Bulgaria–Serbia IPA Cross-border Programme, 2014:242.

Pejanović, R. (2009). Agrieconomical analysis of agricultural subjects. *Škola biznisa, 4*, 3-13.

Pihler, I., Nedić, N., & Plavša, N. (2017). Modern concept to improving a beekeeping production. In: S. Trifunović (Ed.) *The International Symposium on Animal Science (ISAS) 2017* (389-396). Herceg Novi.

Tarekegn, K., Haji, J., & Tegegne, B. (2017). Profitability of Honey Production and Honey Market Performance in Chena District of Kaffazone, SNNPR, Ethiopia. *International Journal of Research Studies in Science, Engineering and Technology, 4* (10), 30-36.

Todorović, S., & Filipović, N. S. (2010). Economic analysis of wheat production on family farms. *Journal of Agricultural Sciences, 55* (1), 79-87.

Vaziritabar, S., & Esmaeilzade, S.M. (2016). Profitability and socio-economic analysis of beekeeping and honey production in Karaj state, Iran. *Journal of Entomology and Zoology Studies, 4* (4), 1341-1350.

Vural, H., & Karaman, S. (2010). Socio-economic analysis of beekeeping and the effects of beehive types on honey production. *African Journal of Agricultural Research*, 5 (22), 3003-3008.

Yildirim, I., & Agar, S. (2008). The Influence of Scale on the Profitability of Honey Beekeeping Enterprises in Eastern Part of Turkey. *Asian Journal of Animal and Veterinary Advances, 3*, 314-320.

Zarić, V., Vasiljević, Z., Nedić, N., & Petković, D. (2013). The marketing strategies of Serbian honey producers. *Applied Studies in Agrobusiness and Commerce, 7* (2-3), 27-31.

EKONOMSKA OPRAVDANOST PROIZVODNJE MEDA U SRBIJI

Nebojša M. Nedić[1][*], Marija M. Nikolić [1] i Senad E. Hopić[2]

[1]Univerzitet u Beogradu, Poljoprivredni fakultet
Nemanjina 6, 11080 Beograd, Srbija
[2]Ecocert Balkan, Glavna 22, 11080 Beograd, Srbija

R e z i m e

Iako pčelarstvo u Srbiji ima dugu tradiciju, zainteresovanost poljoprivrednika za ovu granu poljoprivredne proizvodnje zavisi od ekonomskih koristi koje mogu da očekuju. Sagledavanje prihoda od proizvodnje meda, kao glavnog a često i jedinog proizvoda pčelarstva i troškova koji nastaju u proizvodnji predstavlja osnovu za ocenu ekonomske opravdanosti ove delatnosti. Cilj rada je da se izvrši poređenje prihoda i troškova u proizvodnji meda, kao i da se utvrdi prag rentabilnosti proizvodnje. Kalkulacija prihoda i troškova je sačinjena na osnovu podataka koji su prikupljeni anketiranjem pčelara i iz dostupnih sekundarnih izvora. Sprovedena analiza ukazuje da se prag rentabilnosti ostvaruje sa 68 pčelinjih društava, odnosno pri obimu proizvodnje od 1.450 kg meda. Vrednosti pokazatelja ekonomičnosti, produktivnosti i rentabilnosti ukazuju da je pčelarenje ekonomski opravdano na gazdinstvima sa 100 i 200 pčelinjih društava.

Ključne reči: pčelarstvo, proizvodnja meda, prihodi, rashodi, ekonomska opravdanost.

[*]Autor za kontakt: e-mail: nedicn@agrif.bg.ac.rs