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ANALYSIS OF PRODUCTION AND COMPETITIVENESS ON SMALL BEEKEEPING FARMS IN SELECTED DISTRICTS OF SERBIA

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Abstract: The study researched the costs and returns on typical small beekeeping farms from five districts in Serbia. On the basis of the field research, data on the number of beehives, type of product, volume of production per beehive and values per measurement unit were collected. In order to demonstrate the competitiveness of various apicultural products, analysis of the available data was performed using analytical calculations. According to the analysis, the labour costs comprise about 49.65% to 64.15% of the variable costs on beekeeping farms in the Raška and Šumadija districts, respectively. Production is most economical on the bee farm in the district of Srem, where every dinar spent in production creates a value of 2.22 dinars, while the farm from the district of Raška is the least economical (1.32 din). Bee farms must reduce labour costs and re-direct their business orientation to other bee products, besides honey, such as pollen, which could be significantly more profitable.

Key words: small beekeeping farms, honey, economy

Introduction

Since 1980, global honey production has constantly been increasing, exceeding a million tons annually for the first time in 1983. In 2004, global honey production amounted to approximately 1.37 million tons, which is approximately 29.9% more than production in the 1980's. The largest part of this production was realized in Asia (36.8%), Europe (22.6%), North America (16.0%), and Africa (11.3%), South America (11,0%) and Oceania (2.3%) (*Guoda* and *Chun*, 2003).

The main apicultural product in Serbia is honey, while production of other bee products (pollen, propolis and beebread) is minimal. However, taking into account the agro-ecological conditions, there are some exceptions, such as in the district of Srem, where due to widespread distribution of pollen plants, beekeepers are oriented towards collection of pollen powder. Their total annual production is 10 t of pollen, most of which is used in the production of bee food (pollen sugar patty) or in honey mixtures, and similarly to this practice, royal jelly and propolis are also used for honey mixtures.

The average production of honey in Serbia in 2001 was 2.667 tons, and in 2007 it was increased to 3.538 tons (*Statistical Annual*, 2002; 2008). Central Serbia participates in the total production of honey with 89%, and Vojvodina with 11%.

Consumption of honey in Serbia per capita is still low and in 2004 (as per FAO data) it amounted to 0.37 kg annually. Globally, the largest average annual honey consumption per capita is in the Central African Republic – 3.3 kg, followed by New Zealand with 2.5 kg, then Angola, Austria and Greece with 1.6 kg. Switzerland, Cyprus, Slovenia and Ukraine also has an average honey consumption per capita of over 1 kg (*Munćan* and *Božić*, 2007). The possibilities for development of apiculture production are, from the aspect of natural conditions, very favorable, therefore in Serbia it would be possible to breed up to 800.000 bee colonies, meaning that the current utilization of possibilities is only 33.4%.

Companies, and particularly beekeeping farms, must have competitive advantages, i.e. they must have advantages over competing companies by offering better value to consumers, either through lower prices or by providing more benefits which would justify higher prices (*Kotler* and *Armstrong*, 2008). Beekeepers must be aware of their competitors. Since they produce similar products, they are exposed to direct competition. In addition, there are a number of importers of honey from countries where the price of honey is much lower than it is on the domestic market. For countries with a small market, such as ours, the international market is an important element. There are opportunities for export of honey from our country to the West European and Arabian market. In order to increase export, reduce domestic honey reserves, and thereby increase domestic production, in 2007, the Ministry of Agriculture included for the first time honey amongst products subject to export stimulation, subsidizing its production by 20% of the exported goods value. Stimulation of honey export has already shown results, taking into account that by the end of 2007 about 100 t of

honey were exported to country members of the EU (*Terzić*, 2008). Bearing in mind that the price of domestic honey is somewhat higher than in the surrounding countries, competitiveness could be achieved only by increasing production and reducing costs. In beekeeping the possibility of better product advertising should be considered, as other products in the group of indirect competition are much better advertised.

Measures for stimulating programs for development and improvement of apiculture in the Republic of Serbia undertaken by the Government, through its resource Ministry of Agriculture, Forestry and Water Management have been more intensive since 2004, when for the first time apiculture was equalized with other branches of livestock breeding as regards supportive measures, through programs of selection measures in apiculture. In the same year, agricultural producers, including beekeepers, were enabled to use loans in the amount of 100.000 €in accordance with the Decree on Loan Granting to Agricultural Producers. In 2006, during implementation of the Agreement on Stabilization and Association and liberalization of customs rates, for honey (customs code 0409), the Ministry of Agriculture applied a delayed method of liberalization, the purpose of which was protection of domestic honey producers during the following time period by maintaining, for the import of honey, a high customs rate of 30% plus 15 dinars duty on each kilo of imported honey (*Terzić*, 2008).

Materials and Methods

In this study, where were used data from typical small beekeeping farms (BF) from five districts in Serbia: district of Raška, (BF1), Kolubara district (BF2), district of Banat (BF3), district of Srem (BF4) and Šumadija district (BF5). The records in this study could not be obtained from official statistics records, but were obtained on the basis of field research. A prerequisite for the analysis of competitiveness is the availability of corresponding records. In view of the current situation and scarce availability of official data in Serbia as regards competitiveness in apiculture, this analysis was based on previously conducted field studies. The following data were collected from the researched subjects: number of beehives, type of product, volume of production per beehive and value per measurement unit. The selected producers are representative professional beekeepers from each district and beekeepers owning Langstrot Rut (LR) beehives, which are well-known for this kind of production in the world. Field research was conducted during the period of 2005–2008 when the conditions for production of honey and honey products were different. The calculation includes data reflecting average yields in an average production year. The prices of products and costs are calculated on the basis of records from 2008 when the average value of 1€was 82 dinars.

In accordance with the goal of the research, analysis of the available data was performed by applying analitical calculations of the production of bee products where the direct costs of material, direct costs of production services, depreciation of beehives and direct costs of labor were included. Economy of production was calculated on the basis of the calculated value of small beekeeping farms and their costs.

Results and Discussion

Since Serbia has heterogeneous relief and climate conditions in which bees are bred, but also due to different economic development of some regions and districts, the level of production per bee colony varies, as well as participation of both individual and overall production costs (*Mladenović et. al.*, 2001; *Nedić*, 2009). In 2007, the total number of bee colonies in the Republic of Serbia was 267,000, and the average production of honey per bee colony was 13 kg (*Statistical Annual* 2007). 1.74% of the total number of bee colonies (48,311) is owned by professional beekeepers who have over 100 beehives (*Stojanović*, 2008). Although their participation in the total number of bee colonies is low, the average production per bee colony of professional beekeepers is higher than that of hobby beekeepers, and in the period from 2005–2008, it was approximately 22 kg. The analysis shows that the total production realized by professional producers (bee farms) reaches a level of about 1000 t honey annually, and comprises 28% of the total annual production of honey in Serbia.

Table 1 shows that the volume of honey production per beehive ranges from 11 kg on a bee farm in the Srem district to 23 kg on a bee farm in the Banat district. Large variations in the volume of honey production may be associated with specific apicultural conditions, where the production of one product is dominant while other products are obtained as by-products and in a much smaller volume. Further, the level of production is also influenced by climate and pasture conditions as well as by the applied apicultural technique.

The largest portion of the total production value of the bee farms was the value of honey production, amounting to 61.4% and 68.9% on bee farms in the Raška and Kolubara district respectively, while farms in the Banat and Šumadija districts based their production on honey alone. The exception is the bee farm from the Srem district which realized only 27.2% of its value from honey production, while 70.7% of its earnings were realized from pollen production, which is a result of the excellent pollen pastures for bees in this district and the applied apicultural technique.

A small bee farm in the Raška district based its production and marketing activities not only on honey, but also on honey mixtures, which participate in its production value structure with 34.5%. Every product that contains other ingredients beside honey is of higher quality compared to honey alone, sells better and reaches a considerably higher market price (680 din.). The market is deficient in these products so this farm can be considered one of the main competitors in the production of honey mixtures. As regards competitiveness, it is important to point out that the

Table 1. Value of production on small beekeeping farms

BF	Products	Number of beehives	Measurement unit	Volume of production		Value (din.)		Share%
				Per beehive	Total	Per measurement unit	Total	
BF1	Honey	250	kg	22	5500	220	1,210,000	61.4
	Wax	250	kg	1	250	320	80,000	4.1
	Honey mixtures	250	kg	4	1000	680	680,000	34.5
	I Value of production						1,970,000	100.0
BF2	Honey	130	kg	11.5	1495	220	328,900	68.9
	Pollen	130	kg	0.77	100.1	700	70,070	14.7
	Propolis	130	kg	0.03	3.9	4,000	15,600	3.3
	Beebread	130	kg	0.008	1,04	60,000	62,400	13.1
	I Value of production						476,970	100.0
BF3	Honey	500	kg	23	11,500	220	2,530,000	100.0
	I Value of production						2,530,000	100.0
BF4	Honey	450	kg	11	4950	220	1,089,000	27.2
	Pollen	450	kg	9	4050	700	2,835,000	70.7
	Propolis	450	kg	0.01	4.5	4,000	18,000	0.4
	Honey mixtures	450	kg	0.22	99	680	67,320	1.7
	I Value of production						4,009,320	100.0
BF5	Honey	400	kg	21	8400	220	1,848,000	100.0
	I Value of production						1,848,000	100.0

production of pollen could also be a way to achieve higher profits, since the demand for this product significantly exceeds the offer.

This kind of bee product requires specific application of apicultural technological measures and adequate natural conditions which have proved to be an advantage for the beekeeping farm in the Srem district compared to the other studied farms. Besides this farm, the farm from the Kolubara district also realized 14.7% of its profit from pollen production (*Table* 1).

Table 2 sets out the costs of production on small beekeeping farms. On the basis of the calculated direct material costs at the selected beekeeping farms, we found that their participation in total production costs amounts to 20.3% on average. The exception is the beekeeping farm from the Kolubara district where this participation was 52.46%. This deviation is a result of considerably more frequent replacement of wax foundation per bee colony and use of medicaments that are approximately 50% more expensive than those used on other beekeeping farms. It is important to note that the choice of medicaments, especially those used against bee mites, is made by the beekeepers themselves and causes variation in costs and treatment results.

Professional beekeepers characteristically move bee colonies from pasture to pasture, whereby the profit per colony is increased. However, this also increases the participation of transport costs since transport means are usually hired out, and not owned by the beekeepers. In these studies the beekeeping farms from Raška, Banat and Šumadija district hire transport means for moving the bees and the average participation of these costs in the overall production costs was 13.38%. In the bee farm from the Kolubara district the costs of operating machines were low and amounted to 6.36%. This could be explained by the fact that this is a case of stationary beekeeping where the beehives are not moved. The same type of costs on the beekeeping farm in Srem was the lowest, amounting to 5.92%. The reason for such low costs lies in the fact that the bee pastures, both pollen and nectar, are situated in the vicinity of the apiary so that minimal movement of the bee colonies was performed, all within the same district.

Depending on the type of test, size of the required test samples, and costs of veterinary station services, the costs of veterinary services for the studied bee farms varies. In the studied subjects, apiary amortization costs were calculated at the rate of 10% since the average estimated time of use for beehives is 10 years.

Variable costs, including costs of labour in apiaries with Langstrot Rut beehives, range from 64 to 70% (*Oluwatusin*, 2008). Similar results were obtained in these studies. The participation of labour costs was very large in the beekeeping farms in Raška (64.15%), Srem (55.08%) and Šumadija district (49.65%). Such high costs on the first studied bee farm may be explained by unnecessarily large engagement of permanent and temporary workers for technical and technological jobs on the farm. The specific technology of pollen production, which requires regular collection, drying, and storage during the season, is the cause of high labour costs on the beekeeping farm in the Srem district. On the beekeeping farm in the Šumadija district, because of the large number of bee colonies, in addition to permanent labour, an increased number of temporary workers is engaged during the honey collecting season, so that labour costs comprise half of the total production costs.

Table 2. Production costs on small beekeeping farms

Type of costs		District/BF									
		Raška (BF1)		Kolubara (BF2)		Banat (BF3)		Srem (BF4)		Šumadija (BF5)	
		Amount, din.	Share %	Amount, din.	Share %	Amount, din.	Share %	Amount, din.	Share %	Amount, din.	Share %
a) basic material	sugar	81,000	5.41	56,160	17.86	189,000	16.45	162,000	8.97	151,200	12.51
	sugar patty	80,000	5.35	-	-	-	-	121,500	6.73	64,000	5.30
b) auxiliary material	honeycomb bases	*7,500	0.50	60,000	19.08	*24,000	2.09	96,000	5.31	*12,000	0.99
	medicaments	20,000	1.34	48,810	15.52	52,000	4.52	60,000	3.32	27,200	2.25
1. Direct material costs (a + b)		188,500	12.60	164,970	52.46	265,000	2.06	439,500	24.33	254,400	21.05
c) Machine services		180,000	12.03	20,000	6.36	224,000	19.50	107,000	5.92	104,000	8.61
d) veterinary services		18,000	1.20	7,500	2.38	24,000	2.09	45,000	2.49	40,000	3.31
e) beehive maintenance services		50,000	3.34	10,000	3.18	20,000	1.74	40,000	2.21	50,000	4.14
2. Direct production services (c + d + e)		248,000	16.57	37,500	11.92	268,000	23.33	192,000	10.62	194,000	16.06
3. Apiary depreciation		100,000	6.68	52,000	16.53	200,000	17.41	180,000	9.96	160,000	13.24
4. Direct labour costs	permanent labour	840,000	56.13	-	-	320,000	27.85	960,000	53.14	420,000	34.76
	temporary labour	120,000	8.02	60,000	19.08	96,000	8.35	35,000	1.94	180,000	14.89
II Direct production costs (1 – 4)		1,496,500	100.0	314,470	100.0	1,149,000	100.0	1,806,500	100.0	1,208,400	100.0

* Costs of processing wax into honeycomb foundation

On the beekeeping farm in the Kolubara district, direct labour costs, in accordance with stationary beekeeping and the relatively small number of beehives, are very low, comprising 19.08% of the total production costs.

The concept of economic operation means the degree of benefitial effect of production factors in the production process. The lower the costs of production factors for obtaining a certain volume of production, the higher the economic degree and vice versa (*Andriæ*, 1998). In beehives with a small number of bee colonies and stationary type of beekeeping, there are no large production costs because there are no costs of moving the apiaries, while labour costs for maintenance of the beehives and costs of veterinary services are minimal. However, on professional farms, all of the aforementioned costs burden production, so if professional success is expected, economical production is essential. Since this type of beekeeping is mobile, an economic use of bee pastures would be achieved if the realized profit is considerably higher than the incurred costs, i.e., if pasture moving contributes to the increase of the total profit of beekeeping farm.

Table 3: Economy of production of small beekeeping farms

Districts/BF	Economic coefficient		Profit per 1 din of commercial value of the product
	Commercial production value /Production costs	Production costs /Commercial production value	
Raška (BF1)	1.32	0.76	0.24
Kolubara (BF2)	1.52	0.66	0.34
Banat (BF3)	2.20	0.45	0.55
Srem (BF4)	2.22	0.45	0.55
Šumadija (BF5)	1.53	0.65	0.35

Table 3 shows the economy of production of small beekeeping farms. On the basis of the obtained results for the value of production and production costs of the studied small beekeeping farms, their economic level was also calculated. The economic level was highest on the bee farm from the Srem district, where every dinar spent in production created products in the value of 2.22 dinars, i.e., for each dinar of the commercial value of the products, an expenditure of 0.45 din was made. This shows that the orientation of bee farm towards pollen production is profitable, no matter how high the production costs. The least economical was the farm from the Raška district where every dinar of expenditure brought 1.32 din in product value i.e., for each dinar of the commercial value of the product, 0.76 dinars of costs were incurred. This shows that with realized high direct labour costs (64.15%), for a smaller number of bee colonies than those on beekeeping farms in the Banat and Šumadija district, a low commercial value is realized. If the bee farm in the Raška district were engaged only in honey production, it would operate with losses, with the same costs.

Conclusion

The majority of beekeepers in Serbia are engaged exclusively in honey production and only a small number of them produce other bee products. Average honey production per honeybee colony ranges from 13 to 15 kg, although production capabilities of one honey colony exceed the aforementioned degree of utilization.

On the basis of research it can be concluded that the average direct labour costs of small beekeeping farms are very high (51.27%), excluding the farm from the Kolubara district where these costs were 19.08%, as they have a stationary type of beekeeping. Labour costs were also high also on the farm in Srem as a consequence of the pollen production technology. However, high costs were in this case justified by a high pollen production per bee colony so it can be concluded that a business orientation based on other bee products, besides honey, may be significantly more profitable. This is also

supported by the data from the farm in the Raška district, where 34.50% of the production value is based on the production of honey mixtures. A weak side of the studied bee farms is that they don't have their own transport vehicles for moving bee colonies and therefore they must hire them, which increases transport costs. Different costs of veterinary services and different choice of medicaments caused variations in expenditure costs per studied farm, which were highest on the farm in the Kolubara district, amounting to 15.52%.

Despite the mentioned costs, the studied farms achieved a positive business economy, with a coefficient of economy ranging from 1.32 to 2.22. In order to realize higher operating efficiency in the next period, bee farms should reduce labour costs in their total costs by rearrangement of labour and reduction of the number of permanent workers, and by engaging temporary seasonal labour in accordance with the duration of the beekeeping season. In the next period, by selecting appropriate apiculture technology and spatial planning of beekeeping production in accordance with pasture conditions, it would be possible to increase the bee products yield per beehive and thereby to increase the product value. In order to increase competitiveness of the bee products, and in accordance with the goals of the agricultural food industry it is essential to adopt policies of product quality and product safety.

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