

ANALYSIS OF THE STATE OF BEEKEEPING IN SERBIA IN LINE SUSTAINABLE DEVELOPMENT IN AGRICULTURE

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Abstract

In Serbia, beekeeping is one of the few agricultural branches with a positive export balance. Honey in Serbia is harvested from environmentally safe areas and certain types of honey are globally recognized and have a geographically protected origin, accordingly better quote on the global honey market and at are a more competitive price. Goal of this paper to analyze the state of beekeeping production in Serbia, to consider the legal frameworks and regulations in this field, investments and incentive measures implemented at the state level in order to improve this production. This paper will present the results of the analysis of parameters related to beekeeping production in the last ten years according to official statistics at the national level. Based on the analysis of the situation, it can be concluded that beekeeping has the potential to become a strategic economic sector. Interest in beekeeping in Serbia is in expansion and an increasing number of farms are officially registering this activity, following the regulations and world trends in this area, placing bee products on the market and earning significant revenues.

Key words: Serbia, beekeeping, honey, incentive measures, additional activity, sustainable development

INTRODUCTION

Honey is a product of bees with a complex chemical composition that has long been used in human nutrition because of its nutritional and medicinal properties. Free sugars make up 76-79% of the honey content, of which fructose, glucose and sucrose are predominant (maltose and other disaccharides make up 7% of honey). Higher sugars can be about 1.5%; water can be up to a fifth of honey content. The remaining contents of honey are acids (gluconic, formic, acetic, malic, citric, amber and lactic), minerals: iron, copper, manganese, silicon, chlorine, calcium, potassium, sodium, phosphorus, aluminum, magnesium. Honey is not only an energetic but also a nutritious and medicinal substance that contains the amino acids, enzymes and vitamins necessary for normal metabolism. Studies have found that honey has antibiotic, antifungal and antioxidant properties that are related to polyphenols in honey, and honey is an activator of the immune system and can help with anemic and sclerotic disorders [2]. Honey is often used in combination with herbs and other nutrients [10].

Bees are insects of the genus *Apis* to which nine species belong, of which two species, the eastern bee (*Apis cerana*) and the western bee (*Apis mellifera*, grown for the purpose of obtaining honey for commercial purposes. According to some studies, beekeeping is crucial for the whole food chain because every third bite of our food is thought to originate from crops that are pollinated by bees [12]. The bees are endangered and their survival has been called into question due to the insecticides used as part of agrotechnical measures implemented in agriculture. The eventual disappearance of bees would have a catastrophic effect on food production. The pollination of many plant species, especially fruit trees, is directly dependent on the activity of bees. In 2018, the European Commission adopted a decision to completely ban the use of three neonicotinoids (clotianidin, imidacloprid and thiamethoxam), which caused a massive dying worldwide beekeeping community of bees wherever they were applied to crops in the open. New sulphoximine-based insecticides ("sulfoxaflor") have been used as a replacement for neonicotinoids since 2013. It has been established on the basis of research

conducted that this insecticide also has negative effects on bees in terms of reproductive disorders, reduced colony growth rate, and the immune system as well. This insecticide has no effect on the behavior of bees in eating and collecting nectar, but that the bees are smaller than the normal untreated of these insects and there are half as many reproductive males. It is recommended by beekeeping experts to avoid this insecticide as well. It should be noted that residues of these pesticides were detected in certain types of honey [6]. The beekeeping is a world-wide rave as an economic activity. The honey market is being harmonized and legal regulations are being established at the world and national levels. Specific incentive measures have been introduced and implemented at European Union level in this area to improve the production of bee products and to repair the damage caused by the use of insecticides. At the world level, Apimondia is one of the organizations that collects beekeepers for the purpose of promoting production and introducing good beekeeping practices in accordance with food safety standards.

MATERIALS AND METHODS

This paper uses data from the field of beekeeping and honey production related to honey trade at the world level and within the state of Serbia. Official statistics data were used in the analysis of individual parameters [14]. The data collected are analyzed using standard mathematical and statistical methods, which can serve as a basis for predicting the honey production performance that can be expected in the future.

RESULTS AND DISCUSSIONS

World honey production

In terms of the number of beehives globally, India has 13 million, followed by China nearly 10 million, Turkey has 9.5 million, Iran has 8 million and Ethiopia 7 million. Regardless of the number of hives, the largest honey producer in the world is China with 650,000 tons of honey, accounting for 36% of the

world's honey production, which is around 1,8 million tons. After China, the largest producers of honey are Turkey, the USA, Russia and Iran, which together account for 58% of world production. The EU produces 230,000 tons of honey, which is 12.7% of world production, in Turkey 115,000 tons of honey, which is 6.4%, while the US produces 100,000 tons of honey, which is 5.5%, and the Russian Federation accounts for 95,000 tons of honey produced, world production with 5.2%. Around 708,000 tons of honey are exported annually worldwide. The countries with the largest share (32%) in world honey exports are China (130,000 tons), Argentina (about 7,000 tons), Ukraine (about 68,000 tons), India (close to 53,000 tons) and Vietnam (about 62,000 tons). At the world level, the United States is the largest importer of honey with 202,000 tons of honey per year, followed by Germany with 81,000 tons, the UK importing 46,000 tons, Japan importing 43,000 tons of honey and France 35,000 tons of honey [15]. Despite the fact that honey production is globally endangered, some countries like Romania have used their natural resources and honey production has increased. Between 2000. and 2011. in Romania, honey production increased from 11,746 tons to 24,700 tons [8]. Based on an analysis and monitoring of the development of beekeeping in Romania, it was concluded that EU accession in 2007 led to an increase in honey production. In 2017, honey was found to represent 30,177 tons of honey, 46 % of which was exported mainly to the EU. The beekeeping industry had a positive export balance in 2016, with exports totaling \$ 41.4 million and imports \$ 8.9 [11]. Table 1 also lists other countries with a significant share in global sales of natural honey. Compared to 2014, when global honey exports totalized \$ 2.4 billion, 2018 data indicates a decline in honey production, which has been happening for several reasons in the past few years. One of these is the insecticide spraying (already mentioned) and the massive destruction of bee communities, which has threatened the survival of these beneficial insects and the decline in honey and honey production [16].

Table 1. Shows the export balance of honey producers countries and their percentage representation in relation to the global level of honey exports for 2018

Country	Exports of honey USD millions	Market share in global market sales %
China	249.3	11.0
New Zealand	245.5	10.8
Argentina	169.7	7.5
Germany	140.5	6.2
Mexico	120.4	5.3
Spain	107.3	4.7
India	102.4	4.5
Ukraine	98.2	4.3
Brazil	95.4	4.2
Hungary	90.6	4.0
Belgium	77.6	3.4
Vietnam	67.6	3.0
Canada	61.2	2.7
Romania	49.4	2.2

Source: [16].

In addition, the problem of so-called honey counterfeiting and the massive sale of fake honey is growing in the honey market, which has a significantly lower price, which threatens beekeepers worldwide to market their quality products at adequate prices. Apimondia, as the world beekeeping organization officially in 2019, highlighted this problem and proposed new standards that would ensure that the quality of honey is constantly monitored so that only original and safe bee products can be marketed and fed [3].

China is also the largest consumer of honey with about 400,000 tons a year, while the US consumes about 250,000 tons, in Turkey about 100,000 tons, in Iran and Germany less than 100,000 tons are consumed. At EU level, about 360,000 tons of honey are consumed annually. In terms of quality, the best honey is produced in Ukraine, Greece, Scotland, Yemen, and New Zealand. New Zealand produces the highest quality manuka honey in the world, derived from the flowers of a manuka plant that grows like a bush and is the healthiest honey in the world for which it pays € 130 for 500 g [7]. Worldwide sales of natural honey generated \$ 2,264 billion in 2018 revenue. China accounted for the largest share of this global honey trade at 11%.

Honey production in Serbia

Serbia collects several types of honey (acacia, meadow, linden, sunflower honey, honey; exotic sage, chestnut and heather) of high quality and with geographical origin. Some of these honeys are protected by the Lisbon Convention on the international honey market on the basis of geographical origin, namely Homolski honey, Fruška Gora linden honey, Kacharski honey, Djerdap honey and Vlasinski honey. Apart from honey, other bee products such as royal jelly, propolis, pollen and bee venom are also present. 9,000 beekeepers are registered in Serbia, organized in 218 local associations within the Association of Beekeeping Organizations of Serbia (SPOS). There are estimates that more beekeepers are engaged in honey production than what is officially registered and that is around 15,000. According to these estimates, in 2018, there were 1,011,479 hives in Serbia (official data for registered producers is 850,000 hives, while the official statistics presented in Table 2 are 914,000 hives), and about 11,427 tons of honey was produced. Of the said production, 2,774 tons were exported, with revenue from this activity amounting to \$ 12.4 million. The same year saw the import of 43 tons of honey, which cost the state 266,000 euros. Thus, at the national level, beekeeping recorded a positive export balance [1].

The incentive measures of the state of Serbia amounted to 3.9 million euros or 470 million dinars and when the hive (only for registered producers with a minimum of 20 hives) the allocation amounts to 720 dinars.

In terms of markets to which Serbia exports honey, EU countries are most interested with 53% of total exports, followed by CEFTA countries with 20%, the US with 1% and other countries with the remaining 26%. 700 tons were exported to Italy, 600 tons to Norway, about 300 tons to Germany, 200 tons to Montenegro and about 180 tons to Bosnia and Herzegovina and Macedonia. Quantities of about 120 tons were exported to Sweden, Bulgaria, Australia and France.

Limiting factors for higher honey exports are relatively low production, strong competition on the world market and low price. Increasing consumer demands on the appearance and

distinctiveness of honey packaging are being put to the fore and marketing needs to be targeted and tailored in this regard. Honey must be health-safe, natural, have a geographical origin, have a modern packaging and label design and a good value for money [7].

Table 2. Production of honey in the Republic of Serbia and number of hives in the period 2009-2018

Year	Annual honey production Thousand tons	Number of beehives Thousands
2009	4,577	302
2010	4,479	320
2011	4,283	306
2012	6,865	654
2013	8554	653
2014	4,387	677
2015	12,263	792
2016	5,761	792
2017	7,014	849
2018	11,427	914

Source: [14].

According to the data in Table 2. One can notice the variation in honey production over a given period of time. The variations that are obvious are related to the already mentioned use of pesticides that led to the destruction of bee communities, but also to the effects of climate change and climate disasters that affected vegetation in Serbia, which also led to a decrease in honey yield, which can be especially observed for 2011 and 2014.

By a comparative analysis of the parameters related to beekeeping in Serbia for the stated decade 2009-2018 compared to the decade 2000-2010, we can see an increase in the number of hives (from a minimum of 164.000 in 2002 to 914.000 as in 2018), honey production in these twenty years also grew (from a minimum of 2.317 tons in 2001 to 11.427 tons in 2018) [9].

In Serbia, there are ecologically preserved habitats in mountainous areas, so extensive meadows and forests are increasingly used for growing bees and producing quality honey.

Honey from the Homolian Mountains is of exceptional quality and adequate measures are being taken by local communities and the state to maintain this quality. Breeding bees in this

eco-friendly mountain area is a long tradition. It is a stationary bee-rearing system in cone-shaped beehives knitted with white called bush. The hives are set on the sunny sides of the Homolian Mountains where some fruit trees are planted to collect swarms of bees. The natural conditions, in which meadows and forests are surrounded by homolous mountains, enabled the development of honey meadow and woody plants that serve bees to produce quality honey. Homol honey is thick and varies in color from lighter to dark orange amber hue, produced by mixing meadow and acacia honey in a 1: 1 ratio. The honey has a very pleasant aroma and taste and is of internationally recognized geographical origin, which gives it additional value in the honey market [4].

Honey that stands out for its properties is linden honey from the slopes of Fruška Gora. The linden forests on the slopes of Fruška Gora provide a rich grazing area for bee communities in these regions. This honey has a monofloral and distinctive aroma and taste of lighter orange hues and pronounced antibacterial properties. This honey is recommended to alleviate respiratory and digestive problems [5].

At the level of the Republic of Serbia there is an Association of Beekeeping Organizations of Serbia (SPOS) whose activities are related to the local beekeeping associations, which follow the world trends and developments in beekeeping. Against this background, this Alliance (SPOS) was the organizer and host of the 2012 Apimondium Symposium. The symposium was held under the title "Impact of beekeeping techniques and environmental conditions on the quality of bee products", in addition to the above, the problem of bee diseases was discussed. These developments contribute to drawing attention to Serbia and offering quality honey to the world market. Serbia follows and harmonizes standards of good beekeeping practice with those respected in the EU and in the world. Legislation is also harmonized in the Republic of Serbia and it monitors contemporary beekeeping and needs in this field [13].

Based on the data presented and a comparison of world production that is facing the challenge of how to save bees, there are preserved natural conditions for bee breeding in Serbia, which would also increase honey production. Based on the indicators of honey production and the number of hives listed, it is evident that this activity is in expansion in Serbia. Beekeeping within agricultural holdings is developing as an additional activity and if it is stimulated at the national level and if it has a secure market then in this area sustainable foreign exchange inflow at the level of the Republic of Serbia can be increased.

CONCLUSIONS

Beekeeping and honey production in Serbia are organized economic activities within the legal frameworks and regulations that follow the standards in force at EU and international level. Honey produced in Serbia is of high quality that is recognized worldwide and is an adequately paid export product of Serbia with a positive export balance. Monitored parameters honey production and number of hives for the decade 2009-2018 years have had an increasing trend, also when compared to the previous decade. Serbia is increasingly developing and utilizing its potential for beekeeping development. Indicators of export-import activities in honey production also indicated more significant exports of honey compared to imports, thus generating significant profits in this area. Incentive measures at the state level of Serbia are implemented in order to improve beekeeping and honey production and to introduce good beekeeping practices in accordance with the concept of sustainable development of this agricultural sector.

Investments in this sector are certainly needed in order to meet the requirements for recognition of the geographical origin of certain honey producers and for such bee products to have added value on the market and to be of recognizable quality, such as honey from Homolje and Fruška Gora.

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