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Economic aspects of beekeeping production in Croatia

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ABSTRACT

The aim of this study was to determine the basic economic parameters of honey production, export and import in Croatia and worldwide. We also estimated the market value of Croatian beekeeping as a whole for the year 2007. The most marketable bee product is honey, but its value is many times smaller than the value of pollination that bees deliver to our ecosystem. Besides that, there is also the positive influence of the beekeeping activities on human health since they are bound to dwelling in the natural surroundings. The largest honey producers of the world, for the period 2002-2007 were, in descending order: China, Argentina, Turkey, the USA and Ukraine. The largest world honey exporters in the same period were Argentina, China, Mexico, Germany and Hungary, and largest importers were the USA, Germany, Japan, the United Kingdom and France. Germany is not only a large importer but also a large honey exporter. A trend analysis of the number of beehives in Croatia from 1967-2007 (variable x2) shows with 95% certainty that in the year 2015 the number of beehives in Croatia will be somewhere between 64.80 and 151.20 thousand. The predicted value for the same year for honey production (variable x3) is somewhere between 1,640 and 2,360 tons, and for per hive honey production (variable x4) between 16.34 and 20.87 kg. The total market value of the Croatian beekeeping industry in 2007 was estimated at 28.55 million € (214.09 million HRK).

Key words: honey, production, exports, imports, Croatia

Introduction

The most marketable bee product is honey, but it is not the only one, and certainly not of the highest importance. Some authors suggest that the pollination service delivered

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by the bees is 20 (ŠIMIĆ, 1980) to 117 (PUŠKADIJA, 2001) times more valuable than the financial worth of all beekeeping production. To all pollination done by insects, bees contribute by 70-80% (ŠIMIĆ, 1980). In that sense, beekeeping is important for maintaining our ecosystems in equilibrium. Furthermore, there is a positive influence of beekeeping activities on human health since they are bound to dwelling in natural surroundings.

According to CVITKOVIĆ (2007) Croatia has a large and yet not realized beekeeping growth potential that exceeds the actual production level by at least four times. The growing unemployment rate in recent years could supposedly contribute to the growth of the beekeeping industry. The specific traits of the beekeeping process, as well as the unfavorable prices of honey on the world market slow down the growth of the beekeeping industry in Croatia and make honey exports less desirable. Recent developments in the honeybee health status worldwide slow down industry growth even more. In the market, honey also competes with other sweeteners and medicines that are heavily advertised and this contributes to lower honey consumption.

The aim of this study is to determine the basic economic parameters of honey production, export and import in Croatia and worldwide and to forecast honey production levels, the number of beehives and honey production per beehive in Croatia, using data from the relevant sources such as The Food and Agriculture Organization of the United Nations and Central Bureau of Statistics of the Republic of Croatia for the period 2002-2008, with the help of a prognostic model.

Materials and methods

The objects of the study are the production and economic traits of beekeeping production in Croatia and worldwide. The data on honey production and international honey trade regarding quantity and price were analyzed.

Data sources for this research were the Central Bureau of Statistics of the Republic of Croatia (Available at: http://www.dzs.hr/default_e.htm2009), and The Food and Agriculture Organization of the United Nations (Available at: http://faostat.fao.org/site/291/default.aspx, 2009), as well as scientific and professional literature.

During the study, methods of economic analysis, statistical methods, as well as methods of comparative analysis, synthesis, induction and deduction were used. Some indicators were calculated as ratios from the basic parameters. For the statistical analysis, the STATISTICA 8 package was used.

Indicators of production concentration import and export concentration and the number of beehives concentration were calculated as follows: from the obtained data for the period 2002 to 2007 the yearly averages were calculated for every country which were then sorted in descending order. In the tables, the first five countries with the highest parameter values were shown, with the total for those countries and the value of the parameter on the world level. The proportion of each value in the value of the parameter for the world is an indicator of production, export and import concentration.

Results

In tables 1 to 4 the concentration of honey production, exports, imports and number of beehives worldwide is shown. From these data it could be seen that the largest honey producers in the world were China, Argentina, Turkey, the USA and Ukraine, the largest honey exporters were Argentina, China, Mexico, Germany and Hungary, and largest importers were the USA, Germany, Japan, the United Kingdom and France. The countries with the highest beehive population in the world are India, China, Turkey, Ethiopia and Iran.

Table 1. Concentration of honey production in the world from 2002-2007

Countries	1	2
China	245.141	18.60
Argentina	84.833	6.44
Turkey	78.534	5.96
United States of America	76.210	5.78
Ukraine	64.939	4.93
Total production of 5 leading countries	549.656	41.71
World honey production	1.317.913	100.00

1 = average annual honey production in tons from 2002-2007; 2 = percentage of the world honey production;

Table 2. Concentration of honey exports in the world in tons from 2002-2006

Countries	1	2
Argentina	84.938	20.80
China	83.357	20.42
Mexico	25.470	6.24
Germany	22.005	5.39
Hungary	16.809	4.12
Total exports of 5 leading countries	232.578	56.96
World honey exports	408.302	100.00

1 = average annual honey exports in tons from 2002 – 2006; 2 = percentage of the world honey exports

Table 3. Concentration of honey imports in the world in tons from 2002-2006

Countries	1	2
United States of America	99.360	24.06
Germany	92.869	22.48
Japan	43.818	10.61
United Kingdom	26.964	6.53
France	18.090	4.38
Total imports of 5 leading countries	281.101	68.05
World honey imports	413.051	100.00

1 = average annual honey imports in tons from 2002 – 2006; 2 = percentage of the world honey imports

Table 4. Concentration of the number of beehives in the world from 2002-2007

Countries	1	2
India	9.800.000	13.51
China	7.236.142	9.98
Turkey	4.568.546	6.30
Ethiopia	4.408.451	6.08
Iran	3.500.000	4.83
Total number of beehives in 5 leading countries	29.513.138	40.69
Number of beehives in the world	72.524.653	100.00

1 = average annual number of beehives from 2002-2007; 2 = percentage of the number of beehives in the world

Table 5. Values of basic statistical indicators with variable description for Croatia

Variables	Number of years	Mean	X_{min}	X_{max}	CV	Growth rate (%)
x2	41	118.17	59.00	314.00	44.63	2.17
x3	41	1.200.93	627.00	2.657.00	46.52	2.14
x4	41	10.89	4.57	21.37	39.46	-0.03

x2 = Number of beehives in Croatia from 1967-2007 (in thousands); x3 = Honey production in Croatia from 1967-2007 (in tons); x4 = Honey production per beehive in Croatia from 1967-2007 (in kg); Xmin = minimum value of variable; Xmax = maximum value of variable; CV = coefficient of variation

Table 6. Estimated market value of Croatian beekeeping industry in 2003 and 2007

Indicators	Year 2003		Year 2007	
	(220.000 beehives)		(314.000 beehives)	
	HRK (mil.)	€ (mil.)	HRK (mil.)	€ (mil.)
1	84.00	11.20	119.89	15.99
2	18.00	2.40	25.69	3.43
3	48.00	6.40	68.51	9.13
4	150.00	20.00	214.09	28.55

1 = an estimate of the market value of beekeeping products; (honey, pollen, propolis, wax, bee queens and package bees); 2 = an estimate of the beekeeping input market value (current assets-production); 3 = an estimate of the non-current assets market value; 4 = an estimate of the total Croatian beekeeping industry market value

In 2007, there were 314,000 beehives in Croatia (Fig. 1). 2,638 tons of honey (8.40 kg per beehive) were produced (Fig. 2 and 3). 3.48 tons were imported and 834.39 tons were exported (Fig. 7), which means that yearly consumption was 1,807.09 tons (0.40 kg

of honey per capita). The data on the production of other beekeeping products in Croatia are not officially registered.

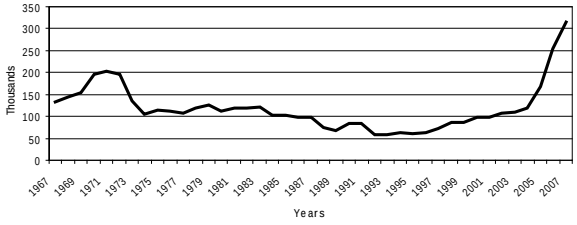

Fig. 1. Number of beehives in Croatia in thousands (1967-2007)

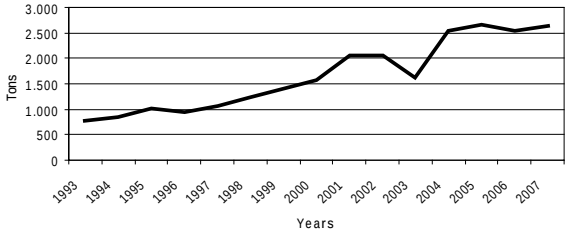

Fig. 2. Honey production in Croatia in tons (1993-2007)

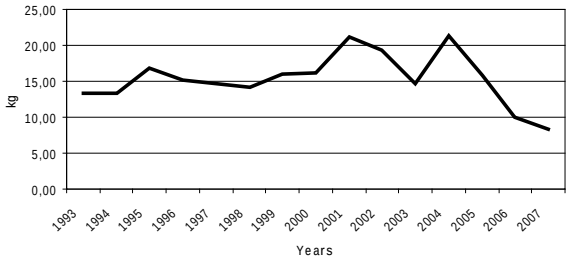

Fig. 3. Average honey production per beehive in Croatian in kg (1993-2007)

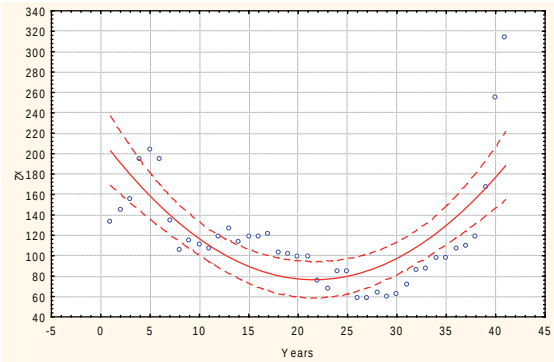

Fig. 4. Beehives in Croatia 1967-2007 (thousands)

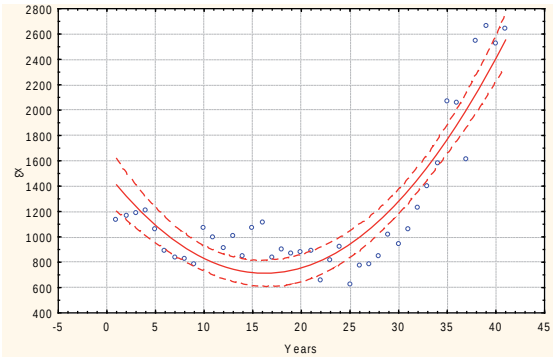

Fig. 5. Honey production in Croatia 1967-2007 (tons)

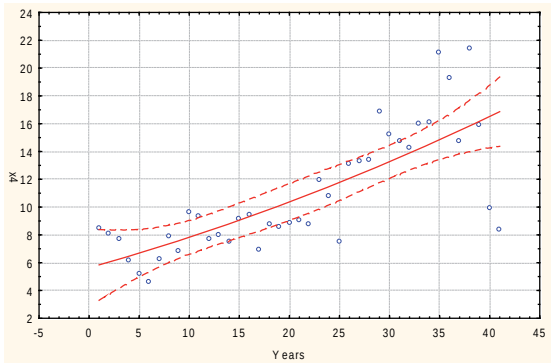

Fig. 6. Per hive honey production in Croatia 1967-2007 (kg)

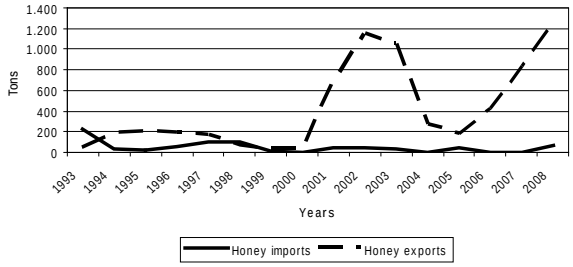

Fig 7. Exports and imports of honey in Croatia in tons (1993-2008)

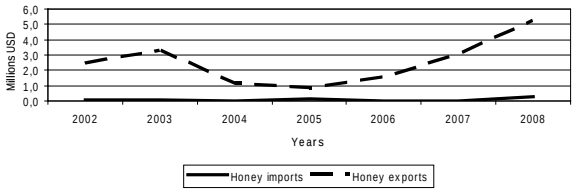

Fig. 8. Honey imports and exports in Croatia in million USD (2002-2008)

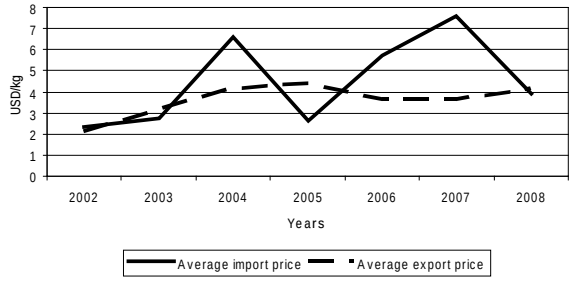

Fig. 9. Average prices of imported and exported honey in Croatia in USD/kg (2002-2008)

The basic statistical indicators of beekeeping production with the description of the variables for Croatia are presented in Table 5. The average number of beehives in Croatia in the period 1967-2007 was 118.17, the average honey production 1,200.93 tons and average honey production per beehive 10.89 kg. The annual growth rate of the number of beehives in that period was 2.17%.

The results of the trend analysis of the number of beehives, honey production and honey production per beehive in Croatia for the period 1967-2007 are shown in Figures 4, 5 and 6, where year 1 represents the first year of the period. The trend analysis predicts with 95% certainty that the number of beehives in Croatia in 2015 will be somewhere between 64.80 and 151.20 thousand beehives (Fig. 4). The honey production increased by 2.14% annually, and trend analysis of the variable predicts with 95% certainty that honey production in Croatia in 2015 will be somewhere between 1.64 and 2.36 thousand tons (Fig. 5). Honey production per beehive was decreasing by 0.03% annually. Trend analysis of the variable predicts with 95% certainty that per hive production in Croatia in 2015 will be somewhere between 16.34 and 20.87 kg (Fig. 6).

Honey exports and imports in Croatia in the period 1993-2008 are presented in Figures 7 and 8. Honey exports peaked in 2008 at about 1,300 tons (Fig. 7), as did their value in USD which was 5.25 million (Fig. 8).

The highest average export price of 4.37 USD/kg was reached in 2005, and the lowest average import price was 2.31 USD/kg in 2002 (Fig. 9).

The estimated market value of the Croatian beekeeping industry in the years 2003 and 2007 is presented in Table 6. In 2007 the estimated market value of the beekeeping industry of Croatia was 28.55 million €, which represents an increase of 1.43 times in relation to 2003.

Discussion

The five countries that were the largest honey producers in the world in the period 2002-2006 were producing on average 42% of all honey produced annually in the world, which was 1,318 million tons (Table 1). The largest honey producer in the world was China, whose average annual production was 245,141 tons, which is almost three times higher than the average annual production of Argentina (84,833 tons). Turkey, the USA and Ukraine follow with production of approximately 70,000 tons annually.

In the period 2002-2007, in the world, 408,302 tons of honey were exported on average annually (Table 2). The five largest exporter countries exported 56.96% of that quantity. These are, in descending order: Argentina, China, Mexico, Germany and Hungary. The largest exporter was Argentina with 84,938 tons of honey exported on average annually. China follows not far behind. Mexico, Germany and Hungary are at the end of the list each exporting less than 1/3 a quantity of the world's largest exporter, Argentina.

In the same period the average annual value of honey exports in the world was 808.27 million USD, and the five largest honey exporters accounted for 50.19% of that sum. Argentina earned 135.50 million USD with its exports, China only about 70% of that amount, Germany 55%, Mexico 40% and Hungary 34%. The percentage indicators in Tables 3 and 4 show that China exports only a slightly smaller quantity of honey than

Argentina, but earns almost 1/3 less money. Besides that, Germany exports only a quarter of the amount of Argentina's honey, but earns half the amount of money Argentina does. This leads to the conclusion that the export price of honey from Germany is twice as high as that of Argentina.

In the period 2002 to 2007, the average annual amount of honey imports in the world was 413,051 tons (Table 3). Five largest importers imported 68.05% of that quantity. The worlds' largest honey importer is the USA (imports about 100.000 tons annually), while Germany imports only 7% less. Japan; United Kingdom and France form the back of the list.

The total financial value of the worlds' honey imports, in that period, was 834.32 million USD annually on average, of which five largest honey importers comprised 63.41%. Although Germany imports less honey than the USD, it pays almost 13% more for it.

In the period 2002-2007, the average annual number of beehives in the world was 72.52 million (Table 4). Five countries with the largest beehive population possessed 40.69% of that amount. These are in descending order: India, China, Turkey, Ethiopia and Iran.

In Croatia the number of beehives has been growing more intensively since 2005 and reached 314 thousand beehives in 2007 (Fig. 1). The results of one questionnaire suggest that the proportion of beehive types is as follows: 41% LR beehives, 45% AŽ beehives and 14% other types. Migratory beekeepers comprise 38% of the beekeeper population (CAPAN, 2001). Honey production has not grown with the number of beehives, but rather remained at the level of approximately 2,500 tons annually (Fig. 2), which directly influences per hive honey production, which was 8.40 kg in 2007 (Fig. 3). Only three years earlier (2004), the average per hive production was 21 kg. Almost all honey in Croatia is produced on family farms (GRGIĆ, 2003).

The data for the period 1967-2007 show that number of beehives in Croatia was increasing 2.17% annually on average, and the average per hive production was decreasing at the rate of 0.03% annually (Table 5).

Correlation coefficient values for the number of beehives, honey production and average honey production per hive in Croatia for the period 1967-2007 show a statistically significant correlation between the number of beehives and honey production (r=0.55), honey production and average honey production per hive (r=0.52). Correlation between the number of beehives and average honey production per hive is statistically significant, but negative (r=-0.39). The statistically significant correlation between honey production in Croatia (variable x3) and honey production per beehive in Croatia (variable x4) confirms the experiential rule that higher honey production per beehive significantly

contributes to the total honey production, just as it does the higher number of beehives (variable x2). The rise in the number of beehives (variable x2) in this sample contributes to the fall of production per beehive (variable x4) which can be observed from the value of the correlation coefficient, which is statistically significant, but negative.

The trend analysis of the variable x2 (number of beehives in Croatia from 1967 - 2007) (Fig. 4) shows with 95% certainty that in 2015 the number of beehives in Croatia will be somewhere between 64.80 and 151. 20 thousand hives. The predicted value for the same year for honey production (variable x3) is somewhere between 1,640 and 2,360 tons (Fig. 5), and for per hive honey production (variable x4) between 16.34 and 20.87 kg (Fig. 6).

The substantial increase in honey exports from Croatia in the years 2001, 2002 and 2003 was due to the export ban from China to the EU market. Honey exports from Croatia increased more intensively from 2005 again (Fig. 7 and 8). In 2008 exports were around 1,300 tons. Honey imports are low and in 2008 were about 65 tons. Average honey prices were volatile during the observed period (2002-2008), and in 2008 the average export price (4 .13 USD/kg) was a little bit higher than the average import price (Fig. 9).

BRAČIĆ (2003) estimates that 50% of beekeeping production and trade in Croatia is unregistered, so that the actual production and trade levels are twice as high as officially stated. It means that, for example, in 2003 there were 220,000 beehives (instead of 110,000 according to the Statistical Yearbook of the Central Bureau of Statistics), and around 3,500 t of honey was produced. The average actual per hive production was 16 kg, and the average number of beehives per beekeeper was 22. (The aforementioned discrepancy between official and estimated number of beehives in 2003 was rectified in 2007 when figures in the Statistical Yearbook matched the figures given by the Croatian Livestock Center).

Some authors' estimates are even more severe in that the registered honey trade covers only 30 to 40% of all honey trade in Croatia (FRICK et al., 2006). The most frequent way of honey distribution in small scale producers is direct selling („at the farm door") (PUŠKADIJA, 2000).

BRAČIĆ (2004) estimates that, in 2003, 3,500 tons of honey, 60 tons wax, 8 tons pollen, 0.8 tons of propolis, 35,000 queen bees and 40,000 package bees was produced. From these figures he calculated the approximate market value of the Croatian beekeeping industry in 2003. The total market value of the beekeeping industry in Croatia is the sum of the estimated product market value, beekeeping input value (current assets - estimated product market value) and non-current assets. In 2003 it was 20 million €. The basis for the calculation for 2007 was the number of beehives, which was 314 thousand in that year. The proportions contained in the calculation for the year 2003 were transposed to the calculation for 2007.

Regarding the number of beehives in Croatia in 2007 (314 thousand) it is estimated that the total market value of the beekeeping industry in Croatia would be 28.55 million € (214,09 mil. HRK) (Table 6).

Apart from the very high importance of pollination delivered by the bees, the value of which exceeds the economic value of bee products many times, beekeeping is also important for the preservation of ecological equilibrium, and the positive effects that beekeeping activities exercise on human health.

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SAŽETAK

Cilj ovog istraživanja bio je odrediti temeljne ekonomske pokazatelje proizvodnje, izvoza i uvoza meda u Hrvatskoj i u svijetu. Također smo procijenili tržišnu vrijednost hrvatskoga pčelarstva za 2007. godinu. Najutrživiji pčelarski proizvod je med, ali njegova je vrijednost puno puta manja od vrijednosti oprašivanja koje u našem ekosustavu obavljaju pčele. Osim toga, pčelarske aktivnosti pozitivno utječu na ljudsko zdravlje zbog boravka u prirodi. Najveći proizvođači meda na svijetu, u razdoblju od 2002. do 2007. godine, bili su Kina, Argentina, Turska, SAD i Ukrajina. Najveći svjetski izvoznici u istom razdoblju bili su Argentina, Kina,

Meksiko, Njemačka i Mađarska, a najveći uvoznici SAD, Njemačka, Japan, Velika Britanija i Francuska. Njemačka nije samo uvoznik nego i veliki izvoznik meda. Analiza trenda broja košnica u Hrvatskoj od 1967. do 2007. godine (promjenjivica x2) pokazuje s 95% pouzdanosti da će 2015. godine u Hrvatskoj biti između 64,80 i 151,20 tisuća košnica. Predviđena vrijednost proizvodnje meda (promjenjivica x3) za istu godinu mogla bi biti između 1.640 i 2.360 tona, a proizvodnje meda po košnici (promjenjivica x4) između 16,34 i 20,87 kg. Ukupna tržišna vrijednost hrvatske pčelarske industrije za 2007. godinu procijenjena je na 28,55 milijuna € (214,09 milijuna HRK).

Ključne riječi: med, proizvodnja, izvoz, uvoz, Hrvatska