Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 18, Issue 4, 2018
PRINT ISSN 2284-7995, E-ISSN 2285-3952

HONEY PRODUCTION AND TRADE BEFORE AND AFTER ROMANIA'S ACCESSION INTO THE EUROPEAN UNION

Agatha POPESCU

University of Agricultural Sciences and Veterinary Medicine Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest Romania, Phone: +40213182564, Fax: +40213182888, Email: agatha_popescu@yahoo.com

Corresponding author: agatha_popescu@yahoo.com

Abstract

The paper analyzed the impact of Romania's accession into the EU on honey production and trade, using the empirical provided by FAOSTAT and National Institute of Statistics. The methodology was adapted to the purpose of comparison between the pre and post accession period using fixed basis index, growth rate, absolute and relative differences, structural indices, specific trade ratios, and graphical representation. Romania is an important honey producer with a potential over 30,000 tonnes per year. The accession into the EU in 2007 has stimulated the development of apiculture. In 2017, Romania produced 30,177 tonnes honey of which, about 46 % was exported mainly in the EU. Romania has over 1,600 thousand bee colonies and 46,000 apiculturists, meaning 24 bee families per apiary. Honey yield per bee family is 18.8 kg, but the potential is over 22 kg, less than in other EU countries. Weather conditions have deeply influenced apiculture performance during the last decade. Both acquisition and producer's price increased in the domestic market, and also the export/import price index was favorable to Romania due to the high quality of honey which is much required on the EU market. In 2016, the export value reached USD 41.4 Million, being 5.37 times higher than in 2000, and the import value achieved USD 8.9 Million, being 52.5 times higher than in the 1st year of the study. Trade balance accounted for USD 32.5 Million, being 4.3 times higher than in 2000. As a conclusion, the accession of Romania into the EU favored honey production, export and import and helped the EU to meet much better its internal market needs and intensify export. For this reason, beekeeping will continue to be an important sector of Romania's and EU agriculture in order to support pollination of agricultural crops, food security and safety and preserve biodiversity. Due to the strong competition, Romania should fight to maintain its position as a top honey producer and exporter of the EU. For this reason, beekeepers should increase apiary size, include organic honey as a market niche, assure honey certification brands and join in more associative forms for increasing efficiency along the honey market chain.

Key words**:** *honey, production, export, import, Romania, pre-accession, post-accession*

INTRODUCTION

Beekeeping is an important activity from an economic, social and environment point of view.

From an economic point of view, bees are a production factor, assuring a large range of products: honey, pollen, beewax, propolis, venom and other products, which are used for human food consumption and health, medicine and industry (pharmaceutical, cosmetics etc.). Also, bees provide services for agriculture, helping the pollination of the agricultural crops and wild flora, contributing to the growth of agricultural production and not only. More than 70 % of agricultural crops are pollinated by insects, among which *Apis mellifica* plays the most important role in the world [3, 10].

Beekeeping contributes to the diversification of the activity in the rural areas, providing jobs and income for rural population, and giving its support to the economic and social development of the communities [32]. It is also a profitable business for apiculturists, but also it could have an important economic impact on the localities and areas, processors and marketers (wholesalers and retailers) along the bee products chain.

Beekeeping is an opportunity to support the sustainable development by the valorization of the natural resources and the production of useful and healthy products for the actual and future generations [7].

The economic efficiency of beekeeping depends on many factors, among which the most important are: the number of bee families and hives and apiary size. The more the number of bee families and the higher, the apiary size, the higher honey production and apiculturists' income and profit [24, 28].

The practice proved that a minimum number of 150 bee families per apiary could assure the economic efficiency, but the higher the number of bee families per apiary could reduce production costs, increase income and profit of the beekeepers [25, 29, 30, 36].

Another factor of economic efficiency in apiculture is the quality of the biological material which is assured by the use of selected bee queens and breeding programmes. The diversity of food resources, the structure of the agricultural cultivated crops and the composition of the wild flora producing nectar could influence pickings, honey production and its quality. Among other factors could be mentioned: the technical endowment of the apiary (hives and their modernization status, specific apiculture tools, transportation means in pastoral, equipment for honey extraction etc), the maintenance of the bee families in all seasons, the measures of prevention and treatment for bees diseases, the lack of aggressive factors which could disturb the normal activity of the bee families such as: the change of crops varieties and hybrids which do not allow the bees to collect nectar and the plant protection measures based on the intensive use of pesticides, insecticides and other chemicals which remain in the nectar, plants, soil, water and could diminish the production performance of the bee families, affect their health and even kill them [17, 30, 35].

Also, beekeeping efficiency depends on the apiculturist training level and experience in the field. In practice, not all the apiculturists are "professionals", because this activity also attracts people who would like to use it as an additional source of money or like a part time job and even as a hobby [5, 30, 31].

Bee products, mainly honey are subject of international trade, contributing to the exchange of goods among various countries to cover better the demand of the internal market [27, 33].

From a social point of view, beekeeping could be practiced by any person (young, mature or old), it needs a few knowledge and skills, but also experience for professional apiculturists. It does not involve large financial capital to assure apiary inputs, and products do not require a high storage capacity. That is why apiculture is also practiced in the developing countries in order to diminish poverty and increase living standard.

Beekeeping offers a chance for people to work, to get income and be healthy making this activity outdoor and using the bee products. Apiculture is also important for food security [22, 36].

Bees have an important impact on the environment, contributing to the preservation of biodiversity supporting the development of the useful insects species and agricultural crops, the maintenance of the wild plants by pollinating the entomophily flora and balancing the ecosystems [14].

Climate change is an unpredictible factor, but it should be known and evaluated and measures are imposed to diminish its negative impact on bee families and honey production.

The development of beekeeping at the world level, in Europe and in the EU is justified by the increased honey demand and the non sufficient offer.

EU is the 2nd producer and exporter of honey in the world, in 2016, having 17 million beehives and producing 237,549 tonnes. The main producers of honey are Spain, Hungary, Germany and Romania, whose annual performance is over 20,000 tonnes. About 20,000 tonnes of honey are exported yearly by the EU to the main beneficiaries: Switzerland, Saudi Arabia, Japan, USA and Canada. About 200,000 tonnes of honey were imported especially from China, Ukraine, Argentina, Mexico to cover the EU market demand [9].

Romania has a favorable geographical position, a temperate climate, a large variety of entomophily plants both cultivated and wild, a long experience in apiculture, a considerable number of bee families and beekeepers and it is an important honey producer and exporter.

Due to the low consumption, no more than 0.55 g/inhabitant, most of the extracted honey is sold in other counties, mainly in the EU, where the demand and consumption are high [34].

Romanian honey has a high quality and purity and a large range of types (monofloral such as: acacia and lime honey etc), polyfloral and forest honey [11, 14].

Honey is a sweet food with a nice smell, pleasant taste and flavor. It has a special chemical composition which consists of: sugars, proteins, amino acids, enzymes, organic acids, vitamins, enzymes, minerals, phenolic and volatile compounds, which provides key nutrients for human diet and also energy [1].

These compounds play an important role on honey quality and also serve for its identification. The prolonged storage and various processing procedures like heating etc could affect honey quality, change its composition and favour its degradation [9, 16, 37].

Romania is among the countries which have the largest number of bee families, being among the top producers and exporters of honey in the EU besides Spain, France and Greece.

In order to satisfy better the needs of honey on the common market, the European Parliament issued Regulation (EU)No.1308/2013 which financially supports the development of beekeeping in the period 2017-2019 providing Euro 72 Million. The money could be used by beekeepers for the modernization of apiaries by purchasing bee hives, bee families, high breeding value bee queens, specific equipment mainly for pickings in pastoral. In this purpose, funding is assured 50 % from the national budget and 50 % from the EU funds [12].

In this context, the paper aimed to analyze the dynamics of beekeeping in Romania in the period 2000-2017, making a comparison between the status of apiculture in the post accession, 2007-2017, versus the pre-accession period, 2000-2006, in order to identify the main trends and changes in honey production, number of bee families, apiary size, export, import and trade balance.

MATERIALS AND METHODS

The indicators used in this study have been the following ones: honey production and its dispersion in the territory, contribution of the regions of development to honey production, honey production per km^2 and per bee family, number of bee families, number of bee families per apiary, number of apiculturists, exported and imported honey quantities, the share of exported quantities in honey production, the ratio between exported and imported quantities of honey, export and import values and honey trade balance, the ratio between export value and import value, honey price in the domestic market in terms of producer's price and wholesaler's price, honey price for export and import, the ration between export price and import price.

The data have been collected for the period 2000-2017 from FAOSTAT Data base and National Institute of Statistics Tempo online Data Base, and from EU Commission and Parliament Reports [6, 8, 10, 19, 20].

In order to comparatively analyze the trends and changes in apiculture, the period of reference was divides into two sub periods: 2007-2017, the post- accession period and 2000-2006, the pre-accession period.

The methodological procedures used in this research have been:

Fixed basis Index, in order to evaluate the changes in the evolution of an indicator in the last year of the chronological series (y_t) compared to the first item of the series (y_0), $I_{FB}= (y_t/y_0)100$,

Average growth rate was determined according to the formula:

$$\bar{R}_a = (\sqrt[n-1]{\frac{y_n}{y_0}} - 1)100.$$

The total value of an indicator in each analyzed period was calculated with the formula:

$Y_t = \sum_{t=1}^{n} y_t$.

The average value of an indicator in each period of analysis was determined based on the formula:

$$\bar{y} = \frac{\sum_{t=1}^{n} yt}{n}$$

Absolute differences, $\Delta = y_n - y_{n-1}$

Mean, $\bar{X} = \frac{\sum_1^n X_i}{n}$

Standard deviation, $S = \sqrt{\frac{\sum_1^n (X_i - \bar{X})}{n-1}}$

Variation coefficient, $V(\%) = (S/\bar{X})100$

Graphical Method in order to display the trend and variations of each indicator during the analyzed period.

The results were tabled and graphically illustrated, the interpreted and commented and also compared and finally the corresponding conclusions were drawn.

RESULTS AND DISCUSSIONS

Honey Production.

Honey production - general trend. Romania has a high potential for producing honey and other bee products. This is due to its climate conditions which offer a large variety of plants with nectar and its long tradition in beekeeping [26].

Honey production has known a general trend in general, with a few inflexions in the unfavourable years for pickings due to rainfalls and drought. In the year 2017, Romania achieved 30,177 tonnes honey, by 156.9 % more than in the year 2000 (Fig.1.)

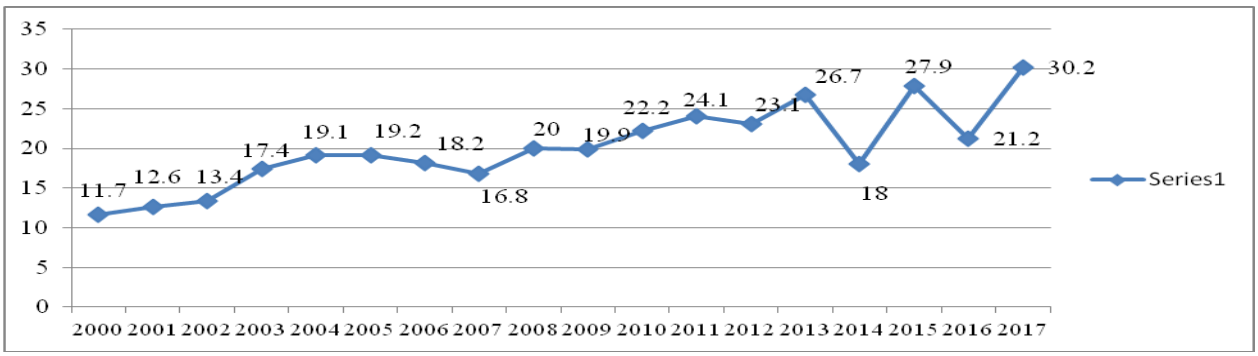

Fig.1. Honey production in the period 2000-2017, Romania (tonnes)
Source: Own design based on the data provided by [20] and [6].

In the pre-accession period, 2000-2006, Romania produced 111,732 tonnes honey, meaning 15,961.7 tonnes in average per year. In the post-accession period, the country registered 250,147 tonnes, by 123.8 % more than in the pre-accession interval. The average honey production per year in the period 2007-2017 was 22.740.6 tonnes, by 42.46 % higher than in the period 2000-2006.

In the territory, there are differences among various regions regarding the level of production.

In 2014, Romania came on the 5th position for honey production in the EU after Spain, Hungary, Greece and Poland, while in 2015, it came on the 1st place with 35 thousand tonnes, representing 13.05 % of the EU honey production (268 thousand tonnes). Romania is followed by Spain and Hungary which occupied the 2nd and 3rd positions in the EU [4, 8, 21].

Honey production in the territory. In the pre-accession period, the highest production was noticed in the NE area (17,253 tonnes), followed by Center (17,030 tonnes) and S. Muntenia (16,794 tonnes). A similar result on the territorial distribution of honey production was found by [15].

In the post-accession interval, the highest production, in the decreasing order, was carried out by SW Oltenia (41,082 tonnes), N East (36,623 tonnes) and Centre region (36,238 tonnes).

In Bucharest-Ilfov area, it was recorded the lowest honey production both in the pre-accession and in the post-accession period.

Regarding the average production per year in the pre-accession period, the same regions registered the highest level as follows: NE (2,465 tonnes), followed by Center (2,433 tonnes) and S Muntenia (2,399 tonnes).

In the post-accession interval, the highest average annual production was achieved as follows: 3,735 tonnes in SW Oltenia, 3,329 tonnes in NE and 3,294 in the Centre area.

By region of development, honey production followed an ascending trend in general from the year 2000 to the year 2017 as shown in

Fig.2. However, honey production declined in the years 2007, 2014 and 2016 when the rains and droughts affected the nectar resources.

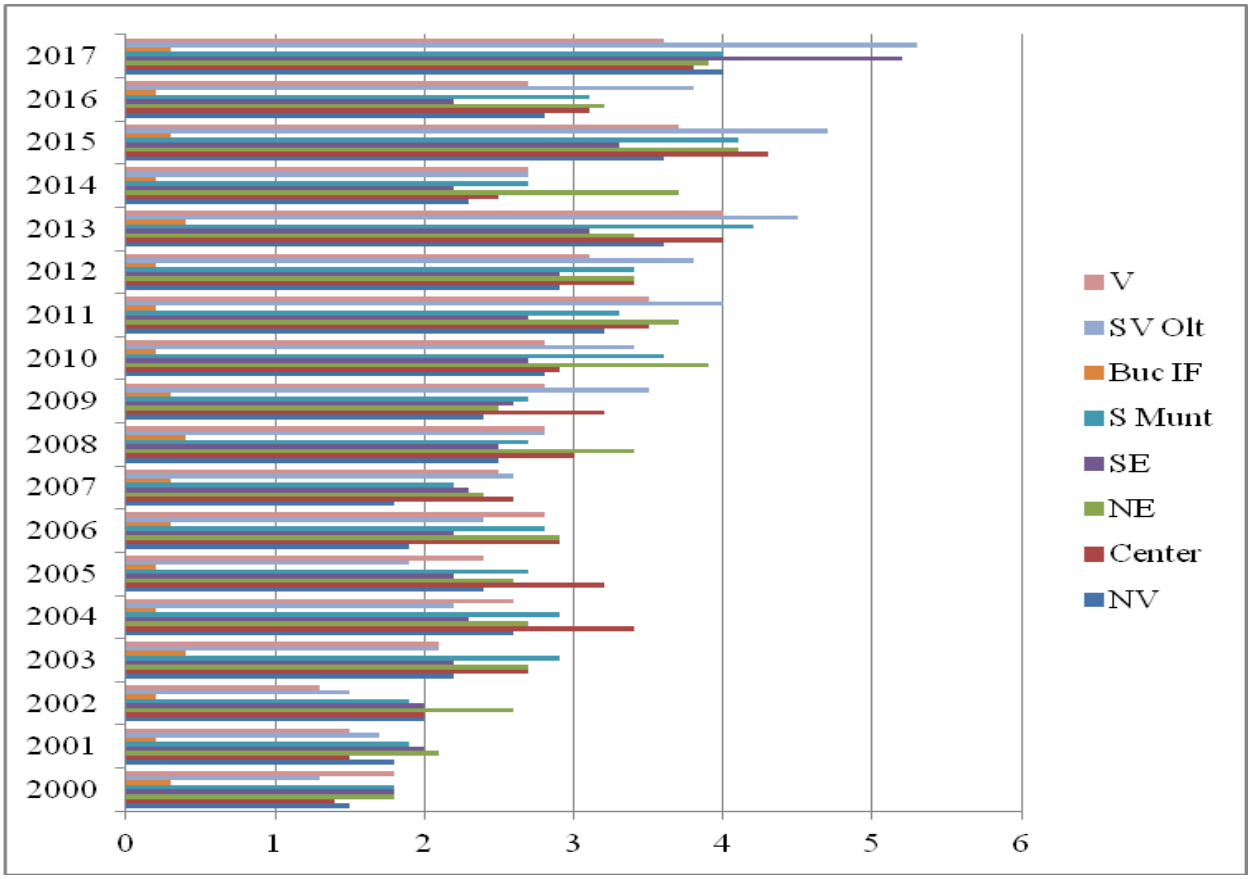

Fig.2.Honey production by region of development, Romania, 2000-2017 (Million tonnes)
Source: Own design based on the data provided by [20] and [6].

Honey production growth by region. The highest increase of honey production, in percentage points, in the period of accession was registered by the following regions: SW Oltenia (310.5%), West (234.5%) and NW (214.7%). The lowest increase was found in Bucharest Ilfov (156.2 %).

Regarding the average honey production in the period of post-accession compared to the level recorded in the period of pre-accession, the highest growth was achieved by the same regions: SW Oltenia (197.6 %), West (149.3 %) and NW (136.6%). Bucharest Ilfov area registered a slight decline of mean production of honey (-0.8%) (Table 1).

Table 1.Honey production and average honey production in the pre and post accession period by region (tonnes)

	Romania	NW	C	NE	SE	S Munt	Buc IF	SW Olt	W
Honey production									
(a)2000-2006	111,732	14,620	17,030	17,253	14,871	16,794	1,903	13,227	14,534
(b)2007-2017	250,147	31,394	36,238	36,623	31,731	36,019	2,974	41,082	34,087
Difference (b)-(a)	148,415	16,774	19,208	19,370	16,860	19,225	1,071	27,855	19,553
(b)/(a)100 (%)	223.8	214.7	212.7	212.2	213.3	214.4	156.2	310.5	234.5
Average honey production									
(a)2000-2006	15,952	2,089	2,433	2,465	2,124	2,399	272	1,890	2,076
(b)2007-2017	22,741	2,854	3,294	3,329	2,885	3,274	270	3,735	3,099
Difference (b)-(a)	142.4	136.6	135.3	135.0	135.7	136.5	99.4	197.6	149.2
(b)/(a)100 (%)	142.5	136.6	135.3	135.0	135.8	136.4	99.2	197.6	149.3

Source: Own calculation.

The contribution of the regions to honey production. Along the years, there were noticed changes concerning the contribution of the regions to honey production. This was caused by the picking conditions in close connection with the climate variations.

In the year 2000, the highest contribution to honey production was given by West area (15.6%), N E (15.4%) and S E (15.2 %). In the year 2006, on the 1st rank there were situated two regions: N E (15.8%) and Centre (15.8%), followed by S Muntenia (15.3%) and West (15.3%), and finally on the 3rd position was situated SW Oltenia (13.2%).

In 2007, the top position belonged to the Centre area (15.7%), followed by SW Oltenia (15.4 %0 and West (14.7%). In 2017, on the top rank came SW Oltenia (17.6%), then on the 2nd position was SE (17.2 %) and on the 3rd position two areas: S Muntenia (13.4%) and NW (13.4%) (Table 2).

Table 2. The contribution of the regions to honey production (%)

	NW	C	NE	SE	S Munt	Buc IF	SW Olt	W
2000	13.2	11.7	15.4	15.2	15.0	2.8	11.1	15.6
2006	10.8	15.8	15.8	12.2	15.3	1.6	13.2	15.3
2007	10.6	15.7	14.5	13.9	13.2	2.0	15.4	14.7
2017	13.4	12.7	13.0	17.2	13.4	0.9	17.6	11.8

Source: Own calculation based on the data provided by [20]

The main counties producing honey. If we consider the distribution of honey production by county, it is important to mention that the highest levels are recorded in the following counties: Valcea (11.9%), Dambovita (10.2 %), Mures (8%), Brasov (5.7%), Caras Severin (3%), which all together totalize 38.8 % of Romania's honey production [13].

The performance in honey production was influenced by many factors, among the most important being: the number of bee families, the power of the colonies, the average honey production per colony, nectar resources, diseases incidence etc.

Number of bee families.

General trend in the number of bee families. The number of bee families increased year by year in the analyzed period. If in the year 2000, Romania had 648,808 bee families, in 2006, their number reached 891,043, being by 37.33 % higher than in the first year of the pre-accession period. For the year 2007, the statistics mentioned 982,368 bee families and for the year 2017 it was found 1,602,453, by 63.12 more than in 2007 and by 146.9 % more than in the year 2000.

The growth rate of the bee families was 5.5 % in the pre-accession period and 6.16 % in the post-accession interval (Fig.3).

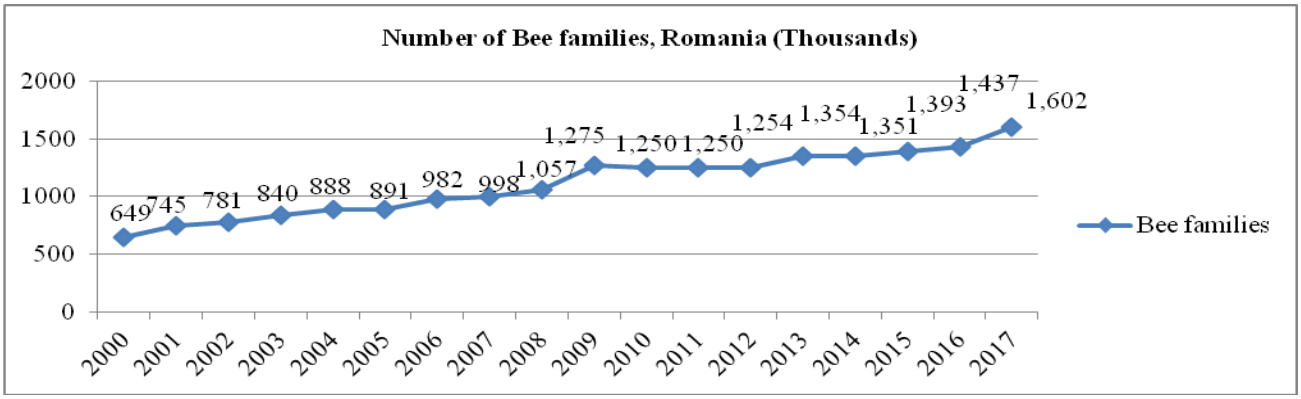

Fig.3. Number of bee families, Romania, 2000-2017 (Thousands)
Source: Own design based on the data provided by [20]

The development of the bee families by region. The highest increase for the average number of bee families in the period of accession in comparison with the mean in the

period of pre-accession was carried out in by SW Oltenia (218.7%), West (165.3%) and Centre (160.8). The lowest growth was noticed in Bucharest Ilfov area (105.1 %)(Table 3).

Table 3. The average number of bee colonies in the pre and post accession period by region

	Romania	NW	C	NE	SE	S Munt	Buc IF	SW Olt	W
(a)2000-2006	825,143	113,326	113,069	133,627	100,191	130,959	16,521	105,462	98,446
(b)2007-2017	1,292,818	162,775	181,843	176,694	149,935	186,574	17,365	230,661	162,736
Differ. (b)-(a)	467,675	49,449	68,774	43,067	49,744	55,615	844	125,199	64,290
(b)/(a)100 %	156.6	143.6	160.8	133.2	149.6	142.5	105.1	218.7	165.3

Source: Own calculation.

The dispersion of bee families in the territory in not so equal among regions, as shown in Table 3. In the year 2000, the regions with the highest share in the total number of bee families were: North East (16.3%), S Muntenia (16%) and N W (14.5%). In 2017, the situation was the following one: S W Oltenia (19.5 %), S E (15.6%) and S Muntenia (14.2 %).

There are regions such as: N W, Centre, N E, S Muntenia and W, where their weight in the total number of bee families recorded a decreasing trend in the period 2000-2017, also regions whose share registered an ascending trend like SW Oltenia and S E, and Bucharest Ilfov region which achieved different shares, either increasing or decreasing from a period to another (Table 4).

Table 4.The share of the number of bee families raised in the regions of development in Romania's number of bee families (%)

	NW	C	NE	SE	S Munt	Buc IF	SW Olt	W
2000	14.5	12.2	16.3	13.0	16.0	2.8	12.2	13.0
2006	13.3	16.0	16.2	11.0	15.8	1.9	11.6	14.2
2007	13.1	14.7	14.1	12.9	14.8	2.3	14.4	13.7
2017	13.1	12.8	13.5	15.8	14.2	0.9	19.5	10.2

Source: Own calculation based on the data provided by [20].

The number of bee families per km^2 was determined in order to better compare the potential of beekeeping by region. In 2017, in Romania, there were 6.72 bee families per km^2 by 63.1 % more than in 2007 and 2.4 times more than in the year 2000. If we look at the figures along the analyzed years, we may notice the development of beekeeping in terms of the number of bee families in each region, and this is obviously seen mainly in the period of post-accession, therefore after 2007.

In the period 2007-2017, the highest increase of the number of bee families was achieved in SW Oltenia (+121.2%), S E (+99%) and N W (+62.8%).

In 2017, the highest number of bee families per km^2 was 10.71 in S W Oltenia, 7.78 in Bucharest Ilfov and 7.07 in S E region. Despite that in Bucharest Ilfov area it is an important number of bee colonies per km^2, here, it was noticed a decrease by 31.26 % from 12.4 bee families in 2007 to 7.78 bee colonies in 2017 (Table 5).

Table 5. The number of bee families per km^2 in the regions of Romania

	Romania	NW	C	NE	SE	S Munt	Buc IF	SW Olt	W
2000	2.72	2.76	2.30	2.88	2.35	3.00	10.40	2.72	2.61
2006	3.73	3.46	4.17	3.92	2.74	4.11	9.33	3.55	3.90
2007	4.12	3.77	4.25	3.76	3.55	4.11	12.40	4.84	4.15
2017	6.72	6.14	6.00	5.84	7.07	6.58	7.78	10.71	5.17
2017/2000%	163.10	162.8	141.1	155.3	199.0	160.0	62.74	221.20	124.5

Source: Own calculation.

The number of bee families per km^2 is used to make comparisons among countries regarding the density and intensity of apiculture. The number of bee colonies per surface unit varies from a country to another in Europe. In 2010, the average number of bee colonies per km^2 of Europe was 4.2, while in Greece it was 11.4, in Hungary 10.7, in Czech Republic 6.6, in Spain 4.9, in Romania 4, in Italy 3.7, in Poland 3.6, in France 2.4 and in Germany 1.9 [5].

The number of bee families per beekeepers (apiary) also varies from a country to another. In 2010, at Europe level, the average number of bee colonies per apiary accounted for 22.4. The highest average number of bee families per apiculturist is in Spain (103), Greece (75), Hungary (56.7), Poland (25), Romania (23.1), France (19.5), Italy (16), Czech Republic (11.1), Germany (7.6) [5].

In Europe there is a large range of persons dealing with beekeeping and not all of them could be named "real or professional beekeepers". It was affirmed that in the EU just 4% apiculturists could be considered "professionals" because they have over 150 bee family in their apiary. The rest of 96 % keep less than 150 bee families/apiary and should be not considered experienced apiculturists. But, this opinion is still a controversial one, a figure more appropriate being 40 bee families/apiary as considered by beekeepers associations [4].

However, there is another opinion based on a detailed survey in many European countries, that in Europe there is the following distribution of beekeepers based on the apiary size: 78 % of beekeepers are growing less than 50 bee colonies, 16 % have between 51-150, 4 % have between 151-300 bee colonies and 2 % keep over 300 bee families. According to this analysis, in Romania, it was found 23.1 bee families per apiary, by 3.1 % more than the European mean. Also, it was affirmed that in Romania 56.6 % apiculturists have less than 50 bee families, 23.9 % are raising between 51-150, 10.4 % have between 151-300 bee families and 9.1 % are keeping more than 300 bee families.

The persons dealing with beekeeping are: professionals, non professionals, part time and hobby beekeepers. According to the EU Commission, only the apiculturists with over 150 bee families could be considered professionals [2, 5].

However, in Romania, the apiary size varies between 20 bee families up to over 600 bee families.

The situation of the number of bee families by county pointed out that the counties where the highest number of bee colonies is grown are: Mehedinti (6.11%), Valcea (5.12%), Iasi (3.85), Caras Severin (3.58%), Bacau (3.47%), Brasov (3.3%), all these counties together accounting for 25.43 % of the total number of bee colonies in Romania [13].

Regarding the number of bee hives. In 2015, Romania had 1,550 thousand bee hives, of which: 6.14 % in Mehedinti, 5.51 % in Valcea, 5.36 % in Mures, 3.80 % in Iasi, 3.70 % in Caras Severin county as affirmed by MARD [13].

According to the EU Commission, in Romania there were 975 thousand bee hives in the period 2008-2010, 1,280 thousand bee hives in the period 2011-2013, and 1,550 thousand hives in 2014-2016 and in 2,472 thousand bee hives in the year 2016. Based on the number of bee hives, Romania is classified in the 2nd position in the EU after Spain [8].

Number of beekeepers. The development of apiculture depends on the number of beekeepers which in general reflects the number of apiaries, but also on the number of bee families and apiary size, in terms of bee families/apiary. We may also add the technologies applied in apiculture regarding the assurance of high value bee queens, breeding programmes, bee keeping technologies, opportunities for pastoral pickings, variety of flora supplying nectar, bee feeding, disease prevention and treatments, beekeepers training level and experience in the field and other factors.

Romania has an important number of beekeepers.

The number of beekeepers in Romania has continuously increased. In the year 2000, Romania had 23,409 beekeepers representing 5 % of the EU number of beekeepers. In 2016, Romania had 43,200 apiculturists, meaning

6.8 % of the beekeepers operating in the EU. For the number of beekeepers, Romania is situated on "the 7th position in the EU, after Germany, France, Poland, Italy, Czech Republic and United Kingdom". (Table 6) [8].

Table 6. The number of beekeepers in Romania and their share in the EU beekeepers number

	2000* EU-15	2004-2006* EU 25	2008-2010** EU 27	2011-2013** EU 28	2014-2016** EU 28
EU	470,797	593,168	624,872	635,638	631,236
Romania	23,409	34,971	36,800	40,000	43,200
Share of Romania's beekeepers in the EU (%)	5	5.9	5.9	6.3	6.8

Source: [8, 19].

About 60 % of the number of apiculturists belong to various associative forms and are members of Beekeepers Association in Romania. About 20 % of the 2,472 thousand bee hives in the year 2016 were owned by the beekeepers with more than 150 bee families [13].

Honey production/Bee family.

Besides the number of bee families, honey production is influenced by the production potential of each bee colony to produce honey. This depends on its power in terms of the number of family members, the use of selected bee queens, opportunities for pickings in stationary and pastoral related to the variety of flora producing nectar, favourable or non favourable weather conditions, works in the apiary made by beekeeper and its experience in supporting the bee family during the winter season and in the period of weak or lacked of pickings [30].

In the whole analyzed period, honey yield varied between 17.7 kg in the year 2000 and 18.8 kg in the year 2007. In the last year of the analysis it was by 6.21 % higher than in the first one.

However, there were favourable years when the average production achieved a good performance such as: 2003 (20.7 kg), 2003 and 2005 (21.6 kg), 2006 (20.4 kg), and also in 2008, 2013 and 2015 (20 kg). The lowest yield level was recorded in the year 2014, which was the worst year for beekeeping due to the unfavourable weather conditions which affected pickings (Fig.4).

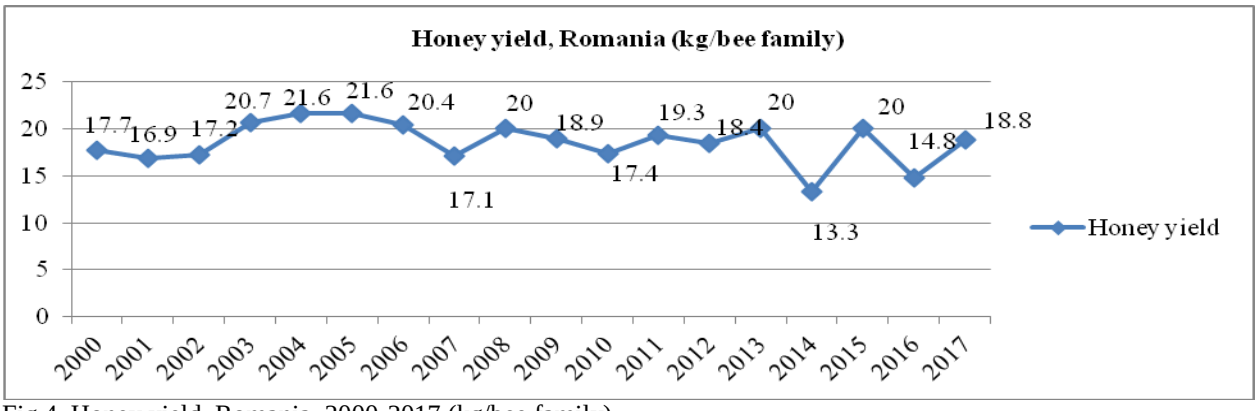

Fig.4. Honey yield, Romania, 2000-2017 (kg/bee family)
Source: Own design based on the data provided by [20]

Honey yield dispersion in the territory by region. The highest performance in honey yield was achieved in the W region, which has been in the top almost every year, except 2006. The highest level recorded by this region was 22.4 kg/bee family in the year 2006. On the 2nd position came the S E region which registered the highest honey yield, 22.6 kg/bee family in the year 2006. On the 3rd position is situated the Central region with the highest honey yield 20.2 kg achieved

in 2006. Also, S W Oltenia had a good yield in 2006 (23.1 kg) and in 2007 (18.1 kg).
The highest growth rate for honey yield in the analyzed period was registered by N W region (+17.1 %), N East (7%), Bucharest Ilfov (6.9%), Central region (6.2 %), A slight decline of 0.9 % was noticed in the W area (Table 7).

Table 7. Honey yield by region of Romania

	Romania	NW	C	NE	SE	S Munt	Buc IF	SW Olt	W
2000	18.1	16.4	17.6	17.0	21.2	17.0	17.3	16.3	21.9
2006	20.4	16.6	20.2	20.0	22.6	19.6	16.9	23.1	22.4
2007	17.1	13.8	18.1	17.6	18.4	15.2	15.1	18.1	18.5
2017	18.2	19.2	18.7	18.2	20.6	17.8	18.5	16.9	21.7
2017/2000 %	100.5	117.1	106.2	107.0	97.2	104.7	106.9	103.7	99.1

Source: Own calculation.

Honey price in the internal market. Honey price depends on the honey type (polyfloral, acacia, lime etc), honey quality, demand/offer ratio, form of delivery (in bulk or bottled), organic honey or usual honey, selling place (beekeeper's price or wholesaler's price) and conjunctural factors.
The share of various honey types in honey production are: multi-floral honey 50%, acacia honey 25 % and lime honey 25 %. Acacia and lime honey have a higher price than polyfloral honey [23].
The average acquisition price registered a general increasing trend in the period 2004-2017. Thus, from Lei 6.17/kg honey in the year 2004, it achieved Lei 16.13/kg in the year 2017, being 2.61 times higher than in the 1st year of the study period. Also, the producer's price increased by 76 % from Lei 13.17 in the year 2004 to Lei 23.18 in the year 2017 (Fig.5).

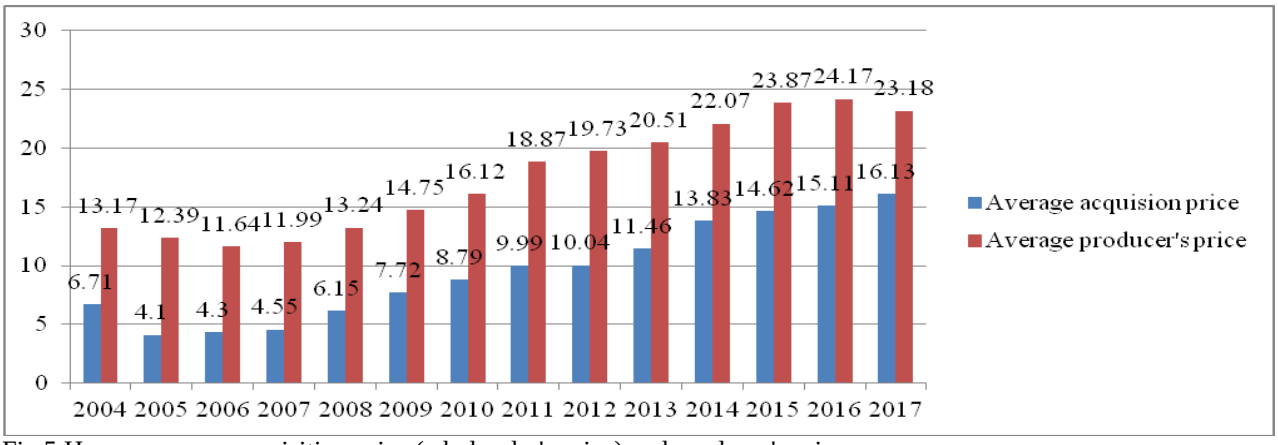

Fig.5.Honey average acquisition price (wholesaler's price) and producer's price
Source: Own design based on the date from [20].

Quantitative honey export and import.
Exported amounts of honey. Romania has a good potential for honey export as production performance is enough high and domestic consumption is low, about 0.45-0.55 kg/inhabitant and 0.078 tonnes in 2016 [18].
Along the analyzed period, honey export varied from a year to another depending on production and export opportunities in the external market. However, in general, it could be affirmed that the export increased. In 2016, Romania exported 10,371 tonnes honey, by 38 % more than in 2007, when its registered 7,512 tonnes. The peak of exported amount of honey was 12,649 tonnes registered in the year 2013, and the low export level was 5,793 tonnes registered in the year 2002. After the country accession into the EU market, the export was mainly oriented to the common market where the demand for honey is high and Romanian honey is appreciated for its high quality. The statistical data confirm that in the period 2007-2017, Romania exported between 10-12 thousand tonnes by year (Fig.6).

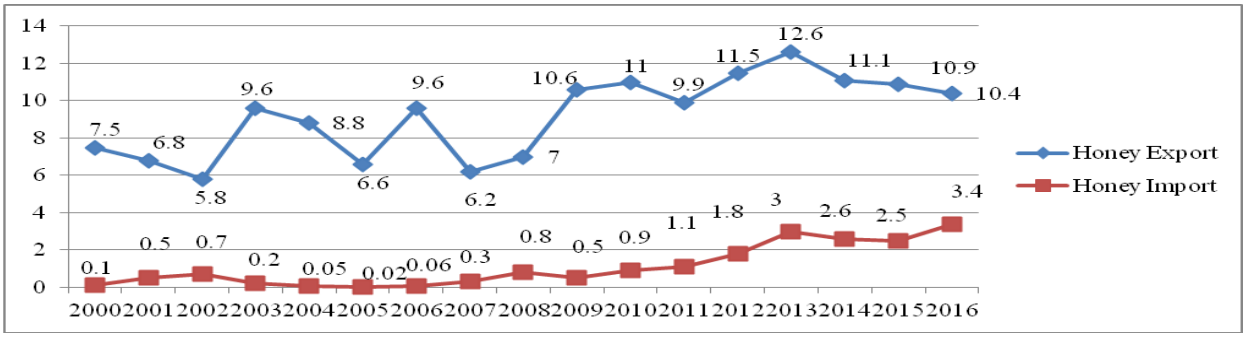

Fig.6. Exported and imported amounts of honey, Romania, 2000-2017 (Thousand tonnes))
Source: Own design based on the data provided by [6].

Imported amounts of honey. Despite that Romania is a producer and exporter of honey, and export is also determined by the weak consumption on the internal market, honey is also a subject of import. In the period, 2000-2006, the imported amounts were very small, practically non significant. But, after 2007, the imports of honey have been intensified. In 2016, Romania imported 3,388 tonnes honey, 25 times more than in the year 2000 and 10.7 times more than in the year 2007 (135 tonnes).

Export/Import ratio. This indicator of efficiency registered higher values in the period of pre-accession, as Romania imported smaller amounts of honey, and lower and lower values in the post-accession interval, when honey imports grew up. The average export/import ratio was 110.1 in the period 2000-2006, and 9.37 in the period 2007-2016. (Fig.7).

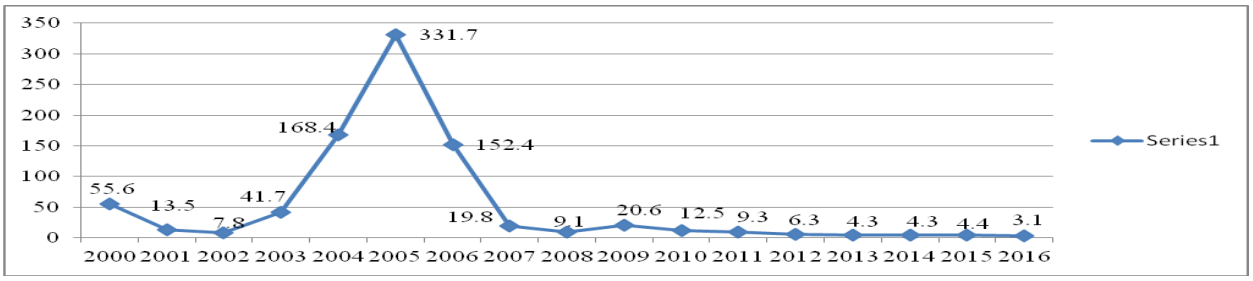

Fig.7. Export/Import ratio for honey amount, Romania, 2000-2016
Source: Own calculation and design.

Export/Production ratio varied between 0.63 in the year 2000 and 0.48 in the year 2016. The average of this ratio accounted for 0.50 in the period 2000-2006, reflecting that 50 % of honey production was exported and for 0.46, showing that 46 % of production was sold on the external market (Fig.8).

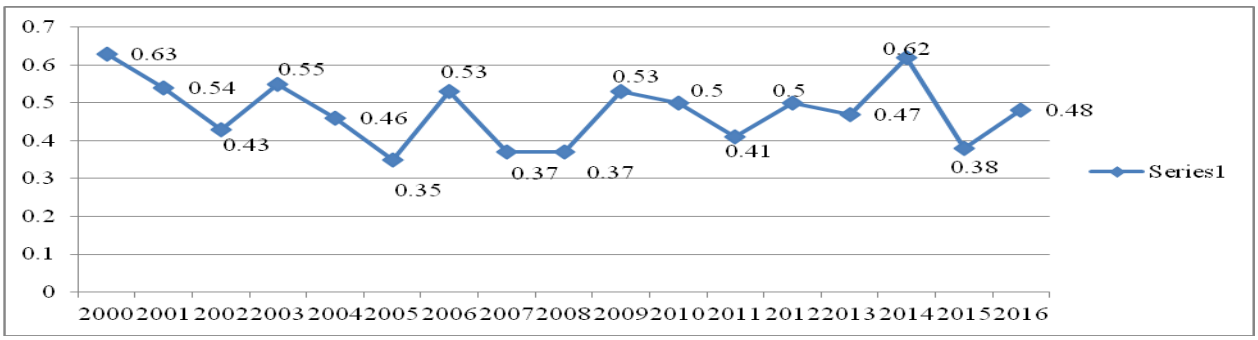

Fig.8. Export/Production ratio for Honey, Romania, 2000-2016
Source: Own calculation and design.

Export and Import Values and Trade Balance.

Honey export value registered a general ascending trend in the researched interval. In 2016, honey export value was USD 41.4 Million, 5.37 times higher than in the year 2000 (USD 7.7 Million).(Fig.9.)

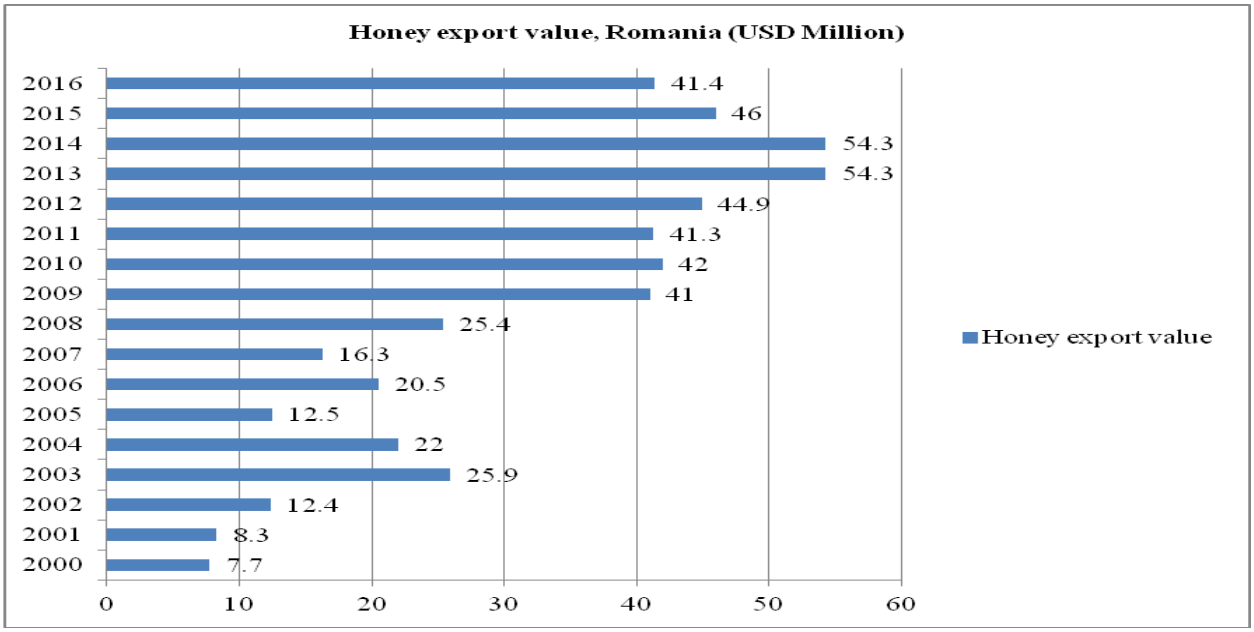

Fig.9. Honey export value, Romania (USD Million)
Source: Own calculation and design, based on the data from [6].

Honey import value has also increased, in the year 2016 accounting for USD 8.9 Million, being 52.5 times higher than at the beginning of the analyzed period. However, the small amounts of honey imported between the year 2000 and 2006 led to a lower import value in this interval, except the year 2002. After 2007, the import value has known a higher dynamics determined by the higher and higher quantities of honey purchased from the external market. Thus, in 2016, the import value was 11.64 times higher than in 2007. (Fig.10).

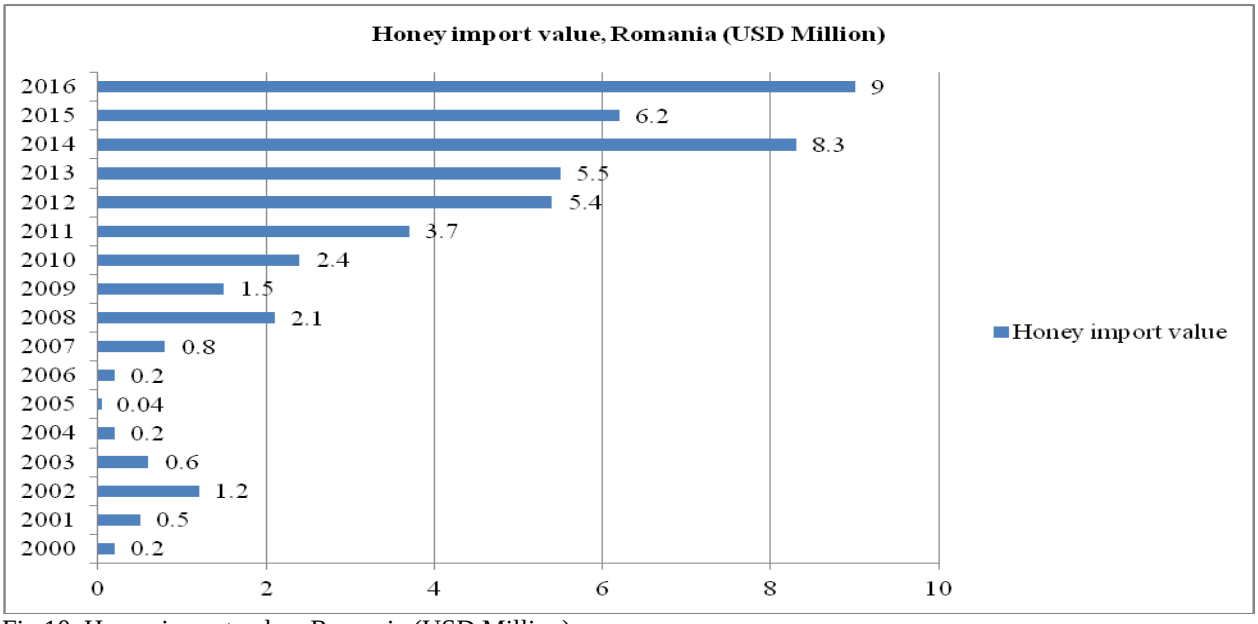

Fig.10. Honey import value, Romania (USD Million)
Source: Own calculation and design, based on the data from [6].

Honey trade balance had a positive value as export value exceeded import value in each of the analyzed years. In 2016, it was recorded USD 32.5 Million compared to USD 7.5 Million in honey trade balance in the year 2000, which means a value 4.3 times higher. Compared to the 2007 level, in 2016 trade balance was 2.09 times higher.(Fig.11).

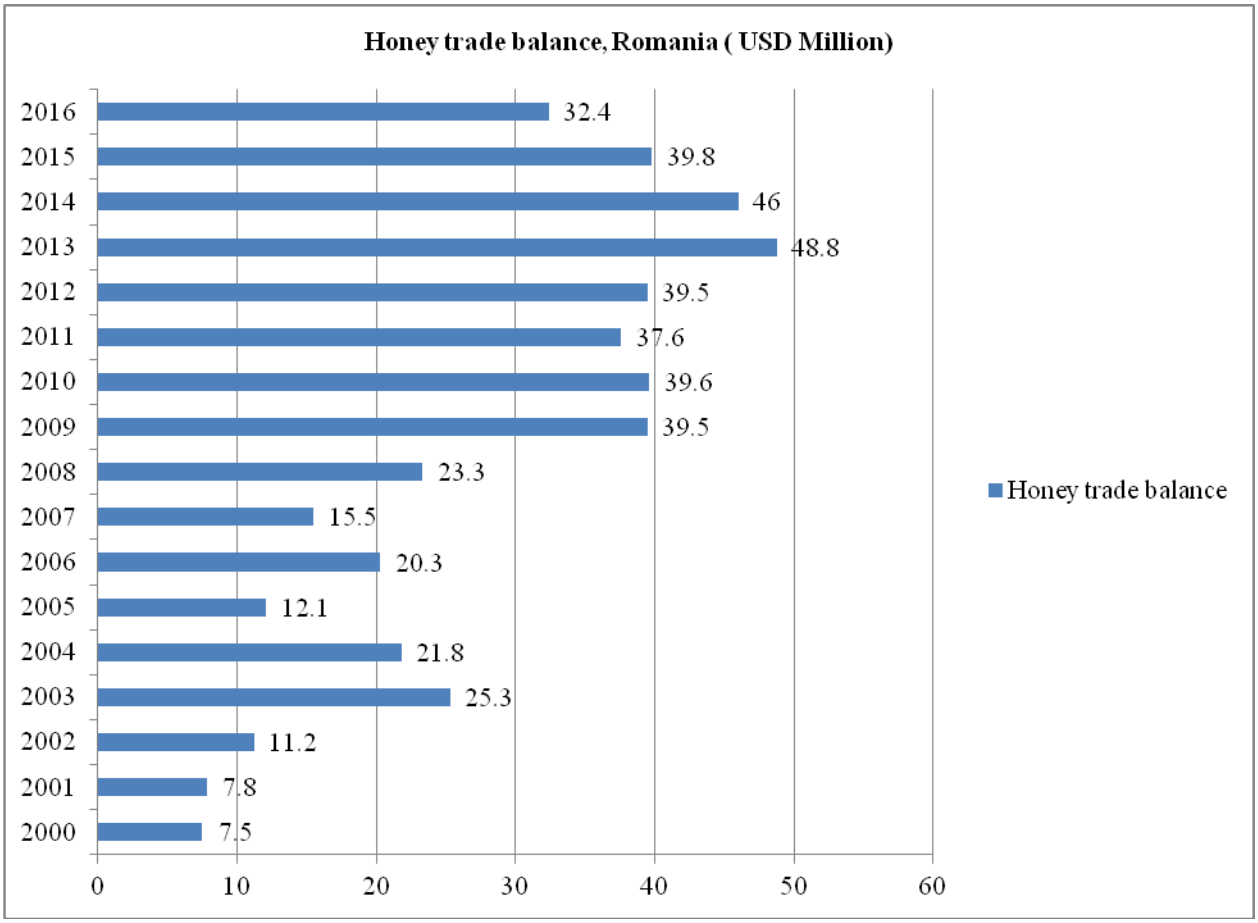

Fig.11. Honey trade balance, Romania (USD Million)
Source: Own calculation and design.

The main partners for export and import of honey.

Export partners. The honey produced in Romania is of high quality which determines to be required on various external markets, but mainly in the EU countries. Among the most important beneficiaries there are: Germany, Italy, France, Poland, Austria, Spain, United Kingdom, Israel, Belgium and China.

Import partners. Honey is imported from various suppliers such: Poland, China, Rep. of Moldova, Ukraine, Germany, Bulgaria, France, Spain, Italy [13].

Honey export and import price.

Honey export price has slowly but continuously went up and the import price as well. The export price ranged between USD 1.02 per kg honey in the year 2000, the lowest price level and USD 4.88 registered in the year 2014. However, honey is exported at a low price, because it is exported in bulk and the external processors offer a low price which does not cover production costs in beekeeping.

The average import price varied between USD 1.07 per kg in 2001, the lowest level and USD 3.42 achieved in the year 2011. In 2016, the honey export price accounted for USD 4/kg and the import price USD 2.65 per kg (Fig.12).

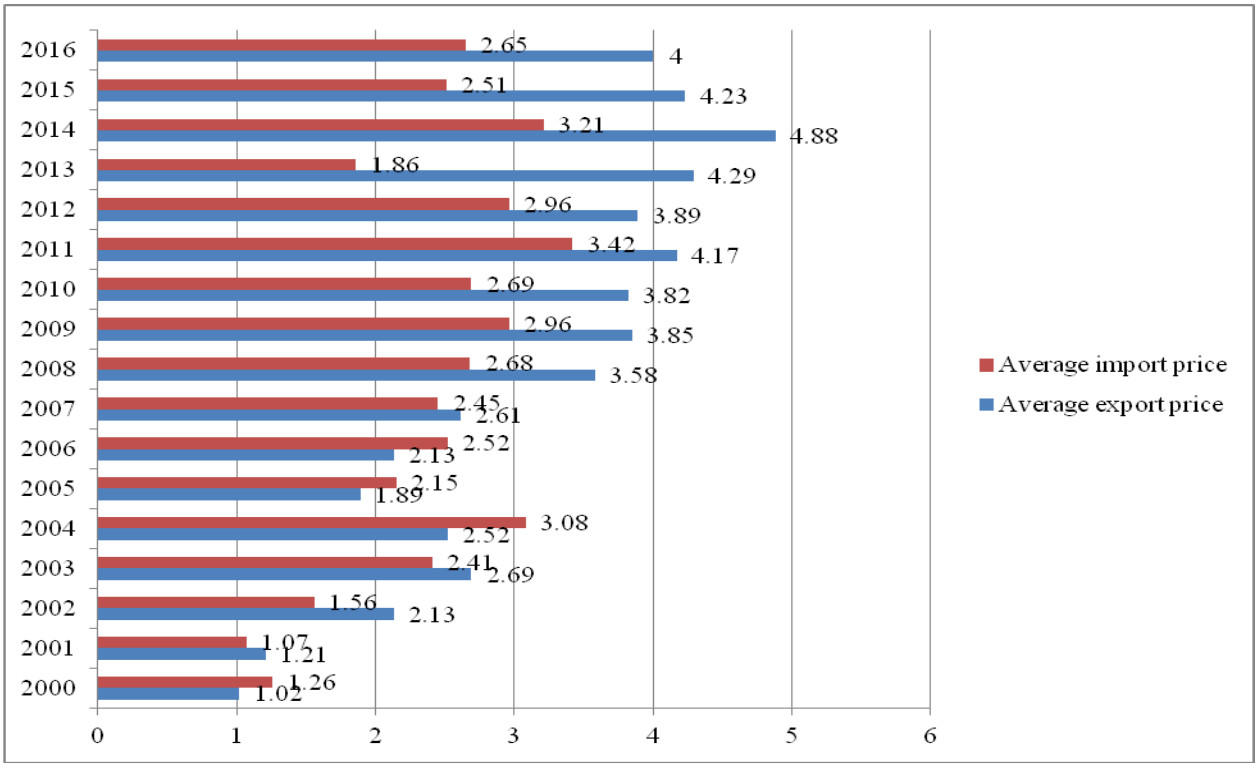

Fig.12. Honey export and import price. (USD/kg)
Source: Own calculation and design based on the data from [6].

Comparison between average export and import price. Making a comparison between the average export and the average import price, one may easily notice that in general, export price was higher than import price.

In the period 2000-2006, the difference between the export and import price of honey had a positive value only in the years 2001, 2002 and 2003, but in the other years it had a negative value. And this reflects that the positive value of honey was determined much more by the quantity of honey exported than the export price. Romania was disadvantaged in export by the lower honey price compared to the higher import price.

In the period 2007-2016, the average export price was higher than the average import price in each year of the analyzed period.

As a result the ratio between the average export price and the average import price was less than 1 in four year and over 1 in the years 2001, 2002 and 2003. in the period 2000-2006 and also in all the years from the period 2007-2016 (Fig.13).

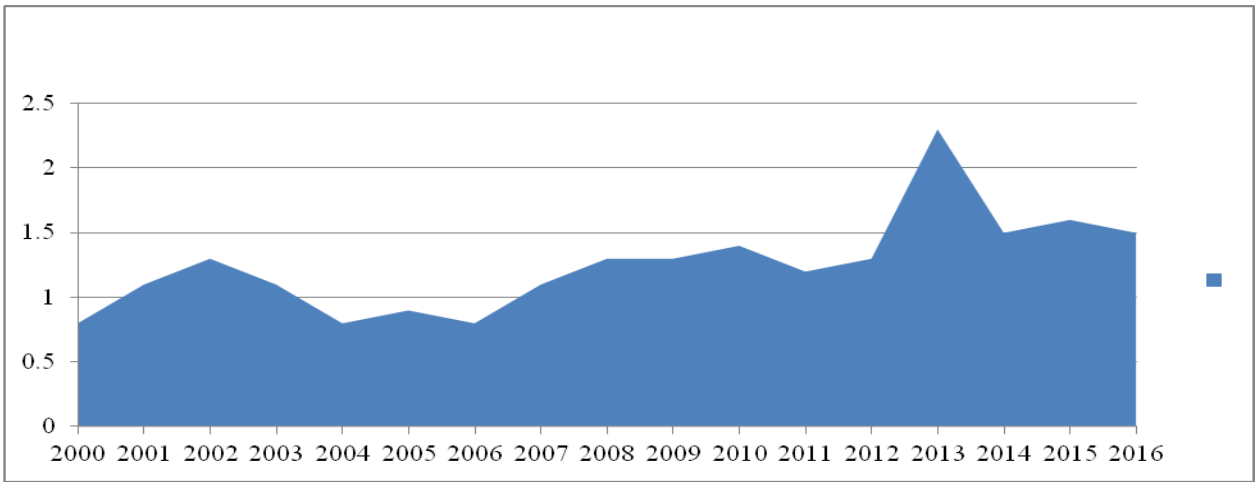

Fig.13. Ratio between the average export and import price of honey
Source: Own calculation and design.

The main statistical parameters in terms of average, standard deviation and variation coefficient for all the analyzed indicators are shown Table 8.

Table 8. The average, standard deviation and variation coefficient for all the indicators used in this study

	Mean	Std. Deviation	Coefficient of variation (%)
Honey production (Million tonnes)			
(a) 2000-2006	15.94	3.25	20.38
(b)2007-2017	22.73	4.19	18.43
Difference (b)-(a)	+ 6.79	-	-
Number of bee families (Thousands)			
(a) 2000-2006	825.14	109.93	13.32
(b)2007-2017	1,292.81	167.79	12.97
Difference (b)-(a)	+467.67	-	-
Honey yield (kg/bee family)			
(a) 2000-2006	19.4	2.09	10.77
(b)2007-2017	18.0	2.21	12.27
Difference (b)-(a)	-1.4	-	
Exported amount of honey (Thousand tonnes)			
(a) 2000-2006	7.81	1.52	19.46
(b)2007-2016	10.12	1.99	19.66
Difference (b)-(a)	2.31	-	-
Imported amount of honey (Thousand tonnes)			
(a) 2000-2006	0.26	0.23	88.46
(b)2007-2016	1.69	1.11	65.68
Difference (b)-(a)	1.43	-	-
Honey export value (USD Million)			
(a) 2000-2006	15.6	7.14	45.76
(b)2007-2016	40.69	11.77	28.93
Difference (b)-(a)	25.09	-	-
(b)/(a)100 %	260.8	-	-
Honey import value (USD Million)			
(a) 2000-2006	0.42	0.39	92.85
(b)2007-2016	4.49	2.84	63.25
Difference (b)-(a)	4.07	-	-
(b)/(a)100 %	1,069.04	-	-
Honey trade balance (USD Million)			
(a) 2000-2006	15.14	7.20	47.55
(b)2007-2016	36.20	10.06	27.79
Difference (b)-(a)	21.06	-	-
(b)/(a)100 %	239.1	-	-
Export price (USD/kg)			
(a) 2000-2006	1.94	0.62	31.95
(b)2007-2016	3.93	0.58	14.75
Difference (b)-(a)	1.99	-	-
(b)/(a)100 %	202.57	-	-
Import price (USD/kg)			
(a) 2000-2006	2.00	0.73	36.50
(b)2007-2016	2.73	0.43	15.75
Difference (b)-(a)	0.73	-	-
(b)/(a)100 %	136.5		

Source: Own calculation based on the data provided by [20]

In case of honey production, the variation coefficient had values below 20 % reflecting that this indicator was relatively homogeneous in the analyzed periods.

For the number of bee colonies as well as for honey yield, the variation coefficient ranged between 10 % and 20 % meaning that the values of the indicators were relatively

homogeneous and that the average is representative in the both periods of analysis.
The average exported amount of honey in the post-accession period was 10.12 thousand tonnes by 29.57 % higher than in the pre-accession period. The imported quantity of honey accounted for 1.69 thousand tonnes in the post-accession interval, being 6.5 times higher than in the previous period.
The variation coefficient ranged between 10 and 20 %, being closer to the maximum threshold, reflecting that the data are relatively homogenous in case of the exported amount of honey. But, in case of the imported honey, the variation coefficient had very high values reflecting heterogeneous data. The high standard deviation reflects a high dispersion from the mean of the values in the both studied periods in case of the imported quantity of honey.
Regarding the export value, in the pre accession interval, the export value was enough small, but the variation coefficient reflect a high variability among the variables in this period of time. In the post-accession period, the average export value of honey is 2.6 times higher than before, and the variation coefficient is much smaller but still expressing a heterogeneous series of data.
Concerning the import value, the mean was very small in the pre-accession period, but the variation coefficient reflected a high variability of the data from the mean. In the post accession period, the average import value was 10.6 times higher than in the previous period and the variation coefficient diminished a little but it is still very high reflecting large discrepancies between the data of the time series and the mean.
The trade balance accounted, in average, for 15.14 USD billion in the pre accession period and for 36.2 USD Billion in the post accession period, meaning 2.39 times more. The values of the variation coefficients reflected a heterogeneous series of data in the first analyzed period, and a moderate heterogeneous sample of data in the second period.
The average export price in the post accession period was USD 3.93 per kg honey, 2 times higher than in the average price in the pre accession period. The average import price achieved in the period 2007-2016 was USD 2.73 per kg, by 36.5 % higher than the average price in the period 2000-2006.
The coefficients of variation were higher in the first studied period reflecting a large dissimilarity among the variables, and in the second period their values being lower reflected more homogeneity among the data.

CONCLUSIONS

In the period 2000-2017, honey production in increased by 56.9 %, reaching 30,177 tonnes at the end of the last year of the analysis.
After its accession into the EU, more exactly in the period, 2007-2017, Romania produced in average 22.740.6 tonnes of honey per year by 42.46 % more than in the pre-accession period. This was due to the continuous increase of production in all the regions of development, but mainly in SW Oltenia, N E and Centre regions which are the top producers, whose market share is 17.6 %, 17.1 % and, respectively, 13.4 %.
In Romania, in 2017, there were more than 1,600 bee families, 2.46 times more than in the year 2000. This was stimulated by the interest of apiculturists to develop apiary size as reflected by the a higher growth rate (6.16%) in the period 2007-2017 compared to 5.5 % in the previous period. The regions with the highest number of bee families are SW Oltenia, SE and E and S Muntenia with a market share: 19.5 %, 15.6% and 14.2 %. The highest number of bee families per km^2 is 10.71 recorded in SW Oltenia, followed by 7.78 in Bucharest Ilfov and 7.07 in SE region.
The average apiary size in Romania is 24 bee families, higher than 22.4 the European average, but lower than the one recorded in Spain, Greece, Hungary and Poland. Therefore, Romania is on the 5th position in the EU for apiary size.
In 2017, Romania had over 46,000 apiculturists, meaning about 7 % of the total number in the EU, placing the country on the 7th rank after Germany, France, Poland, Italy, Czech Republic and United Kingdom.
In 2017, honey yield/apiary was 18.8 kg, by 6.2 % higher than in the year 2000, and by 9.9

% higher than in 2007. Its level depended on total production and number of bee families, but also of the weather conditions. In the good years for pickings, average honey production per apiary reached 21.6 kg. However, honey yield in Romania is lower than in other EU countries.

The average acquisition price of honey was 2.6 times higher in 2017, accounting for Lei 16.13/kg, while the average producer's price increased by 76 %, reaching Lei 23/18 in 2017.

The amounts of exported honey increased by 38.6 %, recording 10.4 thousand tonnes in 2017 compared to the level in the year 2000. The imported honey amounts are much smaller than export but they increased from 0.1 to 3.4 thousand tonnes in period 2000-2017, but mainly in the post accession period. For this reason, export/import ratio declined from 55.6 in the year 2000 to 3.1 in 2017.

If in the pre accession period, Romania exported about 50 % of honey production, in the post-accession interval, it delivered on the external market a little less, 46 %.

The honey export value reached USD 41.4 Million in 2016, being 5.37 times higher than in 2000, while the import value accounted for USD 8.9 Million, being 52.5 times higher than in the 1st year of the study. As a result, honey trade balance was positive, in 2016, accounting for USD 32.5 Million, being 4.3 times higher than in 2000.

In the post accession period compared to the pre accession period, the average yearly export value increased 2.6 times and the average annual import value increased 10.69 times. The trade balance went up 2.3 times.

The beneficiaries of Romanian honey are mainly from the EU: Germany, Italy, France, Poland, Austria, Spain, United Kingdom, Belgium and the main suppliers are Poland, China, Rep. of Moldova, Ukraine, Germany and Bulgaria.

Romania sold honey for USD 4/kg and purchased for USD 2.65 per kg in the year 2016. In the post accession period the export price increased 2 times while the import price went up 1.3 times. The export/import ratio of honey price has continuously increased, mainly in the post accession interval.

Therefore, the accession into the EU was in the benefit of the both sides, as Romania intensified its honey production, export and import, while the EU covered much better the internal market. This was due to the measures taken by the EU Commission and the Romanian Government to encourage the development of beekeeping in order to assure consumers' needs, pollination of agricultural crops, biodiversity preservation and food security and safety.

Apiculture should continue to be an important agricultural sector in Romania as the country to maintain its position as a top honey producer and exporter of the EU. The beekeepers should be focused on the increase of the number of bee families, apiary size, production diversification, paying attention to organic honey as a market niche, honey quality, certification and brands and associative forms which could assure a higher efficiency along the honey market chain.

REFERENCES

[1]Ball, D.W., 2007, The Chemical Composition of Honey, Chemistry for everyone, Journal of Chemical Education, Vol.84, No.10, 1643-1646.

[2]Barbulescu, O., 2017, Romania arrived in the first position in the EU for honey production (România a ajuns pe primul loc in UE la producția de miere), 14 Jan.2017, https://www.profit.ro/stiri/romania-a-ajuns-pe-primul-loc-in-ue-la-productia-de-miere-16480972, Accessed Oct15, 2018.

[3]Bekic, B., Jelocnik, M., Subic, J., 2014, Honey bee colony collapse disorder (Apis mellifera L.) - Possible causes, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 14(2):13-18.

[4]Bernovici, A., 2017, It's official: Romania, the biggest honey producer in EU, https://www.romaniajournal.ro/its-official-romania-the-biggest-honey-producer-in-eu/, Accessed on Oct 25, 2018.

[5]Chauzat, M-P., Cauquil, L, Roy, L., Franco, S., Hendrix, P, Ribiere-Chabert, M., 2013, Demographics of the European Apicultural Industry, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0079018 , Published online 2013 Nov 13, Accessed Oct15, 2018.

[6]FAOSTAT, 2018, Commodities by country, http://www.fao.org/faostat/en/#rankings/commodities_by_country, Accessed Oct.23, 2018

[7]Grigoras, M.A., Popescu Agatha, Holeab, C., Chedea, V., Merce, E., Bridging the innovation gap and the management of interdisciplinary project for

sustainable development, XXXVII Annual Meeting of European Society for New Methods in Agricultural Research, ESNA, pp.10-14.
[8]Honey market presentation, EU Commission, Agriculture and Rural Development, https://ec.europa.eu/agriculture/sites/agriculture/files/honey/market-presentation-honey_en.pdf, Accessed on Oct 25, 2018.
[9]Key facts about Europe's honey market, 2018, News European Parliament, 28.02.2018, http://www.europarl.europa.eu/news/en/headlines/economy/20180222STO98435/key-facts-about-europe-s-honey-market-infographic, Accessed Oct 25, 2018.
[10]Koprivleski, V., Dirimanova, V., Agapieva, V., 2015, Economic analysis of state and development of beekeeping in Bulgaria, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 15(2):167-170.
[11]Lampeitl, F., 2002, Albinăritul pentru începători, Editura Mast, Bucureşti, 22-26.
[12]Majewski, J., 2017, Beekeeping support in the European Union countries, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 17(4):193-197.
[13]MADR, National Programme for Apiculture in Romania for the period 2017-2019, http://www.madr.ro/programul-national-apicol.html, Accessed on Oct 15, 2018.
[14]Marghitas, L.A., 2005, Beefamilies and their, Products, Ceres Press House,15-17
[15]Mierlita, T., Tabacila, N., Teodoroiu, F., 2014, The evolution of honey production in Romania between 2000 and 2011, Scientific Papers Series Management , Economic Engineering in Agriculture and Rural Development Vol. 14(1):227-230.
[16]Missio da Silva, P., Gauche, C., Valdemiro Gonzaga, L., Oliveira Costa, A.C., Fett, R., 2016, Honey: Chemical composition, stability and authenticity, Food Chemistry, Vol.196, a April 2016, 309-323.
[17]Näumann, G., Mahrt, E., Himmelreich, A., Mohring, A., Frerichs, H., 2012, Traces of contamination–well preserved in honey: investigation of veterinary drugs and American foulbrood in honeys of global origin, Journal für Verbraucherschutz und Lebensmittelsicherheit, Vol. 7:35-43
[18]Nica Maria, 2017, Honey Market in Romania, "Ovidius" University Annals, Economic Sciences Series Vol. XVII, Issue 2, 274-280.
[19]NIS Statistical Yearbook, 2006
[20]NIS, Tempo Online Data Base, 2018, www.insse.ro, Accessed on Oct 15, 2018.
[21]Oana, 2017, Romania has become the largest producer of honey in Europe, AgronoMag, 8 Feb 2017, https://agronomag.com/romania-become-largest-producer-honey-europe/, Accessed on Oct 25, 2018.
[22]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 Vol. 15(3):211-216.
[23]Pîrvuţoiu, I., Popescu Agatha, 2011, Analysis of Romania's Honey Market, Scientific Papers: Animal Science and Biotechnologies, 2011, 44 (2):500-503.
[24]Popescu Agatha, 2005, Research concerning the increase of profitability in Beekeeping by creating commercial apiaries, Bulletin UASVM Cluj-Napoca, Romania, Series Zootehnie si Biotehnologii si Medicina Veterinara, 61:188-192
[25]Popescu Agatha, 2005, Research on the possibility to increase profitability in an apiary of 50 bee families, Bulletin UASVM Cluj-Napoca, Romania, Seria Zootehnie si Biotehnologii si Medicina Veterinara, Vol.61:404-407.
[26]Popescu, A., 2010, Home and Foreign Trade, Dominor Rawex Coms Publishing House, Bucharest, 280-283.
[27]Popescu, A., 2010, Study upon the Economic Efficiency of Romania's Honey Foreign Trade, Scientific Papers Series D, Zootehnics, Faculty of Animal Science Bucharest, Vol. LIII: 176-182.
[28]Popescu, A., 2012: Research on Beekeepers Income Estimation based on Honey Production. Bulletin of UASVM Cluj-Napoca, Romania, Animal Science and Biotechnology, Vol.69(1-2):185-191.
[29]Popescu Agatha, 2012, Research Regarding Apiaries Structure and its Relationship with Honey Production, Bulletin USAMV, Animal Science and Biotechnology, 69(1-2)/2012:332-334
[30]Popescu Agatha, 2013, Research concerning apiary size, honey yield and beekeepers' income in Teleorman County, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 13 (1):293-299.
[31]Popescu Agatha, 2013, Research Concerning the Actual Statement of Apiculture in Călăraşi County, Scientific Papers: Animal Science and Biotechnologies, 2013, 46 (1):397-403.
[32]Popescu Agatha, 2016, The effect of Honey Production on Beekeepers' Income. A Study Case in South Muntenia Development Region of Romania, Proceedings of 28th IBIMA Conference Vision 2020: Innovation Management, Development Sustainability, and Competitive Economic Growth, Sevilla, Spain, November 9-10, 2016, 919-934.
[33]Popescu Agatha, 2017, The Intra-Industry Trade in Agro-Food Products - The Case of Romania, 29th IBIMA International Conference on Education Excellence and Innovation Management through Viison 2020: from Regional Development Sustainability to Global Economic Growth Vienna, May 4-5, 2017, IBIMA Conference Proceedings, 1261-1278.
[34]Popescu, A., 2017, Bee honey production in Romania, 2007-2015 and 2016-2020 forecast, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 17, Issue 1, 2017:339-350
[35]Pvan der Sluijs,J., Simon-Delso, N., Goulson, D., Maxim, L., Bonmatin, J.M., Belzunces, L.P., 2013,

Neonicotinoids, bee disorders and the sustainability of pollinator services, Current Opinion in Environmental Sustainability, Vol.5(3-4):293-305.
[36]Sert, D., Demircan, V., 2018, Economic analysis of beekeeping farms: A case study of Isparta province in Turkey, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 18(2):397-402.
[37]Tamba-Berehoiu, R., Visovan, D.M., Popa, C.N., 2013, Study on the presence of antibiotic residues in honey intended for public consumption, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 13(3):305-308.