

Analysis and Development Prospects of the World Honey Market

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Abstract

An analysis was performed on the economic state of the beekeeping industry as well as factors influencing the dynamics of its development in five leading countries of honey exporters namely China, New Zealand, Argentina, Germany, and Spain in order to solve theoretical, methodological and practical problems of increasing the efficiency of the development of regional beekeeping in market conditions. The present paper described some branch peculiarities of the beekeeping functioning, the market development for products of industry, scientific and technological achievements, organizational and economic mechanisms of interaction between agricultural producers and processing enterprises, the legal and information provision of business entities, the development of industrial and social infrastructures of industry, and qualified personnel training in studied countries. Based on the analysis, practical recommendations are offered for improving the efficiency of regional beekeeping development.

Keywords: Honey market; Infrastructure of the beekeeping market; Export of its products; Processing and marketing of bee products.



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1. Introduction

The agriculture development and the food supply improvement for the population are priorities of governments. Beekeeping has high value due to the received commodity production and creation of opportunities for the natural pollination of crops with the purpose of increasing their productivity. Therefore, intensive agriculture areas have great potential in developing this industry ([Food and agriculture organization of the United Nations \(FAO\), 2017](#)). Honeybees pollinate 80% of entomophilous crops, thereby making an indispensable contribution to the production of berries, vegetables, fruits, seeds and forage crops, not only up to 50% increase in the yield of intercross pollinating crops, but they also improve the quality of seeds and fruits. Costs of additional crops from pollination bees exceed costs of direct 10-12 time products of bee keeping. One third of the consumed human food is produced by bees' effort. Honey is produced by honey bees from nectar of plants, as well as from honey dew. Some of the components (carbohydrates, water, and traces of organic acids, enzymes, amino acids, pigments, pollen and wax) are due to maturation of the honey, some are added by the bees and some of them are derived from the plants. Honey of the same oral source can vary due to seasonal climatic variations or to a deferent geographical origin. In addition to the dentition of honey according to the ([Federal state statistics service \(Rosstat\), 2017](#)), there are additional donations in the regulations of various countries and in the EU ([Federal research center of beekeeping, 2017](#)). Various physical types (pressed, centrifuged, drained) and forms (comb, chunk, crystallized or granulated, creamed, heat processed) of honey are on the market. Raw honey contains extraneous matter, such as pollen, traces of wax, variable amounts of sugar-tolerant yeasts, and probably crystals of dextrose hydrate. Unless the moisture content is below 17%, no fermentation takes place. Most honey will crystallize in time unless action is taken to prevent it. The processing of honey, thus includes controlled heating to destroy yeasts and dissolve dextrose crystals, combined with fine straining or pressure filtration. Honey is usually warmed to a temperature of 32±40 extraction, straining or @ltration. This temperature is similar to that in beehives and does not affect the honey very much during the relatively short processing period. However, some honey samples are heated to higher temperatures for liquefaction or pasteurization reasons. Honey consists mostly of the monosaccharides glucose and fructose. The actual proportion of glucose to Food Chemistry, Vol. 63, No. 4, pp. 549±562, 1998 # 1998 Elsevier Science Ltd. All rights reserved Printed in Great Britain PII: S0308-8146(98)00057-0 0308-8146/98 \$19.00+0.00 Analytical, Nutritional and Clinical Methods Section 549 fructose in any particular honey depends largely on the source of the nectar. The average ratio

of fructose to glucose is 1.2:1. Saccharose (sucrose) is present in honey (approximately 1% of its dry weight). However, this level can be increased if the beekeeper has over-fed the bees with sugar during the spring. The mineral content varies from about 0.04% in pale honeys to 0.2% in some dark honey samples. This content is dependent on the type of soil in which the original nectar bearing plant was located. The protein content of honey is normally less than 0.5%. A small fraction of the proteins are enzymes, these include: invertase, diastase, glucose oxidase and catalase. There are many other minor constituents of honey, including very low concentrations of vitamins and plant acids. Amongst the compositional criteria prescribed in the existing EC honey directive are requirements relating to the concentrations of acidity, apparent reducing sugar (calculated as invert sugar) and apparent sucrose, 5-hydroxymethylfurfural (HMF), mineral content (ash), moisture and water-insoluble solids (Anonymous).

2. Research Objective

The transition of the agricultural sector of the Russian Federation to market relations had a negative impact on the state of the domestic market of bee products: the number of bee colonies decreased, labor productivity decreased and there was a shortage of qualified personnel, increased production costs, and large bee farms, apiaries, etc. were closed. About 7 million bee families are required for the full-fledged pollination of sunflower, buckwheat, rape, mustard, melons, perennial grasses and other crops; however, according to state statistics in 2017, the actual number of bee families was about 3.5 million in the country. The main production of commercial honey is taken into account by households of the population (65.5 thousand tons of honey per year); 2.5 thousand tons of honey by the peasant, farm (peasant) and individual entrepreneurs (individual entrepreneur), and 1.7 thousand tons by agricultural associations.

3. Material and Method

The research was based on principles of dialectical logic system and institutional approaches to the analysis of economic phenomena and processes; analysis and generalization of theoretical positions and empirical experience of the industry development in countries with developed beekeeping. Scientific approaches were applied to achieve new scientific knowledge; and they were justified and widely used in the modern scientific research: economic-statistical and analytical methods, selection, distribution, comparison, generalization, problem-hypothetical knowledge, forecasting, and graphical description.

4. Results and Discussion

The research subject was about the organization of beekeeping industry functioning in five leading countries-exporters of honey in China, New Zealand, Argentina, Germany, and Spain.

Two categories of consumers demand for beef products are as follows: 1) those who consume honey as a food product; 2) those who purchase bee products as raw materials for further use in the food, cosmetic, pharmaceutical, paint and other industries. In recent years, a growing need in the latter category of consumers have been concentrated in the major settlements leading to the necessity of involving intermediaries and the development of infrastructure of the beekeeping market.

The export of its products is a criterion for the competitiveness of industry or agriculture; this also applicable to beekeeping. The volume of honey supplies abroad can judge the development of beekeeping industry in a single country. According to the consulting company "The World's Top Exports" (tab. 1) in 2016, the world produced natural honey for 2.2 billion US dollars. Honey exports amounted to 825.3 million US dollars or 36.8% of the value of honey produced in the world (Jiménez and García, 2017), (Mollaei *et al.*, 2018).

Table-1. The Share of Individual Countries in the World Honey Exports, 2016

Country	Honey exports (million USD)	The country's share in global honey exports in 2016 (%)
China	276.6	12.3
New Zealand	206.7	9.2
Argentina	168.9	7.5
Germany	144.9	6.5
Spain	109.0	4.9
Ukraine	108.2	4.8
Mexico	93.7	4.2

Brazil	92.0	4.1
Vietnam	75.9	3.4
Hungary	74.2	3.3
Belgium	72.4	3.2
India	70.8	3.2
Canada	54.4	2.4
Romania	41.5	1.9

The share of continents in the world honey exports in 2016 is as follows: Europe: 36.8%; Asia: 23.5%; Latin America (without Mexico) and the Caribbean: 14.5%; Oceania (mainly New Zealand and Australia): 10.6%; North America: 7.8%; and Africa: 6.8%.

In the world trade of honey, there are 119 leading companies among them the main ones are as follows: Berkman Honey (USA), Bee Maid Honey (Canada), Bee yond the Hive LLC (USA), Billy Bee Products Somrapu (Canada), Capilano Honey (Australia), Comvita Limited (New Zealand), Dabur (India), Dalian Sangdi Honey Co., Ltd. (China) (Prospects of the world market of honey, 2017).

Based on the food and agriculture organization data in the United Nations, we analyzed the current state of the beekeeping industry and dynamics of this industry as well as effective factors in its development in five leading countries as exporters of honey: China, New Zealand, Argentina, Germany, and Spain (Table 2) (Schultz and Peltier, 2013).

Table 2. Economic Indices of the Beekeeping Industry Development in the Leading Countries-Exporters of Honey, 2016 (compiled by the author)

Indices	Country				
	China	New Zealand	Argentina	Germany	Spain
Honey production per year (thousand tons)	450.0	19.8	86.0	36.0	32.1
Number of bee colonies (thousand pieces)	9000.0	820.0	3600.0	900.0	2450.0
Number of beekeepers employed in the industry (thousand people)	300.0	8.5	33.4	90.0	30.0
Honeyexport (milliondollars)	276.6	206.7	168.9	144.9	109.0
The country's share in world export of honey (%)	12.3	9.2	7.5	6.5	4.9
Average per capita consumption of honey (kg per year)	0.3	1.5	0.2	1.1	0.4

4.1. Beekeeping in China

China is a leader in the production and export of honey. In 2016, the country produced about 450 thousand tons of honey, and exported honey to other countries in more than 276 million US dollars. The country's share in the world exports is 12.3%. The number of bee colonies in China reaches 9 million, and most of them are accumulated by amateur beekeepers. Zhejiang province is the center of Chinese beekeeping. There are 1 million bee colonies and 15 thousand beekeepers produce up to 1/3 of the total amount of honey collected in the country. Processing and marketing bee products are engaged in about 2 thousand small and medium-sized companies as well as 10 large companies with a product turnover of more than 15 million US dollars per year, for example, the company "Dalian Sangdi Honey bee Co., Ltd.". The number of beekeepers in the industry is about 300 thousand people. Zhejiang province is the center of Chinese beekeeping. There are 1 million bee colonies, 15 thousand beekeepers and produces up to 1/3 of the total amount of honey collected in the country. Processing and marketing of bee products are engaged in about 2 thousand small and medium-sized companies, as well as 10 large companies with a product turnover of more than 15 million US dollars per year, for example, the company "Dalian Sangdi Honey bee Co., Ltd.". The number of beekeepers in the industry is about 300 thousand people.

The government does not provide any direct financial assistance to beekeepers, but in turn, it finances veterinary services, promotes new scientific developments and trains qualified specialists. Honey is not taxed in China, and it favorably affects the beekeeping industry development in the country. Approved standards aim to increase the

quality of products. These measures allowed China's beekeepers to enter the world market, and it was a significant impetus to the industry development in the country. About 50% of Chinese honey is exported. The main importing countries of Chinese honey are Japan, UK, Belgium, Spain, Thailand, Thailand, Germany, Netherlands, Poland, and Portugal.

Operating since 1979, the Association of the beekeeping science of China (Agricultural Science Association of China – ASA) combines 1380 individual and 300 corporate members among them 150 are members of the academic community. ASA carries out the certification, quality control and licensing of bee products engaging in business consulting, exhibitions and publishing and the participation in the design and construction of processing enterprises (Schultz and Peltier, 2013), (Thompson and Coskuner-Balli, 2007).

4.2. Beekeeping in New Zealand

In 2016, the country produced about 19.8 thousand tons of honey, and exported 206.7 million US dollars of honey. In this index, New Zealand ranked second after China and far away from Argentina, Germany and Spain. According to the Ministry of basic industries, assets of the beekeeping industry for a period of 2010-2016 increased from 75 million to 1.2 billion New Zealand dollars (50 billion rubles). The country's share in the world exports is 9.2 %. The number of employed in the industry of beekeepers and bee farms is 8.5 thousand.

Among this number, 29 farms are large. They account for 34% of bee colonies in the country. Among the largest farms, there are 30 thousand bee colonies. The number of bee colonies is about 820 thousand pieces in the country. According to forecasts of management of the Beeline Supplies Company, the number of bee colonies in the country can grow up to 1 million by the end of 2018. Owners of 50 bee colonies become members of the Association automatically. There are also 16 regional offices. The budget is obtained from membership fees (World honey exports in, 2016-2017), (Villalobos Antúnez, 2002).

The social components of the beekeeping development in New Zealand are as follows: The public awareness of the importance of honeybees for the country's economy, and the preservation of environment and biodiversity. One of the restraining factors for the beekeeping development in the country is the difficulty of selling their own honey on the world market due to competition of cheaper products produced in China, Argentina and other countries. The increase in the number of imported honey in the country hinders the development of trade relations of local beekeepers in the domestic market.

4.3. Beekeeping in Argentina

Argentina is the largest producer of honey in South America with 86 thousand tons of honey production exported to other countries in 2016 in more than 168 million US dollars. In Argentina, beekeeping is divided into Amateur (up to 50 bee families), semi-professional (up to 200 families), professional (up to 500) and industrial beekeeping (over 500). Approximately 30% of beekeepers are professionals. There are farms that number up to 26 thousand hives. In industrial apiaries per worker, there are about 800-1000 bee families. Such farms usually do not have the management staff and specialist staff. The total employed number of beekeepers in the industry is 33.4 thousand people (Zinina, 2014).

Argentina's share in the total volume of all honey products in the world market is 7.5%. Argentina sells its honey mainly in the Western Europe and in particular most areas of Germany (42.6%) (Fridell, 2007).

During the last six years, the Argentine government has allocated 61.1 million pesos (360 million rubles) for the development of national beekeeping. Within the framework of the government program, 15 thousand producers received financial support.

The main aim of the beekeeping development in Argentina is the creation and operation of beekeeping cooperatives that supply honey for the world market directly and without the participation of intermediary companies, for example, the consortium of Buenos Aires province as well as cooperatives, Namuncura and APABE Berisso.

The territorial location of country is a main competitive advantage of beekeeping in Argentina in the world market. It allows the honey collection in October for the beginning of spring. Purchases of Argentine honey of the new harvest at the beginning of the year allow countries of the Northern hemisphere to more evenly saturate their domestic market with honey and organize the work of enterprises for its processing. For many years, the United States is the main importer of Argentine honey.

The integrated beekeeping support program (Proapi) has been implemented in Argentina for more than 15 years. More than 70 universities, municipalities, associations of beekeepers and other organizations take part in this work. The national Institute of agricultural technology (INTA) (Thompson and Coskuner-Balli, 2007) curates the program.

4.4. Beekeeping in Germany

In 2016, Germany produced about 36 thousand tons of honey and exported honey to other countries in more than 276 million US dollars. The number of employed beekeepers in the industry is 90 thousand people. In Germany, about 80% of beekeepers have 10-20 hives and only about 2% of beekeepers work professionally on more than 50 hives. 19 unions of Federal lands, which are united in the German Union of beekeepers, are engaged in the selection work (Yussefi and Willer, 2003).

Despite the overall high level of agriculture, beekeeping is mostly amateur in Germany. Small stationary and mobile apiaries, containing 15-20 families, are located almost throughout the country. Bavaria, Baden-württemberg, Hesse and Rhineland-Palatinate lead the development of beekeeping and honey production. There is a tendency to reduction of number of bee colonies by about 1.5% per year. The number of beekeepers is also reduced. The average

age of beekeepers is 60 years. Owners of more than 25 bee colonies are obliged to insure their bees. The insurance premium is quite high, and thus many beekeepers try to record a part of their apiaries on relatives. German beekeepers are well united. Most of them are members of beekeeping unions, and the Federation of German beekeepers (Yussefi and Willer, 2003).

The contribution of honeybees to the German economy is estimated at 2.5 billion Euros. The Germans independently produce about 200 g of honey per capita and consume 10-20 times more; hence, their country is one of the largest importers of honey in the world.

The ratio of German and imported honey is 1:4. Germany imports about 90 thousand tons of honey per year from other countries. In addition, buying honey is much cheaper than producing in Germany. The selling price of German honey varies depending on its Botanical origin in the range of 8 to 14 US dollars per 1 kg. The purchase price of imports is from 1 to 1.5 US dollars per 1 kg. The difference in price causes discontent among the German owners of apiaries. The produced honeydew honey by bees from produced aphids of the liquid is the most valuable and expensive honey in this country because it contains more trace elements. Turkey supplies about 90% of its honeydew for the German market; and Argentina, Mexico and China are other major suppliers (Harris, 1987).

4.5. Beekeeping in Spain

Spain is a large honey producing country in Europe. The total production of honey is about 30 thousand tons per year, and most of which is exported to the EU including Germany, France and Italy. In 2016, Spain exported honey worthing more than 168 million U.S. dollars.

In Spain, there are about 2.5 million bee colonies, 67% of which are concentrated in professional and semi-professional beekeepers. The number of professional beekeepers is 4.8 thousand people. The total number of employed beekeepers in the industry is 30 thousand people.

The payment of state subsidies for pollination of bees' entomophilic cultures is a factor in the development of professional beekeeping in Spain. Professional beekeepers with more than 100 bee colonies in their farms receive government subsidies for the pollination of entomophilic crops (\$10 per hive). A maximum of 500 beehives is subsidized for the pollination. For beekeepers, who are members of a cooperative or association, subsidies may be 1.5 times higher (Guoda and Chun, 2003).

Spain continues to lead among 28 EU member States in the main indices of national beekeeping. This is obvious in statistics of the Ministry of agriculture and other official and unofficial sources. In 2016, Spain accounted for 17.6% of 13.98 million registered bee colonies in the EU.

The number of beekeepers increased from 23.9 to 30 thousand people in Spain for the period of 2008-2016. The growth was exclusively due to the influx of Amateur beekeepers among whom young people account for a high percentage. Experts primarily explain this phenomenon by the growing environmental awareness of the Spanish population as well as the importance of beekeeping role in the food production and reproduction of flora. The global economic crisis has played a role forcing the population to look for additional sources of income.

The professional sector of beekeeping is more developed than other EU countries in Spain. 26.3 thousand Beekeepers of 506 thousand registered ones in the EU in 2016 belonged to the category of professionals among whom 40% were Spanish. The number of professional beekeepers owning 67% of bee colonies in Spain has slightly decreased from 5 to 4.8 thousand people over the past 7 years (Jacks *et al.*, 2011).

The analysis showed that among the studied countries-exporters of honey, China, New Zealand, Argentina, Germany, Spain are dominated by small group forms of management (80%), family and private bee farms that have apiaries numbering no more than 50 pieces of bee colonies and produce honey for their own needs realizing the surplus. In these farms, bee families are served by beekeepers, and 1-2 seasonal workers, security guards, drivers of vehicles, operators for service of the equipment, experts in the periods of intense works (veterinarians, zoo technicians, etc.) are involved in this regard (Abebe, 2009).

The second category of beekeeping enterprises are specialized farms, experimental-industrial economy, pchelopitomnik honeybee and halocomplex, and the apiary at diversified agricultural enterprises (20%). A large number of farms are provided with modern means of production staffed with qualified personnel who actively implement innovations, achievements of science and best practices of domestic and foreign beekeeping. In studied countries, the beekeeping industry is not standing still and is being reformed in accordance with the model of economic integration between countries: the number of Amateur beekeepers is decreasing, and the number of professionals tends to increase the size of apiaries and numbers of bee colonies respectively.

In modern market conditions, which are characterized by the development of technologies for the production of traditional and biological active additives (BAA) in the structure of commercial production of modern apiaries and bee farms, the share of production of other bee products increases: wax, Perg, pollen, propolis, bee venom, Royal jelly, etc.

The increase in the honey production and reduction of its cost in these countries are obtained by creating a synchronized legal base of beekeeping, the liberalization of honey trade, regulation of beekeeping equipment and facilities, increasing the level of automation and mechanization of industry, combining efforts in the fight against bee diseases, training qualified personnel, etc.

One of the main features of the effective development of industry is that beekeepers are united in associations (society) in various areas: production, processing of products and raw materials; implementation of science and innovation; training and retraining qualified personnel; environmental protection; control of diseases and pests of bees. Association of beekeepers in associations (societies) allows them to adapt to conditions of the modern market.

The technological chain of activity of such formations, as a rule, has a purpose and provides higher results for each of participants (Bogdanov, 1999).

5. Conclusion

1. Experience in the development of beekeeping in five leading countries-exporters of honey namely China, New Zealand, Argentina, Germany, and Spain confirms that it is necessary to develop an economic model for the development of regional beekeeping for further effective improvement of the industry in the country.
2. In modern market conditions, the main directions of increasing the efficiency of regional beekeeping are connected with increasing the competitiveness of industry's products in domestic and foreign markets. The intensification of production; deepening specialization of agricultural enterprises and increasing the concentration of production; rational placement of economic objects in the region; and improvement of labour organization are among the main directions of beekeeping development in the region.
3. The beekeeping development in this region is associated with the observance of scientifically based standards in accordance with which the industry is formed and operated. Basically, rules aim to expand the production.
4. These aims include the organizational factors, characterizing the general conduct of beekeeping; organizational and technical factors reflecting the internal content of the production and management system of industry; and social factors relating to the responsibility of business entities, etc.

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