

Beekeeping and honey production in Russia

Olga Kostenko^{1*}

¹Vyatka State Agrotechnological University, Oktyabrsky prospect, 133, Kirov, 610017, Russia

Abstract. Honey occupies a special place in the diet due to its functional and medicinal properties. Honey consumption is significantly below the level recommended both in Russia and in the world. It is possible to significantly increase honey consumption both in the internal and foreign markets. The research aims to analyze and identify problems, obstacles and driving forces in the development of beekeeping in the case of Russia. Analysis showed that 18 Russian regions are focused on the export of honey to interregional and foreign markets. The beekeeping sector faces significant challenges in honey selling. The adulterated honey share is estimated at 30%. More than half of the honey on the Russian market is sold through direct short channels. Promoting products to metropolitan and foreign markets requires new approaches to building supply chains: data on apiaries and honey quality; optimizing supply chains and income distribution by chain links. The industry drivers can be a cluster approach; digital technologies to solve specific industry issues; new approaches in support of the industry by state.

1 Introduction

Honey traditionally occupies a special place in the diet around the world. It has great taste and many other useful properties.

Natural bee honey has a great variety. According to the botanical origin (honey harvesting), a distinction is made between flower and honeydew honey. Floral honey is distinguished by the number of honey plants (monofloral and polyfloral). In Russia, such monofloral honey as linden, buckwheat, acacia, and chestnut are widely known. The assortment of natural honey is expanding with additives: honey with nuts and fruits, with beebread, cream honey (whipped honey with added fruit and berry juices).

The greatest number of honey types can be distinguished by their geographical origin. In Russia, the best known are the Altai, Bashkir, and Far Eastern honeys. Manuka honey from New Zealand is very popular on the world market. There are numerous studies of the special properties of wild honey from different regions of the world [1], including for therapeutic purposes.

Since ancient times, honey has been used as a folk medicine for colds, and for the treatment of wounds, bedsores, microbial infections, and burns [2-3]. A large number of studies are devoted to the functional properties of honey [4-5]. In recent decades, there has been a growing interest in its medical properties. Honey contains probiotics and prebiotics,

* Corresponding author: kostenko_ov@vgsha.info

has antioxidant, immunomodulatory, and antiviral activity [1], and is used in the treatment of cancer and neurological diseases [6].

According to the Russian Ministry of Agriculture (<https://mcx.gov.ru/>), global honey production has grown at an average annual rate of 1% over the past five years to 1,852,000 tons (2019). China provides almost a quarter of the world's volume (24%). The TOP 5 includes Turkey, Iran, Argentina, and Ukraine. External markets account for about 36% of the world's honey production (calculated according to the Center for Agroanalytics, <https://specagro.ru/>). The largest importers of honey are the United States, Germany, Japan, France, and the United Kingdom. The largest exporters are China, New Zealand, Argentina, Germany, and Ukraine. The highest consumption of honey is in Turkey (1.3 kg/person), Germany (1.0 kg/person), USA (0.7 kg/person). The average per capita consumption of honey in the world remains low – 0.20-0.25 kg. This amount of honey is consumed in China in particular.

Russia is one of the world's top 10 honey producers with a share of 3.5% (2019). Imports amounted to 200 tons, exports 2,400 tons (0.4% of global exports). The country's level of self-sufficiency in natural honey consistently exceeds 100%. The per capita consumption of honey in Russia is 0.42 kg, while the consumption of sugar alone in its pure form (excluding confectionery) is 16 kg (Rosstat data).

Honey consumption in Russia is well below the level recommended in terms of a healthy functional diet. In Russia, there is a tradition of buying honey during the honey harvest season in three-litre glass jars. There may be a significant increase in honey consumption in the internal market.

There are prerequisites for increasing the volume of honey exports, primarily to China, which is now the main importer of Russian honey (56% of honey exports from Russia, 30% share in China's honey imports, 2019). Japan is the second-largest importer of honey in the world. The supply of honey to this country can be considered as one of the strategies for the development of Russian beekeeping.

The study aims to analyze and identify problems, obstacles and driving forces in the development of beekeeping in the case of Russia.

2 Materials and methods

In the course of the study, we used a dialectical method; theories of regional economics, a systematic approach to economics, a review of scientific literature, and economic and statistical analysis.

The analysis of territorial location and specialization of territories was carried out using the territorial location quotient. The classical formula for the location quotient, which uses only the average annual number of employees, does not allow to identify the specialization of narrow agricultural segments.

However, agricultural statistics have indicators of agricultural production in physical terms. This allows the method of modified location quotient to be used. For comparison, in our previous studies, the modified location quotient was applied. This method revealed high levels of localization in several narrow industries: pork production in the Belgorod region at 13.0 [7]; beef production in the Bryansk region at 13.2 [8]; winter rye grain production in the Orenburg region at 9.9 [9].

The modified location quotient was used in this study, which was calculated for agricultural production in physical terms (honey production) in proportion to the average annual number of employees (hereafter – modified location quotient) (Formula 1).

$$Local = \frac{PV_i \div NE_i}{PV \div NE} \quad (1)$$

- secondly, there is no scale effect in the industry. The profitability of apiaries has little to do with their size. According to [11], up to 80% of beekeepers have apiaries with no more than 10 beehives and sell no more than 300 kg of honey per year. The sale is carried out through direct channels, with minimal costs. Income from the sale of products from private farms is exempt not only from taxation but also from the income declaration. The benefits are valid if the household has no more than 0.5 ha of land and does not use hired labor (Tax Code of the Russian Federation, Article 217, item 13);
- thirdly, beekeeping is an additional income (35% according to [12]) or a hobby for a large proportion of households. It is no secret that beekeepers tend to have good health and longevity.

Similar trends are typical for beekeeping worldwide. The United States (U.S.) has seen a growing interest in small-to medium-scale beekeeping within the last decade. Within the last decade, the number of beekeepers in Maine has increased by over 140%, with the majority consisting of small “backyard or hobby beekeepers”. [13]. In Japan, the number of large beekeeping farms is decreasing; in South Korea, 46% of producers have no more than 50 hives [14].

We can look at the study of the territorial location processes of the industry. The sample for subsequent analysis includes Russian regions with a location quotient of 2.0 or higher in 2010 and/or 2020 (Fig. 3). The sample size is 18 regions.

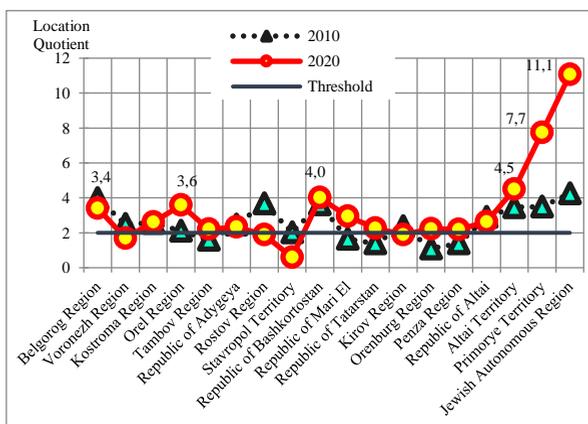


Fig. 3. Russian regions: modified location quotients above 2.0 (honey production in farms of all categories).

These are regions of Central European Russia, the Volga region, the Altai and the Far East. Beekeeping farms in these territories produce 55% of Russian honey. It should be noted that the sample includes 9 regions of the TOP-10 of Russia in terms of honey production.

There has been a moderate increase in location quotients in most regions of this group over the decade. There are multidirectional types of changes:

- Bashkortostan and Belgorod Region maintained a high level of localization (LQ 4.0 and 3.4);
- indicators of the Orel Region and Altai Territory (LQ 3.6 and 4.5) increased significantly;
- the indicators of the southern Rostov Region and especially Stavropol Territory decreased (LQ 1.9 and 0.6);
- a breakthrough increase in the level of localization in honey production occurred in Primorye Territory (LQ 7.7), and its neighboring Jewish Autonomous Region (LQ 11.1).

Such a smooth change is expected in an industry made up of a large number of small producers. The different trends in beekeeping development in different regions indicate both the potential for growth in honey production and the different strategies of regional agricultural policies.

Experts are unanimous that Russia has reserves and resources to significantly increase honey production [15]. For comparison, annual honey production in Ukraine and Russia are comparable (70,000 and 65,000 tons, respectively, average data for 2010-2018), but the areas of agricultural land and wild honey collections differ by a multiple.

Many consumers in Russia prefer to buy honey directly from beekeepers. One of the reasons is the high proportion of adulterated honey in long distribution chains. There are different forms of adulterated honey, from “soft” methods (substituting honey for a well-known brand, heating honey at temperatures above 70 °C) to direct deception (feeding sugar syrup to the bees; mixing molasses, flour, starch, and other ingredients into honey; replacing natural honey with artificial honey). Poor consumer awareness of the properties and quality of honey aggravates the situation.

During the Soviet period, counterfeiting honey was considered a criminal offense. Honey was sold after laboratory tests, which were free of charge to beekeepers. After the abolition of compulsory tests (1990s), honey counterfeiting became widespread. According to various estimates, the level of adulterated honey on the Russian honey market ranges from 30% to 70% [16].

The problem of adulterated honey is typical for most countries. Iran is the world’s third-largest producer of honey and has the resources to produce quality monofloral honey. However, in the study [17], signs of adulterated honey were found in 85% of the samples. A massive method of fraud in the country is feeding of bees with sugar during the feeding season.

The problem of adulterated honey is present in foreign markets (for example, the substitution of expensive well-known brands with cheap honey from other countries). Its scale is so significant that some scientists have drawn attention to the apparent contradictions in global statistics. The number of hives in the world is stable, hive productivity (yield of marketable honey per hive) is sharply decreasing. The problems of bee diseases and herbicide poisoning are acute. Despite this, the volume of honey exports is growing, while at the same time there is a collapse in world prices [APIMONDIA-2019].

The high level of adulterated honey should be recognized as one of the main factors constraining honey consumption. The solution should be sought in the area of supply chain management. It can be a short channel (purchase from a beekeeper) or a long supply, but somehow personalized supply chain.

4 Discussions

A review of scientific literature showed that the marketing and promotion of honey are associated with significant obstacles for beekeepers. Problems with the sale of honey hinder the development of existing apiaries and the creation of new apiaries in most regions of Russia [18]. This is primarily observed in regions that produce honey in volumes exceeding the needs of the internal market – Belgorod Region [19], Altai Territory [20], Kirov Region [21], and others. This creates the appearance of overproduction of honey in the country. The industry needs effective promotion and sales methods. Similar problems exist not only in Russia [22]. There are successful examples around the world, such as the “Bees with Stories” business model in Africa (<https://beeswithstories.com/>).

Honey refers to goods with inelastic demand, the coefficient of elasticity is 0.67 according to [23]. Honey has no substitute products, and the share of the cost of buying honey in the personal budget is not critical (about 0.5%). Survey data also show that the

proportion of people who buy honey is high: 73% of respondents according to [24], 87% according to [25].

According to the level and dynamics of prices, honey traditionally belongs to the group of expensive products. The average retail price on the internal market was 493 rub/kg during the 2021 honey harvest season (\$6.75/kg at the exchange rate for the period). The price increased 2.85 times over 15 years and again equaled the price of mutton (expensive niche meat) (Fig. 4).

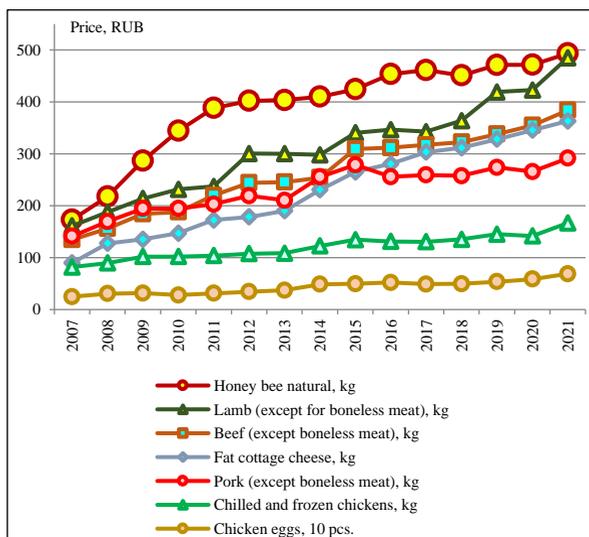


Fig. 4. Average consumer prices in Russia (July), RUB.

Studies show that the first place for consumers is the honey quality – 4.83 points on a 5-point scale [24]. Buyers are conservative in their preferences, with 97% of respondents preferring natural honey without any additives [26]. The proportion of buyers who prefer local honey is also high [26]. This is confirmed by foreign studies [27].

Such characteristics predetermine buyers' choice of places to buy honey. Some researchers publish same data [19, 25-26]. Summarizing the results obtained, the following conclusions can be made:

- more than half of the honey in Russia is sold through direct channels (in the apiary, from the known beekeepers, in beekeeping farms);
- one-third of honey is sold at agricultural markets and specialized fairs;
- only 5-10% of sales come from stores and retail chains (this share is higher in metropolitan areas).

Consumers are solving the problem of honey quality by choosing short supply chains for their purchases. Beekeepers, especially households, also prefer direct sales, reducing commercial costs to a minimum and not wanting to share their income with intermediaries.

The current situation contains obstacles to the possible development of the industry. Traditional direct sales techniques are good mainly for local markets. As shown above, there are opportunities to increase production and sales through mass coverage of markets in major cities, and through the export of honey. Long supply chains, involving intermediaries, are built to enter such markets.

Two problems need to be solved to remove the obstacles. First, there is the problem of poor quality and adulterated honey in long supply chains. These risks increase as the supply

chain lengthens. Thus, according to studies in St. Petersburg, 56% of respondents are completely or partially dissatisfied with the quality of honey and honey products [30].

Secondly, it is the problem of the distribution of income between the participants in the supply chain. The main issue is the share of intermediaries in the price of honey, which beekeepers consider fair. The crisis in Ukraine has shown what a miscalculation in this area can lead to. The country has increased honey exports almost 10-fold in a short period (2010-2017). Exporters have chosen the policy of dumping export and purchase prices. It became unprofitable for beekeepers to produce honey, which led to the reduction of apiaries and conversion to the production of other bee products. There was a collapse in exports in 2018 [APIMONDIA-2019].

Beekeeping has not been on the agrarian policy agenda in Russia for a long time. The reason for the attention to the industry is the massive bee pestilence in 2019. Society began an active discussion of other problems of the industry: the death of bees from pesticides when spraying the fields, the fight against bee diseases, the threat of losing the domestic gene pool, the problems of marketing and adulterated honey, etc. The Federal Law “On beekeeping in the Russian Federation” No. 490-FZ of December 30, 2020, was adopted. A federal online platform has been launched to notify beekeepers about chemical field treatments (<https://specagro.ru/>). The register of the apiaries has been created and is being maintained.

Systematic state support, as it was for pig breeding, poultry farming, dairy cattle breeding, with regard to beekeeping at the moment in Russia is not carried out. The analysis of the regulatory framework in the legal reference system “ConsultantPlus: Regional Legislation” (March 2022) showed the following:

- Only one constituent entity of the Russian Federation has a valid regional program “Development of beekeeping in the Republic of Bashkortostan for 2019-2030”;
- several subjects introduced targeted subsidies for beekeeping as part of the main programs to support the agricultural sector (Altai Territory, Kostroma Region and Tula Region, Khabarovsk Territory, Magadan Region, and Sevastopol);
- there are examples of municipal programs to support beekeeping (Tetyushki district of the Republic of Tatarstan and several other examples).

In order to support beekeeping, regional governments use the resources of federal and regional agricultural development programs, small business support programs, agribusiness export promotion programs, and others. Beekeeping farms and associations participate in competitions for subsidies on a par with other sectors (programs to support agricultural consumer cooperatives, subsidies for the purchase of equipment, commercial and breeding bee families).

Beekeeping is not on the list of priority sectors of agriculture in all regions. Bashkortostan, Primorye Territory, Belgorod Region and Altai Territory are implementing broader beekeeping support programs. There is an effect of regional policies to support beekeeping, it is expressed in the growth of production and export of honey outside the region (high LQ values in Fig. 3).

The regional program for the development of beekeeping in Bashkiria aims at enlarging beekeeping farms and switching to industrial technologies. The development of the industry is focused on exports, for this purpose a laboratory has been created in the republic to monitor the honey quality.

Primorye Territory has made a bet on the development of honey exports. Support is provided, including through the Autonomous Nonprofit Organization “Center for Export Development of Primorye Territory”. A laboratory base was established to control the honey quality for export. More than 772 tons of honey were exported from Primorsky Krai in 2021 (data of Rosselkhoznadzor for Primorye Territory and Sakhalin Region).

The Altai Territory was one of the first to register the Protected Designation of Origin (PDO) “Altai Honey” (2015). The process of registering trademarks in other regions of the country has begun: “Kostroma Diversity Honey” (2020), “Vyatka Honey” (2017), “Chuvash Honey” (2020), and others.

For participation in the national competition of regional food brands “Tastes of Russia” in 2021, there were 23 honey names (5% of the total number of applications). Some regions declared several brands of honey (Bashkiria, Tatarstan, Udmurtia, and the Moscow region).

Summarizing the collected data, the following main features of state support and subsidies for beekeeping can be highlighted:

- the industry is not currently one of the priorities of the agrarian policy of the federal government and the regions;
- decisions on state support for beekeeping (or lack thereof) are made at the regional level;
- limited funds are allocated (no more than 100 mln. RUB per year in the region);
- subsidized areas and activities are copied from support programs for other industries, including those addressed to large and medium-sized businesses;
- households cannot be subsidy recipients (which is 94% of honey production, 2020), only farmers and agricultural organizations can obtain subsidies. In fact, it is a direct stimulus for the restructuring of the industry;
- support measures are aimed at stimulating honey production and strengthening the facilities and equipment of the industry. They do not solve the specific problems of beekeeping – the problems of marketing and restoring lost consumer confidence.

Beekeeping requires collective action. An integrated value chain approach in the beekeeping sector was established in the Pchinja-Krajishte (Macedonia) cross-border region (in the Project “Support to the economic diversification of rural areas in Southeast Europe (SEDRA)”). The beekeeping sector and the honey value chain are supported through various capacity development measures and targeted investments to increase value-added and improve access to finances (from public and private sources) and improve access to markets. [APIMONDIA-2019].

“The Bees with Stories” project in Africa was launched in 2017. (<https://beeswithstories.com/>). Its initial conditions are comparable to Russian conditions: beekeepers have no access to markets, desire to get a fair price for their products, lack of traceability and branding, and yet high-quality honey. Today, 1,300 beekeepers in Ethiopia, Madagascar and Tanzania are participating in the project. Honey is exported to developed countries of the world.

Digital technology is opening up new possibilities for solving beekeeping problems. Researchers present models for hive monitoring and apiary management [28-29]. The digitalization of apiculture first involves systems from the field of the Internet of Things (IoT), with the development of sensors to collect and transfer bee-related data. Then, data analysis comes into play, providing models that connect the data with the biological states of beehives, sometimes thanks to artificial intelligence (AI).

Another direction is to use web applications. For example, a web application for Victorian beekeepers to visualize growth patterns of floral resources using MODIS and other data and thus make remote predictions of whether or not their apiaries will bloom [30].

Of particular interest are digital technologies that make long supply chains personalized. A few important examples:

- research [APIMONDIA-2019] shows how distributed registry technologies can be used to enable small-scale beekeepers to participate in marketing chains. Blockchain technology makes it possible to store reliable information about the origin and quality of honey (even

about individual hives). This could allow small beekeepers to sell their honey with proof of origin, quality and value of their products;

- the beekeeping value chain optimization model was applied to financial and economic decision-making in beekeeping in Argentina [31].

Conclusion

Beekeeping in Russia is one of the few sectors of agriculture in Russia that did not experience a decline in production in the 1990s. Over three decades, honey production has grown by one and a half.

Households are the most profitable type for beekeeping and produce 94% of the honey. There is no scale effect in the industry. Up to 80% of beekeepers keep no more than 10 hives and sell no more than 300 kg of honey per year. Personal subsidiary farms are exempt not only from taxation but also from income declaration.

18 Russia regions are focused on the export of honey to interregional and foreign markets (QL 2.0 and above). Over the decade there has been a moderate increase in QL in most regions. Primorsky Krai has achieved a breakthrough increase in honey production.

The beekeeping sector faces significant challenges in selling honey. Honey quality is the most important characteristic for consumers. The share of adulterated honey is estimated at 30-70% (depending on the distance of the market from the apiaries). For this reason, more than half of the honey on the Russian market is sold through direct channels.

Promoting products to metropolitan and foreign markets requires new approaches to building supply chains: data on apiaries and honey quality; optimizing supply chains and income distribution by chain links.

State support for beekeeping is provided only by the regional governments. Support measures are copied from other programs, including those addressed to large and medium-sized businesses. Households cannot be subsidy recipients. All these measures do not solve the specific problems of beekeeping – the promotion of honey in large markets and the restoration of lost consumer confidence.

The drivers of the industry in the future could be:

- cooperation and integration of supply chain participants (cluster approach);
- application of digital technologies to solve specific problems of the industry;
- new approaches in state support of the industry: assistance in creating infrastructure for honey quality and anti-counterfeiting; encouragement to use the cluster approach and digital technologies in building honey supply chains from apiary to the end consumer.

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