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Beekeeping in Kazakhstan: Production, Practice and Prospects for Sustainable Development

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ABSTRACT: The beekeeping sector in Kazakhstan plays a significant role in the country's agriculture, economy, and environmental sustainability. This review provides a comprehensive analysis of the production of bee products, including honey, beeswax, propolis, royal jelly, and pollen, within the context of Kazakhstan's beekeeping industry. The article highlights key statistics, such as honey production volumes, which reached approximately 10.000 metric tons in 2022, and the number of beekeepers, estimated at around 10.000. Kazakhstan's diverse climatic conditions and rich flora, particularly in regions like Almaty and East Kazakhstan, create favourable conditions for apiculture. The sector not only contributes to rural livelihoods but also supports biodiversity through pollination services, enhancing agricultural productivity. Despite its potential, the industry faces challenges such as climate change, pesticide use, and limited access to modern technologies. However, opportunities exist in the form of growing global demand for organic honey, government support programs, and the potential for eco-tourism. This review emphasizes the importance of sustainable practices, scientific research, and policy interventions to address challenges and unlock the sector's full potential. By leveraging its natural resources and addressing existing barriers, Kazakhstan can strengthen its position as a key player in the global bee products market while promoting environmental conservation and rural development. This article synthesizes available data and insights to provide a holistic understanding of the beekeeping sector in Kazakhstan, offering recommendations for its sustainable growth and development.

Keywords: Beekeeping, Economic impact, Honeybee products, Kazakhstan, Sustainable agriculture.

INTRODUCTION

Bee products have been used in traditional medicine for thousands of years, with historical references found in ancient civilizations such as Egypt, Greece, and China (Eteraf-Oskouei and Najafi, 2013). They have been employed for their wound-healing, antimicrobial, and immune-boosting properties (Martinotti et al., 2023). In modern medicine, bee products have gained attention due to their natural bioactive components, which exhibit potent pharmacological effects. The prevalence of antibiotic resistance and the need for alternative therapies have further research into these natural remedies (Nainu et al., 2021). Numerous studies have demonstrated that honey, propolis, and royal jelly exhibit significant anticancer effects by inducing apoptosis, inhibiting tumour growth, and modulating key signalling pathways involved in cancer progression. These properties position bee-derived compounds as promising candidates for complementary cancer therapies. Beyond their therapeutic properties, honeybees play a crucial role in sustaining biodiversity and agriculture through pollination, which indirectly contributes to human health by ensuring the availability of medicinal plants.

However, challenges such as standardization, bioavailability, and regulatory approval must be addressed to ensure their safe and effective use in clinical settings. Future research should focus on optimizing delivery systems, conducting large-scale clinical trials, and establishing standardized protocols for the therapeutic application of bee products. By leveraging its natural resources and addressing existing barriers, Kazakhstan can strengthen its position as a key player in the global bee products market while promoting environmental conservation and rural development. In the present review paper, it is emphasized the importance of sustainable practices, scientific research, and policy interventions to address challenges and unlock the sector's full potential.

Beekeeping in Kazakhstan has a rich history that dates back centuries, deeply intertwined with the country’s agricultural traditions and rural way of life. The practice of apiculture in the region can be traced to ancient times when nomadic tribes utilized wild bees for honey and beeswax. These early beekeepers relied on natural hives found in tree hollows and rock crevices, harvesting honey using rudimentary methods (Bradbear, 2009). Over time, as agricultural practices evolved, so did beekeeping techniques.

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During the Soviet era, beekeeping in Kazakhstan underwent significant transformation. State-owned farms and collective systems were established, introducing modern beekeeping practices and equipment. The Soviet government recognized the importance of honey production for both domestic consumption and export, leading to the standardization of beekeeping methods and the introduction of European honeybee species (*Apis mellifera*) to enhance productivity (Chauzat et al., 2013). However, the collapse of the Soviet Union in 1991 brought challenges to the sector, including the fragmentation of large-scale beekeeping operations and a decline in production.

In recent decades, Kazakhstan's beekeeping sector has experienced a revival, driven by increased interest in honey as a natural and healthy product. Traditional practices, such as the use of log hives, coexist with modern techniques, including the adoption of Langstroth hives and advanced hive management systems (Web Link-1). Today, beekeeping is not only a source of livelihood for thousands of rural households but also a symbol of Kazakhstan's cultural heritage and connection to nature.

Beekeeping plays a multifaceted role in Kazakhstan's agriculture, economy, and environment. One of its most critical contributions is pollination, which is essential for the reproduction of many crops and wild plants. Bees are responsible for pollinating a wide range of agricultural products, including fruits, vegetables, oilseeds, and forage crops (Klein et al., 2007). In Kazakhstan, crops such as apples, sunflowers, and alfalfa heavily depend on bee pollination, which enhances yields and improves crop quality (Potts et al., 2016). This ecological service provided by bees directly supports food security and agricultural productivity, making beekeeping an integral part of the country's farming systems.

Beyond pollination, beekeeping contributes to biodiversity conservation. By maintaining healthy bee populations, beekeepers help sustain ecosystems and promote the growth of diverse plant species. This, in turn, supports other wildlife and maintains ecological balance (IPBES, 2016). In a country like Kazakhstan, with its vast steppes, forests, and mountainous regions, the role of bees in preserving natural habitats cannot be overstated.

Economically, beekeeping is a vital source of income for rural communities. With over 10.000 registered beekeepers and an estimated 1.5 million hives, the sector generates significant revenue through the production and sale of honey and other bee products (KBA, 2021). In 2022 alone, Kazakhstan produced approximately 10.000 metric tons of honey, with a growing portion being exported to international markets such as Russia, China, and the European Union (KMA, 2022). The economic impact of beekeeping extends beyond honey production, as it creates employment opportunities in rural areas and supports ancillary industries, including packaging, transportation, and marketing (Rucker et al., 2012).

Moreover, beekeeping aligns with global trends toward sustainable and organic agriculture. Consumers worldwide are increasingly seeking natural and environmentally friendly products, and Kazakhstan's high-quality honey, produced in pristine environments, is well-positioned to meet this demand (FAO, 2018). By promoting sustainable beekeeping practices, Kazakhstan can tap into lucrative niche markets while contributing to global efforts to combat climate change and environmental degradation.

Kazakhstan's vast and diverse landscape, spanning steppes, deserts, forests, and mountainous regions, provides a unique environment for beekeeping (Faria Khan et al., 2018). The country's climatic conditions vary significantly across its regions, creating distinct ecosystems that support a wide range of flowering plants essential for apiculture. The southern and southeastern parts of Kazakhstan, including Almaty, East Kazakhstan, and Zhambyl regions, are particularly favorable for beekeeping due to their rich flora and moderate climate (Gritsenko et al., 2023).

The Almaty region, nestled at the foothills of the Tian Shan mountains, is renowned for its lush meadows and diverse plant species, which provide abundant nectar sources for bees (Dimeyeva et al., 2016). Similarly, East Kazakhstan, with its forested areas and river valleys, offers ideal conditions for honey production (Bocharnikov et al., 2018). The Zhambyl region, characterized by its fertile plains and mild climate, is another key area for beekeeping. These regions collectively contribute the majority of Kazakhstan's honey production, thanks to their favorable geographic and climatic conditions.

The seasonal variations in Kazakhstan also play a crucial role in beekeeping (Shimelkova et al., 2020). Spring and summer are the primary seasons for honey production, as the blooming of plants such as wildflowers, sunflowers, and fruit trees provides ample forage for bees (Aqueel et al., 2023). The country's relatively low levels of industrial pollution further enhance the quality of its honey, making it highly sought after in both domestic and international markets.

Beekeeping in Kazakhstan is characterized by a blend of traditional and modern practices, reflecting the country's rich cultural heritage and its gradual adoption of advanced technologies. Traditional methods, such as the use of log hives or hollowed-out tree trunks, are still prevalent in rural areas, particularly among small-scale beekeepers. These methods, while labor-intensive, are deeply rooted in local traditions and are often passed down through generations (Balara, 2024).

In contrast, commercial beekeepers have increasingly adopted modern practices to enhance productivity and efficiency (Duarte Alonso et al., 2021). The Langstroth hive, a standardized and modular hive design, is widely used for its ease of management and ability to support larger bee colonies. Modern beekeepers also employ techniques such as queen breeding, swarm control, and disease management to optimize hive health and honey yields (Urban and Chlebo, 2024). Additionally, the use of protective gear, smokers, and honey extractors has become commonplace, improving the safety and efficiency of beekeeping operations (Ingrao, 2021).

Despite the adoption of modern practices, many beekeepers in Kazakhstan continue to face challenges related to access to equipment, training, and financial resources (Korabayev et al., 2022). Efforts to bridge this gap through government programs and international collaborations are gradually transforming the sector, enabling more beekeepers to adopt sustainable and productive practices.

MATERIALS AND METHODS

Beekeeping Statistics

The beekeeping sector in Kazakhstan is a significant contributor to the country's agriculture and rural economy. Key statistics highlight its scale and importance:

Number of Beekeepers

Approximately 10.000 beekeepers are officially registered in Kazakhstan, with many more engaged in small-scale, informal beekeeping. These beekeepers range from hobbyists with a few hives to commercial operators managing hundreds of colonies. Number of Hives: Over 1.5 million hives are estimated to be in operation across the country, with the majority concentrated in the Almaty, East Kazakhstan, and Zhambyl regions.

Honey Production

In 2022, Kazakhstan produced around 10.000 metric tons of honey, with Almaty and East Kazakhstan regions contributing the largest shares. The country's honey is known for its high quality, with varieties such as flower honey, mountain honey, and sunflower honey being particularly popular (ICYB, 2025). These statistics underscore the growing importance of beekeeping in Kazakhstan, both as a source of livelihood for rural communities and as a contributor to the national economy. Kazakhstan is renowned for its diverse and high-quality honey, which is produced in various regions across the country (Moldakhmetova et al., 2023). The most popular types of honey include flower honey, mountain honey, and sunflower honey, each with unique flavors and properties derived from the local flora. Flower honey, sourced from wildflowers and meadows, is light and aromatic, while mountain honey, produced in the foothills of the Tian Shan and Altai mountains, is darker and richer in minerals. Sunflower honey, derived from vast sunflower fields, is known for its mild taste and high glucose content (Zhang et al., 2023). Kazakhstan's honey is increasingly gaining recognition in international markets, with exports to Russia, China, and the European Union growing steadily (Rustenova et al., 2024). The country's pristine natural environment and low levels of industrial pollution contribute to the high quality of its honey, making it a preferred choice for health-conscious consumers.

Production Volumes

Kazakhstan's honey production has shown consistent growth over the years, reflecting the sector's potential for expansion. Below is a summary of honey production volumes from 2018 to 2022

Export Data

The majority of Kazakhstan's honey production is concentrated in regions such as East Kazakhstan, Pavlodar, Abai, Almaty, Turkestan, and Zhetysu, as shown in table 1.

Table 1. *Kazakhstan's Honey Trade in 2024: Exports and Imports by Country*

Category	Country	Volume (tonnes)	Percentage	Reference
Exports (603.7 tonnes)	Uzbekistan	442.0	73.2%	
	Canada	54.0	8.9%	
	China	36.8	6.1%	
	Saudi Arabia	23.0	3.8%	
	Russia	21.1	3.5%	
	United States	18.5	3.1%	
	Other Countries	8.3	1.4%	
Imports (1,657.3 tonnes)	Russia	1,621.9	97.9%	ICE, 2024
	Germany	21.0	1.3%	
	China	7.1	0.4%	
	Other Countries	7.3	0.4%	

RESULTS AND DISCUSSION

Contribution to the Economy

Beekeeping is a vital economic activity in Kazakhstan, particularly in rural areas where alternative income opportunities are limited (Mikhaylova et al., 2022). The sector provides livelihoods for over 50.000 families, many of whom rely on beekeeping as their primary source of income. Small-scale beekeepers, often operating with fewer than 50 hives, form the backbone of the industry, while larger commercial operations contribute significantly to honey production and exports.

The beekeeping sector generates an estimated $50 million annually, with honey exports playing an increasingly important role in the national economy. In 2022, Kazakhstan exported over 3.000 metric tons of honey, earning substantial revenue and strengthening trade relations with countries such as Russia, China, and the European Union. The growing demand for natural and organic honey in international markets presents a significant opportunity for Kazakhstan to expand its export base and increase its share of the global honey trade (ICE, 2025).

Beyond honey production, the sector supports ancillary industries, including packaging, transportation, and marketing, creating additional employment opportunities. Beekeeping also contributes to the development of rural infrastructure, as increased income from honey sales enables communities to invest in education, healthcare, and other essential services (Prodanović et al., 2024).

Environmental Benefits

Beekeeping plays a crucial role in supporting environmental sustainability and biodiversity in Kazakhstan (Gritsenko et al., 2023). Bees are essential pollinators, responsible for the reproduction of many crops and wild plants (Singh and Adhikary, 2021). In Kazakhstan, crops such as apples, sunflowers, and alfalfa depend heavily on bee pollination, which enhances yields and improves crop quality (Al-Mohamed et al., 2023). This ecological service provided by bees directly supports food security and agricultural productivity, making beekeeping an integral part of the country's farming systems.

In addition to crop pollination, beekeeping contributes to the preservation of natural ecosystems. By maintaining healthy bee populations, beekeepers help sustain diverse plant species, which in turn support other wildlife and maintain ecological balance (Prodanović et al., 2024). Kazakhstan's vast steppes, forests, and mountainous regions are home to a wide variety of flowering plants, many of which rely on bees for pollination. The presence of bees in these habitats promotes biodiversity and strengthens the resilience of ecosystems against environmental changes (Web Link-1, 2025)

Beekeeping also aligns with global efforts to combat climate change and promote sustainable agriculture (Al-Mohamed et al., 2023). By adopting eco-friendly practices, such as organic beekeeping and habitat conservation, Kazakhstan's beekeepers can contribute to reducing the environmental impact of agriculture while producing high-quality, sustainable products (Richardson, 2023; Asan, 2024).

Challenges

Despite its economic and environmental benefits, the beekeeping sector in Kazakhstan faces several challenges that threaten its sustainability and growth.

Climate Change: Changing weather patterns are affecting the availability of nectar and pollen, as shifts in temperature and precipitation disrupt flowering cycles. Prolonged droughts and unpredictable weather conditions are particularly concerning, as they reduce the forage available for bees and impact honey production.

Pesticide Use: The widespread use of chemical pesticides in agriculture poses a significant threat to bee populations. Pesticides can weaken bees' immune systems, making them more susceptible to diseases and reducing their ability to forage effectively.

Habitat Loss: Urbanization, deforestation, and the expansion of agricultural land are leading to the loss of natural habitats for bees. This reduces the availability of diverse forage and nesting sites, further endangering bee populations.

Addressing these challenges requires coordinated efforts from policymakers, researchers, and beekeepers. Strategies such as promoting sustainable farming practices, reducing pesticide use, and conserving natural habitats can help mitigate the impact of these threats and ensure the long-term viability of the beekeeping sector in Kazakhstan.

CONCLUSION

The beekeeping sector in Kazakhstan is a vital component of the country's agriculture, economy, and environment. With its rich history, diverse climatic conditions, and high-quality bee products, Kazakhstan has the potential to become a leading player in the global honey market. The sector not only provides livelihoods for thousands of rural families but also plays a crucial role in pollination, biodiversity conservation, and sustainable agriculture. However, challenges such as climate change, pesticide use, and habitat loss threaten the sector's growth and sustainability. Addressing these issues requires a collaborative approach involving policymakers, researchers, beekeepers, and farmers. By adopting sustainable practices, investing in research, and implementing supportive policies, Kazakhstan can overcome these challenges and build a resilient beekeeping industry. The

future of beekeeping in Kazakhstan is bright, with opportunities for growth in both domestic and international markets. By leveraging its natural resources, embracing innovation, and prioritizing sustainability, Kazakhstan can ensure the long-term success of its beekeeping sector while contributing to global efforts to protect bees and the environment. This review underscores the importance of beekeeping as a driver of economic development and environmental conservation, offering a roadmap for its sustainable growth in the years to come.

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CONFLICT OF INTEREST

No conflict of interest was declared by the authors.

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