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# Apiculture in Bangladesh: scientific insights and transformation towards modern beekeeping

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## Abstract

Apiculture is one of the predominant sub-sectors of agriculture in Bangladesh, playing a vital role in crop production and ecological balance through pollination services. Despite its growing significance, there is a lack of systematic documentation and analytical assessment of advancements, challenges, and prospects in this sector, which hinders long-term development. This study aims to compile existing information, evaluate recent progress, and identify challenges in beekeeping practices in Bangladesh. In 1977, the Bangladesh Small and Cottage Industries Corporation (BSCIC) initiated scientific beekeeping and achieved success with *Apis cerana*. In 1990, *Apis mellifera* was introduced from India by two beekeepers, and in 1996, BSCIC successfully managed *A. mellifera* colonies. The major natural honey-producing regions are the Sundarbans mangrove forest, Chittagong Hill Tracts, and Madhupur Tract. About 75% of honey is produced in the Sundarbans by *Apis dorsata*. However, *A. mellifera* is highly valued for pollination due to its ability to carry heavier pollen, its docile nature, and its higher honey yield compared to *A. cerana*. Currently, around 25,000 beekeepers produce approximately 10,000 metric tons of honey annually, against a national demand of 30,000 metric tons. With better utilization of natural resources, it is estimated that 100,000 metric tons of honey could be produced each year, creating significant income and employment for rural youth. Key bee forage crops include litchi, coconut, tobacco, coriander, onion, mustard, sunflower, and sesame. Apiculture has vast potential, requiring minimal investment and labor, which is accessible to men, women and young people with the help of training, financial support and technical assistance.

**Keywords:** Apiculture, *Apis mellifera*, beekeepers, honey, pollination**.**

## Introduction

Apiculture is a sub-sector of agriculture where honeybees are reared or managed in bee hives for the production of honey, beeswax, propolis, royal jelly, bee venom. Beekeeping also plays an important role in the ecosystem as pollinators and facilitating 70-80% pollination among other insects (Amin *et al*. 2019). It is a profitable occupation that offers opportunities for the unemployed to become employed and get income from this work. In Bangladesh, beekeeping is possible as there is abundance of bee pasturage like mustard, litchi, sal, leucas, sisso, palash, rubber, sorghum, cotton, millet, onion, sweet potato, maize, tobacco and others from which nectar, pollen are collected by the bees. Four species of honey bees are available but only *Apis cerana* and *A. mellifera* are important for commercial honey production in our country (Kumsa and Takele 2014, Islam *et al*. 2016). The main areas for beekeeping are the Sundarban mangrove forest, Madhupur tract, Chittagong hill tract and others. This is an opportunity for rural women to work in this sector to improve their livelihood and support their family by their income (Famuyide *et al*. 2014, Vaziritabar and Esmaeilzade 2016). Honey bees contribute to conserve sustainable ecological system by their pollination services as they play role in different process like flowering of plant species which are important for the plant to provide food. Bangladesh lags behind the average net income of USD 1,015.30, with local beekeepers earning only around USD 67.02, mainly because they harvest only honey and beeswax instead of utilizing all potential honeybee byproducts (Schouten 2020). Bangladesh has the potential in honey production about 25000 metric tons, as we have abundant floral sources. Improved methods, scientific techniques and cultivation of plants that are attractive to honeybees, can expand the ability of honey production to 100,000 metric tons, which will contribute in agriculture-based economy (Jahan *et al*. 2021). There is a huge difference between the demand and the supply of honey

as the country produces low amount of honey, so majority (70%) of the honey we find in our market is imported from other countries with high price. According to FAO (2024a), China produced the highest amount of honey (4,74,110 tons) with a global share 28.3% in the world. Beekeeping in Bangladesh is facing many challenges mainly due to traditional methods. These practices lead to lower yields and less profit, often due to inbreeding depression that weakens the colonies and lack of knowledge about modern techniques and management. Other major problems are pesticides effect of agricultural, pest and disease attacks and various economic constraints. The high cost of starting a beekeeping business and the cost of artificial feeding during scarcity period also hinders rural people. Despite all these obstacles the sector is moving forward. Many organizations like BRAC, Caritas and Proshika are promoting beekeeping by providing training, tools and market. Government with the support of international bodies like FAO and USAID is also encouraging these activities. By bringing together beekeepers, researchers and government and non-government organizations the sector can build a stronger foundation. Adopting scientific methods and more research will help to create sustainable livelihoods especially for women and youth and preserve ecological balance through pollination.

**History of beekeeping in Bangladesh**

Beekeeping in Bangladesh started in Sylhet in 1950 but failed due to lack of modern techniques and planning (Hossain 2017). BARD tried to introduce beekeeping in 1958 but failed due to diseases. BSCIC started promoting traditional beekeeping in 1963 and later trained on modern techniques (Khan and Khan 2018). In 1977 BSCIC adopted scientific techniques with native bee species, *Apis cerana* (Hossain 2017). This period saw involvement of government and non-government organizations like DAE, BRDB, Grameen Bank, Proshika and BRAC, often in collaboration with international organizations like Denmark, FAO/UNDP and Canadian organizations (Moniruzzaman and Rahman 2006). The beekeeping industry faced a major setback in 1989 due to a 'sac brood virus' that caused a collapse of Apis cerana colonies. Proshika responded by introducing the *Apis mellifera* species in 1992, which was later adopted by BSCIC in 1996 for successful management in divisional centers (Hossain 2017). Today, beekeeping is supported by several societies, including the Bangladesh Beekeepers Association (BBKA) and various regional "Mouchashi Somitees" (Hossain 2017).

**Beekeeping techniques in Bangladesh**

There are four types of honeybees important in the country. Their morphological features, behavior and hive products vary greatly.

*Apis dorsata*: They are big in size and are native in Asia. They can yield 30-40 kg of honey from each colony but this is very low quality. Honey is collected by traditional methods and sold locally. These bees are found in natural condition specifically in the Sundarban mangrove forest of Bangladesh.

*Apis cerana:* These are native to Asia. They have many combs in a single colony and easy to domesticate. Honey production is between 8-10 kg and the quality is very good.

*Apis florea*: These are also native to Asia. They are the smallest in size and honey production is very low. On average 0.5 kg of honey is produced from a colony and the quality is good with medicinal properties.

*Apis mellifera*: They are European and African originated which came in our country in 20th century. They are the highest honey producing bee species with low absconding and swarming nature. They can produce about 45 kg of honey per colony.

**Traditional beekeeping:** It is an old practice that depends on local materials and is practiced in rural areas near the Sundarban, Chittagong hill tracts. The features of traditional beekeeping:

1. Beekeepers make non-movable hives by using logs, wooden boxes and bamboo tubes.
2. Honey is harvested by cutting the comb and it causes brood loss.

3. Beekeepers manage the colony without interfering with the activities of bees.
4. Honey is harvested without using any safety gear and then the hives are abandoned.

**Modern beekeeping:** Scientific and systematic ways with different modern tools are used in managing bees. The features of modern beekeeping:

1. Beekeepers use movable hive (Langstroth hives) for commercial purpose with *Apis mellifera* and *A. cerana*.
2. Beekeepers often move hive from one place to another on basis of flower availability.
3. They provide artificial diet to the bees during dearth period when food source is not adequate for the bees.
4. As artificial queen rearing and breeding is practiced, dependency on wild bees become reduced as the queen can produce more bees for the colony.
5. Regular inspection makes the management easy. So, the colony is less affected by pest and diseases.
6. Modern tools like motor generated honey extraction tool, centrifugal tool, pressurized spinning tools, filtration tools are used in honey extraction and then processed.

In Bangladesh, we had 1551 active beekeepers and 42911 boxes used as beehives. Uttar Bongo Mouchashi Somitee had 16766 bee boxes which was the highest among others. According to Bangladesh Small and cottage Industries Corporation (BSCIC) 25000 beekeepers have been trained but only 1551 beekeepers actively working in this occupation (Hossain 2017).

**Bee pasturage that supports beekeeping:** Bangladesh has a rich diversity of plants that provide a continuous supply of nectar and pollen for bees throughout the year, ensuring honey production.

**Floral resources for honeybees**

Nectar Plants: Key nectar sources include Leucas, sisso, jujube, palash, and litchi.

Pollen Plants: Important pollen resources are sorghum, sweet potato, maize, tobacco, and coconut.

Plants like mustard, onion, cotton, and sunflower provide both nectar and

**Honey production seasons**

The availability of these floral resources varies seasonally, which influences the quantity, color, flavor, and thickness of the honey produced.

Winter: This is the primary honey production season. Major sources like mustard, coriander, and date palm dominate, leading to the highest honey yields.

Spring: Litchi, mango, and guava trees bloom, producing popular honey varieties known for their distinct sweetness, aroma, and golden color. Summer and Rainy Season: During this period, when nectar availability from other

**Table 1. Present status and potential for apiculture in Bangladesh**

| Content | Current data | Scope |
|---|---|---|
| Honey production | 1,600 Mt | 25,000 Mt |
| No. of wild colonies | 4,55,000 | 9,50,000 |
| No. of domesticated colonies | 35,000 | 9,00,000 |
| No. of beekeeper | 25,000 | 4,00,000 |
| No. of honey hunter | 45000 | - |
| No. of beekeeping farms | 2000 | - |
| Employment generation | 70,000 | 4,30,000 |
| Enhanced crop yield per year | Tk. 1200 million | Tk. 80,000 million |

Table 1 represents the current status and potential of apiculture on the basis of economical perspective in Bangladesh (Rumman *et al*. 2021).

plants is low due to rain, jujube, sunflower, and black plum serve as crucial sources. The resulting honey is often darker and has a richer flavor.

Sundarbans: In the Sundarbans mangrove forest, certain plants like Aegiceras corniculatum and Rhizophora mucronata ensure year-round nectar production, though the maximum honey is harvested in the winter.

**Major beekeeping regions of Bangladesh**

1. Sundarban Mangrove Forest: Mainly in Khulna and Satkhira, this is the home of wild Apis dorsata bees. Honey is collected by honey hunters from April to July.
2. Madhupur Tract: In Tangail and Jamalpur this area is rich in mustard plants, *Apis cerana* and *Apis mellifera* are found here. Migratory beekeeping is common here. (Islam *et al*. 2017).
3. Rangpur and Dinajpur: Known for high quality honey from litchi and mustard plants, which are the main nectar source of *Apis mellifera*.
4. Chittagong Hill Tracts: Indigenous people here practice beekeeping for cultural and self consumption.
5. Sherpur and Mymensingh: These areas produce polyfloral honey from black plum, guava and mango. Mymensingh is also famous for sesame honey.

According to DAE (2018), figure 1 represents among different agricultural crops mustard, black cumin, coriander produce most of the honey than other sources. Honey from mustard, black cumin, sesame is very popular.

**Economic trends of apiculture in Bangladesh**

Figure 2 indicates annual honey production in Bangladesh which is increasing every year and the reason can be increasing of global demand, expansion of beekeeping with modern techniques, profit to the beekeepers (BBS 2018-2023).

Figure 3 represents higher gross return of all the bee products (honey, wax, pollen, colony, queen bee) in modern poly hive technique in comparison to wooden hive technique of beekeeping (Sadia *et al*. 2021).

According to FAO (2024), figure 4 represents the export value base price of natural honey from 2014 to 2023. In 2014 the value was lowest (76 thousand USD) then sharply increased in the next year. From 2016 to 2018 the value was decreasing. It showed inconsistency in export as 2019 to 2021 showed decreasing value. The value sharply increased in 2022 (681 thousand USD) and decreased in 2023 (123 thousand USD) that can be due to strict standard policy and authentication barriers but overall an increasing trend line indicates a gradual increase with time.

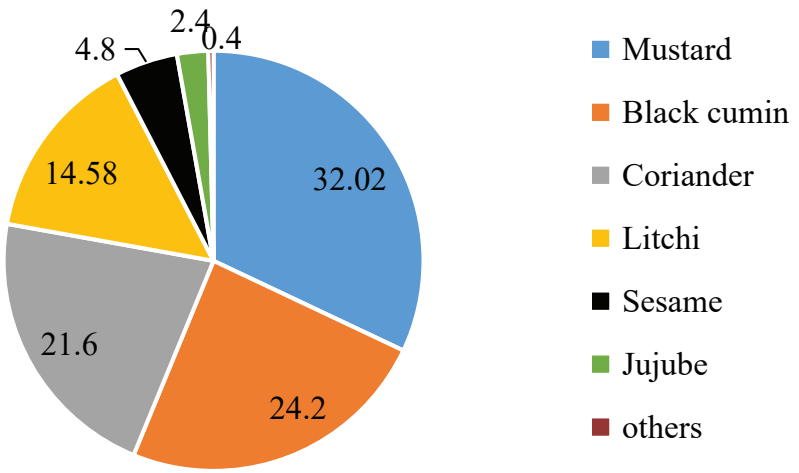



**Figure 1. Percentage of honey production in Bangladesh by cultivated honeybees on different agricultural crops.**

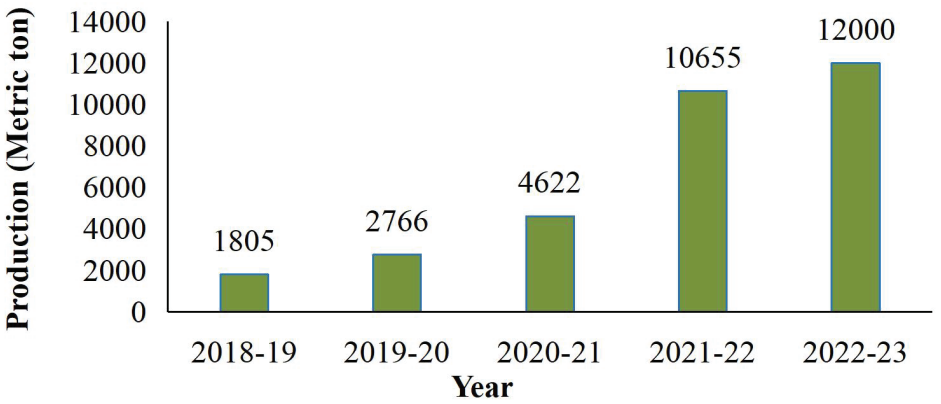



**Figure 2. Annual honey production in Bangladesh.**

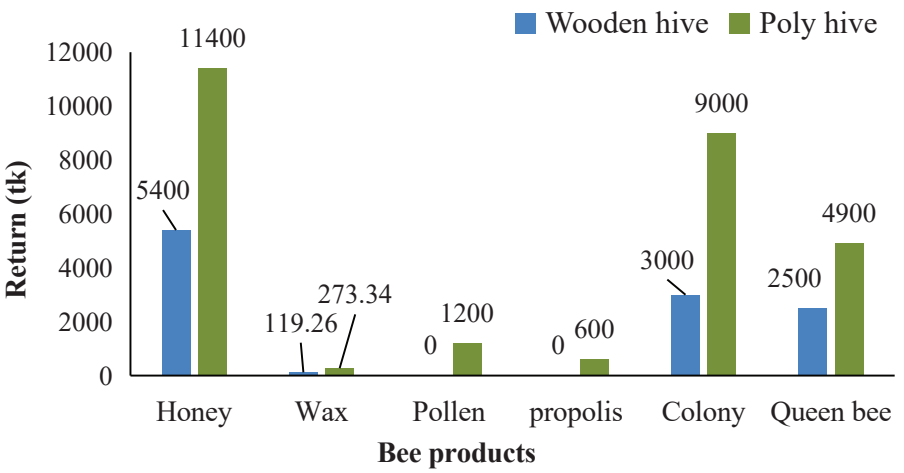



**Figure 3. Per hive return of beekeeping.**

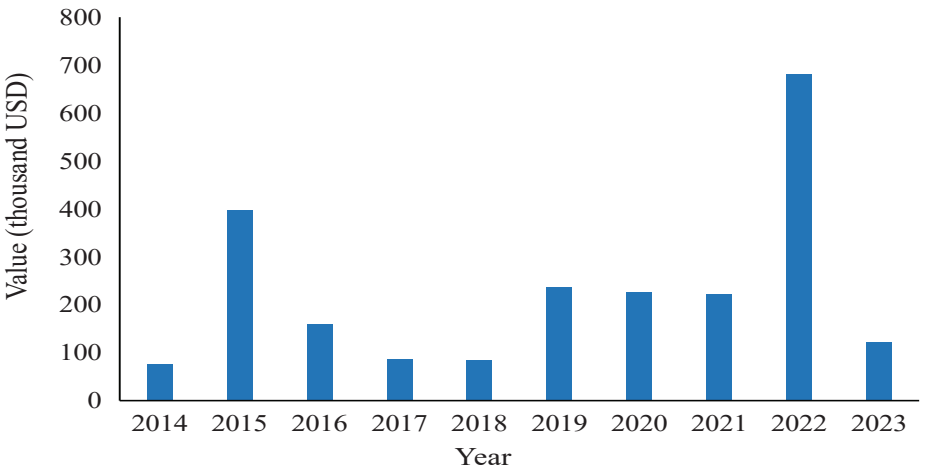



**Figure 4. Export value base price of natural honey from Bangladesh.**

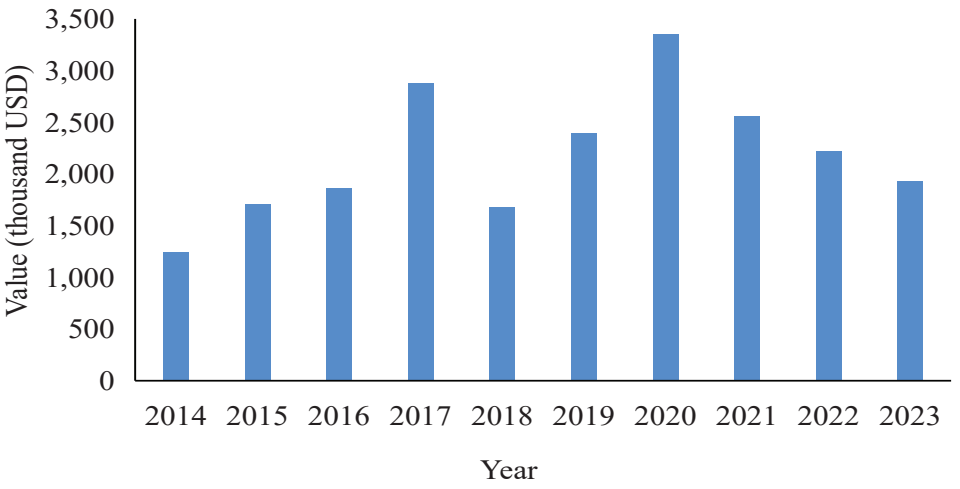



**Figure 5. Import base price of natural honey in Bangladesh.**

According to FAO (2024), figure 5 shows import base on price of natural honey from 2014 to 2023. In 2014 the value was lowest (1239 thousand USD). From 2015 to 2017 the value was increasing but sharply decreased in 2018 with 1676 thousand USD. After that import was increasing again in 2019 and 2020. Starting from 2021 to 2023 import value was decreasing it indicates the necessity of importing was decreasing as the production of honey is increasing day by day.

**Honey market in Bangladesh:** Honey is sold through various channels like grocery stores, super shops and online platforms, while other bee products like pollen, beeswax and propolis are less common. Online platforms have made bee products more accessible with many brands available. But concerns about purity and adulteration of honey are common online. So, consumers are advised to buy from reliable sources like directly from beekeepers or trusted platforms to ensure product quality.

**Challenges of apiculture**

**Effect of pesticides on honeybee:** Increasing use of chemical pesticides in agriculture is a big threat to honeybees. These chemicals can disrupt their communication systems and make them disoriented and unable to find food. This ultimately leads to reduced foraging and weakened colonies. (Zhang *et al*. 2020).

**Effect of pests and diseases:** Bees face many pests and diseases that threaten their survival and productivity.

**Pests:** Varroa mites are a major parasite that spreads viruses and deforms bees. Ants and wax moths invade hives, steal resources and disrupt internal balance. Birds also weaken colonies by preying on worker bees.

**Diseases**: Nosemosis shortens a bee's life through intestinal infection. Foulbrood (both European and American) and chalkbrood are diseases that kill bee larvae and pupae. Deformed Wing Virus and Acute Bee Paralysis Virus are viruses that cause physical deformities and neurological issues and severely impact bee health and colony strength.

**Economic and abiotic constraints on Beekeeping:** Beekeeping in Bangladesh is faced with economic constraints as modern hives and equipment are very expensive and most beekeepers can't afford. Lack of access to credit from banks forces many to rely on traditional and low yielding method. When bees are lost to pests and diseases it adds to the cost and the low quality products sell for very low price and it's hard to cover the expenses. Risk of honey adulteration further reduces the price and hinders the country's export potential. Beekeepers also face abiotic constraints. Absence of sufficient flowering plants and lack of nearby water source can harm the bees and reduce honey production. Climate

change is a growing problem as rising temperature can alter the blooming time of the plants and reduce the nectar and create food scarcity for the bees. These changes also create conducive environment for pests and diseases and increase the risk of colony loss.

**Adulteration and future opportunities:** Honey adulteration is a big issue as foreign substances like corn syrup and artificial flavor degrades the nutritional and medicinal value of the honey. This not only pose health risk to the consumers but also prevent Bangladesh's honey to meet the international standard and hinders the export to the global market. Despite all these challenges apiculture has future opportunities. It can create self employment and reduce poverty especially for the rural women and youth as the initial investment is very low. The sector also supports small scale manufacturing of beekeeping tools and create additional employment. Improved marketing and sales can connect the beekeepers to the global market and help them to be economically empowered and better livelihood.

**Self-employment and poverty reduction:** Apiculture is a great path to self employment and poverty reduction as it has low initial investment and minimal land requirement. It's especially beneficial for rural women and youth who can earn with limited capital. NGOs provide training, low interest loan and essential tools. The sector also supports local manufacturing of beekeeping equipment and connects local beekeepers to global market for better livelihood.

**Export and value added products:** Bangladesh has huge export potential in apiculture as there is growing global demand for high quality bee products like organic honey, beeswax, royal jelly and pollen. By adopting modern beekeeping standards and ensuring product purity Bangladesh can tap into this market. Beekeepers can also increase their income by creating value added products from raw materials like cream honey, beeswax candles, medicinal propolis sprays and bee venom for therapeutic use. This approach targets premium market, increases profit and reduces post-harvest waste.

**Apitherapy:** Apitherapy, the use of bee products like honey, pollen and bee venom to treat health issues is a growing field. Bee venom is used to treat conditions like rheumatoid arthritis and certain types of cancer (Bava *et al*. 2023). Though not popular in Bangladesh, with more research, training and collaboration with the health sector apitherapy can be recognized and developed to provide both health and economic benefits.

## Conclusion

In Bangladesh, beekeeping is practiced as a mix of traditional and modern methods, with about 25,000 beekeepers, 4,500 honey hunters, and 2000 bee farms and around 12,000 metric tons of honey produced annually. But most of the beekeepers still rely on traditional beehive technique. In 2023, only 0.123 million USD valued honey was exported, 0.932 million USD valued was imported by Bangladesh, indicating a deficient trade status. Challenges include pesticide exposure, pest and disease infestation such as Varroa mites, wax moths, nosemosis, bee paralysis, foulbrood and deformed virus, which all affect colony health. But apiculture provides opportunities from generation of self-employment to use of apitherapy for medicinal purposes, which offering both economic and health benefits for the future.

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