



Problems and prospects of apiculture in Bangladesh: A review

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ABSTRACT

Honey bees are significant economic resource as commercial producers of bee products, such as honey, beeswax, pollen, venom, and royal jelly. It plays a pivotal role in pollination, environment conservation, and the maintenance of biodiversity. Although Bangladesh has a favorable ecological condition for beekeeping, only a fraction of its potential is being utilized. To identify the reasons behind it, this paper reviews the socioeconomic status of the beekeepers, the problems faced by them in rearing honey bees, and in the processing and marketing of bee products. It also highlights the modern technologies that can be adopted to improve the beekeeping sector. Reviewed literature shed light on the constraints in beekeeping as poor educational status, inadequate training facilities, and lack of utilization of modern scientific instruments. This situation is further worsened by the adverse effects of pests, diseases, and the indiscriminate use of pesticides in bee flora. Furthermore, the lack of modern technologies to extract the byproducts, added with poor marketing strategies, hinders potential income in local and foreign markets. Along with the introduction of up-to-date tools and technologies, the government and non-government organizations should collaborate to alleviate the threats faced by this sector to make it more profitable.

Keywords: Honey bee, bee products, dearth period, pest and predators, pesticides, modern technologies



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1 Introduction

The honey bee is the floral generalist of nectar and pollen. It is a eusocial and cooperative insect that works as a commercial producer of the bee products. It also plays a crucial role in the ecological system as one of the most common pollinators facilitating 70-80% pollination among insects (Amin et al., 2019). Almost everything that can be found in the beehives can be collected and sold commercially as bee products, such as honey, beeswax, pollen, venom, and royal jelly (Farrugia, 2018). Nature's sweet super-food honey is not only used in preparing many delicacies, but also as an antibacterial agent, antiseptic, and to prevent many disorders such as cancer, neurologi-

cal degeneration, cardiovascular diseases, infectious disease, etc. (Cooper and Molan, 1999; Molan, 2001; Khalil et al., 2010). Beeswax is used in manufacturing candles, soaps, and cosmetics (Conrad, 2016). Its use can be seen in food, medicine, pharmaceuticals, electronics, paper, textile, 3D printing, and metallurgy industries (Jouttijärvi, 2009; Zhang et al., 2014; Fratini et al., 2016; Zaharia et al., 2020). Bee pollen can work as an antioxidant (LeBlanc et al., 2009). It is also regarded as an important part of different therapeutic applications (Komosinska-Vassev et al., 2015). The peptides and enzymes present in bee venom can be used in apitherapy to treat inflammatory diseases and arthritis (Wehbe et al., 2019). It has shown poten-

tial anti-cancer and anti-viral properties (Park et al., 2011; Jo et al., 2012; Hood et al., 2013; Rady et al., 2017). Royal jelly is used to reduce cholesterol and low-density lipoprotein (Guo et al., 2007).

To effectively maintain and extract these bee products, beekeeping has become one of the common methods. Occurrences of honey collection from wild honey bees date back 10,000 years ago (Dams and Dams, 1977). The earliest instances of domestication of the honey bee were seen in Egypt around 4,500 years ago (Crane, 1999). The conventional method of honey collection can be considered as honey hunting rather than beekeeping. Smoke is used to get rid of honey bees from the hives which are then destroyed while collecting the honey. In the modern era, emphasis has been given on the advanced techniques for bee culture and honey collection. Despite natural and man-made disasters like hurricanes, extreme fires, flooding, drought, extended winter climate, many foreign countries have pioneered advanced and sophisticated methods of beekeeping (Ranz and Eduardo, 2020).

In Bangladesh, honey hunting can be considered as one of the age-old traditions that started more than 400 years ago (Sivaram, 2012). Nowadays some instances of such methods can still be found in some areas of the country (Moniruzzaman and Rahman, 2009). However, recent years have seen a decline in such methods of natural honey production (Paul, 1996). Considering the agricultural dependence of the rural areas of Bangladesh and the pivotal role of honey bees in cross-pollination, forest conservation, environment conservation, and maintenance of biodiversity (Minja and Nkumilwa, 2016), the need for beekeeping, along with its expansion, and growth are evident. Through the improvement of the quality of seed and fruits via heterosis, beekeeping can contribute significantly to the sustainable development of agriculture. The huge difference between the demand and the supply of honey in the local market is evident from the fact that the majority (70%) of honey sold in the shops of Bangladesh is imported (Abdullah, 2019). Additionally, the global market worth of honey was USD 8.4 billion in 2018 (Grand View Research, 2019). To meet the ever-growing demand for honey and bee products in foreign countries (Richardson, 2019), Bangladesh can tap into an unexplored market, creating potential jobs for thousands of unemployed people in the country.

Unfortunately, the beekeeping sector in Bangladesh is currently facing a myriad of difficulties. Primitive age-old methods used by the poorly educated beekeepers are decreasing the quality of the bee products. To add to that, the lack of awareness regarding problems of traditional beekeeping, such as inbreeding depression is producing weaker colonies, susceptible to pest and disease attacks. The lack of training on the rearing and management of

bee colonies is reducing the overall profit margin. People living below the poverty line are facing hurdles in starting their own beekeeping business due to the high cost of productive honeybee colonies. Poor management of bees during the dearth period has contributed to the losses faced by the beekeepers. The agriculture sector is missing out on the latent capability of honeybees in enhancing the production of seeds, fruits, crops, and vegetables via cross-pollination. The use of harmful pesticides and insecticides, in addition to the diseases, pests and predators, is causing colony losses. Failure to collect and sell bee products other than honey and beeswax is depriving the beekeepers from gaining large profit. To aggravate the problem, limited use of modern tools and technologies that can enhance the productivity of honeybees and low return from the sold bee products is further decreasing the profit.

To facilitate the sustainable development of the beekeeping sector, this review explores the status quo of the apiculture sector in Bangladesh compared to other countries with thriving beekeeping sectors. The objective of the study is to find out the existing challenges faced by the beekeepers and highlight the modern methods and technologies that can help to identify possible solutions.

2 Socioeconomic status of the beekeepers

2.1 Gender distribution

Around 80% of the housewives of Bangladesh live in rural areas where bee flora like mustard, sesame, litchi plants are grown in plenty (Moniruzzaman and Rahman, 2009). Given appropriate opportunities, this population can contribute to the enhancement of beekeeping sector. However, currently beekeeping practices are largely dominated by males. For example, in Tangail, one of the most prominent beekeeping areas, among the beekeepers surveyed, 87.8% were male (Islam et al., 2016). This disparity contributes to the reduction of the potentials of beekeeping in Bangladesh.

2.2 Educational status

Previous studies on beekeeping has shown a positive correlation between the educational status of the beekeepers and the adoption of modern technologies (Bayissa Gedefa, 2014; Rasa, 2020). This serves as an indication that farmers having a higher educational background have better access to information and can easily adopt modern tools and technologies. Increase in education is also positively correlated to beekeeping entrepreneurship practices (Fuad et al.,

2019). As seen in Fig. 1, all the beekeepers in Dinajpur, another well-known beekeeping area, received at least some form of education. But a very small percentage of beekeepers received higher-level of education. Most of the beekeepers (78.70%) were limited by their secondary school education. As a result, they did not have access to information and remained unaware of the modern technologies used in beekeeping all over the world. This caused them to follow the age-old primitive methods. For example, the use of conventional bee species year after year is creating inbreeding depression (Hossain et al., 2019). This is responsible for reducing the fitness of biological organisms. Its serious consequences can result in a weak colony susceptible to pest and disease attack, a greater number of drone, lazy worker bees, non-productive queens, a lower rate of honey production and pollination, etc. leaving the apiculture sector at risk (Moritz, 1986). Use of conventional techniques like single box hives also affects the yield of honey, which could be solved by replacing them with Poly Super Hives (Hossain et al., 2019). Lack of awareness regarding this and many other modern technologies can be alleviated by facilitating proper education for the beekeepers to bridge the information gap.

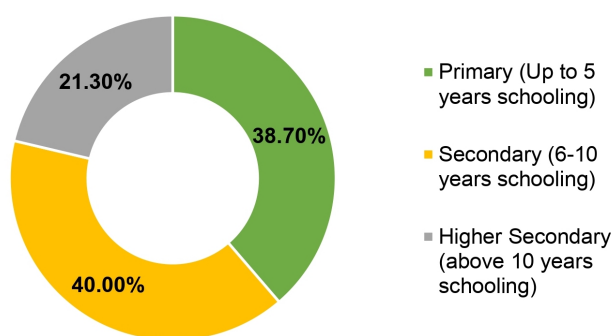


Figure 1. Educational status of the beekeepers of Bangladesh. Source: Fuad et al. (2019)

2.3 Training status

Fig. 2 shows the nature of training the beekeepers received regarding beekeeping from different government and non-government organizations prior to setting up their beekeeping practices. Although different organizations such as Bangladesh Small and Cottage Industries Corporation (BSCIC), Bangladesh Institute of Apiculture (BIA), Mouchas Unnayan Sangstha (MUS), Proshikkhan (Training) Shikkha (Education) and Kaj (Action) (PROSHIKA) have undertaken numerous programs, they were not able to reach the beekeepers who had been spread throughout the country (Saha, 2002). Consequently, many beekeepers are not yet proficient in rearing honey bees and collecting bee products. For this reason, they require more labor which adds to the cost, thus decreasing profitability

(Islam et al., 2016). Additionally, due to the unavailability of proper training, many newcomers struggle to start beekeeping, which hinders the expansion of this sector (Fuad et al., 2019). They also report that the majority of beekeepers learn beekeeping from other beekeepers, through their family, or in some other way (70%), instead of getting training from different organizations (30%). Many beekeepers report a lack of training regarding disease control (Islam et al., 2016). As a result, they cannot even identify the attack of pests, predators, and diseases caused by different organisms, let alone control them. Even after the training, many beekeepers reported a lack of communication with NGOs (Islam et al., 2016). Because of the absence of follow-ups from the organizations, the effectiveness of the training programs cannot be evaluated. In this case, if the beekeepers are confronted by any issue while implementing what they have learned throughout the program, they remain unable to find any reliable contact for solution.

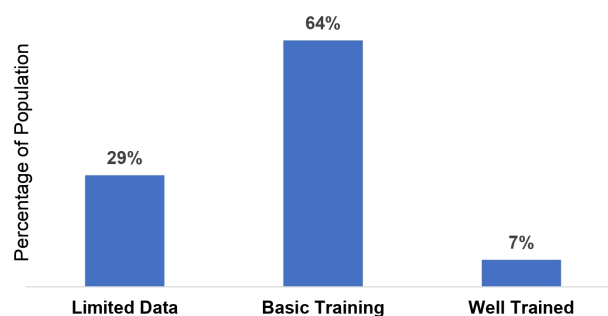


Figure 2. Training status of the beekeepers of Bangladesh. Source: Islam et al. (2016)

Table 1. Benefit to cost ratio (BCR) for different hive sizes

Species	Colony size	BCR
<i>Apis mellifera</i>	Small hive	2.712
	Medium hive	2.780
	Large hive	3.184
<i>Apis cerana</i>	Small hive	2.332
	Medium hive	2.689
	Large hive	3.029

Source: Islam et al. (2016)

2.4 Economic condition

According to Table 1, rearing honey bees in larger hives produce a higher net return. However, the cost of buying a larger hive is almost double than that of the smaller ones. To add to the problem, *Apis mellifera* bee species, which can generate a higher return on sales, require higher expenditure (Islam et al., 2016). Again the cost of colonies with queen bees is also high (Moniruzzaman and Rahman, 2009). According to

the survey conducted by [Fuad et al. \(2019\)](#) in Dinajpur, most of the beekeepers (66.52%) belong to low income families, earning up to 100,000 taka per year. Even the medium-income families (24.78%) earn at most 200,000 taka per year. Only a small amount of families (8.70%) earn more than 200,000 taka per year. These low to medium-income families can barely support their families, let alone invest their money in expanding their beekeeping business. And the high cost of starting beekeeping business can demoralize potential entrepreneurs.

3 Beekeeping techniques

3.1 Effect of monsoon season

Since honey bees do not forage in rain or wind stronger than 24.1 km hr^{-1} ([Thorp, 1996](#)), the monsoon season causes lots of difficulties in beekeeping. In Bangladesh, the majority of the flow of honey lasts from December to May, which sees a reduction in June, October, and November ([Saha, 2002](#); [Moniruzzaman and Rahman, 2009](#)). During June to October, the monsoon season brings heavy rainfall ([Bangladesh Contributors, 2021](#)). This results in the unavailability of nectar and pollen, two of the most crucial ingredients of honey bee nutrition ([Lawson and Rands, 2019](#)). As demonstrated in [Fig. 3](#), rainwater mixed with pollen grains via osmosis can interrupt the pollen transfer of honey bees to the hive ([Sun et al., 2008](#)). Again, diluted nectar caused by rainfall discourage honey bees from visiting those flowers ([Cnaani et al., 2006](#)). Even if there is a limited supply, rainy conditions restrict the foraging activity of honey bees rendering the available nectar and pollen useless ([Neupane and Thapa, 2005](#)). Heavy rainfall interferes with the flight of honey bees by increasing the energy required, and destabilizing movement and flight control ([Haines and Luers, 1983](#); [Ortega-Jimenez and Dudley, 2012](#)). Additionally, irregular and uneven precipitation patterns that are prevalent in Bangladesh possess a huge challenge for beekeepers ([Fuad et al., 2019](#)). According to [Lawson and Rands \(2019\)](#), change in the daily cycle of precipitation interrupts the foraging of honey bees who have a temporal relationship with the plants. They suggested transferring honeybee colonies to a location with less rainfall to counter this adverse situation. However, many beekeepers get worried while transferring their beehives from their own areas to other locations due to inadequate security measures causing hive theft ([Moniruzzaman and Rahman, 2009](#); [Hossain et al., 2019](#)).

3.2 Poor dearth period management

One of the major challenges that beekeepers face is the management of honey bees during the dearth pe-

riod. From August to December, when most of the flowers turn into fruits, a significant lack of bee flora reduces the nectar flow for honey bees ([Rokonuzzaman, 2015](#)). For the survival of honey bees during this situation, artificial food supplements need to be provided. [Table 2](#) demonstrates the effect of artificial supplements compared to untreated hives. There is a positive correlation between the amount of sugar supplied in artificial foods and the overall population density of honey bees. However, the increased amount of sugar contributes to the cost of rearing honey bees decreasing the total profit.

3.3 Misconceptions in farmers

The farmers are not familiar with the concept of cross-pollination that results in enhanced production of seeds, fruits, vegetables, and crops ([Saha, 2002](#)). On the contrary, many farmers possess the misconception that the collection of pollen by the bees has a detrimental effect on mustard flowers ([Moniruzzaman and Rahman, 2009](#)). Despite their pivotal role in crop pollination, these farmers think that honey bees weaken the flowers. As a result, beekeepers face difficulties when placing their hives in crop fields.

3.4 Effects of pesticides

Spraying of insecticides and pesticides in crops has harmful effects on honey bees ([Saha, 2002](#)). A list of pesticides that are commercially available in Bangladesh ([DAE, 2019](#)) and their toxicity levels are listed in [Table 3](#). Among these Carbofuran, Chlorpyrifos, Endosulfan are banned in many foreign countries due to their harmful effects on honey bees and other beneficial insects ([Hogue, 2011](#); [Pohanish, 2015](#); [Solomon, 2020](#)). By incorporating itself into the soil and seeds, systemic pesticides can harm the bees by reaching the nectar, and pollen of plants ([Sanchez-Bayo and Goka, 2016](#)). In addition to these, contact pesticides can also have a devastating effect on the entire bee colony. On one hand, bees can crawl over the surface treated by contact pesticide and die immediately, without causing any harm to the queen bee, brood, and worker bees. On the other hand, they can come in contact with pesticides and carry the pesticide-contaminated nectar or pollen back to the hive, potentially causing the death of the colony ([Honey Bee Program, 2018](#)). Pesticides have been linked to Colony Collapse Disorder (CCD) that happens when most of the worker bees vanish, leaving only a queen, lots of food, and a few nurse bees ([Dwayer, 2014](#); [EPA, 2018](#)).

3.5 Pests and predators

The beekeeping sector is plagued by various pests, predators, and diseases. A list of pests and predators

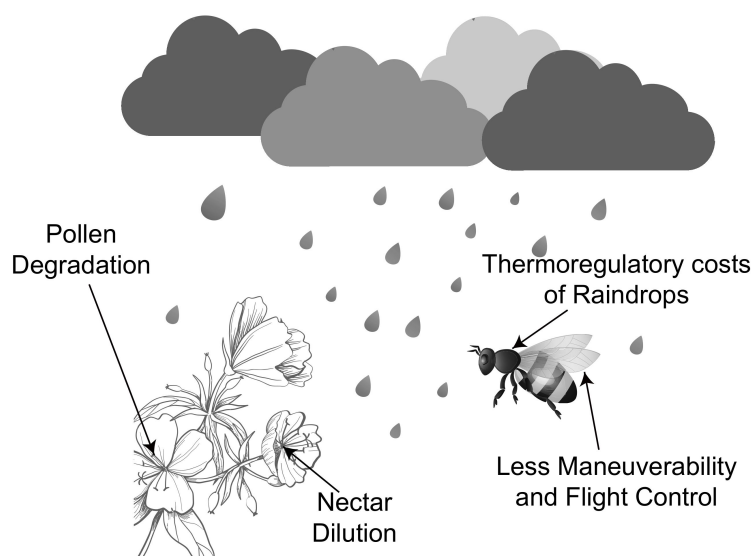


Figure 3. Effects of the monsoon season on honey bees. Adapted from [Lawson and Rands \(2019\)](#)

Table 2. Effect of artificial food on the population density of honey bees

Food supplements	Space covered (cm ²) by			No. of workers per 4 cm ² area	No. of drones per frame
	egg	larvae	pupae		
Nectar 1 + mungbean flour	197.27	213.79	256.4	3.03	1.53
Nectar 2 + mungbean flour	230.13	249.58	292.73	3.544	1.95
Nectar 3 + mungbean flour	249.39	282.32	330.9	4.11	2.42
Untreated control	147.53	152.2	173.2	1.77	1.02

Nectar 1 = sugar:water = 1:1, Nectar 2 = sugar:water = 1.5:1, Nectar 3 = sugar:water = 2:1; Source: [Rokonuzzaman \(2015\)](#)

Table 3. List of common pesticides and their harmful effects on honey bee

ISO common name	Duration of residual toxicity	Effects on honey bees
Chlorpyrifos	Several weeks	Highly toxic; harmful towards foraging honey bees
Acephate	3 days	Moderately toxic
Bifenthrin	<1 day	Highly toxic
Carbaryl	3-7 days	Highly toxic; bee dies within 2-3 days of contact
Carbofuran	7-14 days	Highly toxic
Methomyl	2 hours	Highly toxic; harmful towards foraging honey bees
Cypermethrin	<2 hours	Highly toxic
Diazinon	2-14 days	Highly toxic; harmful towards foraging honey bees
Dimethoate	3 days	Highly toxic; harmful towards foraging honey bees
Endosulfan	8 hours	Moderately toxic
Fenitrothion	14 days	Highly toxic
Fenthion	4-6 weeks	Highly toxic
Fenvalerate	1 day	Highly toxic
Malathion	5.5 days	Highly toxic for bees and other beneficial insects
Thiamethoxam	5-15 days	Highly toxic; affects hives situated near crop fields, causing death, and other abnormalities like movement disorders and seizures in bees
Resmethrin	30 days	Highly toxic; lethal dose: 0.063 µg bee ⁻¹

(Highly toxic: Acute lethal dose <2 µg bee⁻¹, Moderately toxic: Acute lethal dose = 2- 10.99 µg bee⁻¹); Source: [Ellis et al. \(1998\)](#)

Table 4. Major pests and predators of honey bee

Pests and predator	Season of occurrence	Effect on honey bees
Ants	All year round	Opportunists. Steals bee products from the hive. Ant infestation is a sign of vulnerable hives. Can invade recently split hives, newly captured swarms, or weak and failing hives (Anderson, 2021).
Mite	All year round	Lays eggs in bee-brood cells. Their offspring feed on the haemolymph of the developing brood. They spread and infect other colonies by attaching to the body of worker and drone bees (Akratanakul, 1990).
Birds	April-July	Can consume queens and worker bees causing hive-fail (Wongsiri et al., 2014).
Honey badger	All year round	Feed on bee larvae and honey (Carter et al., 2017).
Termite	June-September	Do not affect honey bees directly. But they feed on the wooden boxes where beehives are stored, making them completely useless (Aiyeloja et al., 2014).
Wax Moth	May-September	Dig tunnels lined with silk that entwine and starve emerging bees to death (Kwadha et al., 2017).

Source: Fuad et al. (2019)

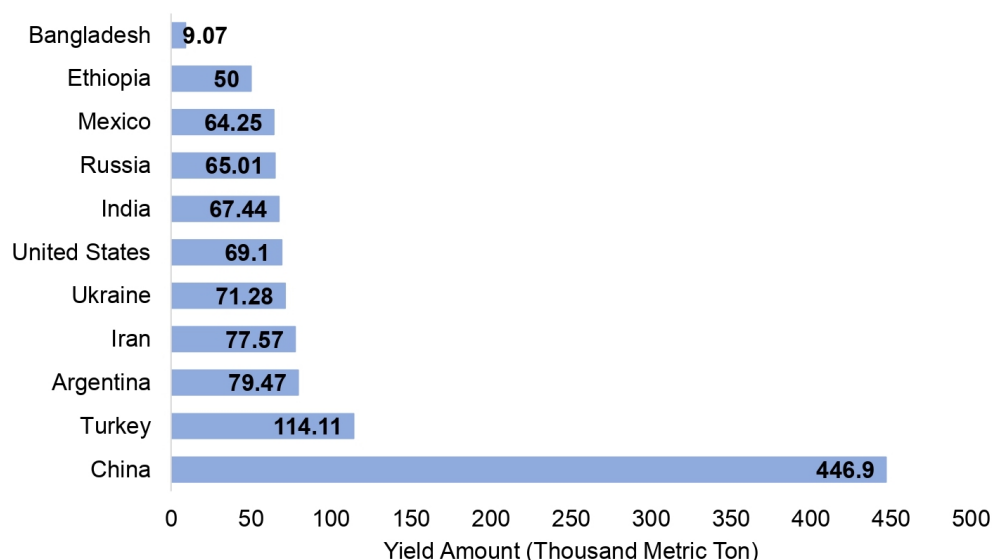


Figure 4. Annual yield of natural honey in different countries in 2018. Data Source: Abdullah (2019); Shahbendeh (2020)

Table 5. Yield of honey per hive in different locations of Bangladesh

District	Upazilla	Honey yield (kg hive ⁻¹) in 2015-16		Honey yield (kg hive ⁻¹) in 2016-17	
		Traditional hive	Poly super hive	Traditional hive	Poly Super hive
Sirajganj	Ullapara	12.68	16.33	13.18	18.63
	Shahzadpur	12.81	16.46	14.6	18.51
	Tarash	12.61	17.03	13.93	18.6
Gazipur	Gazipur Sadar	15.98	20.35	10.4	14.92
	Kapasias	16.23	20.46	10.85	14.57
	Kaligonj	14.58	20.11	10.98	13.93
Satkhira	Munshigonj	9.07	14.87	8.91	11.45
	Kaligonj	9.55	14.65	8.96	11.83
	Tala	9.32	14.92	8.47	12.5

Source: Hossain et al. (2019)

that are prevalent in Bangladesh is shown in Table 4. The situation is worsened by the use of wooden boxes, popular in Bangladesh, which enables the attack of pests and diseases (Hossain et al., 2019).

3.6 Lack of modern technologies

Modern technologies can contribute to the efficiency of beekeeping (Fadare et al., 2008; Affognon et al., 2015). Countries like China, USA, Russia, against their diverse and extreme climate, are using the latest and greatest tools to produce honey that placed them among the top natural honey-producing countries (Ciesla, 2002). Fig. 4 shows the yield of honey in different countries compared to that of Bangladesh and Table 5 presents the scenario in Bangladesh. This high yield can be attributed to the use of advanced technologies in those countries. Beekeeping farms, equipped with multi-frame electric extractors, centrifuges, and furnaces to facilitate the harvesting of wax, machinery for packing honey, are using multi-hull hives to bring a significant return in bee products (Gaga and Esaulov, 2016). In addition to the improvement in the pollination of crops, mobile apiaries are being used in the USA and Canada to reduce the time and energy consumption of honey bees from the fields to hives (Degterev and Degterev, 2016). Reusable plastic honeycombs are being used that can tolerate a greater load and reduce losses due to moth infestation (Gaga and Esaulov, 2016). Continuous monitoring of the bee colony and precise data collection are being made possible using smart apiary management systems (Zacepins et al., 2016). In this regard, despite having a favorable ecological condition, Bangladesh is still lagging due to the unavailability of sufficient machinery, equipment, and medicine (Saha, 2002; Amin et al., 2019). Even replacing the traditional single box hives, commonly used by the beekeepers in Bangladesh, with poly super hive boxes can prevent the damages caused by pest and diseases, facilitate easy transporting of beehives and reduce the risk of damaging honey broods during harvesting, consequently resulting in an increase of honey yield (Hossain et al., 2019). Incorporating the modern tools and technologies in the beekeeping sector can elevate the overall production of bee products increasing profitability of the beekeepers.

4 Processing and marketing

4.1 Loss of byproducts

Table 6 compares the average income from beekeeping in different countries. From the table, it is evident that Bangladesh is far behind the average net income of 1015.30 USD. This high income is a result of harvesting all possible byproducts from honeybees (Schouten, 2020). Surveys conducted in areas

where beekeeping is popular reveal that the beekeepers of our country are adamant about only harvesting honey and beeswax (Moniruzzaman and Rahman, 2009; Islam et al., 2016). This is a consequence of beekeepers not having access to available technology and inputs to gather and sell other bee products like pollen, propolis, bee venom, etc. (Hossain, 2017). As a result, most of the byproducts remain unused. The situation is further worsened by the lower marketing of bee products in local and foreign markets (Islam et al., 2016).

Table 6. Mean net income from beekeeping per household in different countries

Country	Mean income (USD)
Zambia	62.16
Bangladesh	67.02
Kenya	107.45
Nigeria	810.05
Nepal	972.18
Ghana	1102.15
Tanzania	1641.50
Turkey	1841.79
India	2533.43

Source: Schouten (2020)

4.2 Local market status

Even in the case of selling honey within our country, the beekeepers gain only a small amount in return. They usually sell their honey at a local market, or to wholesalers, and other organizations. Although these vendors sell quality honey in supermarkets at a high price (around 12.87 USD kg⁻¹), the beekeepers only get around 10-15% of that price (Islam et al., 2016). This also discourages promising beekeeping entrepreneurs (Fuad et al., 2019).

4.3 Export status

Fig. 5 shows the honey export trend from the year 2014 to 2018. Bangladesh is ranked 69th worldwide based on the market share in global exports, only exporting to Japan, United States, India, Mauritius and Singapore (Tridge, 2020). The honey export from Bangladesh reached its peak in 2015, but it's gradually decreasing due to less amount of marketing and a lack of honey authentication methods (Soares et al., 2017). As the price trend shows, Bangladesh can get a higher price in return. However, due to the less amount of export, this potential income is not attained.

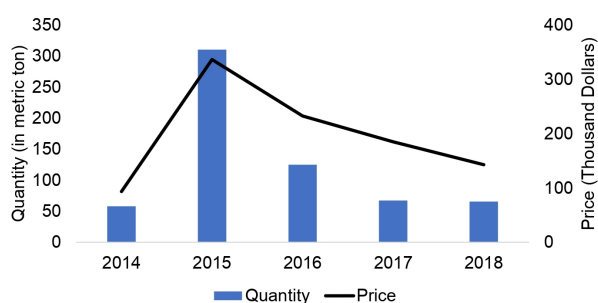


Figure 5. Honey export trend in Bangladesh. Source: [Tridge \(2020\)](#)

4.4 Lack of research in apiculture

In developed countries, extensive studies are being conducted to analyze the social behavior of honeybees using functional analysis of molecular and neural mechanisms ([Kohno and Kubo, 2019](#)), diversity using morphometric and molecular genetic markers ([Ostroverkhova et al., 2019](#)), the invention and utilization of transgenic honeybees ([Ben-Shahar, 2014](#)), the reduction of hatching capability of honey bees due to radiation and its physiological effects ([Gagnaire et al., 2019](#); [Odemer and Odemer, 2019](#)). Additionally, advanced biochemical methods are being researched to prevent adulteration through fraudulent production practices such as addition of sugar, thermal treatment, filtration, mixing of water and mislabeling of origin ([Soares et al., 2017](#)). However, considering to the huge potential research opportunity presented by the beekeeping sector of Bangladesh, the number of works in this sector is minimal.

5 Recommendation

- (i) Housewives living in rural areas can be utilized to create additional income source for poverty-ridden families.
- (ii) Educated people should be encouraged to participate in beekeeping so that they can learn and introduce new methods and tools for increasing productivity and efficiency in beekeeping. Microcredits can be managed to both help people start beekeeping and expand existing businesses.
- (iii) Proper training focused on modern tools and technologies, harvesting the byproducts, pest, predators, and disease control should be ensured. The training organizations should ensure help for the beekeepers staying in remote areas.
- (iv) Honey bee sanctuaries can help mitigate the harmful effects of monsoon season and dearth period. Government subsidies can be provided

for the artificial food supplies during the dearth period.

- (v) Use of pesticides should be limited during the active foraging period of honey bees.
- (vi) Competitive local markets should be established to ensure the profit of the beekeepers. Research efforts should be concentrated to ensure the quality of bee products to meet the standards of global markets.
- (vii) Awareness campaigns should be organized to educate the people regarding the multidimensional benefits of beekeeping via publicity in mass media.

6 Conclusion

The challenges that are faced by the beekeepers in Bangladesh and the necessity of using modern tools and technologies were reviewed in this paper. Due to the poor educational status of the beekeepers and lack of training on rearing and marketing, they are sticking to age-old crude techniques for beekeeping. On the other hand, the use of harmful pesticides and insecticides in crop fields, improper management of honeybees during the dearth period, and the attack of diseases, pests and predators are causing colony losses. Failure to collect and sell bee products other than honey and beeswax and low return from the sold products are depriving the beekeepers of huge profit. Limited use of modern tools and technologies is not only decreasing the quality of bee products but also reducing the profit gained. The government and non-government organizations should come forward to alleviate the hurdles faced by the beekeepers, fund researchers to work on the advancement of the apiculture sector, and introduce modern scientific methods and instruments to harness the full potential of honey bees.

Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

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