

# **A SEMINAR PAPER ON**

## **IMPROVING LIVELIHOOD OF RURAL PEOPLE IN BANGLADESH THROUGH SUSTAINABLE BEEKEEPING**

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# **IMPROVING LIVELIHOOD OF RURAL PEOPLE IN BANGLADESH THROUGH SUSTAINABLE BEEKEEPING**

## **ABSTRACT**

Today, beekeeping is an important, sustainable and integral agricultural activity for the development of rural people livelihood in Bangladesh. Various types of secondary data under the title have been compiled. . Sustainable beekeeping provides self-employment opportunities which eradicate poverty from rural life. The bee enhances yield of crops up to 30% - 40% by increasing pollination. Most of the beekeeper are male, young, lower educated and obtain basic beekeeping from NGOs. Beekeepers who had started the enterprise with higher number of hive were higher in number and their hive number had also increased .The benefit cost ratio indicates that sustainable beekeeping is profitable. The profit is highly correlated with beehive colony, wooden box, labor and transportation cost because they are variable cost. In beekeeping, there are some constraints like investment problem, marketing problem, security problem, lower training facilities etc. Proper beekeeping training and effective marketing of honey and other beekeeping byproducts is highly desired by the beekeepers. Government concern and NGOs involvement is mandatory to improve beekeeper training, marketing, and overall beekeeping business, which could contribute to the socio-economic development of marginal farmers of Bangladesh.

Keywords: self-employment, socio economic, profit, constraints.

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## CHAPTER I INTRODUCTION

Bangladesh is a South Asian country, which is located between 20° 34" and 26° 38" north latitude and 88° 01" and 92° 41" east longitude with a total area of 147570 km<sup>2</sup> and 156.6 million populations (World Bank,2013). Total GDP of this country was dominated by manufacturing 21.23%, agriculture 14.79%, with 1602\$ per capita GDP earning in 2017 (BBS,2017). Bangladesh is a developing country and a large portion of people still living under the poverty line. However, agriculture is the second GDP earning sector, but majority people associated with agriculture practice, particularly in rice cultivation. Besides rice cultivation, some other agriculture practice is showing potential profit among farmers in Bangladesh. Sustainable Beekeeping is one of them, which demand is increasing day by day because of its quality products, lower investment, lower technical knowledge and higher profitability. (Islam *et al.*, 2015)

Since time immemorial beekeeping has been practiced randomly in Bangladesh. In past, this activity was known as bee hunting not as beekeeping. It was done mainly for honey collection by crude method in the way of bee hunting which is even found in the present time in some areas .(Saha,1990)

Rearing of honeybees in wooden hives probably started in the country at the time of self-reliant movement of Mahatma Gandhi in 1940. Before this, people used to keep bees in clay pots, bamboo and straw baskets etc. Their attempt appears to be very limited. In 1950's the Govt. of East Pakistan understood the necessity of beekeeping.They tried to start beekeeping in the Sylhet district. But this practice was not satisfactory due to insufficient scientific technology and improper planning. (Saha,1990)

Bangladesh Small & Cottage Industries Corporation (BSCIC) started apiculture in wooden hives at Jatrapur under Khulna in the 1960's. The result at that time was not so satisfactory due to inappropriate technology and ultimately the activities were stopped in the same decade BSCIC again started beekeeping in modern and scientific way in 1977. Having successful efforts promotion and extension of beekeeping activities is being started by BSCIC throughout the country since 1977. Now on realizing the importance and utility of honey,

other bee products and beekeeping, many other organizations started and assisted modern beekeeping in the country. (Saha,1990)

Bangladesh government and many NGOs like, Bangladesh Institute of Apiculture ,Bangladesh Small and Cottage Industries Corporation, ProshikkhanShikkhaKarmo, MouchasUnnayanSangstha have taken various schemes to provide technological support for sustainable beekeeping to increase the production of honey in the country . PROSHIKA has innovated and introduced a number of new technologies to modernize apiculture practice in Bangladesh. Beekeeping needs low capital and little time, promises a high return. (Moniruzzaman *et al.*, 2009)

Four species of bees are mainly considering for honey production in Bangladesh, such as *Apis dorsata*, *Apis cerana*, *Apis florea*, *Apis mellifera*. Among them, *Apis mellifera* introduced in Bangladesh in 1992 for experimental basis which have originated from Africa, Europe and Middle East (Sivaram *et al.*, 2012). Three other species are Asian native and available in Bangladesh. *Apis dorsata* contribute more than 50% honey production in Bangladesh, which is a conventional honey production (bee hunting) from the Sundarban Mangrove forest. However the honey quality is inferior, damage bee colony, disrupt natural habitat and on average 4 honey collectors are killed every year during honey hunting season (Gani *et al.*,2001). For this reasons apiculture or beekeeping is practiced at present years increasingly.

Sustainable beekeeping is raising, management and maintenance of honeybee colonies for better economic and environmental benefits. It is described as an art and science of rearing, breeding, managing, and maintaining honeybees for getting economic and environmental gains (Ezekiel *et al.*, 2013; Nwali, 1996; Morse, 1989; Ikediobiet *et al.*,1985).

Sustainable beekeeping can play a vital role in sustainable agricultural development as it increases resource without changing environmental balance. As a cottage industry, it is a source of income of the rural people. Beekeeping is one of the important components of integrated rural development programmes (Verma *et al.*,1990). Rural poor dependent on subsistence agriculture and small farm lands often rely on alternative sources of income for their livelihoods. For such circumstances, (Yap *et al.*, 2015) propose that beekeeping is often promoted in the context of rural development because the practice provides monetary, nutritional, and social benefits to poor families, without requiring land ownership or large



amounts of capital investment. According to (Lietaer,2007), beekeeping can be practiced as an additional source of income for farmers in rural areas and has been successfully implemented in poverty-alleviating projects. (Joni,2004) also states that beekeeping plays a major role in the socio-economic development of rural livelihoods.

Considering the above fact this seminar paper is prepared with the objectives

- I) To know how sustainable beekeeping becomes a potential perspective for improving livelihood of rural people in Bangladesh,
- ii) To get idea about the socio-economic profiles of the beekeepers,
- iii) To review the cost and return of beekeeping in understanding profitability of the enterprise, and
- iv) To review the problems of beekeeping and suggestion of beekeeper in Bangladesh.

## **CHAPTER II**

### **MATERIALS AND METHODS**

This seminar paper is completely a review paper. Therefore, all the information was collected from secondary sources in order to prepare this paper. Various relevant books and journals, which were available in the library of Bangabandhu Sheikh MujiburRahman Agricultural University (BSMRAU) were used for the preparation of this paper. For collecting recent information, internet browsing was also practiced. Good suggestions, valuable information and kind consideration from my honorable major professor and other personnel's were taken to enrich this paper. After collecting necessary information, it has been compiled and arranged chronologically for better understanding and clarification.

## CHAPTER III

### REVIEW OF FINDINGS

#### **Sustainable beekeeping : A potential perspective for development of rural people livelihood in bangladesh**

There is a demand for honey and other bee products and so there is a need to motivate traditional beekeepers to adopt modern and scientific beekeeping practices in order to increase the productivity of beekeeping (Nisha,2017) .The growing market potential for honey and other byproducts that the hive produces results in apiculture emerging as a viable enterprise.

#### **1. Honey**

Honey is non-perishable so it can be kept indefinitely in a cool, dry place. There is almost no place in the world where honey is not widely used and celebrated as a part of the cultural diet. It also plays a vital role in religion. It is savored by all, making it extremely useful and versatile. Initially it was only used in various foods and beverages as a sweetener and flavoring agent. Over the years people have realized that honey has far more qualities. There are numerous health benefits, therapeutic and nutritive qualities which can be gained from honey (Ball,2007). It has antimicrobial, antibacterial and anti-fungal properties, which can be used as antioxidant (Chen *et al.*,2000 ; Nagai,2006) especially polyphenols and flavonoids, which are effective in reducing the risk of heart disease, cancer, inflammatory processes, asthma, infected wounds, chronic wounds, skin ulcers, and cataracts (Yao *et al.*,2004) boosts athletic performance, used in skin care, and is a rich source of vitamins and minerals. Honey has substantial medicinal properties and it is used in traditional medicine such as ayurvedic treatments. Today, scientists are also researching the benefits of honey in relation to modern medicine, particularly in the healing of wounds. (Nisha,2017).

#### **2. Bee wax**

Bee wax is secreted by worker bees' abdominal glands and it has industrial importance. It is used in the making of many items including cosmetics, shaving cream, face cream, ointments, plasters, carbon papers, pencils, electric goods, toothpaste, lotions, furniture-polishes, boot polishes, protective coating, ink paints and candles. It is also used in model

and mould making and in printing industry. It is also used in the laboratory for microtomy with the common wax for block preparation of the tissues. (Nisha,2017).

### **3. Pollen**

Bee pollen is approximately 40% protein .It is considered nature's most complete nourishing foods. About half of its proteins are in the form of free amino acids that are ready to be used directly by the human body. Bee-gathered pollen is also rich in vitamins including B-complex and folic acid has anticancer qualities. (Nisha2017)

### **4. Propolis**

Propolis, or bee glue, is a mixture of beeswax and resins which are collected from leaf bugs and twigs. It is used to line nest cavities and brood combs, seal cracks. It is also used to reduce the size of the hive entrance. Propolis has also antibacterial and antifungal properties .(Nisha ,2017)

### **5. Royal jelly**

Royal jelly is a protein rich substance which is fed to larvae. More is given to the queen larva, causing her to grow larger than the other bees. It is made from digested pollen and honey.Royal jelly contains sugars, fats, amino acids, vitamins, minerals and proteins. Royal jelly production has a great role to increase the income of beekeepers. Since the consumption is increasing, there is a big demand for fresh and good quality royal jelly and the price is very high. (Nisha,2017)

### **6. Bee Venom**

Venom from the bee sting which is made up of a complex mixture of proteins . Recent research suggests that venom may have benefits to mankind. The venom of stings of honey bees has been used in the treatment of rheumatoid arthritis and snake bite (Nisha,2017)

## **Role of beekeeping in self-employment and poverty reduction**

Now-a-day young people are facing fewer opportunities to contribute to their community's development. Sustainable Beekeeping is an economically sustainable occupation, offering attractive opportunities for self-employment with multiple benefits. Participation of rural women and youth in beekeeping activities provides a unique opportunity to improve rural livelihood and also poverty reduction (Mwakatobe *et al.*,2016).The growth of the beekeeping industry, will help to overcome the growing unemployment rate in present years. Sustainable Beekeeping has potential to provide regular income especially in agricultural areas. Eighty six thousand villages of Bangladesh are favorable for beekeeping. So it is to be expected that if there would be at least 5 beekeepers in each village in average then there would be more than 0.4 million people to be engaged in beekeeping activities. By way of this 0.4 million people to be engaged in keeping bees and when each beekeeper on average will produce 10 kilogram of honey then there would be a total honey production of about 4,000 metric tons which is worth Taka 800 million per year( Saha,1990). So sustainable beekeeping has the ability to generate economic, social and environmental value simultaneously . Beekeeping can be done by all ages and gender and requires relatively low capital and does not require daily attention (FAO,2009). Beekeeping contributes up to 33% of household income in the miombo woodlands of Tanzania (Monela *et al.*,2001) and it employs about 2 million rural people (Mapolu,2005).

Apicultural practices towards rural income can be viewed as a means of eradicating poverty in developing countries (Goldenberg,2004; Lalika,2009.,Mickels,2006; Ogaba,2007).Food, income in form of cash, employment and scenery creation for tourism are major benefits derived from apicultural practices in Chitanga village of Mwenezi district of Zimbabwe (Chazovachii *et al.*,2012). Sustainable beekeeping requires less expensive equipment, as simple hives can be made from local materials by local artesian (Bradbear,2009). Ajao and Oladimeji (2012) assessed the contribution of apicultural practices to household income and poverty alleviation in Kwara state of Nigeria. Qaiser *et al.* (2013) conducted an impact assessment of beekeeping in sustainable rural livelihood in Chakwal and Sargodha in Pakistan. Relying on descriptive statistics, apiculture was found to increase keepers' income. Saha (2002) conducted an exploratory study in Bangladesh and concluded that beekeeping is

a proven technology as a good profitable venture requiring small investment of capital and skilled labor and high yield in comparison to other poverty reduction activities. To alleviate the problem of poverty in rural areas, looking for alternative technologies that too which are environment friendly are crucial. So, introduction of improved beekeeping technologies is an alternative income generating activities which can be appropriate solution for sustainable development (Admassu et al., 2008)

### **Honeybee pollination increases weight and commercial grade of crop**

Some people also provide bees on a rental basis to farmers and orchardists for pollination. Pollination fees can be an important source of income for some commercial beekeepers. The pollination service delivered by the bees to our ecosystem is 20 to 117 times more valuable than the financial worth of all beekeeping production. To all pollination done by insects, bees contribute by 70-80%. The bee enhances yield of crops up to 30% - 40% by increasing pollination. The presence of managed pollinators can increase quantity and improve quality of fruit yield in honeysuckle and various orchard plants (Bieniasz, 2008; Bozek,2012;).From Table 1 we see the effects of pollination of honeybee.

**Table 1. Honeybee pollination increases weight and commercial grade of strawberry, cotton, Sesame.**

Crop	Pollination effects by bee
Strawberry	<ul style="list-style-type: none"> <li>❖ Increase the commercial value per fruit by 38.6% compared with wind pollination and by 54.3% compared with self-pollination.</li> <li>❖ Fruits were on average 11.0% heavier than wind-pollinated and 30.3% heavier than self-pollinated fruits.</li> </ul>
Cotton	<ul style="list-style-type: none"> <li>❖ Increase fruit set 48.73% compared to 37.45% in self-pollination</li> <li>❖ Increase fiber weight by 33% compared to self</li> <li>❖ Increase the yield quality between 27% and 31% (98.38 US\$-112.96 US\$)</li> </ul>
Sesame	<ul style="list-style-type: none"> <li>❖ Increase fruit set 45.82% compared to 20.36% in self-pollination</li> <li>❖ Increase seed weight by 59% compared to self</li> </ul>

(Source: Klatt,2014)

## Socio-economic status of beekeepers

### Gender status of beekeeper

The genders of beekeeper of Madhupur, Bhuapur, and Gopalpur and kalihatiupazila of tangail district are illustrated in Fig.1. The beekeeping practice is largely dominated by 87.80% male, whereas the female is only 12.20%.

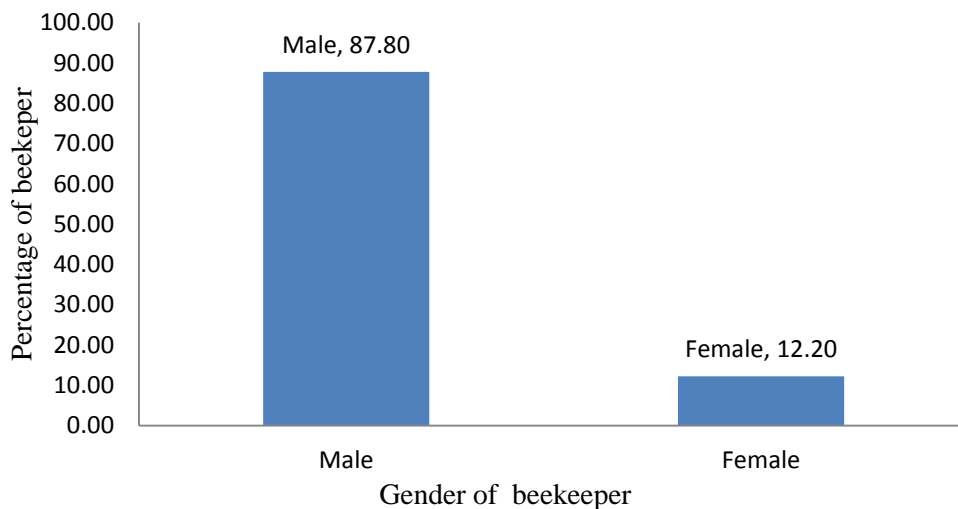


Fig.1. Gender status of beekeeper

( Source :Islam et al., 2015)

### Educational status of beekeeper

The Educational statuses of beekeeper of Madhupur, Bhuapur, and Gopalpur and kalihatiupazila of tangail district are illustrated in Fig.2. Educational status of beekeepers is mostly under primary (34.15%) and primary label (56.10%). The young people (53.66) are mainly associated with beekeeping practice.

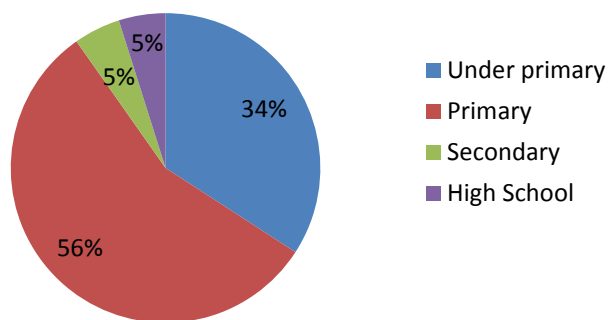


Fig.2. Educational status of beekeeper

( Source :Islam et al., 2015)

### Age of beekeeper

The age of beekeeper of Madhupur, Bhuapur, Gopalpur and kalihatiupazila of tangail district are illustrated in Fig.3. Mainly young people like 53.66% , middle age (21.95%) engaged in beekeeping area. Adult and juvenile also connected with beekeeping.

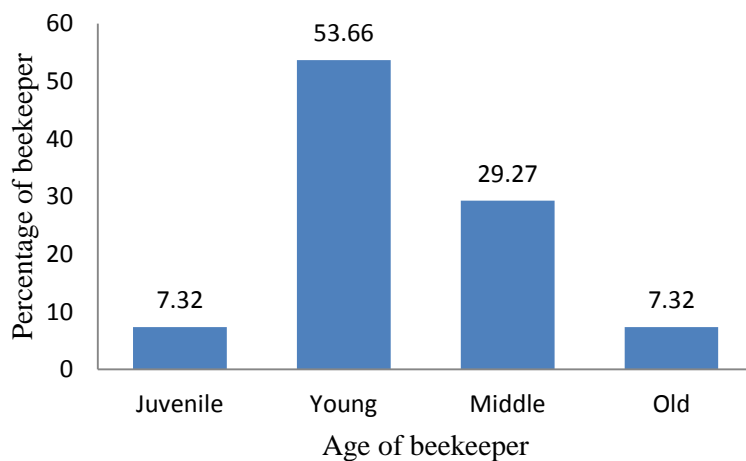


Fig.3. Age status of beekeeper

( Source :Islam et al., 2015)



### Own land holding status of the beekeepers

Landless people (11 per cent) were engaged in beekeeping activities in the Modhupur, Bhuapur and Gopalpur upazila of tangail district and Sadarpur upazila of Gopalganj district of Bangladesh. Most of the beekeepers were small and marginal land holding categories. Forty six percent of the total beekeepers had own land of 0.51 to 1.50 acres. Average own land size was 1.29 acres per beekeeper (Moniruzzaman et al.,2009).

### Training of beekeepers

The government institute, NGO and some local NGOs provide training to the beekeeper. From fig.4 we see that in the study area, 7.32% respondents have well beekeeping training, 63.41% have basic training and 29.27% has a limited idea about beekeeping.

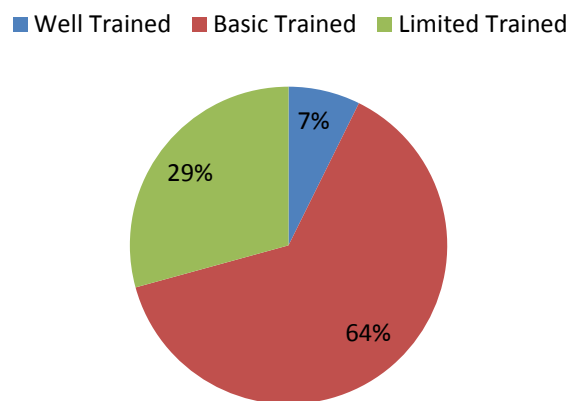


Fig.4.Percentage of training of beekeepers

( Source :Islam et al., 2015)

### Occupational status of the beekeepers

In the Modhupur, Bhuapur and Gopalpur upazila of tangail district and Sadarpur upazila of Gopalganj district, hundred percent of the beekeepers have taken beekeeping as a main occupation. But they also worked in agriculture, petty business, fisheries, van pulling in the off-season of honey production about five months from June to October. Most of the beekeepers (74 per cent) were mobile with respect to flowering time of mustard, litchi and sesame mainly. Beekeepers go to the areas with hives where (and when) the availability of flowers of the aforesaid crops/fruits and stay there about one to two months. (Moniruzzaman et al.,2009)

### Size of hives and beekeepers

There were three types of hives in size like i) small ii) medium, and iii) large. Large hive was preferable to beekeepers because net return was higher from large hive (Table 2).

**Table 2. Number of beekeepers having different number of hive size wise of Modhupur, Bhuapur and Gopalpur upazila of tangail district and Sadarpur upazila of Gopalgonj.**

Hive size	Total number of hives	Number of beekeepers
Small hive (2 boxes in a hive)	540	45
Medium hive (3-4 boxes in a hive)	117	6
Large hive(more than 4 boxes in a hive)	869	53
Total	1526	*54
Number of hives per beekeeper	28.26	

\*Each beekeeper possesses more than one size of boxes

(Source: Moniruzzaman *et al.*, 2009)

### Number of hives and beekeepers

At the initial period (not a single year, different for most of the beekeepers), the total number of hives was 257 but at the data collection time it was at 1526. Total number of hives was 115 at the starting period in this category where stood it at 34 in the data collection period and 70 percent lower than before. The number of beekeepers was 44 who started this enterprise with one to five hives. But at the data collection period this number stood at 8 decreasing from 44 (81 percent decreased).

**Table 3. Number and percentage of hives and beekeepers of Modhupur, Bhuapur and Gopalpur upazila of tangail district and Sadarpur upazila of Gopalganj district.**

Farm size (on the basis of number of hive)	Starting period		Data collection period		Change %	
	Number of hives	Number of beekeepers	Number of hives	Number of beekeepers	Number of hives	Number of beekeepers
1-5	115	44	34	8	-70	-81
6-10	62	7	75	11	+21	+57
11 and above	80	3	1417	35	+1671	+1066
Total	257	54	1526	54	+493	-

(Source: Moniruzzaman *et al.*, 2009)

Beekeepers have increased their number of hives. At first, three beekeepers started this beekeeping with 11 and above hives and at the data collection period the number of beekeepers was at 35. At first, their total number of hives was 80 and the number of hives stood at 1417 at the data collection period. So there was enormous positive increment (1066 per cent). It means that it is a profitable enterprise. If it were not profitable then they would not increase the number of hives. Beekeepers want to increase the number of hives for getting more income. They don't need to buy new colony for increasing the farm. Beekeepers increased their hives by grafting method. They have to buy box, frame and other equipment, which are not costly. So, this is a great opportunity for the beekeepers. Otherwise, it will be difficult for them to increase the number of hives because of high price of colony with queen bee.

## Profitability of sustainable beekeeping

Recently, *Apis cerana* and *Apis mellifera* are widely used for honey production in Bangladesh (Fig.5). Due to native origin of *Apis cerana* bee colonies, it is easy to find and cultivate. *Apis mellifera* is highly productive, ability to adopt a wide climatic range (Matavele et al.,2007), and provide 40-50 kg/yr. high-quality honey ( Saha et al.,1990).



Fig.5. *Apis mellifera* and *Apis cerana*

(Source: [www.ehoney.com](http://www.ehoney.com))

The net present value cost, net present value benefit and benefit-cost ratio of *Apis mellifera* and *Apis cerana* are illustrated in Table 4. The net present value cost (NPVC) of *Apis mellifera* beekeeping is higher than *Apis cerana* in small hive, medium hive and large hive, which affecting higher net present value benefit (NPVB). The Benefit-cost ratio is increased with the increase of beehive size as well as bee colony. In beekeeping business, the higher investment is required for *Apis mellifera* bee species, which contribute a larger beekeeping business profit.

**Table 4. NPVC, NPVB and B/C of *Apis mellifera* and *Apis cerana* (in USD) of Modhupur, Bhuapur and Gopalpur upazila of tangail district .**

Bee species	Hive size	No. colony	NPVC	NPVB	B/C
<i>Apis mellifera</i>	Small hive	1-3	118.77	322.13	2.712
	Medium hive	4-6	184.45	512.89	2.780
	Large hive	7-9	239.54	762.65	3.184
<i>Apis cerana</i>	Small hive	1-3	57.38	133.80	2.332
	Medium hive	4-6	81.39	218.84	2.689
	Large hive	7-9	107.47	325.57	3.029

( Source: Islam *et al.*,2015)

Most of the costs are fixed for beekeeping .Table 5 shows that the total cost of beekeeping per hive per year was Tk.6,017 to Tk.12,054of Modhupur, Bhuapur and Gopalpur upazila of tangail district and Sadarpur upazila of Gopalgonj district. For small, medium and large hive the average cost was Tk.6,017, Tk.9,209 and Tk. 12,054, respectively. The largest amount of cost item in beekeeping was the colony. So, if it becomes cheaper than more people will be involved in this profession. It is difficult to start this enterprise for small and marginal farmers of our country if they do not get credit for this purpose. Hives were categorized into three groups to compare the costs and return from different size of hives of beekeeping.

For small, medium and large hive; cost of honey extractor, bee veil, and hand gloves must be same because it is not related with the size of hives. Conceptually, the cost of feed, labor, and transportation for the different size of hives should be different, but technically it was very difficult to differentiate this cost according to size of the hives, because most of the beekeepers had all types of hives.

**Table 5. Average cost of beekeeping per year per hive for *Apis mellifera* (in Taka) .**

Cost of items	Size of the hive			All farms
	Small	Medium	Large	
1.Wooden box	107.84	116.04	225.92	175.71
2.Colony(Queen bee with other bees)	2590.00	5773.50	8508.50	6204.45
3.Honey extractor	237.50	237.50	237.50	237.50
4.Feed(sugar)	785.32	785.32	785.32	785.32
5.Labour Family supplied	580.53	580.53	580.53	580.53
Hired	667.25	667.25	667.25	667.25
6.Transportation	914.04	914.04	914.04	914.04
7.Bee veil	50.00	50.00	50.00	50.00
8.Hand gloves	60.00	60.00	60.00	60.00
9.Knife	25.00	25.00	25.00	25.00
Total	6017.84	9209.18	12054.10	9699.80

(Source:Moniruzzaman *et al.*,2009)

Hired labor cost was Tk.667 per hive per year (normally, it can vary on the basis of total number of hives, not on the basis of size of the hive). Average labor wage was Tk. 2,428.57 per month (it was not on the day basis). In the study areas, beekeepers had to hire the labor because they are owner of the large number of hives. The study showed that transport and labor are the most significant components of costs, which would be spent in the rural areas where the enterprise is based. The beekeeping enterprise is therefore creating a substantial contribution to economic activity in such rural areas of the country. Beekeeping is based on the availability of flowers of mustard, sesame and litchi mainly, this enterprise was not developed all the areas where these crops are grown, beekeepers bring out their hives where nectar producing crops and fruits (mustard, sesame and litchi) are available through

truck/van. Most of the beekeeping farms (74 per cent) are mobile in nature i.e. they transferred their hives in different regions for getting more honey and stayed there for one to two months. They also produced beeswax but they did not sell it, they utilized it for preparing the comb foundation sheet of the colony for expansion sheet of the colony for expansion.

Table 6 shows that the beekeepers produced 52 kg honey from a small hive, 63.25 kg from a medium hive and 94.3 kg from a large hive per year on an average. Table 6 shows that 2 kg beeswax is produced from a small hive, 3 kg from a medium hive and 5.5 kg from a large hive on an average per year. They could earn Tk.6302 from a small hive, Tk.7654 from a medium hive and Tk.11,169 from a large hive on an average per year if the beekeepers sell both of honey and beeswax. Price of honey was varied from Tk.100 to Tk. 150 (it depends on where they sell, if they sell to consumers then they get more price than if they sell their honey to AP/ MUS/ BIA/ wholesaler).

**Table 6. Average gross return from bee keeping per year per box from *Apis mellifera*.**

Return items	Small hive			Medium hive			Large hive		
	Amount (kg)	Price (Tk/kg)	Value (Tk)	Amount (kg)	Price (Tk/kg)	Value (Tk)	Amount (kg)	Price (Tk/kg)	Value (Tk)
<b>Honey</b>	52.50	116.10	6095.25	63.25	116.10	7343.32	91.30	116.10	10599.93
<b>Wax</b>	2.00	103.78	207.56	3.00	103.78	311.34	5.50	103.78	570.79
<b>Colony</b>	-	-	2590.00	-	-	5773.50	-	-	8508.05
<b>Total</b>	-	-	8892.81	-	-	13428.1	-	-	19678.77

(Source: Moniruzzaman *et al.*, 2009)

For estimation of the total return, the author considered the price of colony, because if the beekeepers want to sell it then they can easily sell the colony at least at their purchasing price. If it is not so old then its price will be greater than previous price, if it is better managed. Here, purchasing price has been considered as selling price for determining the gross return. It has been included as return in this calculation because costs and returns are estimated for one year. If it is not considered then actual return will not be occurred from this enterprise.

From Table 7 we see that on an average the beekeepers earned net return of Tk.2,875 from a small hive, Tk.4,218 from a medium hive and Tk.7,624 from a large hive per year. Net return was Tk. 5,682.92 per year per hive without considering the size of hives. Benefit cost ratio (without discounting) was higher for large hive i.e., beekeeping with large hive was more profitable than others.

**Table 7. Average net return from bee keeping per year per hive from *Apis mellifera* (in taka)**

Size of the hive	Net return	B/C
Small hive	2875.33	1.48
Medium hive	4218.98	1.46
Large hive	7624.67	1.63
All farms	5682.92	1.59

(Source: Moniruzzaman *et al.*, 2009)

### **Problems and suggestions of beekeeper**

There were some problems in beekeeping, which were reported by the beekeepers (Fig. 6). Initial cost of beekeeping was high, if a person wants to start this enterprise with five hives, then it was needed about Tk.40,000. Most of the beekeepers (69 per cent) reported this problem. Beekeepers suggested availability of credit by the government.



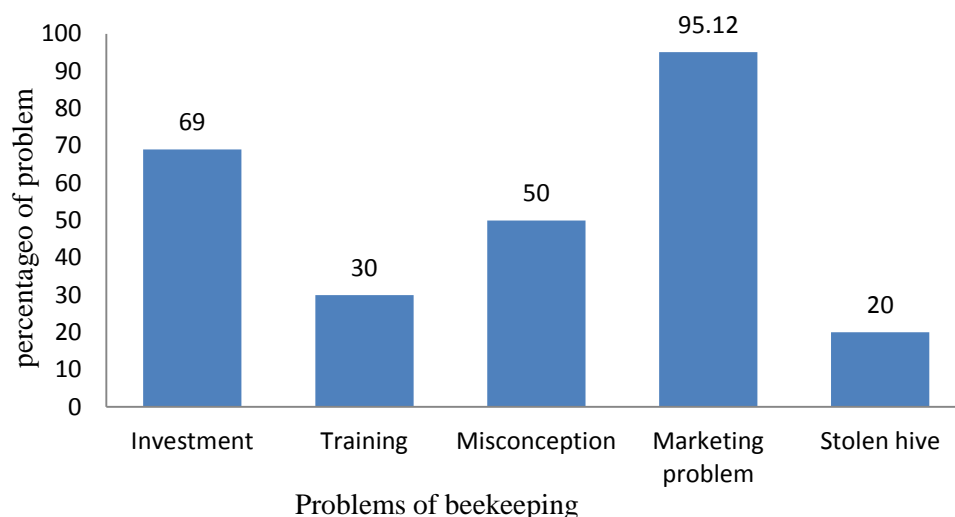


Fig.6. Limitation of Beekeeping

(Source:Moniruzzaman *et al.*,2009; Islam *et al.*; 2015;Saha,2002)

In this profession, training is necessary to run the beekeeping properly. The beekeeper doesn't have proper knowledge about pesticides and bee disease .If it is properly managed then it will give more money to the beekeepers. But training is not available throughout the country. Beekeepers (30 per cent) think that lack of training facility is a problem to expand this enterprise.

Some farmers think that bees are harmful for mustard because they take honey from the flowers become weak. So, sometimes the farmers do not allow the beekeepers to put their hives in the cropping field. Fifty per cent beekeepers reported this problem. Agricultural officers can play an important role to educate the farmers about the positive contribution of bees to cop production.

Though beekeeping is a profitable business, but the popularity is still lower because of lower marketing of honey and other byproducts in Bangladesh and all over the world.About 95.12% respondent mentions that, the lower marketing system is affecting the real profit of beekeeping business. In the supermarket (Mina Bazar), the price of quality honey is around 12.87 USD/kg, whereas the wholesalers give only 2-4 USD/kg, also selling in local market can't make higher profits.Marketing in beekeeping business is not only a problem in Bangladesh but also a worldwide beekeeping problem (Masuku,2013;Holzschuh *et al.*,2007 ). Beekeeper suggested more training facilities by the GO and NGOs.

Some beekeepers (20 per cent) reported that their hives had been stolen in some region. So, when they transferred their hives in unknown areas they are to be worried.(Moniruzzaman et al.,2009)

## **CHAPTER IV**

### **CONCLUSIONS**

Beekeeping must be an income generating, an additional source of income, and an instrument of reduction of poverty by increasing the purchasing power of the rural people. So it is a prospective enterprise in Bangladesh.

In Bangladesh most of the beekeeper are male, young, lower educated and obtain basic beekeeping from NGO. Beekeepers that had started the enterprise with higher number of hive were higher in number and their hive number had also increased.

The benefit cost ratio indicates that sustainable beekeeping is profitable. Beehive colony, wooden box, labor and transportation cost have high correlation with profit. The B/C is increased with the increase of beehive size as well as bee colony.

In beekeeping, there are some constraints like investment problem, marketing problem, security problem, lower training facilities etc. For expanding this beekeeping more in rural areas, awareness and training program should be enhanced. The price of colony (*Apis mellifera*) is high for small, marginal farmers and landless people. So, colony division project should be started by the Bangladesh Rural Development Board (BRDB) or NGOs.

## REFERENCES

- Addi, A., & Lamessa, D. (2009). Bee plant inventory and the pollen potentiality of Menagesha Suba State Forest for beekeeping utilization. *Ethiopian Journal of Biological Sciences*, 8(2).
- Akinmulewo, B. O., Oladimeji, Y. U., & Abdulsalam, Z. (2017). Assessment of the Profitability of improved apiculture in Federal Capital Territory (FCT) Abuja, Nigeria. *Journal of Sustainable Development in Africa*, 19(2), 24-36.
- Ball, D. W. (2007). The chemical composition of maple syrup. *Journal of chemical Education*, 84(10), 1647.
- BBS. 2017. GDP of Bangladesh 2016-2017(Base:2005-06). Bangladesh Bureau of Statistics, Bangladesh.
- Bradbear, N. (2009). Bees and their role in forest livelihoods: a guide to the services provided by bees and the sustainable harvesting, processing and marketing of their products. *Non-wood Forest Products*, (19).
- Bieniasz, M. (2007). Effects of open and self-pollination of four cultivars of high bush blueberry (*Vaccinium corymbosum* L.) on flower fertilization, fruit set and seed formation. *Journal of Fruit and Ornamental Plant Research*, 15, 35.
- Bożek, M. (2012). The Effect of Pollinating Insects on Fruiting of Two Cultivars of *Lonicera caerulea* L. *Journal of Apicultural Science*, 56(2), 5-11.
- Chen, L., Mehta, A., Berenbaum, M., Zangerl, A. R., & Engeseth, N. J. (2000). Honeys from different floral sources as inhibitors of enzymatic browning in fruit and vegetable homogenates. *Journal of agricultural and food chemistry*, 48(10), 4997-5000.
- Chazovachii, B., Chuma, M., Mushuku, A., Chirenje, L., Chitongo, L., & Mudyariwa, R. (2013). Livelihood resilient strategies through beekeeping in Chitanga village, Mwenezi District, Zimbabwe. *Sustainable Agriculture Research*, 2(1), 124.
- Gani, M. O. (2001, October). The giant honey bee (*Apis dorsata*) and honey hunting in Sundarbans reserved forests of Bangladesh. In Proceedings of the 37th Apimondia Congress (Vol. 1, p. 2001).

- Goldenberg, D. (2004). Honey gospel beekeeping converts african wildlife poachers in zambia to a new way of life. *Wildlife Conservation*, 107(2), 34-37.
- Holzschuh A., Kleijn D., Tschardtke T. (2007). Diversity of flower-visiting bees in cereal fields: Effects of farming system, landscape composition and regional context. *Journal of Applied Ecology*, 44.
- Islam, M. R., Chhay, L., Mian, M. M., & Nasry, A. A. N. B. 2015. The Financial Analysis of Apiculture Profitability in Bangladesh.
- Ikediodiobi, C. O., Obi, V. C., & Achoba, I. A. (1985). Beekeeping and honey production in Nigeria. *The Nigerian Field* 50, 49-51.
- Klatt, B. K., Holzschuh, A., Westphal, C., Clough, Y., Smit, I., Pawelzik, E., & Tschardtke, T. (2014). Bee pollination improves crop quality, shelf life and commercial value. *Proc. R. Soc. B*, 281(1775), 20132440
- Lalika, M. C. S., & Machangu, J. S. (2008). Beekeeping for income generation and coastal forest conservation in Tanzania. *Bee for development journal* No. 88.
- Lietaer, C. (2009, October). Impact of beekeeping on forest conservation, preservation of forest ecosystems and poverty reduction. In XIII World Forestry Congress (pp. 18-23).
- Mwakatobe, A. R., Ntalwila, J. A., Kohi, E. M., Kipemba, N., & Mrisha, C. (2016). Income generation promote the participation of youth and women in beekeeping activities in Western Tanzania. *J. Ent. Zool. Stud*, 4(4), 718-721.
- Mapolu, M. (2005). Beekeeping in Tanzania. *An Overview*, 8.
- Monela, G. C., Kajembe, G. C., Kaoneka, A. R. S., & Kowero, G. (2001). Household livelihood strategies in the miombo woodlands of Tanzania: emerging trends. *Tanzania Journal of Forestry and Nature Conservation*, 73.
- Moniruzzaman, M., & Rahman, M. S. (2009). Prospects of beekeeping in Bangladesh. *Journal of the Bangladesh Agricultural University*, 7(1), 109-116.
- Morse, R. A. (1989). History of Subsection Cb: Apiculture and Social Insects. *Bulletin of the ESA*, 35(3), 115-119.

- Morse, R. A., & Calderone, N. W. (2000). The value of honey bees as pollinators of US crops in 2000. *Bee culture*, 128(3), 1-15.
- Matavele, R. (2007). Situation analysis of beekeeping in Mozambique. Maputo, Mozambique.
- Mickels-Kokwe, G. (2006). Small-scale woodland-based enterprises with outstanding economic potential: the case of honey in Zambia. Cifor.
- Mazorodze, B. T. (2015, May). The contribution of apiculture towards rural income in Honde Valley Zimbabwe. In national capacity building strategy for sustainable development and poverty alleviation conference (NCBSSDPA 2015).
- Masuku, M. B. (2013). Socioeconomic analysis of beekeeping in Swaziland: A case study of the Manzini Region, Swaziland. *Journal of Development and Agricultural Economics*, 5(6), 236-241
- Nagai, T., Inoue, R., Kanamori, N., Suzuki, N., & Nagashima, T. (2006). Characterization of honey from different floral sources. Its functional properties and effects of honey species on storage of meat. *Food chemistry*, 97(2), 256-262 World Bank. Bangladesh, Population. United States Census Bureau; 201.3
- Nwali, L. (1996). Agric Panorama. Media Extension, NAERLS, Ahmadu Bello.
- Ogaba, M. (2002). Household poverty reduction through bee-keeping amongst Uganda rural women. Standing commission of beekeeping for rural development, Monmouth.
- Qaiser, T., Ali, M., Taj, S., & Akmal, N. (2013). Impact assessment of beekeeping in sustainable rural livelihood.
- Saha, J. (2003, August). Beekeeping for rural development. its potentiality and beekeeping against poverty-Bangladesh perspective. In Proceedings of the 38th Congress Apimondia. Apimondia.
- Sivaram, V. (2012). Status, prospects and strategies for development of organic beekeeping in the South Asian Countries. Division of Apiculture and Biodiversity, Department of Botany, Bangalore University.

- Verma, L. R. (1990). Beekeeping in integrated mountain development: economic and scientific perspectives.
- Valkila, J. (2004). The possibilities and constraints of improving livelihoods through apicultural development in Ranomafana National Park in Madagascar.
- Warade, N. V. (2017). Apiculture: Technology for rural development and socio-economic upliftment—a review.
- World Bank. 2013. Bangladesh, Population. United States Census Bureau.
- Yap, N. T., & Devlin, J. F. (2015). Beekeeping innovation for sustaining rural livelihoods. A success story. *International Journal of Innovation and Sustainable Development*, 9(2), 103-117.
- Yao, L. H., Jiang, Y. M., Shi, J., Tomas-Barberan, F. A., Datta, N., Singanusong, R., & Chen, S. S. (2004). Flavonoids in food and their health benefits. *Plant foods for human nutrition*, 59(3), 113-122.
- <http://www.ehoney.com.np/local-honey-apis-cerana/>