Asian Journal of Agricultural Extension, Economics & Sociology
9(2): 1-8, 2016; Article no.AJAEES.22985
ISSN: 2320-7027

SCIENCEDOMAIN *international*
www.sciencedomain.org

The Financial Analysis of Apiculture Profitability in Bangladesh

M. R. Islam[1], L. Chhay[2*], M. M. Mian[3] and A. A. N. B. Nasry[3]

[1]School of Management, National University, Gazipur, 1704, Bangladesh.
[2]School of Economics, IIC University of Technology, Phnom Penh, 12353, Cambodia.
[3]School of Urban Construction and Environmental Engineering, Chongqing University, 174 Shazhengjie, Shapingba, Chongqing, 400044, China.

Authors' contributions

The research was carried out equally by authors MRI, LC, MMM, AANBN. Authors MRI and LC conceived the main idea and plan of the study. The statistical analyses were conducted by author LC. The data collection, literature review and manuscript writing were conducted by authors MMM, AANBN and MRI. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2016/22985
Editor(s):
(1) Jurislav Babic, Faculty of Food Technology, University of Osijek, Croatia.
Reviewers:
(1) Xesus Feas, University of Santiago de Compostela, Spain.
(2) Hasan Vural, Uludag University, Turkey.
(3) Satyendra Gautam, Bhabha Atomic Research Centre, Mumbai, India.
Complete Peer review History: http://sciencedomain.org/review-history/12735

Original Research Article

Received 8th November 2015
Accepted 4th December 2015
Published 18th December 2015

ABSTRACT

Aims: Apiculture is one of the potential businesses in Bangladesh. This study tries to examine, the profitability of apiculture practice by using financial analysis of investment costs and benefits.
Study Design: To evaluate the accurate and particular investment on beekeeping, entire data were categorized into two major sections on the basis of bee species *Apis mellifer* and *Apis cerana*. However, overall investment costs and benefits also analyzed to measure overall profitability.
Place and Duration of Study: Entire study data were collected from secondary sources and field questionnaire survey in Tangail District, Bangladesh in November 2014.
Methodology: Standard financial techniques were used to evaluate the investment costs and returns of beekeeping business, the sensitivity analysis was made by using net present value, internal rate of return, return of investment and benefit-costs ratio. A correlation of benefit and cost

**Corresponding author: E-mail: chhayleaksmy@gmail.com;*

factors were simulating the effects of cost factors on beekeeping outcome. The ranking of beekeeping limitation was made on the basis of respondent opinion.

Results: The socio-economic status of beekeeper indicates that most of the beekeeper were young, lower educated, obtain basic beekeeping training from NGO and considered beekeeping as a part-time job. The sensitivity analysis shows that *Apis mellifera* bee species have a higher IRR than *Apis cerana* for a particular size of a beehive. The larger beehive obtains larger IRR, ROI, and B/C ratio. However, the average IRR is higher for *Apis cerana* (185.60), the bigger number of large beehive of *Apis cerana* contributing larger outcome. The correlation of beekeeping benefits and cost factors suggest that, overall profit is highly correlated with beehive colony, wooden box, labor and transportation cost.

Conclusion: 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: Beekeeping; profitability; socio-economy; apiculture; Bangladesh.

1. 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 km2 and 156.6 million populations [1]. Total GDP of this country was dominated by manufacturing 17.78%, agriculture 16.11% and trade 13.41% sectors, with 838$ per capita GDP earning in 2014 [2]. As a developing country a large portion of people still living under the poverty line, 17.6% people live under low poverty line and 31.5% under upper poverty line [3] with 2.7 million of economically active unemployed people [4]. 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. Apiculture is one of them, which demand is increasing day by day because of its quality products, lower investment, lower technical knowledge and higher profitability.

At the early stage, the honey collection in Bangladesh was conventional bee hunting practice, where entire bee colonies were killed during honey collection. In 1977, Bangladesh Small and Cottage Industries Corporation (BSCIC) launched modern beekeeping in a scientific way throughout the country. Now days, many government and nongovernment organization undertake beekeeping program [5]. Four species of bees are mainly considering for honey production in Bangladesh, such as *Apis dorsata*, *Apis cerana*, Apis florae, *Apis mellifera*. Among them, *Apis mellifera* introduced in Bangladesh in 1992 for experimental basis [6], which have originated from Africa, Europe and Middle East [7]. 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 [8]. Recently, *Apis cerana* and *Apis mellifera* are widely used for honey production in Bangladesh. 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 [9], and provide 40-50 kg/yr high-quality honey [5], however the cost of *Apis mellifera* colony is so high for small, marginal farmers and landless people [10].

Beekeeping practice is very easy, acceptable and comparatively less expensive income generating activity. A previous study has shown that, 1-5 bee colonies does not require any extra land space [5], and the maintenance of colonies were cheap and easy [11]. To maintain 5 bee colonies, a technical labor needs only 35 minutes/day on average, that could possible to give 17$ monthly profit [5]. It could be an effective business for the marginal farmers who have little business capital [12] and land resource, beekeeping practice also possible to integrate with other agricultural activity as well as agro-forestry [13]. Moreover, the socio-economic factors of beekeepers do not affect beekeeping business [14]. It is possible to adopt by any level of education, gender, age, marital status and religious people. 86 thousand villages of Bangladesh are favorable for beekeeping. A wide

variety of bee plants are available throughout the country, among of them are : (Rapeseed) *Brassica napus L*., (Litchi) Litchi *chinensis Camb*., (Red date) *Zizyphus jujuba Lamk*., (Moringa) *Moringa oleifera Lam*., (Coconut) *Cocos nucifera*, (Sunflower) *Helianthus annus* L. and (Black plum) *Eugenia jambolana Lamk* are very common. Surprisingly, only 20 thousand beekeepers are existed in Bangladesh, and the average honey production per colony is unsatisfactory because of conventional honey collection process (bee hunting) and harvesting [5]. However the scientific process of beekeeping and harvesting could possible to gain higher yield, the average honey production from a bee hive is 16 kg in Turkey, 27 kg in Mexico, 33 kg in China, 40 kg in Argentina and Hungary, 55 kg in Australia and 64 kg in Canada [15]. Bee hive provides both direct and indirect benefits, direct benefits are honey, bees wax, royal jelly, bee venom, propolis, medicine raw materials, and bee colonies [16,17]. Nevertheless, in Bangladesh only uses honey, bee colony, and beeswax. As an agricultural country, the indirect benefits of beekeeping are higher than direct benefits. Several studies proved that, beekeeping promotes conservation and rehabilitation of nature, natural habitat [18], cultivated land and watershed [19], as well as increase pollination and agricultural productivity [17,20-22].

This study tries to analyze the costs and benefits of beekeeping in Madhupur, Bhuapur, Gopalpur and kalihati upazila of Tangail district, Bangladesh, using slandered financial techniques. The selective areas are prominent for beekeeping practice in that region, and the natural forests and surrounding environment is suitable for beekeeping. To address the profitability of beekeeping in that area could speculate the scenario of beekeeping in Bangladesh.

2. MATERIALS AND METHODS

2.1 Data Collection

Primary and secondary data were collected from Madhupur, Bhuapur, Gopalpur and kalihati Upazila of Tangail district, Bangladesh. The secondary data were collected from Proshika office (local NGO) and primary data were collected from questionnaire survey. The investment and return of beekeeping were categorized on the basis of bee species (*Apis mellifera* and *Apis cerana*). However, some respondents had both species of beekeeping practice; in that case the recorded data of proshika office were used for the particular investment and profit of each category bee species. Three sub-categories were made on the basis of beehive size, small beehive (1-3 bee colonies), medium bee hive (4-6 bee colonies) and large beehive (7-9 bee colonies). The cost variables and profit data were collected from secondary sources and also a primary questionnaire was made for the cross check. The cost and benefit factors of beekeeping practice from the secondary data and questionnaire survey are given in Table 1, and the entire monetary unit was converted from BDT to USD by, 1 USD = 77.69 BDT.

Table 1. Cost and benefit factors of beekeeping

Cost benefit factors	Particulars
Fixed cost	Bee colony
	Wooden box
	Honey execrator
	Accessories
	Bee veil
	Hand gloves
	Knife
	Brush
	Buckets
Variable cost	Feed
	Labor cost
	Transportation
Direct Benefit	Honey
	Bee colony
	Bee wax

2.2 Financial Analysis

The costs and benefits of one year (2013-2014) beekeeping practice were measured. The particular and average beekeeping costs and benefits were calculated by financial techniques. The mean value of costs and benefits were considered for calculation of Net Present Value (NPV), Internal Rate of Return (IRR), Return of Investment (ROI), benefit and cost ratio, and correlation of yield and cost variables.

$$\text{NPV} = -PV + \frac{FV_1}{(1+i)^1} + \cdots + \frac{FV_t}{(1+i)^t}$$

IRR % = *i,*

$$\text{NPV} = -PV + \frac{FV_1}{(1+i)^1} + \cdots + \frac{FV_t}{(1+i)^t} = 0$$

$$\text{ROI} = \frac{Gains - Investment\ costs}{Investment\ costs} = \%$$

$$B/C = \left[\frac{B_0}{(1+i)^0} + \cdots + \frac{B_t}{(1+i)^t}\right] \Big/ \left[\frac{C_0}{(1+i)^0} + \cdots + \frac{C_t}{(1+i)^t}\right]$$

Where, NPV is net present value, PV is the present value, FV is future value and (i) is the discount rate. NVP measured at 0% to 350% discount rate and IRR percentage can be achieved when the sum of NVP is 0. ROI is an annual return of investment and B/C is the ratio of present value benefit and cost. Entire data were calculated by using MS excel 2010 and SPSS 2012.

3. RESULTS AND DISCUSSION

3.1 Socio-economic Status of Respondents

The magnitudes of socio-economic status of the respondents are illustrated in Table 2. The beekeeping practice is largely dominated by 87.80% male people, whereas the female is only 12.20%. Educational status of beekeepers is mostly under primary (34.15%) and primary label (56.10%). The young people are mainly associated with beekeeping practice where as some middle age, adult and juvenile also connected with beekeeping, a major share (90.24%) of respondents considered beekeeping as a part-time work. The government institute, NGO and some local NGOs provide training to the beekeeper. 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. Most of the respondents (78.05%) have one-year beekeeping experience and a few has 2 years, 3 years and more than 3 years experience. Among 41 beekeepers, 11 beekeepers have only *Apis mellifera* species and 25 beekeepers have only *Apis cerana* species, whereas 5 beekeepers have both species of bee colony. The number of large bee hive is higher in *Apis cerana* colony and smaller in *Apis mellifera* colony.

The socio-economic status of the respondents suggests that, beekeeping practice is popular to the young people, where as majority of the respondents have lower education status and basic beekeeping training. However, respondents take beekeeping as a part-time business because of its short maintenance time require. The field observation and previous studies indicating, beekeeping takes an average 35-60 minutes for the maintenance of 1-5 bee colonies [5].

3.2 Sensitivity Analysis

The net present value, internal rate of return, return of investment and benefit-cost ratio of *Apis mellifera* and *Apis cerana* are demonstrated in Table 3. The net present value cost (NPVC) of

Table 2. The socio-economic distribution of beekeeper

Respondents (N= 41)								
	%	N		%	N		%	N
Gender			**Nature of beekeeping**			**Beekeeping experience**		
Male	87.80	36	Part-time	90.24	37	1 year	78.05	32
Female	12.20	5	Full-time	9.76	4	2 years	12.20	5
						3 years	4.88	2
Education			**Major occupation**			More than 3 years	4.88	2
Under primary	34.15	14	Farming	68.29	28			
Primary	56.10	23	Trading	17.07	7	**Types of hive**		
Secondary	4.88	2	Service	4.88	2	*Apis mellifera*	41.30	19
High school	4.88	2	Beekeeping	9.76	4	Small hive	23.91	11
						Medium hive	1.87	5
Age			**Nature of training**			Large hive	6.52	3
10-19	7.32	3	Well Trained (NGO/Gov.)	7.32	3			
20-29	53.66	22	Basic trained (Local NGO)	63.41	26	*Apis cerana*	58.70	27
30-39	21.95	9	Limited idea	29.27	12	Small hive	8.70	4
40-49	7.32	4				Medium hive	19.57	9
50-59	7.32	3				Large hive	30.43	14

Apis mellifera beekeeping is higher than *Apis cerana* in all (small hive, medium hive and large hive) cases, which affecting higher net present value benefit (NPVB). The internal rate of return and the return of interest of beekeeping are approximately similar, because of the sensitivity analyses were measured for one year (2013-2014). Perhaps with the magnitude of timing, the yearly ROI will increase, which will contribute higher IRR. Many research shows that, the higher IRR % of beekeeping can be achieved with the magnitude of timing [23-25], however the ROI of this study is comparatively higher than previous study [23]. The IRR and B/C is increased with the increase of beehive size as well as bee colony, the highest IRR obtains for large bee hives. In particular types of hives, IRR of *Apis mellifera* is higher, but the average IRR is lower than *Apis cerana*, the bigger number of large beehive of *Apis cerana* affects larger average IRR %. In general, larger investment of business makes a larger profit with the increasing of risk [26]. In beekeeping business, the higher investment is required for *Apis mellifera* bee species, which contribute a larger beekeeping business profit.

The relationship between (*Apis mellifera* and *Apis cerana*) beekeeping NPV with the discount factors are illustrated in Fig. 1. Different curves represent the changes of NPV with the changes of discount factors. As for a specific discount rate 100%, the *Apis mellifera* (AM) shows higher NPV than *Apis cerana* (AC). The result suggests that, for a specific discount rate *Apis mellifera* will give higher profit than *Apis cerana* bee species. Moreover, the larger bee hive is always shows the higher NVP than medium and small hives, perhaps the investment costs and return for large hive makes larger profit, and the rate of expenditure for large hive is lower than the rate expenditure for medium and small hive.

Table 3. The sensitivity analysis of *Apis mellifera* and *Apis cerana*

		No. colony	NPVC	NPVB	Disc. Fact.	IRR	ROI	B/C
Apis mellifera	Small hive	1-3	118.77	322.13	2.7122	171.22	171.23	2.712
	Medium hive	4-6	184.45	512.89	2.7803	178.03	178.07	2.780
	Large hive	7-9	239.54	762.65	3.1837	218.37	218.38	3.184
	Average		148.01	419.02	2.8310	183.10	183.11	2.831
Apis cerana	Small hive	1-3	57.38	133.80	2.3316	133.16	133.19	2.332
	Medium hive	4-6	81.39	218.84	2.6887	168.87	168.90	2.689
	Large hive	7-9	107.47	325.57	3.0294	202.94	202.94	3.029
	Average		90.73	259.13	2.8558	185.58	185.60	2.856

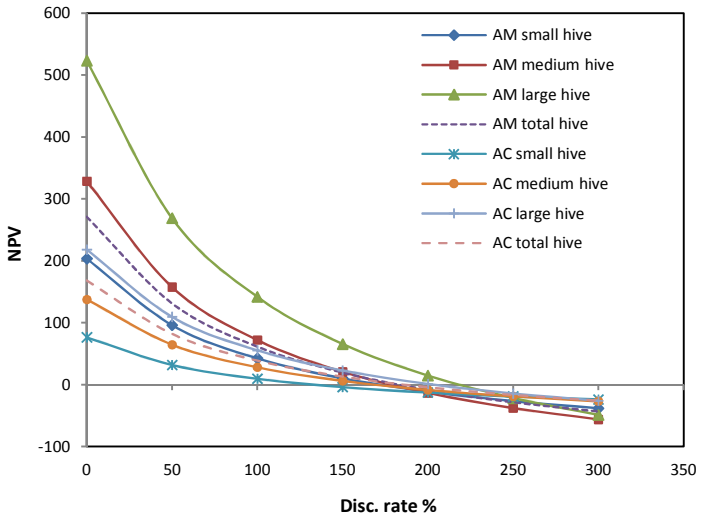

Fig. 1. The relationship of NPV and discount rate of *Apis mellifera* and *Apis cerana* beekeeping

3.3 Cost and Benefit Factors

The costs and benefits of beekeeping are illustrated in Fig. 2, there three groups represent the cost and benefits of average (both species), *Apis mellifera* and *Apis cerana* beekeeping. The higher benefit can be gained from *Apis mellifera* beekeeping. However, it is difficult to obtain an *Apis mellifera* colony by the bee farmers because of its foreign origin. From the respondent opinion and previous observation [10], it is revealed that the price of *Apis mellifera* colony is so high for the marginal farmers. So that, a comparatively high initial cost is required for *Apis mellifera*, but in terms of long time business it could provide efficient gain by higher yearly return. *Apis cerana* exhibit lower benefit than *Apis mellifera*, but the initial investment costs is lower and comparatively easy to obtain a bee colony. The high labor cost of beekeeping practice largely affecting the benefit. A majority of respondent had basic training in beekeeping, it's required to provide more technical training to reduce labor cost and increase profitability.

The correlation of (*Apis mellifera* and *Apis cerana*) benefit and cost variables are presented in Table 4. The benefit of beekeeping is highly correlated with bee colony, wooden box, feed, transport and labor costs. The higher bee colony is resulting higher honey production as well as a higher return. The larger box enables more space for more beehives. The negative correlation with extractor represents, the increasing of extractor price will affect decreasing of benefit. To increase production, it is necessary to increase technical labor. If appropriate training is given to the beekeepers, the cost of hire labor could possible to reduce. Another important variable is transport, which is highly correlated with benefit, but beekeepers usually spend lower budget for transporting (Fig. 2). So the local NGO and government organization could provide incentives for transporting their products or initiate an effective system for the marketing of honey and other by-products.

Table 4. Correlation of beekeeping benefits and cost factors

	Benefit	
	***Apis mellifera* (N=19)**	***Apis cerana* (N=27)**
Colony	.961**	.849**
Box	.844**	.852**
Extractor	-.327	.410*
Accessories	.282	.147
Feed	.660**	.627**
Labor	.857**	.882**
Transport	.917**	.865**

*** Pearson Correlation is significant at the 0.01 level (2-tailed)*

** Pearson Correlation is significant at the 0.05 level (2-tailed)*

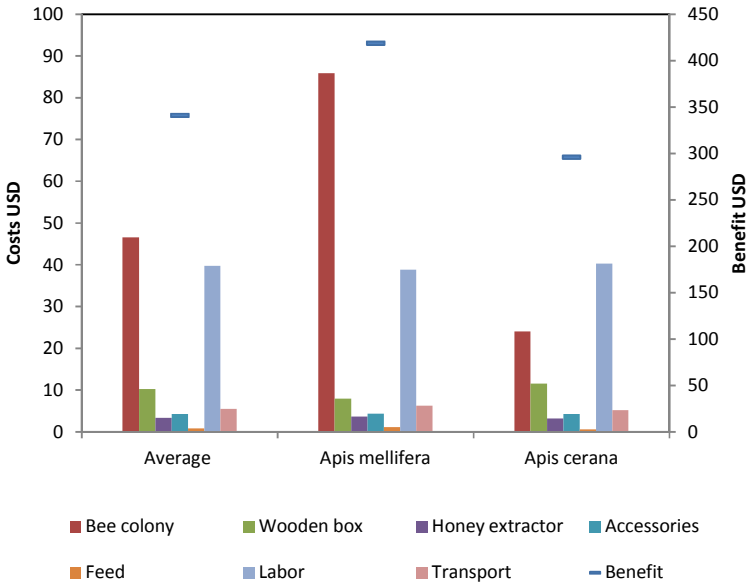

Fig. 2. The benefit and cost factors of beekeeping

Table 5. Problems ranking of beekeeping

Problems	Rank	N	%
Marketing of honey and byproducts	1	39	95.12
Lower training about pesticides and disease control	2	28	68.29
Lack of proper equipment for high-quality honey production	3	19	46.34
Difficulties of obtaining *Apis mellifera* bee colony	4	16	39.02
Lack of communication with NGO after training program	5	8	19.51
Lower demand of byproducts	6	4	9.76

However, the direct benefits are discussed in this study, but indirect benefits of beekeeping are higher than direct benefits. The scientific record shows that, beekeeping could provide 10 times worth for additional crop, vegetable and fruit production than the direct benefits [5]. From the financial analysis, it can speculate that beekeeping direct benefit with considering indirect benefit is the potential business practice to create profitability and employment opportunity to improve the livelihood for small marginal farmers, this result is supported by various previous research findings [10,11].

3.4 Limitation of Beekeeping

The limitations of beekeeping of the study area are presented with ranking in Table 5. Each respondent describes one or more problems, which are they faced during their tenure of beekeeping.

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 [11,15,19,27,28]. The beekeeper doesn't have proper knowledge about pesticides and bee disease, and they have a little communication with local NGO after the training program. The byproducts of beekeeping might familiar in many countries, but in Bangladesh the byproducts are not properly utilized.

4. CONCLUSION

The costs and benefits of beekeeping business in Tangail district, Bangladesh was successfully investigated. The financial analysis suggested that, beekeeping is a profitable business for marginal farmers. However, the profit is largely affected by beekeeper training, transportation and mainly the marketing of honey and other byproducts. It is suggested that, government concern and NGOs involvement could improve beekeeping business as well as to contribute for the socio-economic development of the country.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. World Bank. Bangladesh, Population. United States Census Bureau; 2013. Available:wwwcensusgov
2. BBS. GDP of Bangladesh 2013-2014 (Base : 2005-06). Bangladesh Bureau of Statistics, Bangladesh; 2014.
3. Bank TW. Poverty MAPS of Bangladesh. Bangladesh Bureau of Statistics, Bangladesh. 2010;5.
4. BBS. Report on monitoring of employment survey-2009. Bangladesh Bureau of Statistics, Bangladesh; 2014.
5. SAHA JC. Beekeeping for rural development, its potentiality and beekeeping against poverty - Bangladesh perspective. Standing Commission of Beekeeping for Rural Development, BSCIC.
6. Sivaram V. Status, prospects and strategies for development of organic beekeeping in the South Asian countries. Division of Apiculture and Biodiversity, Department of Botany, Bangalore University; 2012.
7. Hisashi F. Profitable beekeeping with *Apis cerana*. Bees for Development Journal. 2007;94:9-11.
8. Gani MO. The giant honey bee (*Apis dorsata*) and honey hunting In Sundarbans reserved forests of Bangladesh; 2001.

9. Matavele R. Situation analysis of beekeeping in Mozambique. Maputo, Mozambique; 2007.
10. Moniruzzaman M, Rahman MS. Prospects of beekeeping in Bangladesh. J Bangladesh Agril Univ. 2009;7:109–16.
11. Micah B Masuku. Socioeconomic analysis of beekeeping in Swaziland: A case study of the Manzini Region, Swaziland. Journal of Development and Agricultural Economics. 2013;5:236-41.
12. Farinde A, Soyebo K, Oyedokan M. Improving farmers' attitude towards honey production experience in Oyo State, Nigeria. J Hum Ecol. 2005;18:21-33.
13. TTA ltd. Situation Analysis of Beekeeping Industry. Total Transformation Agribusiness (PTY) LTD; 2008. Available:http://www./apiservices.com/article/us/beekeeping regional analysis.pdf (accessed 28-09-2010)
14. Ayansola AA. An appraisal of apicultural practices in Southwestern Nigeria. J Agri Sci. 2012;3:79-84.
15. VURAL H, KARAMAN S. Socio-Economic analysis of beekeeping and the effects of beehive types on honey production. Notulae Botanicae Horti Agrobotanici Cluj-Napoca Cluj. 2009;37:223-7.
16. Gurung M, Partap U, Shrestha N, Sharma H, Islam N, Tamang N. Beekeeping training for farmers in the Himalayas – Resource manual for trainers. Kathmandu: ICIMOD; 2012.
17. Lietaer C. Impact of beekeeping on forest conservation, preservation of forest ecosystems and poverty reduction. XIII World Forestry Congress, Argentina. 2009;18–23.
18. Carruthers I, Rodriguez M. Tools for Agriculture. Russell press, Nottingham, United Kingdom. 1992;70.
19. Munthali SM, Mughogho DE. Economic incentives for conservation: Beekeeping and Saturniidae caterpillar utilization by rural communities. Biodiversity and Conservation. 1992;1:143-54.
20. Somerville D. Beekeeping in the Mildura Forestry Management Area. NSW Agriculture, Goulburn; 1997.
21. Brown C. Responding to deforestation: Productive conservation, the World Bank, and beekeeping in Rondonia, Brazil. The Profess. Geog. 2001;53:106-19.
22. Bradbear N. 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. Food and Agriculture Organization, Rome; 2009.
23. Jagadish Chandra Saha. Appropriate technology for apiculture and its economic potentials. PalliKarma-SahayakFoundation (PKSF), Pro-Poor Economic Activities.
24. Mohd Mansor Ismail, Makhdzir Mardan. The potential of beekeeping projects for Rural development Faculty of Agriculture Universiti Putra Malaysia, 43400 UPM Serdang, Malaysia.
25. AFC. Feasibility Study- Beekeeping Center. AFC Consultants International. LBN/B7-4100/IB/99/0225/JC20/0105.
26. Leaksmy Chhay, Md Manik Mian, Rathny Suy. A comparison of small businesses costs and returns in developing socioeconomic: A study in phnom penh, Cambodia. International Journal of Economics, Finance and Management Sciences. 2015;3:406-10.
27. Holzschuh ADI, Kleijn D, Tscharntke T. Diversity of flower-visiting bees in cereal fields: Effects of farming system, landscape composition and regional context. Journal of Applied Ecology 2007;44.
28. Paraïso A, Sossou A, IZ-haquou D, Yegbeme YR, Sanni A. Perceptions and adaptations of beekeepers and honey hunters to climate change: The case of the communes of Natitingou and Tanguieta in Northwest of Benin. African Crop Science Journal. 2012;20:523-32.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/12735