UTTAR PRADESH JOURNAL OF ZOOLOGY

42(18): 18-25, 2021
ISSN: 0256-971X (P)

APICULTURE AS AN INCOME ALLEVIATION IN THREE VILLAGES OF SOUTH WEST KHASI HILLS, MEGHALAYA

I. WANSWETT[1*] AND D. MARNGAR[2]

[1]Department of Economics, Synod College, Shillong, India.
[2]Department of Zoology, Synod College, Shillong, India.

AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

Editor(s):
(1) Dr. Telat Yanik, Professor, Atatürk University, Turkey.
Reviewers:
(1) Ichinkhorloo Bazarragchaa, University of Life Sciences, Mongolia.
(2) Witness Maluleke, University of Limpopo (UL), South Africa.

Received: 10 June 2021
Accepted: 14 August 2021
Published: 04 September 2021

Original Research Article

ABSTRACT

Beekeeping acts as a subsidiary occupation in rural areas which farmers and entrepreneurs take up as to generate additional income. The study focuses on how much that income generated through beekeeping over the years. If the income of the household from beekeeping played a role in generating an extra income to the households in these villages. Most of the studies focus on the problems of beekeeping rather the role of income from beekeeping in reducing poverty in rural areas. The collection of honey for household consumption has been done for generations but the exploitation for commercial purposes has gain momentum in the present scenario. The aim of the study is to examine that beekeeping can be considered as one of the solutions for poor households in rural areas to enhance their household income. The objectives of the study are to know about the households in the villages, the role that beekeeping played in breaching the gap between farm and non-farm activities and increasing the households' income over the years. The research design was based on the three villages with a purposive sampling and based on a random sampling in choosing the samples of beekeepers. Results obtained shows that with globalisation and the spread of social media, the market for export of honey even from remote areas has increase and this has made beekeeping as a subsidiary occupation. Apiculture in Meghalaya can be considered as a subsidiary occupation which can help in poverty reduction and as a supplement to the household income in rural areas. Even though beekeeping is a significant subsidiary occupation for households in rural areas for increasing income it still has a long way to go to make it more viable. The pricing of the honey sold should be determined so that it does not take away the profit from the primary producers, good advertisement is needed and there is a need for community linkage to further add to the growth of commercialisation of honey and its products.

Keywords: Apiculture; income elevation; market potential; poverty reduction.

**Corresponding author: Email: ibandalin.wanswett@gmail.com;*

1. INTRODUCTION AND PROBLEM EXPOSITION

Beekeeping is an agro-based enterprise which acts as a subsidiary occupation in rural areas which farmers and entrepreneurs take up as to generate additional income. Honey bees (*Apis Cerana Indica)* convert nectar of flowers into honey and store them in the comb of the hives. The collection of honey for household consumption has been done for generations but the exploitation for commercial purposes has gain momentum in the present scenario. The growing potential for honey and its products has resulted in beekeeping as an emerging viable enterprise. Honey and wax are the two economically important products. With globalisation and the spread of social media, the market for export of honey even from remote areas has increase and this has made beekeeping as a subsidiary occupation which is a combination of farm and non-farm enterprise.

Beekeeping requires less money less time and less investment. It is and was an indigenous knowledge passed from one generation to another. Bees play an important role in the pollination of different flowering plants, which increases the yield of certain plants like sunflowers and fruits. Honey bee (*Apis Cerana Indica*) is the most common here in India and even in Meghalaya. The honey produced in Meghalaya differs in colour from one area to the other due to the different species of flowers in different regions. The honey produced in the War region of East Khasi Hills is dark brown in colour, in Ri-Bhoi District it is black in colour and in honey from South West and West Khasi Hills Districts is light brown in colour.

Apiculture or beekeeping in Meghalaya is considered as a subsidiary occupation which can help in poverty reduction or as a supplement to the household income. Most of the households in rural areas of Meghalaya are mainly involved in farm activities where the incomes barely cover their household expenditure. The apiculture mission which started in Meghalaya has helped the producers of honey in the rural areas to commercialise it which has increase their household incomes [1].

Honey hunting is a practice that has been going on for many thousands of years when people practised bee collection from the bee hives which they realised the benefits derived from it. Beekeeping tends to be perceived as a hobby or as a subsidiary occupation but also a resilient livelihood- one that keeps people out of poverty [2]. This perception of bee keeping has started way back 4500 years ago when the Egyptians started domesticating bees for honey. Beekeeping is advocated to improve human welfare by alleviating poverty through increased household income, biodiversity conservation, food and nutritional security, raw materials for industries and enhance environmental resilience [3]. It is a fascinating occupation which has been taken by the people in many countries not only for honey but for the products that come with the extraction of honey e.g., wax, pollen, propolis used for different purposes enhancing incomes. It is an activity with less investment requirement since the raw materials needed for making honey are readily available in nature. Furthermore, it can be carried out by all age groups, men, women, and children and even by physically handicapped and retired persons [4]. According to Hill and Webster [5] shows that forestry and bee production goes a long way. According to them purposeful planting of trees as in agro forestry systems, could be designed to favour bee production. The work done by Kishan, Aruna, Mishra & Srinivasan [6] on beekeeping in India provides an insight of beekeeping as a full-time occupation providing a handsome income for households since it has market potential by using simple mechanized techniques. Beekeeping even though started on a small scale just for recreation purposes for many people in the rural areas but with time the increase in the demand of honey has introduced beekeeping as a business activity and improving their pre-existent skills. According to a study by Ntaliwa, Mwakatobe, Kipembe, & Kohi [7] in their study in beekeeping in Western Tanzania shows the role that apiculture has in poverty alleviation. It states that when apiculture form a part of people's livelihood it brings about various outcomes which includes not only income and material things but also contentment and well beings of the apiarists. Honey is considered as a medicine and the consumption of honey has increased over the years in all countries. Honey which is produced if it is sold in markets in rural areas or in a better and captivating packaging generates income to households and increases their chance of a better livelihood in the society. The products produce from beekeeping like beeswax can be used to produce candles, beauty creams, beer, etc. where the majority of import for beeswax comes from developing countries.

2. LITERATURE REVIEW

Beekeeping or honey production is an age-old tradition carried out by families for generations. The main purpose is basically to utilised as food consumption especially for poor families since they can gather it naturally from the forests. Honey collected from the forests have often been used in food, confectionary, bakery, pharmaceutical and medicine [8]. Beekeeping has emerged over the years as a subsidiary occupation in rural villages of India

and in the world and this has gain widespread attention where many farmers have also turn entrepreneurs to generate additional income. Anandhy & Buella [9], highlights the prospects, potential of beekeeping as an entrepreneurship activity being an economically profitable enterprise. A project which is carried out by Yap & Devlin [10] for Vietnam small farmers on modern beekeeping and shows that farmers developed more benefits than those envisioned in terms of health, more income, a greater satisfaction in life. A financial analysis carried out by Islam, Chhay, Mian & Nasry [11] in a study of apiculture in Bangladesh analyses that higher bee colony is resulting higher honey production as well as higher return. The indirect effects of beekeeping could provide 10 times worth for additional crop, vegetable and fruit production than the direct benefits of marketing of honey. The Indian apiculture market is also growing with the adoption of modern beekeeping in recent years though its per consumption is less as compared to developed countries. Beekeeping has proven to be such an alternative livelihood option with potential of providing alternative income security to smallholder farmers living in forest areas of Dantewada as an effort initiated by the Krishi Vigyan Kendra Dantewada Chhattisgarh [12]. In Meghalaya when the government launched the State Apiculture Mission under the Integrated Basin Development and Livelihood Promotion Program (IBDLP) in 2014 with the main objective of reducing poverty, generating employment and generating livelihood. In a Report "In conversation with people of Meghalaya, Apiculture mission" (2015), a Meghalaya Basin Development Authority (MBDA) publication of IBDLP shows an insight of the success of some entrepreneurs benefitted from the apiculture mission. The report also added that honey produced from Meghalaya is almost organic and it's the best in the country due to its multi floral type of ecology [13].

2.1 The Study Area

Meghalaya is one of the Indian states located in the North East of India. Meghalaya is predominantly an agrarian economy with the majority of its population tribal. The geographical location of the state is in between 20°1'North and 26°5'North latitude and longitude 85°49'East and 92°52'East and the state is almost 2000 metres above mean sea level. Meghalaya has a geographical area of 22,429 square kilometres which is 0.70 percent of the total area of the country. Its total population as per census 2011 is 2.967 million. The density of population per square kilometre is 132, literacy percentage is 74.43 percent. The Apiculture Mission is one of the specific missions under the Integrated Basin Development and Livelihood Promotion Program [14] as a way of improving employment, poverty reduction and livelihood promotion. The Apiculture Mission in Meghalaya is an initiative taken together with the Department of Commerce and Industries to improve the mode of honey production create market linkages for profitable production of honey and honey products, providing financial and human capacity development. Meghalaya has a huge potential for beekeeping and around 7000 potential beekeepers are there owing to the superior quality of honey produced here in the state.

The study is carried out on three villages namely Mawten, Wahkaji and Phlangdiloin from South West Khasi Hills District of Meghalaya.

2.2 Profile of Selected Villages

The three villages belong to Mawkyrwat District under the South West Khasi Hills District of Meghalaya. The district has an area of 1341 square kilometres and is located at 25.3106°North and 91.2059°East. The district has its headquarters at Mawkyrwat. As per census 2011, the district has a population of 1, 10,152 with a literacy rate of 76.84 percent. South West Khasi Hills is mainly agrarian with 81 percent of the population depending entirely on agriculture for its livelihood.

Mawten village situated at a distance of 2 kilometres from the district headquarters Mawkyrwat with a population of 2,268 as per census 2011 with 347 households altogether. Mawten has a higher literacy rate of 90.58 percent than that of Meghalaya. The village have more main workers working in government and private sector; however, agriculture still occupies an integral part of their daily life. Apiculture forms an important subsidiary occupation for most households in the village.

Wahkaji is a medium size village located in Ranikor block of South West Khasi Hills of Meghalaya with a population of 626 as per census 2011 and 64 households residing in the village. The literacy rate is 89.77 percent. The roads condition is at its worse especially after the abandonment of uranium mining fell through. The village is dependent on agriculture with potato, rice, maize as main crops grown. There is timber production and charcoal which is rampant in the village. To supplement their income most households in the village takes up beekeeping as a subsidiary occupation.

Phlangdiloin has a total of 122 families residing with a population of 675 as per census 2011. It is a village situated near Wahkaji, there is huge charcoal production and rampant destruction of forests,

however, with the increase in demand of honey consumption by people in the state and the initiatives taken by the government in apiculture, most households in the village have started beekeeping to enhance their income generation.

3. MATERIALS AND METHODS

The study is confined primarily to the three villages of Mawten, Wahkaji and Phlangdiloin of South West Khasi Hills district of Meghalaya. The selective villages are quite prominent in beekeeping practice in the district since the natural forests and the surrounding environment are suitable for apiculture. The villages are purposely selected and a random sample of 20 households' having apiaries were chosen. The respondents' who were chosen randomly from the households' having apiaries in the three villages were interviewed with the help of a structured and semi- structured questionnaire (close and open ended) and the interview conducted developed into a group discussion.

The study uses primary data and the purpose is to draw both qualitative and quantitative data. The qualitative data is based on the open-ended questionnaires which are usually descriptive data while the quantitative data are based on the closed ended questionnaires and are mostly numerical data which are analysed.

The data is analysed by using ANOVA for the qualitative data and SPSS version 19 for the quantitative collected data to establish occupational pattern, purpose of beekeeping by using descriptive tools and graphs whenever necessary. The descriptive statistics would be used to describe the various characteristics of the households of the respondents in the three villages. Interviews and field notes taken during the conversation and interactions with the respondents were compared to ensure trustworthiness. Data triangulation is incorporated to ensure validity and reliability of the data for qualitative analysis.

The main aim of the study is to test the hypotheses that there is significant difference between the income earned by the respondents and the production of honey by the apiaries or bee boxes of the beekeepers.

4. RESULTS AND DISCUSSION

The three selective villages differ in their socio and economic levels since those villages nearer to the district capital can access more of the socio-economic and health benefits than those farther away. The socio-economic status shows that most households considered beekeeping an important part for earning livelihood as has been shown by various studies [11]. Beekeeping is also seen as an opportunity from field observations that most of the households having young people look at it as an entrepreneurship for employment opportunities [9,15].

Most of the respondents are male headed households which is around 70 percent while the rest 30 percent are headed by females. This shows that beekeeping is not confined or restricted as male oriented due to its physical activity but females can also take on the opportunity to supplement their earnings from beekeeping. All of the respondents are married while some female headed households where their husbands had passed away and the burden falls on them to take care of the family. From the field observations and discussions with the households maintaining of the apiaries takes about 30-45 minutes for 7 colonies. However, with more members helping, maintaining of the apiaries becomes much easier. Thus, beekeeping becomes a subsidiary occupation for most households since the majority of the households are engaged in farming and cattle rearing.

The mean and standard deviation are given in Table 1 which shows that the variation in age in the villages shows that experience helps in identifying the local honeybees and in the process of production of good honey.

In terms of educational qualifications around 35 percent of the respondents passed their secondary education, 30 percent of the respondents have passed their higher secondary education, 25 percent are illiterate and 5 percent of the respondent have finished their post graduate and professional course. The data shows that beekeeping applies to diverse people with varied educational qualifications and even to those who are illiterate. People take up this occupation due to the increasing demand of honey as a way to supplement their income. Most of the young people in the villages observed through their fathers, mothers and elders in beekeeping and they try to help to innovate and improve their methods of beekeeping for increase production.

From the answer of the respondents around 60 percent of the respondents as well as the households have less than 5 years of experience, 20 percent have an experience of 6 to 10 years, 5 percent have an experience of 11 to 15 years, 10 percent have an experience of beekeeping for 16 to 20 years and 5 percent have an experience of 20 to 25 years.

Table 1. The mean and standard deviation in age of the beekeepers in the villages

Villages	No of cases	Mean age of beekeepers	Minimum	Maximum	Standard deviation
Mawten	10	46	31	79	19.066
Wahkaji	5	40.6	29	59	9.333
Phlangdiloin	5	45	34	58	9.539

Source: Field Work

The Table 2 shows a vast difference in the years of experience of the people in the three villages with mean years of experience of 7.60 and standard deviation of 6.613 showing no significant difference from the mean with a range from 2 to 25 years.

The number of hives which the respondents have also depends on their years of experience in beekeeping. Around 35 percent of the beekeepers have less than 5 beehives, 45 percent owned around 6 -10 beehives, 5 percent of the respondents owned 16-20 and 21-25 beehives respectively and 10 percent owned 31-35 beehives or bee colonies.

The honey being produced in these villages differ in colour owing to the type of vegetation and bees present in the ecosystem. The honey is a darker shade of brown in Wahkaji and Phlangdiloin compared to the honey of a lighter shade of brown produced in Mawten (*field observations*). Since the bee boxes are kept in the premises of the house the bee is of lighter brown colour which is less harmful.

In the villages, around 60 percent of the respondents could produce honey twice a year that is February-March and October-November while 40 percent of the respondents produce honey once a year mainly in October-December. The production of honey from the apiaries depends on the vegetation grown, the forests around the villages. The honey production for some respondents comes from wild honey (wasps honey) collected from the forests and sold at a higher price in the market. The reason may be that the honey is from a wild bee and not domesticated ones which limits its production. The villagers usually collected honey directly from honey frames from their apiaries without any protection and this has been done with the knowledge passed from one generation to the other. Since most of the respondents do not use a machine for honey production, hence honey is separated manually from the beeswax.

From the Table 3 the production of honey shows a range from 3 kg to 9 kg per apiary with a mean production of 5.20 and a standard deviation of 1.936 showing significant difference from the mean.

The price of honey differs where some respondents keep the price at Rs 400 per kg, others at Rs 500 per kg and some at Rs 450 per kg of honey. The difference in price lies in the purity of honey produced. Some respondents state that if honey is not mixed with the beeswax, then the price becomes more expensive. Beekeeping as an occupation have helped the respondents in earning an additional income for the households.

From the Table 4 the income earned by the respondents ranges from a minimum of Rs 9000 per year to Rs 196000 per year depending on the production of honey by the respondents in the three villages. The mean income earn is Rs 41895 with a standard deviation of Rs 53229.607 per year.

Table 2. The experience in years of beekeeping

	N	Minimum	Maximum	Mean	Std. Deviation
No years	20	2	25	7.60	6.613
Valid N (list wise)	20				

Source: Field work

Table 3. The production of honey per hive

	N	Minimum in Kg	Maximum in Kg	Mean	Std. Deviation
Prod honey/apiary	20	3	9	5.20	1.936
Valid N (list wise)	20				

Source: Field Work

In the survey of the 20 households in the three villages of Mawten, Wahkaji and Phlangdiloin the income earnings from beekeeping shows an increase. The Table 5 below depicts the growth of income from beekeeping for the respondents from the three villages.

All the respondents' states that their main livelihood is agriculture (98%) while others are involved in services and other non-farm services (2%). Beekeeping is a subsidiary occupation which has shown its growing importance for generating additional income for households which is 10 percent for households in Mawten, 20 percent in Wahkaji and Phlangdiloin.

Using ANOVA one way shows that production of honey per year helps in increasing the income of the respondents.

The descriptive Table 6 shows that as the number of production of honey increases the mean income increases (M=18±, S.E. = 13±) to (M=85±, S.E=105±). The increase however is not significant since some beekeepers having fewer beehives earn more than those having more beehives and vice versa. The Fig. 1 shows that the value of money income generated increases as the production of honey from beehives increases with some exemptions.

Table 4. Income earned by the beekeepers per year (in rupees)

	N	Minimum (Rs)	Maximum (Rs)	Mean	Std. Deviation
Value of honey/year	20	9000	196000	41895.00	53229.607
Valid N	20				

Source: Field Work

Table 5. Depicts the growth of income from beekeeping

Village	No. of respondents	Mean Income /year	Total income of beekeepers/year	% of increase in income from beekeeping
Mawten	10	Rs 99381.8	Rs 993818	10
Wahkaji	5	Rs 58460	Rs 292300	20
Phlangdiloin	5	Rs 117800	Rs 117800	20

Source: Field work

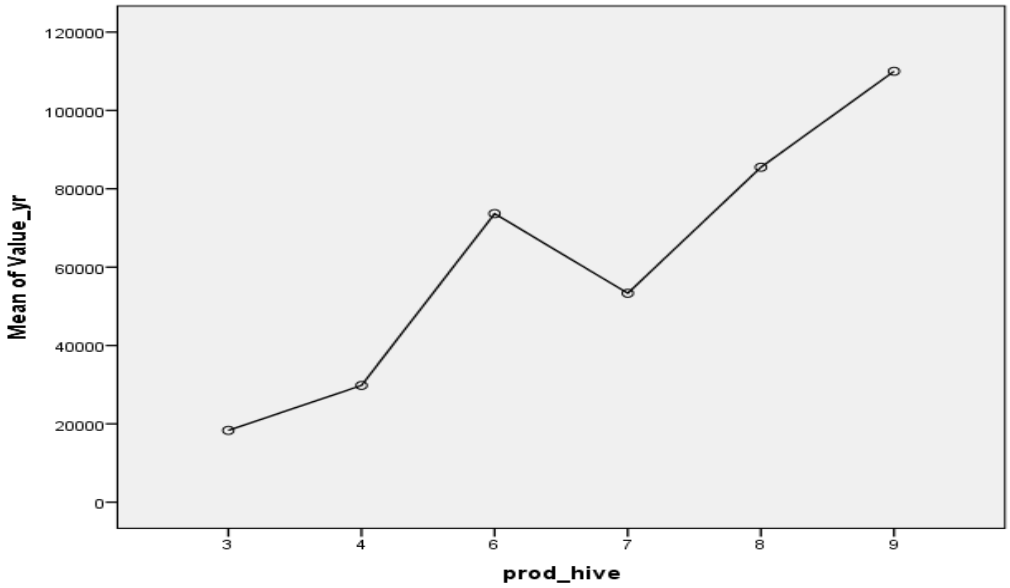

Fig. 1. Production of honey and the increase of income of the beekeepers per year
Source: Field work

Table 6. Production of honey with increase in income per year

No of apiaries	N	Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
3	4	18325.00	13123.357	-2557.19	39207.19	9000	37500
4	7	29800.00	23466.572	8097.04	51502.96	12000	64000
6	3	73666.67	105973.267	-189585.52	336918.86	10000	196000
7	3	18000.00	3464.102	9394.69	26605.31	14000	20000
8	2	85500.00	105358.910	-861112.25	1032112.25	11000	160000
9	1	110000.00	.	.	.	110000	110000
Total	20	41895.00	53229.607	16982.78	66807.22	9000	196000

Source: Field Work

The ANOVA test shows that there is significant difference between the production of hives and the income generated by the beekeepers (F 5, 14) =4.029) and p=.064 which is less than the significant level (p=0.05). This only shows that the income of earning by the beekeepers in the villages shows significance difference from the production of beehives.

The production of honey has increase over the years with the efforts and intervention of various factors of the Government, private entrepreneurs, demand by consumers and so on. As the majority of the people in Meghalaya lived in rural areas, commercial beekeeping can provide job opportunity and meaningful income. It is essential however to raise the level of this industry through creating effective national and international trade linkages to improve the marketing and processing.

5. CONCLUSION

Examining the various characteristics of the respondents from the three villages shows that beekeeping is not confined only to the elder adults but the younger generation are also keen in being part of this activity which is another way of sustaining their livelihoods. Beekeeping is a small-scale industry especially in the rural areas. With age and experience respondents know what kind of bee to be domesticated, how and where to keep the bee frames for bee swarming so that it helps in increasing production of honey. These will positively help in increasing the quality of honey produced which will fetch them better value to increase income earnings.

Beekeeping requires care and attention to the bees especially during swarming since it would be uneconomical to the beekeepers if care and prevention is not taken. In these study areas some of the respondents started bee pollination to start increasing their yields.

Since the implementation of the Integrated Basin Development and Livelihood Promotion Program launched by the Government of Meghalaya (IBDLP) in April 2012 trainings were given to beekeepers and some of the respondents have even undergone training organised to further enhance their skills at beekeeping.

In Meghalaya most people market their own products at different prices. In India there are departmental marketing depots located in various parts of India and they purchase, process, in collaboration with Khadi and Village Industries Commission (KVIC). Now the IBDLP also focus on this aspect by the intervention undertaken realizing the importance of honey in both national and international markets.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Marngar D, Lyngdoh RD. Apiculture: An Alternative Income Generation in Meghalaya. Ind. J. Sci. Res. and Tech. 2014;2(5):90-93.
2. Bradbear N. “Bees and their role in forest livelihoods” in FAO diversification books, No. 19, Rome; 2009.

3. Ajao M, Adeyemi, Oladimeji Y. Structure, production and constraints of honey hunting and traditional beekeeping activities in Patigi, Kwara State, Nigeria in Research Gate; 2015.
4. Monga K, Manocha A. Adoption and constraints of beekeeping in District Panchkula (Haryana), India in Livestock Research for Rural Development; 2011.
5. Hill, Daniel B., Webster, Thomas C. Apiculture and Forestry (bees and trees) in Agro forestry Systems; 2004.
6. Tej, M. Kishan, Aruna R, Mishra Geetanjali, Srinivasan MR. In the book beekeeping in India; 2011.
7. Ntalwila J, Mwakatobe A, Kipembe N, Kohi E. Contribution of beekeeping to livelihood and biodiversity conservation in–Inyonga Division (Mlele District) Western Tanzania, Entomology Journals. 2017;2(6):33-38.
8. Agarwal T. Beekeeping Industry in India: Future potential. Int. Journal of Research in Applied, Natural and Social Sciences, IMPACT: URANSS. 2014;2(7):133-140. ISSN(E): 2321-8851, ISSN (P): 2347-4580.
9. Anandhy A, Buella K. A study on prospects and potential of beekeeping entrepreneurship in India. Kamaraj Journal of Academic Research. 2019;I(4). ISSN: 2582-1466.
10. Yap NT, Devlin JF. Beekeeping Innovation for Sustaining Rural Livelihoods. A Success Story. International Journal of Innovation and Sustainable Development. 2015;9(2):103-117.
11. Islam MR, Chhay L, Mian MM, Nasry AANB. The financial analysis of apiculture profitability in Bangladesh. Asian Journal of Agricultural Extension, Economics and Sociology. 2016; 9(2):1-8. Article No. AJAESS 22985. ISSN: 2320-7027.
12. Kumar V, Sahu N, Dhruv SK. Beekeeping as a livelihood for rural people of District Dantewada. International Journal of Research and Analytical Reviews. Cosmos Impact Factor 4.236. 2018;5(4). ISSN: 2349-5138.
13. Meghalaya Basin Development Authority. Report; 2015.
14. Integrated Basin Development and Livelihoods Promotion Programme (IBDLP), Meghalaya; 2013.
15. Md. Fuad AF, Md. Nurhasan, Md. Kayess O. Potentials and Prospects of Beekeeping Entrepreneurship in Dinajpur region: A participatory Analysis. Agri. Research and Technology Open Access Journal. 2019;5. ISSN: 2471-6774, Juniper Publishers.