e-ISSN 2320 –7876 www.ijfans.org
Vol.11,S Iss 1, 2022

Study On Beekeeping And Its Entrepreneurship For Sustainable Livelihood Of Tribal Farmers In Jharkhand, India

Mayur Gautam[1], Sneha Kumari[2] and Shrestha Gautam[3]

1. *Department of Social Work, Jamia Millia Islamia Central University, New Delhi, India.*
Email: mayurgautammg@gmail.com
2. *Birsa Agricultural University, Kanke, Ranchi (Jharkhand), India.*
Email: sneha.life15@gmail.com
3. *Department of Social Work, Jamia Millia Islamia Central University, New Delhi, India.*
Email: shresthagautamsg@gmail.com

Abstract:

The present study was conducted in ten districts of Jharkhand, India to assess the potentiality of beekeeping as a subsidiary source of income to small and marginal farmers. About 1000 beekeepers from 40 villages of 20 blocks of 10 districts were identified as the beneficiaries to obtain the primary data of the study through schedules. The results revealed that, honey has immense potential to increase the farmers' income. Entrepreneurship development by providing proper training and other handholding supports from various stakeholders will develop the sector to pave the way for sustainable "Meethi Kranti" and Doubling of Farmers' income in a time bound manner. India's honey estimated production is 1.05 lakh metric tons during 2017-2018.With the existing vegetation wealth about 150 million bee colonies can be sustained, which may produce more than 1.50 lakh tonnes of honey annually in India. In addition to phenomenal enhancement in crop productivity with higher returns from per unit area, it may generate employment to around 15 million landless rural and tribal families.

Key Words: KVKs, Beekeeper, Bee boxes, Bee Colonies, Beehives.

Present status of Beekeeping:

Honey is the common, sweet, thick nourishment substance delivered by the bees and other related creepy crawlies from the botanical nectar of blooms Nectar comprises of 76% sugar, 18% water and the rest 6% is constituted by other components. The major consumption of honey in India is made by medicine manufacturing firms. The other chief product obtained from bee colonies – beeswax' is fundamentally utilized in the manufacturing of pharmaceuticals, cosmetics soaps etc.

India's honey production in 2017-2018 was 1.05 lakh metric tons (MTs) as compared to the 35,000 metric tons in 2005-06. At present, India has 35 lakh bee colonies as compared to 8 lakh bee colonies in 2005-06. The number of bees keeping companies and social orders has too augmented and

as of January 2019, there are 9091 enrolled individuals in apiary commerce. Government plans to set up an Integrated Beekeeping Advancement programme in 16 states of India like Andhra Pradesh, Tamil Nadu, Jammu and Kashmir, Haryana, Uttarakhand, West Bengal, Madhya Pradesh, Karnataka, Bihar, Manipur, Tripura, Arunachal Pradesh, Himachal Pradesh, Delhi, Punjab, and Uttar Pradesh [1]. However, beekeeping sector faces major challenges of devastation of honey bees due to exceptional climatic alter. [2].

Potential and Prospects:

Considering the significance of beekeeping for increasing the farmers' income in Jharkhand, the Beekeeping was taken up in ten districts viz; Simdega, Lohardaga, East Singhbhum, Pakur, Dumka, Sahibganj, Garhwa, Latehar, West Singhbhum and Ranchi. Presence of various kind of floras like Pongamia (Karanj), Eucalyptus, litchi, jamun, shisham, acacia, rapeseed & mustard,, maize, moringa, coriander etc that attracts the honey bees for nectar in these districts [3].

Practice of Agriculture is very tough in these areas due to scanty rainfall and lack of water in this plateau region. There is need to initiate production of bulk organic honey of Pongami (Karanja), Mahua, Eucalyptus, Moringa (drumstick), Tamarind (Imli), Ocimum (Vantulsi). It is estimated that there are about one Million colonies of honey bees in India, however, according to National Commission on Agriculture with the present vegetation wealth about 150 million bee colonies can be sustained, which may produce more than 1.50 lakh tonnes of honey annually. It is also important to mention that in addition to phenomenal enhancement in crop production and productivity with higher returns from per unit area, it may also generate employment to around 15 million landless rural and tribal families in our country [4].

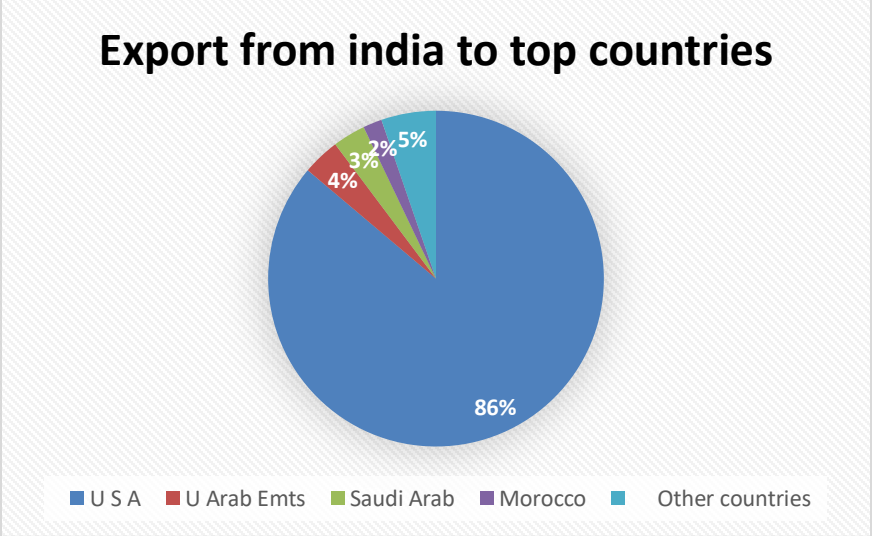
Export Potential and Foreign Exchange:

Beekeeping has been one of the oldest activities in India. This makes it one of the leading honey markets in the world, which has created an intense competition in terms of innovation and cost. The honey market in India was worth Rs 17.3 Billion in 2019 [5]. Additionally, the demand for honey in India is augmenting on account of the growing consumer preference for natural and healthy alternatives of artificial sweeteners, rising awareness regarding the benefits of honey and increasing popularity of various honey flavours. In addition, owing to its proven anti-bacterial, anti-microbial and anti-inflammatory properties, honey is projected to gain a momentum in both the food and non-food applications across the country.

Exports of Honey From India during 2018-19

	Country	**Qty (MT)**	**Rs. Lacs**
1	U S A	50,396.45	56,309.26
2	U Arab Emts	2,100.04	3,092.81
3	Saudi Arab	1,844.05	3,066.02
4	Morocco	1,064.57	1,228.56
5	Other countries	3,083.03	4,707.43
6	**Total**	**58,488.14**	**68,404.08**

Table:1 Source: DGCIS Annual Export



The 15 countries that exported the highest dollar value worth of natural honey during 2019

Country	**Dollar value**	**Percentage**
China	US$235.3 million	11.8%
New Zealand	$228.8 million	11.5%
Argentina	$146.7 million	7.4%
Germany	$131.5 million	6.6%
Ukraine	$113.3 million	5.7%
India	$99.6 million	5%
Spain	$92.1 million	4.6%

Hungary	$82.5 million	4.1%
Brazil	$67.9 million	3.4%
Belgium	$64.1 million	3.2%
Vietnam	$57.4 million	2.9%
Mexico	$55.7 million	2.8%
Romania	$44.5 million	2.2%
Poland	$43.2 million	2.2%
Canada	$41.3 million	2.1%

Table:2 ***Source: Central Intelligence Agency, The World Fact book Field Listing: Exports – Commodities. Accessed on April 29, 2020***

Framework of Beekeeping:

The present's study of bee keeping has been taken up in ten districts of Jharkhand. These 10 districts including Headquarter, BAU,Ranchi has been chosen for the present study based on availability of many beekeepers in these districts, those who get their inputs and information from the KVK including Headquarter, Birsa Agricultural University, Ranchi. The beekeepers from the 40 villages from 20 blocks of 10 districts including Headquarter of Birsa Agricultural University, Ranchi were chosen for the study. A total of 750 beekeepers were randomly selected. The primary data for the present study was collected using structured schedule for the period 2019-20. Supplied small tool kit set, small implement tool kit and shelter (Tamboo), complete set of bee keeping equipment through 10KVks including Ranchi district under BAU, Kanke, Ranchi. The conceptual framework of the study presents honey producers of these ten district of Jharkhand for production of honey.

Figure:1 Bee boxes placed at Village Ulihatu, district: khunti, the Birth Place of Bhagwan Birsa Munda

Figure:2 Bee Boxes with Bee Colonies for distribution to Beekeepers

[Table: 3] Technical specification of Bee Keeping Units:

1. **Bee Hives Box:**

Sr. NO.	Item	Type of Wood	Other conditions	Dimension of Bee Boxes
1.	BIS-LT hive-Type-“c”	1.wooden body (Bottom Brood chamber, inner	1. Stainless steel wire shall be used in wooden frames. 2. Top cover with food graded	1. Brood chamber length 508mm X width 413 mm X

	*Apismellifer*aBeeBox with shallow super &10 frames.	cover and Top cover.) 2. Total 10 frames 3. Entire body in wooden color paint. 4.Only well-seasoned wood should be used in the bee hives (boxes)	aluminums sheet fixed on top 3. One food graded feeder frame 4. Stand, height5" minimum 5. Ventila to on three sides of the box 6. Migratory gate(one) 7. Queen gate (one) 8.Ant weels (four) 9. Bottom board on brood chamber should not be nailed together 10. Nails used in construction of the bee hive shall be of stainless steel only.	height 242 mm. 2. Bottom board: 560 mm X 413 mm. 4.Tpo of the Beehives with wooden frame and aluminium sheet covered 5.Bee space:10mm

Source: Directorate of Horticulture, Govt of Jharkhand order No: 45 dated 25/12/2018

Table:4 Size of Bee hives boxes.

Sr.No	Hive Part	Length	Width	Height	Thickness of wooden board
1.	Bottom/floor board	560	413	55	22
2.	Brood chamber				
a.	outer	508	412	242	22
b.	Innet	464	368	242	--
3.	Brood frames				
a.	Top bar	483	25	--	22
b.	Side bar	232	--	--	10
c.	Bottom bar	448	19	--	10
4.	Shallow super chamber				
a.	Outer	508	413	150	22
b.	Inner	464	368	150	22

Source: Directorate of Horticulture, Govt of Jharkhand order No: 45 dated 25/12/2018

2. **Table:5 Honey Bee Colony:**

Sr.No.	Product	Specification	Other condition
1.	*Apismellifera* colony	1. Eight disease free *Apismellifera* bee frames 2. Young & freshly mate queen not less than three months of age. 3. Six frames of brood 4. Two frames of honey & bee bread (pollen store) 5. Wax-1Kg	1. Supplier should be ascertained disease free at the time of delivery. 2. Colonies may be supplied with respective bee boxes

Source: Directorate of Horticulture, Govt of Jharkhand order No: 45 dated 25/12/2018

3. **Table:6 Honey Extractor:**

Sr.No.	Product	Specification
1.	Honey Extractor	Durable type 4 frame extractor made of anti-corrosive SS/GI with manual operated level.20 litre capacity
2.	Container	30 Kg capacity food grade pvc/hdpe container
3.	Tool Kit Set	SS/GI smoker, Bee veil-made up of cotton cloth with nylon neiting,12" SS knife suitable for use in Beekeeping ,Queen cage ,Leather/cotton hand gloves. Bee brush wooden/nylon length -42 cm, Width-8 cm

Source: Directorate of Horticulture, Govt of Jharkhand order No: 45 dated 25/12/2018

4. **Honey processing Plant:**

5. Handling of nectar implies circuitous warming of nectar. Amid this prepare group pasteurization, kept up @ 63 ºC for 5-6 minutes is by and large taken after. Overabundance warm will diminish the quality in term of supplement substance. Another strategy of warm treatment incorporates, uncovering nectar in warm sunny day for 30 minutes. At that point the handled nectar is kept in round and hollow holder for straining/purification prepares [6].

5. Honey Packaging Unit:

Packaging of Honey and Honey containing items requires them possess particular bundling materials. Capacity holders for fluid or crystallized nectar ought to be made either of glass or stainless steel or coated with nourishment endorsed plastic, paint or beeswax to form discuss tight. Bundle choice ought to in any case too consider recyclability, disposability and ecologically neighborly fabricating of the bundling materials [6].

6. Storage

Honey is considered as a steady item, within the sense that it isn't ruined by the microscopic organisms and organisms regularly dependable for nourishment decay. A temperature of 20 ^{o}C was specified as a compromise for capacity of fluid or crystallized nectar. Too, legitimate capacity and bundling along with fast promoting and utilization will diminish or dispose of required additives [6].

Bee Products:

(a) Honey

Bees produce honey from the sugary secretions floral nectar of plants or from secretions of other insects by regurgitation, enzymatic activity, and water evaporation [7].Honey generation is the major product of Bee keeping. It is estimated that one box of bee generally produces 60-80 kg honey annually with 4-6 migration and depending upon the availability of flora as well as location specific climatic conditions.

Figure:3

(b) Bee Wax

The wax is formed in to scales by eight wax- producing glands in the abdominal segments of workers bee, which discard it in or at the hive. Chemically, bee wax consists mainly of easters of fatty acids and various long chain alcohols [8]. Beeswax is edible; having similar negligible toxicity to plant waxes, and is approved for food use in most countries and in the European Union. One box of beehives produces about 7 kg bee wax in one year [9].

Figure:4

(c) Pollen

Pollen could be a common vegetarian protein source containing numerous nutritive elements and minerals and can do much to make strides the common dietary admissions in rural areas [10 There's huge potential for dust generation by the bees especially from coconut, sunflower, mustard and maize etc

Figure:5

(d) Propolis

Propolis is the resinous substance collected by bees from trees to seal breaks within the hive. Propolis has been found to be a characteristic anti-microbial and has numerous therapeutic qualities, when utilized remotely or internally and is important within the field of Apitherapy. There's extraordinary demond for propolis for export. One beehive can produce approximately, 300 to 500 gram of Honey Propolis [10].

Figure:6

(e) Bee venom

Bee venom is an unexploited source of generation from the bees in India. Bee poison has different therapeutic uses in Homeopathy, Allopath and frameworks of normal pharmaceutical. Extraction is complicated and can be done by beekeepers with extraordinary technical skill using uncommon bee poison extractors before the hive [10]. The estimated production of Venom is 10 to 15 grams from 100 beehives annually.

Figure:7

(f) Royal Jelly

It is discharged by the bees from extraordinary organs in their body and is utilized to nourish the ruler bee hatchling. It is supposed to rejuvenate and advantageous properties like Ginseng. The estimated production of Royal Jelly is 5 to 7 kg from 100 beehives annually. China is a major producer and exporter of royal jelly [10].

Figure:8

Impact of Bee keeping:

1. **Nutritional Value**

The composition of honey is mainly sugars and water. In addition, it also contains several vitamins and minerals, including vitamins-B. The other constituents of honey are amino acids, antibiotic-rich inhibin (inhibit the production of FSH-Follicle Stimulating Hormone), proteins, phenol antioxidants, and micronutrients. The sugars in honey are sweeter and give more energy than artificial sweeteners, and the most abundant sugar in honey is fructose.[11]

Table:7 Major nutrients & Vitamins in honey.

Ingredient	**Amount in 100g**
Protein (g)	0.5
Carbohydrates(kcal)	300
Fats(g)	0
Vitamins	**(mg/kg)**
Thiamin (B_1)	0.02-0.9
Riboflavin (B_2)	0.01-0.9
Niacin[2] (B_3)	0.10-2.7 (170-355)
Panthothenic acid (B_5)	0.02-1.9
Pyridoxin (B_6)	0.01-0.32
Folic acid (B_9)	0.01-0.7
Ascorbic acid (C)	0.1-2.5 (52-62)
Phyllochinon (K)	ca. 0.025

Source: Honey as Nutrient and Functional Food, Article, Researchgate

2. **kinds of honey and its medicinal properties:**

(a) Eucalyptus Honey

Unifloral honey derived from the flowers of eucalyptus (Eucalyptus rostrata) has luteolin, kaempferol, quercetin, myricetin, and ellagic acid [12]. This honey acts as a powerful antioxidant and anti-inflammatory agent. Eucalyptus honey has sodium, potassium, manganese, magnesium, iron, copper, and zinc. Eucalyptus honey can particularly be helpful for children with compromised immunity.

(b) Neem Honey

Raw neem honey is dark honey, which has a taste of rich natural dark toffee, gingerbread taste, and has a distinctive taste of honey itself. Organic neem honey is kept raw and unheated. It preserves the natural and delicate enzymes (Azadirachtin) that promote our health derived from flower essences collected from wild beehives. To increase your immunity and boost energy levels take honey before breakfast. You can also eat it by applying it on bread or toast, wafers, nuts, or cereals [13].

(c) Tulsi Honey

- Tulsi is one of the oldest herbs and besides using it for spiritual reasons it also has healing properties. [14]. The major chemical constituents of Tulsi are: Oleanolic acid, Ursolic acid, Rosmarinic acid, Eugenol, Carvacrol, Linalool, and β-caryophyllene. These chemical properties are helpful in treating fever, skin care, disease-fighting antioxidants and Anti-inflammatory problems.

(d) Karanj Honey

The source of Karanj Honey is lies in Pongamia plants widely used for cold and cough, good for indigestion, used for skin problems due to its antiseptic properties, quick wound healing, used to treat Diarrhea and diabetes [15].

3. Value added products of honey

Honey is the most excellent known primary items of beekeeping. It is the foremost wonderful gift of god and Mother Nature to mankind. [16]

Figure 9: A display of various products in which honey is an ingredient and also Birsa honey which is product of beekeepers.

i. Honey as a substitute of sugar
ii. Honey used as food
iii. Milk Product of Honey
iv. Honey used in Bakery products
v. Honey as a food ingredient
vi. Use of Honey in confectionary food
vii. Honey used in Breakfast cereals
viii. Honey with fruits and nuts
ix. Honey Products by fermentation
x. Honey in spreads

xi. Honey used in non-alcoholic beverages

4. Marketing:

The first option is direct marketing whereas, the producers can sell their products directly to the consumers from their own sources, retail stores; road side stands at retail price. The second option is indirect marketing where the producers sell their honey to several intermediaries at wholesale price before the honey reaches to the consumer. The third option is honey marketed by Birsa Agricultural University outlet in the trade named as Birsa honey. There are number of organizations and outlets where honey can be marketed like Tribal Cooperative Federation of India (Trifed) New Delhi to buy Honey - @ 225/kg [17], khadi & Village Industries Commission buy honey @230/kg [18], Patanjali buy honey @275/Kg, Reliance buy honey @260/Kg in India.

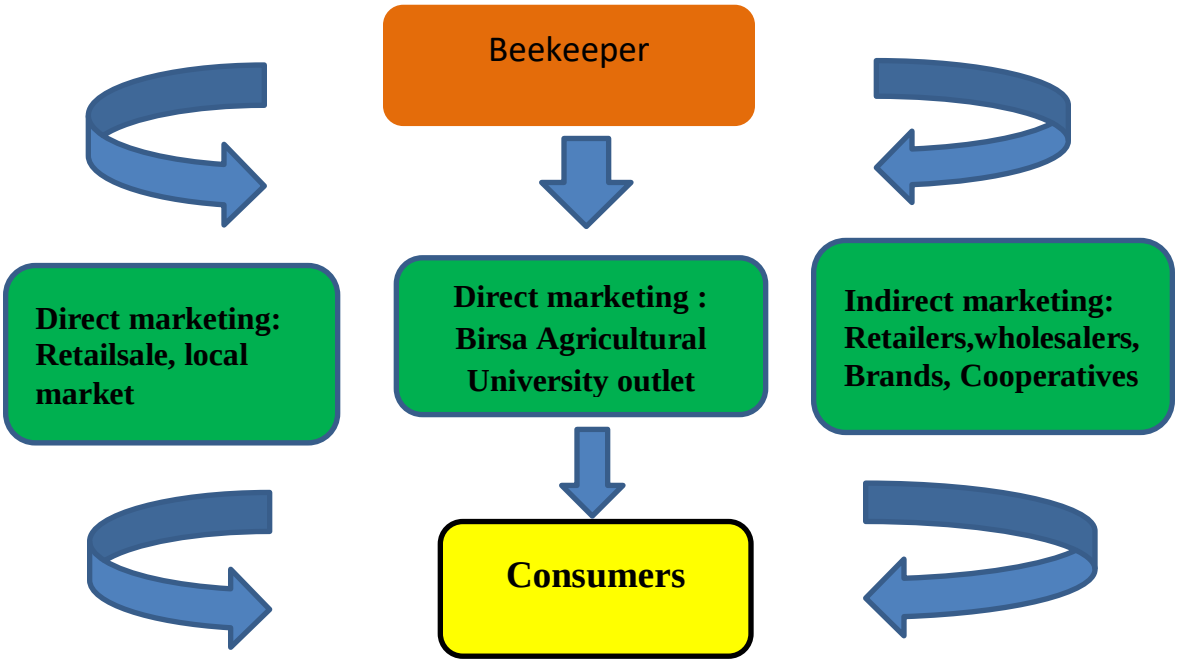


Fig-10 Conceptual framework of marketing

Cost Economics:

As per Directorate of Horticulture, Govt of Jharkhand the per unit cost of Honey Bee box, Honey Bee Colony and Honey Bee Extractor with complete set of tools as well as other estimated expenditure, the recurring & Non-recurring cost per unit of 100 bee hives is Rs **6, 81,324/-** has been calculated as cost of production for first year as detailed in Table 8. The normal life of the bee boxes is 5 years. Non recurring expenditure will not be required from second year onward till 5 years; therefore, from 2nd year to 5th years only recurring cost Rs 3.00 lakhs will be required per year for one unit of 100 beehives.

Table-8: Cost of production of honey per unit of / 100 bee hives:

S No	Inputs	Per unit cost	Quantity	Cost (Rs.)
1.	Honey Bee box	@Rs 1948	100	194800
2.	Honey Bee Colony	@ Rs1958	100	195800
3.	Honey Bee Extractor with set of Tools	@ Rs19,362	2	38724
	Sub Total **Non-recurring**			**4,29,324**
4.	2 Persons (1 Skilled +1Labour)	@Rs 16000/ Month	12	1,92,000
5.	Shifting charges in migration	@ Rs 50/ box	4 times	20,000
6.	Off season maintenance of bees &boxes	@ Rs 100/	3 months	30,000
7.	Miscellaneous Expenditure	@ Rs100/ Box	100	10,000
	Sub Total (Recurring)			**2,52,000**
	Total			**6,81,324**

(a) Return:

Considering the estimated produce from one unit of 100 beehives i.e. around 700kg honey, 70 kg bee wax, 25 bee colonies of 5 to 8 frames, 30 kg propolis, 10 gram bee venom,5 kg Royal jelly and Considering the average procurement price of honey @ Rs 247.50 per Kg of existing agencies (Trifed @ Rs 225/kg, KVIC @ Rs260/kg, Reliance @260/kg, Patanjali @ Rs275/kg), bee wax @ Rs 500 per kg, bee colonies @Rs 1500 per colony, propolis (Honey bee gum) @ Rs1000 per kg, bee venom @Rs10000 per gram and royal jelly@ Rs3000/kg, the return is estimated from one unit of 100 beehives per year is as hereunder:-

Table-9: Return from per unit of 100 honey bee hives :

Sl No	Produce	Quantity	Price @	Amount (Rs)
1.	Honey	700kg	Rs 247.50 per Kg	1,73,750
2.	Honey Bee wax	70 kg	Rs 500 per kg	35000
3.	Honey bee colonies	250	Rs 1500 per colony	375000
4.	Honey Propolis	30 kg	Rs1000 per kg	30000
5.	Bee venom	10 gram	Rs10000 per gram	1,00,000
6.	Royal jelly	5 kg	Rs3000/kg	15000
	Total			**728750**

(c) Net return:

Considering the cost of production and return from one unit of 100 bees hives as per table 9 and table 10, the year wise net return is as hereunder:

Table-10: Year wise Net return from per unit of 100 honey bee hives:

Sl No	Year	Expenditure-Non-recurring	Expenditure-recurring	Total expenditure	Return	Net Return
1.	2.	3.	4.	5. (3+4)	6.	7. (6-5)
1.	Ist Year	Rs 4,29,324	Rs 2,52,000	Rs 6,81,324	Rs 728750	Rs 47426
2.	2nd Year	00	Rs 2,52,000	Rs 2,52,000	Rs 728750	Rs 476750
3.	3rd Year	00	Rs 2,52,000	Rs 2,52,000	Rs 728750	Rs 476750
4.	4th Year	00	Rs 2,52,000	Rs 2,52,000	Rs 728750	Rs 476750
5,	5th Year	00	Rs 2,52,000	Rs 2,52,000	Rs 728750	Rs 476750
	Total		**Rs12,60,000**	**Rs 16,89,325**	**Rs 36,43,750**	**Rs19,54,426**

Now the year wise cost of production, return and net return reveals that one unit of 100 beehives gives net return of Rs 19, 54,426.00 in five years.

Conclusions:

The present study reveals that:

1. There are about one Million colonies of honey bees in India, however, according to National Commission on Agriculture with the present vegetation wealth about 150 million bee colonies can be sustained, which may produce more than 1.50 lakh tonnes of honey annually in India.
2. Beekeeping can be a subsidiary as well as primary source of occupation having potentiality to add income of resource less poor and tribal farmers' in Jharkhand.
3. There is need to establish proper marketing system by making backward and forward linkages to ensure disposal of raw honey of beekeeper at remunerative price.
4. Skill development through training programmes for proper management including increasing the honey production, production of bee products.
5. Pollination activity through apiculture enhances both quality as well as productivity of different crops

References

1. A sweet success story: by Anjali Marar , Pune , Published: May 20, 2019 .
2. Honey Production in India – Current growth in Economy and Challenges, October 16, 2019.
3. Chand H., Singh R. & Yazdani S. S. (1995) *Indian Bee Journal*, 57, 3, 147-148.
4. National Agricultural Scenario - ICAR, icar.org.in.
5. Directorate General of Commercial Intelligence and Statistics. (DGCIS). Ministry of Commerce and Industry. Government of India Summary Trade Data · Annual Report · Foreign Trade Statistics · Ancillary Statistics.

6. Annual Bulletin, CCT, TribhuwanFoodwave University – 2010 (V - 7),Processing, Packaging and Storage of Honey.
7. Government of India,Ministry of Micro, Small & Medium Enterprises,STATUS REPORT ON BEE KEEPING AND HONEY PROCESSING.
8. Beeswax - Wikipediaen.wikipedia.org.
9. Sanford, M.T.; Dietz, A. (1976). "The fine structure of the wax gland of the honey bee (Apis mellifera L.)". Apidologie. 7 (3): 197–207. doi:10.1051/apido:19760301.
10. Entrepreneur,The Complete Book on Beekeeping and Honey Processing (2nd Edition)
11. Stefan Bogdanov, Bee Product Science, www.bee-hexagon.net, April 2016.
12. "Honey as a Complementary Medicine" Integrative Medicine Insights, US National Library of Medicine.
13. Benefits Of Neem Honey: An Effective Herbal Remedy,Navmi,10/11/2019.
14. Amazing Benefits OfTulsi Honey For Cough, Cold And Skin:www.navmi.co.in.
15. Karanj, Benefits, Useswww.ezeebeeoverseas.com, karanj-pongamia-honey.
16. Value added products of honey,Shiwani Bhatnagar,GBPUAT,05/06/2009
17. Tribal Co-operative Marketing Federation of India, Ministry of Tribal Affairs, Govt of India.
18. Khadi & Village Industries Commission (KVIC), Govt of India, Ministry of Micro, Small & Medium Enterprises.