



SOCIO-ECONOMIC STATUS AND OPPORTUNITIES OF BEEKEEPING FOR FARM WOMEN: A CASE STUDY

JYOTI NAYAK¹, LOPAMUDRA MOHANTY^{1*}, GEETA SAHA¹, ARUN KUMAR PANDA¹ AND MRIDULA DEVI¹

¹ICAR-Central Institute for Women in Agriculture, Bhubaneswar 751003, Odisha, India

*Email: lopamudramohanty987@gmail.com (corresponding author): ORCID ID 0009-0001-1638-3048

ABSTRACT

Beekeeping is both an art and a science. In India, people commonly pursue beekeeping as a full-time occupation and an engaging hobby that generates substantial income and enhances nutritional status. This study was conducted in Kadua village, Satyabadi block of Puri district, in 2023. The trainees' responses were assessed based on gender, age, educational status, occupation, and the adoption of beekeeping as an entrepreneurial activity. This study aims to discuss the socio-economic characteristics of beekeepers and to explore the status, strategies, and opportunities for beekeeping at the village level. Cartographic techniques were developed in Excel to achieve the study's objectives, while descriptive statistics, correlation and regression analysis were calculated using SPSS statistical software. The study found that honeybee rearing practices enhance the economic well-being of farmwomen, enabling them to utilize their time more effectively. Both honeybee rearing experience and the number of bee boxes per family contributed significantly to increased honey production.

Key words: Beekeeping, honey, farmwomen, sustainability, socio-economic, bee, livelihood, income, box, production, market, consumer, opportunity, regression

Beekeeping, also known as apiculture, derives its name from the Latin word "apiculture," where "apis" means "bee" and "culture" refers to "cultivation through education" (Chhuneja and Gatoria, 2017). Globally, beekeeping offers numerous invaluable benefits to farming communities. It enhances agricultural production by pollinating crops, thereby increasing yields of pollinator-dependent crops. Global estimates place the economic value of bees' pollination services at USD 215 billion annually (Smith et al., 2014). Beekeeping also provides a source of livelihood for millions of people. Income from beekeeping can support investment in agricultural inputs, fund children's education, and help stabilize household consumption. Additionally, beekeeping contributes to the maintenance of biodiversity (Krishnan et al., 2020).

Beekeeping is a socio-economic activity practiced by both women and men worldwide. It entails rearing and managing bees for the commercial production of honey and other beehive products. In Kenya, beekeeping is predominantly a male-dominated venture; however, advocacy programs have encouraged smallholder women to enter the field. Despite efforts by county governments and non-governmental organizations to promote women's participation in beekeeping, uptake remains low, highlighting the gap between the norm and actual practice (Yator and Jemase, 2021). In India,

beekeeping is practiced in various environments, including mountains, foothills, forests, agricultural lands, and mangrove forests. The techniques involved in beekeeping vary from region to region.

The main harvest in beekeeping comes from *Apis dorsata*, *Apis cerana*, and *Apis mellifera*. Beekeeping with *Apis cerana* has become a growing industry in Central and Southern India. This activity is a crucial, sustainable, and integral part of the rural development program in India, offering nutritional, economic, and ecological benefits. Knowledge of agroclimatic conditions, diversified flora, changing agricultural and horticultural crop patterns, bee species, and management practices plays a pivotal role in transforming the beekeeping industry in the country (Thomas et al., 2002). Development agencies and regional development experts favour promoting growth and revenue-generating enterprises, based on the idea that rural farm households often combine farming with other non-farm activities rather than relying solely on agriculture for their livelihoods (Bryceson, 1999). Beekeeping is becoming a highly successful agricultural practice for rural populations in developing countries, primarily due to the financial benefits derived from beekeeping products (Mujuni et al., 2012). It improves livelihood conditions by enhancing agricultural production and profitability (Chazovachii et al., 2013).

MATERIALS AND METHODS

Kadua village is situated in the Satyabadi tehsil of Puri district, Odisha, India. It is situated 22 km from the sub-district headquarters in Satyabadi and 22 km from the district headquarters in Puri. The village covers a total geographical area of 54 hectares and has a population of 678 people, with 347 males and 331 females. The literacy rate in Kadua is 80.97%, with 86.17% of males and 75.53% of females being literate. There are approximately 141 houses in the village. The study focused on a sample size of 100 beekeepers and employed a mixed research design due to its flexibility in gathering data from various scenarios. Primary data were collected through structured surveys, interviews with beekeepers, meetings with beekeeping officers, village leaders, and prominent beekeepers in Kadua. The analysis considered factors such as gender, occupation, marital status, religious status, caste, educational status, income sources, market conditions for honey, demand for crude honey, and the economic improvements resulting from beekeeping. All the analyses were carried out using Excel and SPSS statistical software version 28.

RESULTS AND DISCUSSION

The results in Table 1 show represents the demographic and occupational distribution in the Kadua village. The population of Village Kadua was composed of 51.17% males and 48.82% females. Among these, the literacy rates were recorded at 86.17% for males and 75.53% for females. The occupational distribution of women in the village was categorized as follows: 34% were engaged

Table 1. Socio-economic characteristics of farm women of Kadua village

Social variable	Categories	No. of beekeepers (%)
Gender	Male	51.17
	Female	48.82
Literacy rate	literate	80.97
	Illiterate	19.03
Religious status	Hindu	100
	Muslim	0
	Christen	0
Caste	General	42
	SC	10
	ST	05
	OBC	43
Occupational status of women of the village	Agriculture and allied service	34
	Home maker	48
	Service	5
	Business	13

in agriculture and allied sectors, 48% were homemakers, 5% were employed in services, and 13% were involved in business activities. Participation in beekeeping activities showed a gender disparity; only 34.6% of women participated compared to 65.4% of men. However, this participation rate was considered promising (Olana and Demrew, 2018). The majority of beekeepers were from the Other Backward Classes (OBC) and General categories, each comprising 42% of the beekeepers. This was followed by 10% from the Scheduled Castes (SC) and 5% from the Scheduled Tribes (ST). The majority of beekeepers (53%), who had an annual income of INR 10,000–20,000, kept honey bees as a supplementary source of income. In contrast, 7% of beekeepers had an annual income exceeding INR 30,000 and engaged in beekeeping as an increasingly agricultural-linked activity. Additionally, 53% of beekeepers earned between INR 10,000 and INR 20,000 a year, which was projected to increase following the adoption of modern beekeeping technologies. The lowest-income group consisted of a 9% cohort with an annual income of less than INR 10,000. The economic value of honey bees has been a global concern in this century. Honey, as a bee product, holds significant importance globally as a source of income. It was estimated that there is an annual earnings of approximately 6 billion USD in the global market (Naz et al., 2022).

Farm women in Kadua village were involved in beekeeping for a variety of reasons. The majority (80%) of beekeepers practiced beekeeping primarily for monetary benefit, as it acted as an additional source of income, while 20% engaged in beekeeping to utilize their leisure time. Nearly half (40%) of beekeepers preferred both options for the purpose of beekeeping. In many places, beekeeping was used to prevent elephant attacks. Paul and Ghosh (2022) suggested that a majority (85%) of beekeepers practiced beekeeping primarily for monetary benefit, while 56% did so to prevent elephant attacks and save their homes, property, and families' lives. Nearly half (44%) of beekeepers preferred both options for the purpose of beekeeping. The majority of beekeepers (48%) began the beekeeping practice out of self-interest. In contrast, 32% were introduced to beekeeping through various training programs conducted by government institutes and television programs, and 20% learned about beekeeping from their ancestors and fellow beekeepers. After analysing the data, it was discovered that the yearly output of honey was only 340 kg/ year in 2020-2021 and 420 kg/ year in 2021-2022, but it was expected to increase to 490 kg/ year in 2022-2023. Various positive elements were identified as driving this annual output

development, including the use of modern beehives, improved skills, gradual improvement in educational levels, government facilities, and awareness campaigns (Paul and Ghosh, 2022). Additionally, Vaziritabar and Esmaeilzade (2016) found that the average annual household earnings from beekeeping were relatively high (USD 68,845.6), contributing to an average 26.64 of the total annual income of beekeepers. This indicates that beekeeping plays a vital role in increasing and diversifying the incomes of rural communities.

The majority of Indian beekeepers were found to be primarily involved in the harvest of raw honey from the bee colonies that were maintained by them. It was observed that 42% of the honey was sold directly to individuals. When sold in local markets, the quantity was significantly lower, amounting to only 33%. According to findings reported by Adgaba et al. (2014), it was noted that a majority of honey producers sold their products directly to consumers through personal communication. This observation indicated that the honey market was characterized by inefficiency and poor organization, which was identified as one of the challenges faced by the producers. In the study village, three methods were employed for honey production, reflecting varying levels of technological advancement: the modern method, the traditional method, and the intermediate or transitional method. It was observed that the majority of beekeepers (55%) utilized traditional methods. In contrast, only 20% of beekeepers employed modern beehives in conjunction with traditional or transitional methods. The prevalence of traditional methods was attributed to the age demographic of the beekeepers, as the elderly population predominantly practiced traditional beekeeping techniques. Additionally, 25% of beekeepers adopted a combination of both traditional and modern methods.

Factors influencing honey production with insights from beekeeping practices and analysis when analysed shows that data includes four key variables: experience in honeybee rearing (years), number of bee boxes per family, number of family members involved in beekeeping, and honey production per year (kg/year) (Table 2). Data for each of these variables from 30 participants provided a comprehensive overview. The mean experience in honey bee rearing was 4.07 years, indicating moderate variability among the beekeepers' experience levels. The average number of bee boxes per family was 4.63, showing some variation in the scale of operations. The mean number of family members involved in beekeeping was 2.77, with lower standard deviation, suggesting a more uniform level of family participation. Honey production/ year has a mean of 28.13 kg and a significantly higher standard deviation, reflecting considerable variability in annual honey yields among the families. These statistics offer a detailed snapshot of the central tendencies and dispersion in beekeeping practices and outputs among the study participants. The correlation analysis revealed significant relationships among the variables involved in honey production. The number of bee boxes per family demonstrated a strong positive correlation with experience in the field of honeybee rearing ($r = 0.87, p < 0.01$), indicating that more experienced beekeepers tend to manage a higher number of bee boxes. Similarly, the involvement of family members in beekeeping showed a moderate positive correlation with both experience ($r = 0.64, p < 0.01$) and the number of bee boxes per family ($r = 0.70, p < 0.01$), suggesting that more experienced and better-equipped families engage more members in beekeeping activities. Most notably, honey production per year was highly correlated with experience in beekeeping ($r = 0.89, p < 0.01$), the number of bee boxes ($r = 0.95, p < 0.01$), and the number of family members involved ($r =$

Table 2. Descriptive statistics of variables involved and correlation coefficients (Regression analysis)

Variables	Sample size	Range	Mean (S.E.)	S.D.
Experience in the field of honeybee rearing (years)	30	1-8	4.07 (0.34)	1.87
Number of bee boxes per family	30	2-10	4.63 (0.36)	1.96
Family members involved in bee keeping	30	1-5	2.77 (0.22)	1.19
Honey production per year (kg/ year)	30	14-55	28.13 (2.16)	11.86

Regression analysis					
Variables	B	S.E.	P value	95% CI	
Constant	1.04	1.87	0.58	-2.81	4.89
Experience in the field of honeybee rearing (years)	1.54*	0.75	<0.05	0.00	3.09
Number of bee boxes per family	4.36**	0.78	<0.01	2.77	5.96
Family members involved in bee keeping	0.22	0.81	0.79	-1.44	1.88

S.E.= Standard error; S.D.= Standard deviation; * $p < 0.05$; ** $p < 0.01$; B= coefficients; CI= Confidence interval

0.68, $p < 0.01$). These results suggest that the beekeeper's experience, the scale of operations, and the collective involvement of family members in beekeeping practices significantly influence honey production. Results of the regression analysis reveal that experience in the field of honeybee rearing had a positive and significant effect on honey production ($\beta = 1.54$, $p < 0.05$), indicating that each additional year of experience contributed to an increase of approximately 1.54 kg of honey/ year (Table 2). The number of bee boxes per family was also identified as a significant predictor ($\beta = 4.36$, $p < 0.01$), showing a substantial impact on honey production, where each additional bee box contributed approximately 4.36 kg of honey per year. Conversely, we found that the number of family members involved in beekeeping ($\beta = 0.22$, $p > 0.05$) did not significantly affect honey production. These findings underscored the importance of practical experience and resource allocation (bee boxes) over merely increasing the number of individuals involved in beekeeping activities. According to Masuku (2013), honey production was positively and significantly influenced by the experience of the beekeepers in honey production. The more experienced farmers tend to have better management skills of bee farming. Experience helps farmers to master complex practices in beekeeping (Masuku, 2013). Hauser and Lensky (1994), also found a significant influence of colony size with production of honey.

The current analysis highlights that in a developing country like India, which is well-suited for beekeeping and heavily reliant on agriculture, there is substantial potential for agro-based businesses. The survey indicates that beekeepers exhibit significant entrepreneurial potential. By evaluating their strengths and weaknesses, the results can enhance entrepreneurial prospects. Beekeeping agencies could create targeted training programs for beekeepers, offering policymakers a better understanding of their entrepreneurial potential and enabling them to design effective strategies for business development. Additionally, extension policymakers could implement tailored beekeeping programs for small and marginal holders to boost honey bee production in the future.

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AUTHOR CONTRIBUTION STATEMENT

The research conceived by the whole team. All authors read and approved the manuscript.

CONFLICT OF INTEREST

No conflict of interest.

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