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Research Article

Keywords: Honeybee, Artificial feeding, Sugar syrup, Beekeeping, Honey production

Posted Date: April 28th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9247230/v1

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Additional Declarations: No competing interests reported.

PRACTICES AND EFFECTIVENESS OF ARTIFICIAL FEEDING IN BEEKEEPING IN LAMJUNG DISTRICT, NEPAL

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ABSTRACT

The honey bee (*Apis cerena)* is an important insect for pollen collection and honey production and plays a crucial role in agricultural production, pollination, and honey yield in Lamjung district. The study was conducted from February to July 2025 in Sundarbazar, Rainas, and Besisahar Municipalities of Lamjung district under the Project Implementation Unit, Bee Zone, Lamjung of the PMAMP program. The research aimed to assess the current artificial feeding practices in beekeeping and their impacts on colony performance and honey production. A total of 94 beekeepers were selected through purposive sampling and Bee forage availability fluctuated seasonally, with autumn (Ashoj–Kartik) being the best honey flow period, while Poush–Falgun and the rainy season were identified as dearth periods requiring artificial feeding. Almost all respondents (98%) practiced artificial feeding, primarily every 15 days (37.23%). Sugar syrup (78.72%) was the most commonly used feed, followed by candy (12.77%) and pollen substitutes (5.32%), with a preferred water-to-sugar ratio of 1:2 (67%). Feeding was generally done at night using normal water. Artificial feeding significantly enhanced colony performance 95.74% of beekeepers reported improved colony survival during winter, 92.55% observed an increase in brood area, 82.98% noted higher honey yields, and 77.66% experienced better pollen collection. Major problems faced during feeding included robbing (index 0.82), aggressiveness (0.69), and disease risk (0.53). In honey production, pests and diseases (0.77), unfavorable climate (0.68), and high input costs (0.553) were key challenges. Major predators such as Yellow-throated Marten, Asian hornet, and Bee-eater birds were controlled through traditional methods. Overall, the study concluded that artificial feeding is a vital management practice enhancing colony health, productivity, and sustainability in Lamjung. It recommends strengthening training programs, promoting cost-effective feeding techniques, and improving market access to ensure the long-term success of apiculture enterprises in the region.

Key words: Honeybee, Artificial feeding, Sugar syrup, Beekeeping, Honey production

1. INTRODUCTION

1.1 Background information

Nepal is primarily an agricultural nation. Agriculture accounts for 24.10 % of the country's Gross Domestic product (NRB, 2024). According to MoALD, (2023) Agricultural employs 61.21 percent of total population. Fruits are used on a large scale in the country, which supports the livestock and sericulture industries, as well as cattle farming and beekeeping. Nepal has favorable conditions for all types of temperatures, from tropical to subtropical and even temperate. In Nepal, this form of farming, known as Apiculture, is growing quickly and has become a popular business as it is a less labor-intensive form of agriculture. Nepal is the only country in the world that can successfully produce honey in a large range of altitudes, ranging from 70 to 4,200 meters above sea level (Gautam et al., 2022). In the context of beekeeping, the presence of varied types of floral resources coupled with the favorable climatic condition renders Nepal a land of vast opportunities. Nepal has a carrying capacity of one million bee colonies producing more than 10,000 mt of honey per year, according to (Pokhrel et al., 2006). There are nine types of honeybee species in the world, eight of which are located in Asia. Of these, five species of economic importance are present in Nepal: *Apis cerana* (Asiatic honeybee), *A. dorsata* (Giant honey bee), *A. laboriosa* (Rock honeybee or Himalayan honey bee), *A. florea* (Little honey bee), *Apis mellifera* (European honey bee). *Apis mellifera* differs from the other four species as they are all indigenous to Nepal. *A. cerana* is the only domesticated bee species, while the rest still exist in the wild. Weighing up to 300mg, *Apis laboriosa*, also known as Himalayan cliff bee, is the largest bee and *A. florea* is the smallest, rather dwarf honey bee. *Apis mellifera* are dominantly kept by farmers in the Terai region, whereas *A. cerana* is common in the hills. Beekeeping is done using both modern beehives and local wooden log hives. Rural mountain farmers use traditional wooden log hives to keep *A. cerana* however, urban farmers use modern beehives for both *A. cerana* and *A. mellifera* in the lowland Terai region. It is estimated that Nepal has potentiality to produce over 10,000 mt of honey (Pokhrel et al., 2006) but only 3990 mt of honey was produced in Nepal from 242,500 hives in the FY 2018/19. At present, different *Apis* spp. in Nepal is always on a low of 4 metric tons, whereas the nation spends over 300 metric tons of honey every year, demonstrating the deficiency of development in our country's apicultural industry. Research has revealed that farmers are having difficulties when running their enterprise and are also faced with a number of limitations and problems. Most of beekeepers

still lack knowledge in the production database of honey and other apiary commodities, the cost of production of honey for good business, profitability, marketing route, etc. identifying Lamjung as one of the most promising districts in terms of available apicultural raw materials, manpower, and market still needs to be substantiated. Either in traditional or modern hives, *Apis cerana* is principally reared bee species in this district. According to Lamjung Annual Report the total production of honey in Lamjung district is only 35 mt from 9500 beehive (AKC, 2079). Now, according to recent Lamjung Annual Report the total production of honey in Lamjung district is 89.65 mt from 6700 beehive (PMAMP, 2080).

1.2 Statement of the problem

Lamjung has prominent contribution in the overall honey production of Nepal. But insufficient trainings and knowledge, poor management practices and low technological dissemination have been major problem to commercial honey production. Similarly, beekeeping success in Lamjung is hindered by pests, diseases, pesticides, and climate factors (Belsky & Joshi, 2019), due to which farmers are demotivated and problem of smallholder farmers negatively affected the honey production. Lack of trainings and knowledge and appropriate management practices including queen production, artificial feeding, pests, diseases, and predators further weaken colonies, limiting expected outcomes (Thapa & Manandhar, 2000). As a result, absconding, problem of egg laying workers, predators and pest have been common and major problems among beekeepers of Lamjung. Beekeepers of Lamjung district are still not aware about the basic management practices due to which colony expansion is limited. The basic knowledge about management practices is prerequisite for commercial beekeeping and only the way to overcome the major problems seen among the beekeepers of Lamjung district of Nepal. Absconding due to inappropriate colony management is the major constraint in the district and beekeepers fail to produce healthy and strong colony as well as sufficient amount of honey, regardless of apiculture potential in the study area.

1.3 Rationale of study

Low-cost honey production technology with proper feeding management, mite and other pest's management are prerequisite for good honey production (Bhusal, & Kafle, 2021). The poor knowledge on apiary management practices among farmers caused different problems and challenges in beekeeping. This study aims to evaluate the farmer's knowledge and attitude towards apiary management practices including the feasibility of artificial feeding

among the farmers. Inadequate knowledge on beekeeping, low number of trained manpower, poor availability of modern bee equipment, honeybee disease and predators that limit the bee management practice (Bahadur, 2023).This study focuses on understanding farmer problems and common management practices carried out in their beekeeping operation which will help to find out the weakness of beekeeping and management practices and helps to organize required trainings on management practices.

1.4 Objectives

1.4.1 General objective

To assess the current artificial feeding practices in beekeeping in Lamjung district.

1.4.2 Specific objectives

- ✓ To identify the forage situation of bee in Lamjung.
- ✓ To assess the major substances adopted for artificial feeding practices by commercial beekeepers in Lamjung.
- ✓ To evaluate the impact of artificial feeding on colony health and honey production in Lamjung.
- ✓ To determine the major problem of honey production in Lamjung.

1.5 Scope and limitations of study

Beekeeping is recognized as a high-value agricultural enterprise in Lamjung district and serves as an important source of income and livelihood security for rural households. Honey production and other hive products significantly contribute to improving family income while supporting the local and national economy. Beekeeping in Lamjung has been found to be more profitable compared to several competing agricultural activities due to the district's rich floral diversity and favorable climatic conditions. This research helps to identify the existing practices, challenges, and adoption of improved beekeeping techniques among beekeepers in Lamjung district. The research studies in social science do face some limitations, and the present research study is no exception to this.

The study has the following limitations:

Differences in beekeepers' educational levels, experience, and access to information may affect their understanding and implementation of recommended practices, leading to varied adoption rates and heterogeneous outcomes among respondents.

2. REVIEW OF LITERATURE

2.1 Beekeeping in Nepal

Beekeeping is the science of controlling and managing honeybee colonies for human consumption. Beekeeping, also known as honey production, has been practiced by the rural communities of Nepal for a long time. Nepal's topography, climate, and floral diversity make beekeeping possible. The largest honeybee (*Apis laboriosa*), Asian bee (*Apis cerana*), rock bee (*Apis dorsata*), and little honeybee (*Apis florea*) are said to be indigenous to Nepal (Abrol, 2007).

Table 1. Number of beehives and honey production in the past 10 years in Nepal

Beekeeping and honey production status		
Years	Number of beehives	Production (mt.)
2012/13	169,000	1,625
2013/14	170,000	1,650
2014/15	222,000	3,000
2015/16	232,000	3,500
2016/17	240,000	3,950
2017/18	242,000	3,980
2018/19	242,500	3,990
2019/20	248,037	3,997
2020/21	249,680	4,062
2021/22	248,995	5,168
2022/23	245,010	4,308

(Source: MoALD, 2023)

The data of number of beehive and honey production shows a steady increase in beekeeping activity and honey production in Lamjung over the three fiscal years.

Table 2. Beekeeping and honey production in Lamjung, 2025

Year	Number of beehives	Production (mt)
2078/79	5000	66
2079/80	6500	87.98
2080/81	6700	89.65

(Source: MoALD, 2024)

2.2 Apiary management practices

Apiary management practices are the methods and techniques used to care for and maintain beehives and bee colonies in an apiary. Good management practices must be developed with proper training and experience (Agrebi et al., 2021).Honey production by Apis cerana in Asia has long been kept low by primitive management methods. There were few colonies and low honey yields, both of which increased when new methods of beekeeping and queen rearing were adopted (Verma, 1990).

2.2.1 Seasonal colony management

Seasonal colony management is the set of management practices designed to meet the different needs of a colony throughout the year (ICIMOD, 2012). Modern beekeeping requires effective colony management to enhance honey production, divide colonies, produce other bee products, and provide pollination services. Insufficient management procedures and inadequate training led to low yields of honey and other beekeeping products (Bhusal & Thapa, 2005).

Honeybees require pollen and nectar, which are only available during specific periods.
Honey flow season occurs when there is an abundance of food resources. During a dearth period or off season, there will be scarcity of food. Local knowledge of bee flora and seasonal colony management strategies are crucial for modernizing the beekeeping industry (Kumar et al., 2014)

Table 3. Honey flow and dearth periods at different altitudes in the Himalayas

Regions	Honey flow season	Off season (dearth)
High hills	April, May, June, July, August	September, October, November, December, January, February, March
Mid hills	April, May, September, October, November, February, March	June, July, August, December, January
Foot hills and plain areas	April, October, November, December, January, February, March	May, June, July, August, September

(The honey flow and off (dearth) seasons vary according to forage source and exact location)

(Source: ICIMOD, 2012)

2.2.2 Feeding management

Honeybees *(Apis mellifera*) live in a wide geographic range occupying various climatic regions and face different challenges in different parts of the world and times of the year (Ruttner, 1988).The availability and the nutrients in the hive determine the health, longevity and development of honeybee colonies. However, off-season periods, such as rainy and winter seasons, pose significant challenges due to the scarcity of these resources. The plant flora changes according to the season and this effect colony development (Radev et al., 2014). During winter season, weather conditions are not suitable for bees and the availability of food (nectar and pollen) resources is very low (Kumar & Agrawal, 2014). To mitigate these challenges, beekeepers must provide alternative feeds. For nectar alternatives, sugar syrup (1:1 ratio) is commonly used, while pollen substitutes, such as soybean flour, brewer's yeast, or pollen patties, ensure adequate protein intake for brood development and colony health (Aryal et al., 2015). High overwintering mortality rates of honeybee colonies have been reported in many countries, and low temperature during winter has been considered as a cause of honeybee colony losses (Neumann & Carreck, 2010). Also, colony losses are often attributed to poor nutrition and starvation (Brodscneider & Crailsheim, 2010).Those who are willing to initiate the beekeeping enterprise, must manage the artificial feeding during severe winter and rainy months and management when necessary (Bista & Shivakoti, 2000). Supplement diet for the honeybee study resulted that low dose sugar syrup combined with 30g pollen substitute diet was suitable for off-season honeybee colony management which also

helps high rate of flight activities (Aryal et al., 2015). It had been found from the experiment that the cost of sugar feeding during off-season can be reduced by more than 50% by feeding bees with bananas and the bees collected and stored the lowest amount of pollen and produced the least number of broods during rainy season (Neupane & Thapa, 2005).The shortage of pollen and decline of brood production during rainy season is directly associated with the washing of pollen grains through heavy and continuous rain.

Honey harvesting in the study area was mainly conducted in October and November, aligning with the availability of key nectar and pollen sources. Beekeepers did not practice migratory foraging, relying instead on local flora. Effective honey production required large, populous colonies during major honey flows, which depended on beekeepers' knowledge of flowering periods and the main nectar- and pollen-yielding plants. Monitoring bee plant availability and periods of dearth was essential for colony management. Artificial feeding was commonly applied during the rainy season and in December to prevent food shortages when major floral resources were scarce (Bhattarai , 2023).

2.2.3 Swarming and absconding management

Swarming is a natural phenomenon which occurs each year on seasonal basis. The reigning queen along with 60% of workers and drones come out to form a new colony (Winston, 1987). A few hypotheses have been projected for explaining the causes of reproductive swarming in honey bee species which include excess number of young bees that result in too much brood food, limited space for brood, overcrowding of adult worker bees and reduced transmission of queen pheromone among the workers (Hyatt, 2012).

Apis cerana bee has a high tendency of absconding behavior and migration creating problems to the farmer than *Apis mellifera* (Baidhya et al., 1997). According to (Radloff et al., 2011), there are two types of absconding in honeybees. First is the seasonal absconding or migration caused by the depletion in resources, decline in quality of nest and chronic disturbance. The other is the disturbance absconding that is caused by the acute disturbing factors such as fire, flooding or some interventions by the beekeepers. The disturbance absconding is also regarded as a sudden phenomenon where no preparation occurs before absconding whereas in case of seasonal absconding there is a preparation time prior to moving which lasts for few days to weeks, when there is reduction in foraging, honey and brood levels (Radloff et al., 2011). Predators, pests as well as robbing against the *Apis cerana* colonies are generally regarded as major factors responsible for prepared absconding throughout Asia (Verma,

1992).One of the experiment shows that absconding of *A. cerana* colonies under Chitwan condition occurred during summer and rainy dearth in May and July due to short supply of nectar and pollen, unfavorable climatic conditions and parasitic and predatory pressures (Pokhrel et al., 2006). According to the key informant interview (KII), the beekeepers of Lamjung identifies the shortage of forage, incidence of diseases and pest, especially wax moth, and poor dearth period feeding management as the major causes of absconding.

2.2.4 Queen and laying worker management

A queen's quality has a critical role in beekeeping success. Genetic progress requires constant selection and multiplication of the fittest colonies. The genetic quality of the queen affects several aspects of the colony, including population growth, the ability to collect pollen and nectar, storage capacity, resilience to disease, and kindness. Requeening colonies once a year keeps them robust and healthy. Queen production is carried for requeening of a queen-right colony or queening of a queen less colony to sale queens to others and to sale colonies through colony multiplication. Two methods are employed for queen production; Natural and Artificial. Natural method includes Swarming, Supersedure and Emergency. Artificial method includes grafting a queen cell (Gurung et al., 2012).

When a new queen is unable to emerge from the queen cells, worker laying occurs. When a queen dies, the workers attempt to become queens by laying eggs because the queen's pheromone controls their desire to lay eggs. A worker-laying colony that does not have a queen will gradually die unless it is given a new queen since worker bees can only lay drone (male) eggs. The only way to fully address worker laying is to replace the lost queen, but before that can happen, the laying workers must be eliminated to prevent them from killing a new queen or queen cell (Saville & Acharya, 2001).

2.2.5 Comb foundation management

Comb foundation is a sheet made of beeswax which is used in modern beekeeping to speed up the process of building combs regularly. Comb foundation has several advantages; it makes beekeepers easier to inspect and replace combs, honey harvesting with an extractor is faster and does not break the combs so that they can be reused, collection and storage of hive product is faster, and also combs are stronger and will not be damaged during migration (Gurung et al., 2012).

3. METHODOLOGY

This chapter consists of different tools and techniques for research procedures, such as conceptual framework selecting the study area, selecting a sample, identifying sources of information, using data collection techniques, and analyzing data.

3.1 Conceptual framework

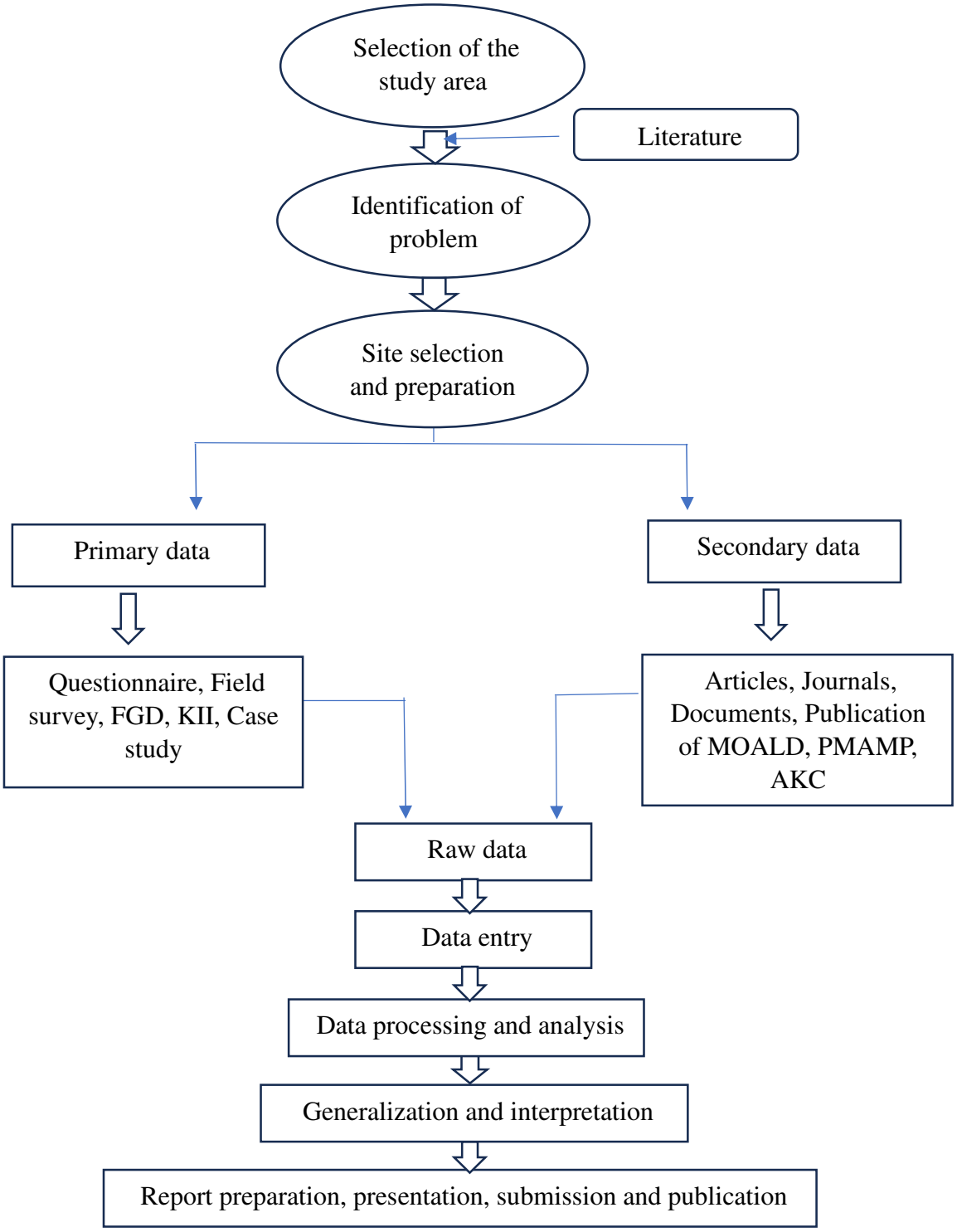


Figure 1. Conceptual framework

3.2 Selection of the study area

The sites selected for the study were mainly Rainas, Sundarbazar and Besisahar municipality of Lamjung district, Nepal. The sites were selected purposively through purposeful criteria: the majority of the beekeepers were available in these sites; representatives of diverse geographical and socio-economic characteristics were available. Similarly, kwholasothar, Madhyanepal and Dudhpokhari Gaupalika of Lamjung district were visited and interviewed during this study. Hence, 6 study sites were selected in total.

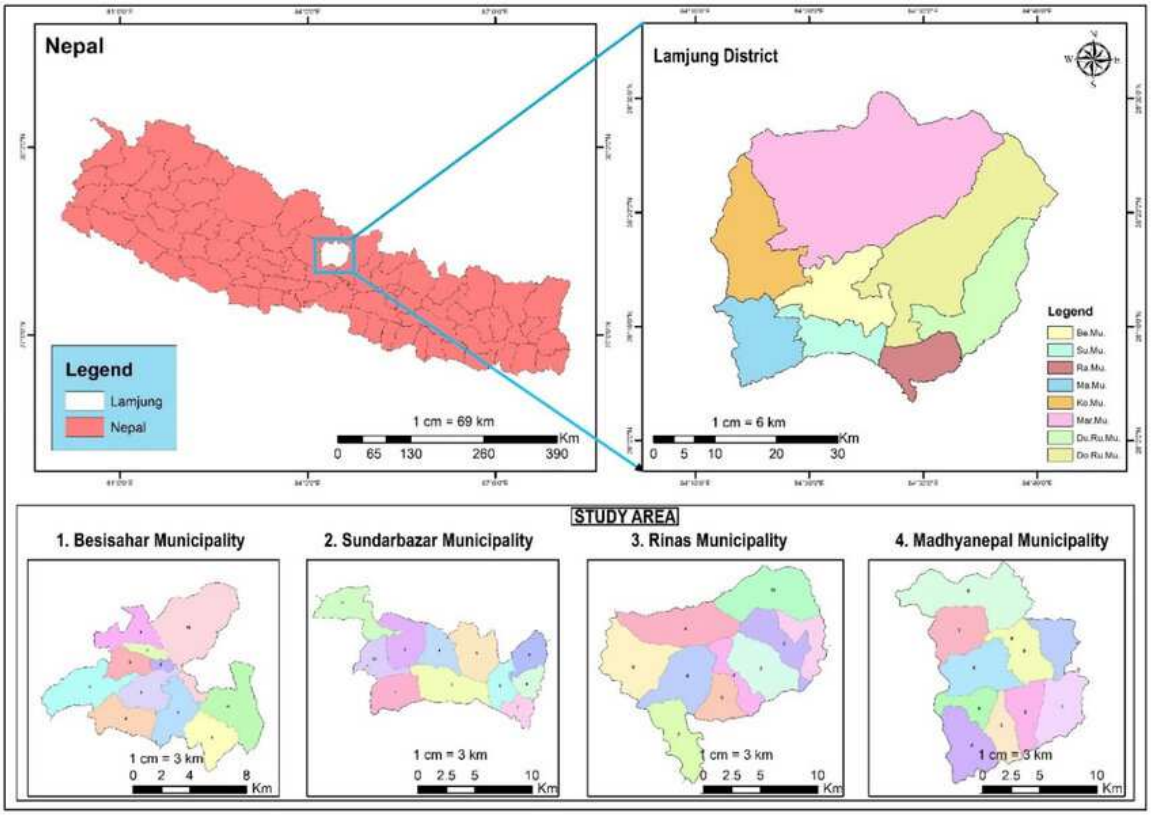


Figure 2. Map of study area

3.3 Population sample and sampling technique

Farmers rearing *Apis cerana* were the target population of the study. According to the progress report book of PMAMP Lamjung; there were total of 780 registered farmers in Lamjung district. Hence, sample size estimation was done by using Yamane's (1967) formula at 10% as the margin of error.

Sample size (n) = $\frac{N}{1+Ne^2}$

Where, N = Population size, e = Margin of error

A total of 94 beekeeping farmers were selected for interviews. The information about registered beekeepers, including their names and addresses, was sourced from PMAMP in Besisahar, Lamjung. The selection of respondents was carried out through purposive sampling.

Table 4. Sample distribution among the local administrative divisions

S.N.	Survey area	Number of beekeepers
1.	Sundarbazar	24
2.	Besisahar	24
3.	Rainas	25
4.	Dudhpokhari	2
5.	Madhyanepal	8
6.	Kwholasothar	11
	Total	94

3.4 Preliminary study

A preliminary study was conducted to gain an initial understanding of the beekeeping practices, major forage availability, and ongoing artificial feeding trends in the study area. Informal discussions with local beekeepers, field observations, and consultation with key stakeholders were carried out to identify the existing management practices, feeding methods, and seasonal challenges faced by beekeepers. The insights obtained from this preliminary assessment were used to refine the research tools and finalize the questionnaire for the main survey. The pre-testing of questionnaire was conducted to 10 to 15 farmers in adjoining areas of the research site and the final questionnaire was prepared by incorporating the feedback and difficulties encountered during the pre-testing.

3.5 Research design

Personal interviews were used to collect data, and the respondents were asked questions based on an interview schedule and checklist to obtain the desired information. In addition, Key Informant Interview (KII) and Focus Group Discussion (FGD) were conducted primarily to cross-check and validate the data and information gathered from the scheduled interviews, and secondarily to gather further qualitative information.

3.6 Data sources and types

To collect the necessary information, a variety of sources and techniques was employed. Both primary and secondary data were collected and analysed. All the beekeepers serve as the primary sources of data. Secondary information was gathered from documents from various institutions and organizations by reviewing different articles, journals, documents, and publication of MoALD, NARC, PMAMP, AKC of Lamjung district.

3.6.1 Primary data

Primary data were gathered by researcher and usually done for survey research. Primary data was collected by conducting Household survey, Field Observation, Key Informant Interview (KII), Rapid Market Appraisal (RMA), FGD and by Questionnaire survey.

3.6.2 Household survey

Data was collected through a household survey, using a semi-structured questionnaire that includes both closed and open-ended questions, as well as pre-tested interview schedules. Additionally, field observations were also conducted to gather additional information.

3.6.3 Key Informant Interview (KII)

KII was conducted with progressive farmers, farmer leaders and local extension workers to seek some key information about the overall trend of Beekeeping and honey production in the study area. These interviews were conducted with the help of semi-structured checklist.

3.6.4 Field observation

Frequent visit to commercial as well as subsistence bee farm was done as far as possible. This observation was very helpful to develop an idea about current scenario of beekeeping production at grass root level of the study area.

3.6.5 Focus Group Discussion (FGD)

After the completion of the household survey, Focus Group Discussion (FGD) was conducted with 5-8 participants to cross-check and validates the results. The FGD aims to capture any information that may have been missed during the household survey. A pre-prepared checklist of questions was used to guide and facilitate the discussion, and the outcomes were recorded in a notebook. The FGD includes local farmers of all ethnicities, genders, and backgrounds to ensure diverse perspectives are represented, and accurate information is obtained. It was held

at Sundarbazar and Rainas area where beekeepers actively participated during basic level training on beekeeping.

3.7 Secondary data

The research study collected secondary data from a variety of sources, including newspaper articles, annual reports, and publications from the PMAMP, reports from the Ministry of Agriculture Development (MoALD), NARC, various NGOs and INGOs, PMAMP, and published materials such as research articles and journals.

3.8 Data analysis

Data analysis in this study will involve processing the large volume of information obtained from field research. To systematically record and retrieve information for future use, it is necessary to reduce the voluminous text by coding and classifying related concepts. The raw data collected from the field will be analysed to conclude. Both primary and secondary information obtained from the field survey and other methods were coded, tabulated, and analysed using Stata, Statistical Package of Social Science (SPSS), and Microsoft Excel. Quantitative and descriptive analysis was done to analyse different variables in the study.

3.8.1 Descriptive analysis

The farmers were categorized into two groups, i.e., Subsistence, medium scale, semi-commercial, and commercial. Variables like gender of respondents, family size, education status, sources of income, etc., will be analysed by using simple descriptive statistics such as frequencies, percentages, mean, standard deviation, and so on.

Problems in beekeeping, Challenges faced in artificial feeding, Training needs, and Trends of beekeeping enterprise were ranked by the scaling technique. It was computed by using the following formula:

Mathematically, $Imp = \sum (Sifi) / N$ Where,

Imp: Index of importance

$\sum$: Summation

Si: Scale value

Fi: Frequency of respondent

N: Total number of respondents

4. RESULTS AND DISCUSSION

This section deals with the results and discussion of the research based on the primary and secondary data obtained by using the materials and methodology described in the earlier section. It is divided into the following sub-sections.

4.1 Socio-economic and demographic characteristics of beekeepers

The data collected in this study regarding socio-economic characteristics of respondents were age, gender, family size, ethnicity, and education level, primary source of income, economically active members, and years in beekeeping. In the Nepalese context, the major decisions regarding agricultural activities are made by the household heads. Adaptation regarding modern honeybee farming Practices cannot be done without the agreement of the household head. That's why the information regarding the age and the level of education of the household head was taken into consideration.

Regarding age, the average age of the farming household head was 47.65. The experience of farmers in beekeeping in average was 8.17 years, ranging from a maximum of 23 years to a minimum of 2 years. The average household size was found to be 5.18, ranging from 2 to 11. The average male and female numbers were 2.64 and 2.55, respectively, ranging from 1 to 6 and 1 to 5, respectively.

The sampled population was categorized into 4 different groups according to the number of bee colonies they own, i.e., <50, 50-100, 100-150, and >150 colonies, and are defined as subsistence, small scale, medium scale, and commercial farmers, respectively (Gurung et al., 2024).The average number of bee colonies was found to be 43.44, ranging from 5 to 350. In the study area, the average economically active member was 1.32 with the dependency ratio of 0.28. It means that 100 beekeepers had to fulfil the basic requirement of 28 members in the study area.

Table 5. Socio-economic characteristics (continuous variable) of beekeepers of Lamjung, 2025

Variables	Minimum	Maximum	Mean ± Standard deviation
Age of respondent	26	73	47.65 ± 11.77
Family size	2	11	5.18 ± 1.65
Economically active members	1	3	1.32 ± 0.51
Number of male	1	6	2.64 ± 0.99
Number of female	1	5	2.55 ± 1.01
Total number of bee colonies	5	350	43.44 ± 56.17
Beekeeping experience	2	23	8.17 ± 5.03
Dependency ratio	0.09	0.75	0.28 ± 0.13

(Source: Field survey, 2025)

Dependency ratio= Dependent members/Economically active members (KC & Paudel, 2023)

Table 6 showed the responses about gender, ethnicity, religion, education status, started beekeeping as and family type of the household were collected. Out of 94 respondent, 81.9% male and 18.1% female headed family was found among the beekeeping farming community.

The ethnicity was categorized as Brahmin, Chhetri, Dalit and Janajati. From the table, it is evident that Janajati (68.1%) was dominating group among them followed by Brahmin (17%), Chhetri (11.7%) and Dalit (3.2%).

The religion of the respondents was categorized as Hindu and Buddhist among which major religion was found to be Hinduism (51.1%) which is more or less equal to Buddhist (48.9%) as shown in table 6.

Regarding the education status of the respondent as shown in table above, 1.1%, 24.5%, 47.9% and 26.6% of the beekeepers were illiterate, primary level, secondary level and higher level (university level) education respectively.

The farmers had started their beekeeping as a primary source of income and as additional source of income which were categorized accordingly. Among the sampled population, 25.5% had started beekeeping as their primary income source while 74.5% had started beekeeping just as their additional income source.

The type of family was categorized as joint and nuclear family and 64.9% were found to have nuclear family and 35.1% of beekeepers were found to have joint family.

Table 6. Socioeconomic and demographic characteristics (categorical variables) of beekeepers of Lamjung, 2025

Variables	Frequency	Percentage
Gender of HHH		
Male	77	81.9
Female	17	18.1
Ethnicity of the respondent		
Brahmin	16	17
Chhetri	11	11.7
Dalit	3	3.2
Janajati	64	68.1
Religion of the respondent		
Hindu	48	51.1
Buddhist	46	48.9
Education Status		
Illiterate	1	1.1
Primary level	23	24.5
Secondary level	45	47.9
Higher level	25	26.6
Started beekeeping as		
Primary economic activity	24	25.5
As an additional source of income	70	74.5
Family type		
Nuclear	61	64.9
Joint	33	35.1

(Source: Field survey, 2025)

4.2 Relationship between socio-economic characteristics and farmer categories

Table 7. Socio-economic characteristics (continuous variable) of beekeepers with farmer's category of Lamjung, 2025

Variable	Between Groups (SS)	Df	Mean Square	Standard Deviation	Standard error	F	Significance
Age of Respondent	239.48	3	79.82	11.77	1.21	0.58	0.638^{ns}
Family Size	7.91	3	2.63	1.64	0.17	0.93	0.409^{ns}
Number of Male Members	2.37	3	0.79	0.99	0.10	0.79	0.498^{ns}
Number of Female Members	6.15	3	2.05	1.01	0.10	2.07	0.11^{ns}
Economically Active Members	0.16	3	0.54	0.51	0.05	0.19	0.897^{ns}
Dependency Ratio	0.01	3	0.04	0.13	0.13	0.20	0.895^{ns}

(Source: Field survey, 2025)

Note: ns indicate non-significant, Df indicate degree of freedom.

The distribution of socio-economic characteristics (continuous variable) with the farmers category is described in above table 7. This table shows the result of ANOVA test showing relationships between selected socio-economic characteristics of sampled households and farmers categories. The F-static and significance values indicate whether there is statistically significant difference among groups or not.

The variation between the farmers category i.e. subsistence to commercial farmers due to age is 239.46. Since the p value due to age is 0.638; this means the age of respondents is non-significant. The variation between the farmer categories due to size of family is 7.91 and the p

value due to it is 0.409; this means that the family size doesn't show any significant difference.

The variation between the farming categories due to number of male and female is 2.37 and 6.15 respectively and their p value is 0.498 and 0.11 respectively. It indicates that the number of male and female do not implies any variation due to which it shows non-significant result.

But there is too little variation between the farming categories because of economically active members and dependency ratio i.e. 0.16 and 0.01 respectively. Due to it, the p value is higher in them i.e. 0.897 and 0.895. It means that there is no meaningful difference across different farming groups due to these two variables.

Overall, the findings highlight that all the demographic variables, remain relatively uniform across groups.

Table 8. Distribution of socio-economic characteristics (categorical variable) with farmer's category of Lamjung, 2025

Variables	Farmer's category				Chi-Square value	p-value
	Subsistence	Small scale	Medium scale	Commercial		
Gender (Male)	53	16	4	4	4.68^{ns}	0.19
Ethnicity					14.01^{ns}	0.12
Brahmin	13	2	1	0		
Chhetri	11	0	0	0		
Janajati	43	15	2	4		
Started (additional source)	60	9	1	0	26.61***	0.00
Education status					12.84^{ns}	0.17
Secondary	27	10	4	4		
Higher level	20	5	0	0		
Family type (Nuclear)	49	8	3	1	6.48*	0.09

(Source: Field survey, 2025)

Note: ns indicate non-significant, ***, ** and * indicate 1%, 5% and 10% levels of significance respectively.

The distribution of socio-economic characteristics (categorical variable) with the farmer's category is described in Table no. 8. With respect to gender of the household head, 53, 16, 4, 4

were male under subsistence, small scale, medium scale and commercial level category of farmer's respectively, the difference in gender was however statistically non-significant.

Janajatis were the dominating ethnic group in all the farming categories although the chi-square testing doesn't show any statistically significant difference due to ethnicity. The household head who had started beekeeping as additional source is higher in subsistence level farmers, and the difference between them is statistically highly significant at 1% level.

Among different levels of education, many sampled farmers were literate among secondary level and higher level (university level) but the difference caused by it is also found to be non-significant. On average; 49, 8, 3 and 1 were under nuclear family on subsistence, small scale, medium scale and commercial level category of farmer's respectively and the difference between them is statistically significant at 10% level.

4.3 Information and apiary management practices

Information and apiary management practices among beekeepers in the study area largely depend on the availability of floral resources and the knowledge level of beekeepers. The following sub-sections describe in details.

4.3.1 Bee forage situation

According to selected beekeepers in Lamjung District, the availability of flowering plants for bees changed throughout the year, affecting the nectar and pollen they collected. In winter (Mangsir – Magh), only a few plants like Mustard, Chiuri and Paiyu bloomed, so bees had limited food. Spring (Chaitra – Baisakh) was the best season, with many plants such as Sal, Mango, Litchi, Naspati, Amala, Aarubakhada and Coffee providing plenty of nectar and pollen for colony growth and honey production. During the summer/monsoon (Asar – Shrawan), Katus, Maize, Patke, Maledo, and Rice bloomed even in the rain, helping bees stay active. In autumn (Bhadra – Kartik), Chilaune, Rudhilo, Kalikath, and Katus supplied post-monsoon nectar to prepare bees for winter. A dearth period occurred in Poush and early Falgun, early Chaitra when most flowers stopped blooming, despite of large number of flower blooms during monsoon due to rain there is scarcity of nectar and pollen, to compensate this problem the beekeepers had to feed bees artificially to keep colonies healthy. Understanding these flowering patterns helped beekeepers plan colony management and improve honey production.

Table 9. Seasonal forage situation of Lamjung, 2025

Season	Flowering months	Main flora
Winter flow	Mangsir – Magh	Mustard, Chiuri, Paiyu
Spring flow	Chaitra – Baisakh	Sal, Mango, Litchi, Naspati, Amala, Aarubakhada, Coffee
Summer/monsoon flow	Asar – Shrawan	Katus, Maize, Patke, Maledo, Rice
Autum flow	Bhadra – Kartik	Chilaune, Rudhilo, Kalikath, Katus

(Source: Field survey, 2025)

4.3.2 Management of the shortage of forage

According to field survey (2025), the species mainly cultivated in lamjung district was *Apis cerana*, and modern beehives were preferred by most of the farmers for beekeeping. Almost all (98 %) selected respondent beekeepers of lamjung district adopt artificial feeding at their apiary management practices**.**

4.4 Trend of feeding

Artificial feeding practices among beekeepers in the study area show a growing trend as a major strategy to support colonies during periods of nectar shortage. Most beekeepers frequently rely on sugar syrup and locally available feed materials to maintain colony strength, particularly during dry seasons and floral-dearth periods. The following sub-sections describe key aspects of artificial feeding adopted by beekeepers

4.4.1 Frequency of artificially feeding in colonies

Based on the survey data the frequency of feeding, it was observed that the majority of respondents preferred feeding their bees every 15 days, accounting for 37.23% of the total. This was followed closely by those who fed their bees every 7 days, representing 26.60%, and every 10 days, at 25.53%. A smaller proportion of beekeepers, 10.64%, reported feeding their bees only occasionally. This indicated that most beekeepers maintained a relatively regular feeding schedule, with a significant number favoring a biweekly routine, while only a few adopted irregular or sporadic feeding practices.

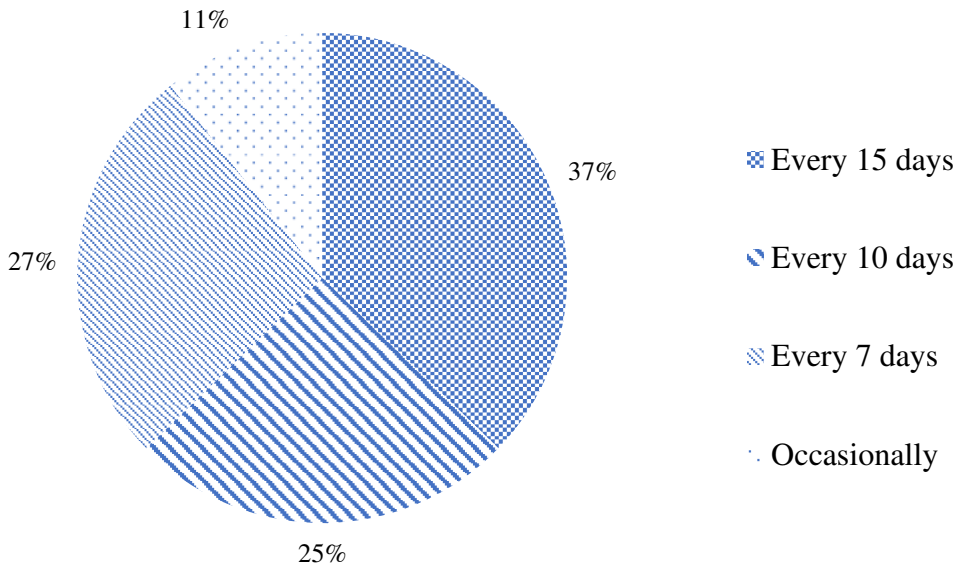


Figure 3. Frequency of feeding interval

(Source: Field survey, 2025)

4.4.2 Materials used for feeding

From the table. 10 data, the majority of beekeepers (78.72%) fed their bees with sugar syrup, with a frequency of 74. This was followed by candy, which was used by 12.77% of beekeepers (frequency 12), and pollen substitutes, used by 5.32% (frequency 5). A small proportion, 3.19%, reported using other types of feed (frequency 3). This indicates that sugar syrup was the most commonly preferred artificial feed among beekeepers, while other types of feed were used less frequently.

Table 10. Types of artificial feeding adopted by beekeepers of Lamjung, 2025

Types of artificial feeding		
Feed	Percent	Frequency
Sugar syrup	78.72	74
Candy	12.77	12
Pollen substitute	5.32	5
Other	3.19	3

(Source: Field survey, 2025)

Materials used by respondent during preparation of feed.

Table 11. Materials used by beekeepers of Lamjung during preparation of feed, 2025

Feed	Ingredients
Sugar Syrup	sugar, water (sometimes with added honey)
Candy	Sugar, glucose, sometimes honey, sometimes lactogen
Pollen substitute	Soyabean flour, chickpea flour, powdered pollen, sugar, vitamins, and sometimes milk and egg yolk
Other	Could include honey substitutes, fruit juices, or locally available ingredients

(Source: Field survey, 2025)

During the study period, it was observed that sugar syrup was feed by frame feeder and the most efficient, economical, and easy-to-prepare type of artificial feed, which led to its widespread adoption among beekeepers in Lamjung district. Farmers reported that *Apis cerana* readily accepted sugar syrup, making it more effective for maintaining colony strength and ensuring consistent nutrition compared to other feeding options. In contrast, pollen and protein substitutes were rarely consumed by *Apis cerana*, limiting their practical use in routine colony management. Additionally, it was noted that candy, which is a mixture of sugar and honey, proved to be a convenient alternative feed during the rainy season. Candy had the advantage of staying in the hive for 2–3 days, according to the respondents, thereby reducing the frequency of hive openings and minimizing disturbances to the bees. This characteristic made candy particularly useful during periods when frequent feeding was impractical due to adverse weather conditions. Overall, sugar syrup remained the preferred choice for most beekeepers, while candy served as a supplementary feed under specific seasonal conditions, and pollen/protein substitutes were less favored.

4.4.3 Time of feeding and types of water for preparation of sugar syrup

Beekeepers fed their colonies at night time throughout the year. During winter, most beekeepers used normal water to prepare sugar syrup, although some occasionally used lukewarm water. In summer and rainy seasons, the majority consistently used normal water.

Overall, normal water was the preferred choice across all seasons, with temperature adjustments only made during colder periods.

4.4.4 Ratio of sugar syrup

The survey on artificial feeding in beekeeping revealed that beekeepers used different water-to-sugar ratios when preparing sugar syrup for their colonies. The most commonly used ratio was 1:2 (water to sugar), which was preferred by 67% of the respondents, indicating that they tended to provide thicker syrup. About 29.8% of beekeepers used a 1:1 ratio, showing that a moderate consistency was also fairly popular. Only a small proportion, 3.2%, used a 2:1 ratio, representing very thin syrup. These results suggested that the majority of beekeepers favored thicker sugar syrup when feeding their honeybee colonies.

Table 12. Sugar syrup ratio adopted by beekeepers of Lamjung, 2025

Water: sugar	Frequency	Percent
1:1	28	29.8
2:1	3	3.2
1:2	63	67

(Source: Field survey, 2025)

4.4.5 Improvements noticed after artificial feeding.

From the table. 13 it was shown that after artificial feeding, significant improvements were observed in the performance of bee colonies. Most beekeepers (95.74%) reported enhanced colony survival during winter, indicating that supplemental feeding helped colonies withstand periods of forage scarcity. Increased pollen collection was noted by 77.66% of respondents, suggesting that the colonies were more active and better able to gather protein sources for brood rearing. A larger brood area was observed by 92.55% of beekeepers, reflecting improved queen egg-laying and colony growth. Additionally, 82.98% of respondents recorded higher honey production, showing that well-nourished colonies were more efficient in foraging and nectar processing. Overall, artificial feeding positively affected colony health, brood development, pollen collection, and honey yield.

Table 13. Improvements noticed after artificial feeding by beekeepers of Lamjung, 2025

Improvements noticed after artificial feeding		
Improvements	Frequency	Percent
Colony survival in winter		
Yes	90	95.74
No	4	4.26
Pollen collection		
Yes	73	77.66
No	21	22.34
Increased brood area		
Yes	87	92.55
No	7	7.45
Higher honey production		
Yes	78	82.98
No	16	17.02

(Source: Field survey, 2025)

4.4.6 Problems arising during artificial feeding in the study area

Table. 14 presents the problems encountered by beekeepers during the artificial feeding of honeybees, ranked based on their calculated index values. The major five problems were insufficient training, risk of disease transmission, increasing robbing tendency, cost and aggressiveness. The farmers were asked to rank these problems. Forced ranking scales were used for scaling by giving score of 5 to the most severe problem and descend the score on less severe problems. The index value was obtained and ranking was done based on high index value.

Among the identified issues, robbing (index value = 0.82) was ranked as the most serious problem. This indicates that during artificial feeding, bees often attempt to rob feed or honey from neighbouring colonies, which can lead to colony stress and loss of productivity.

The second major problem was aggressiveness of bees (index value = 0.69), suggesting that bees tend to become more defensive or irritable during feeding, possibly due to disturbances or feed competition. Disease transmission risk (index value = 0.53) ranked third, showing that

shared feeding equipment or improper management practices can increase the likelihood of disease spread among colonies.

Cost of artificial feed (index value = 0.50) ranked fourth, reflecting that although expenses are a concern, they are less critical than behavioural and health-related challenges. Insufficient training (index value = 0.48) was ranked fifth, implying that lack of proper knowledge and skills in feed preparation and feeding techniques still exists but is comparatively less severe.

Overall, the results reveal that behavioural and biological issues such as robbing, aggressiveness, and disease risk are the main challenges during artificial feeding, while economic and technical issues like cost and training are of lesser concern.

Table 14. Ranking of the problem related to artificial feeding faced by beekeepers of Lamjung, 2025

Problems	Index value	Rank
Robbing	0.82	I
Aggressiveness	0.69	II
Disease transmission risk	0.53	III
Cost	0.50	IV
Insufficient training	0.48	V

(Source: Field survey, 2025)

4.5 Problems of honey production in the study area

Table. 15 shows outline the primary challenges encountered by respondents in honey production. Based on the direct field observation and informal talks with the PMAMP officers, major problems associated with honeybee production in the district were identified and included in interview schedule. The major five problems were incidence of pest and disease, higher input cost, heavy pesticide use in foraging areas, lack of proper technical knowledge and issues related to climate change and habitat loss. The farmers were asked to rank these problems. Forced ranking scale was used for scaling by giving score of 5 to the

most severe problem and descends the score on less severe problems. The index value was obtained and ranking was done based on high index value.

The majority of farmers responded that the foremost issue confronting beekeepers in the study area was the incidence of diseases, bee predators and parasites. The index value of this problem was highest (0.77) and as ranked as the most serious problem of that area. If this problem arises then the population of bees in colony greatly declines due to which bee farmers may face huge loss.

The second significant problem was related to climate change and habitat loss with the index value of (0.68). Due to climate change and habitat loss, it may cause issues like food shortage for bees, increasing vulnerability to diseases and parasites and making it difficult for colonies to survive extreme weather events.

With the index value of (0.55), higher input cost was ranked as the third problem. The beekeepers respond that the high price of essential equipment, protective gear, and supplies like hives, frames and tools are challenging them to expand the beekeeping operations. But some farmers have received subsidy from various governmental organizations which had helped them to reduce this problem easily.

Lack of proper technical knowledge was ranked as the 4^{th} problem with the index value of (0.50). Most of the farmers have already received the basic level training from the organizations like PMAMP, municipality level and so on. Some have also received the training related to hive construction and colony division. However, some farmers are still unaware about the proper technical knowledge due to lack of access to those training.

The last but not the least, 5^{th} problem was concerns related to heavy pesticide use in bee foraging areas. There is lack of mutual understanding between crop growers and beekeepers due to which this problem is arising in some areas of Lamjung district. But in many areas this problem is not a bigger issue due to which it is ranked at last with the index value of (0.49).

Table 15. Ranking of the problem related to honeybee production faced by beekeepers of Lamjung, 2025

Problems	Index value	Rank
Pest and disease	0.77	I
Climate related issues	0.68	II
Input cost	0.55	III
Technical knowledge	0.50	IV
Pesticide use	0.49	V

(Source: Field survey, 2025)

4.6 Major predators and parasite of honey bee in Lamjung district of Nepal

Table. 16 shows major five predators and parasites were identified, listed and ranked from the study area. The incidence of these predators and parasites has been found as the factors which complicates the beekeeping operation. Among all identified predators and parasites, Yellow-throated Marten locally called Malsapro, had been ranked as a first major predator in the study area. Similarly, Asian hornet locally known as Aringal, had been found as the second major predator followed by Bees eater bird locally known as chibe chara and hariyo chara, bear and finally the parasite named mites is ranked as fifth major.

Table 16. Major predators and parasite of honeybee in Lamjung, 2025

Priorities given by respondent		
Problems	Index value	Rank
Yellow- throated Marten	0.73	I
Asian hornets	0.66	II
Bee eater bird	0.54	III
Bear	0.53	IV
Mites	0.52	V

(Source: Field survey, 2025)

Table 17. Management practices followed by the beekeepers of Lamjung, 2025

Predators and pest	Management practices followed
Asian hornet	Beating with slippers, burning the nest
Bee eater bird	Creating of sounds
Bear	Creating sounds
Yellow-throated Marten	Hive inspection, Heavy stone on the top of hive
Mites	Use of sancho plant, bakaino, ginger and garlic paste in the bottom board

(Source: Field survey, 2025)

4.7 Training status and needs of beekeepers in Lamjung district of Nepal

This section presents the existing training status of beekeepers and identifies their major training needs for improving productivity and sustainability in the district.

4.7.1 PMAMP's top priority to inspire beekeepers of Lamjung

This shows that PMAMP's top priority to inspire beekeepers is mainly focused on providing marketing facilities (37%)**,** followed by increased training opportunities (35%)**,** and subsidies (28%)**.**This indicates that better market access and skill development are seen as more motivating than direct financial support.

Table 18. PMAMP's top priority to inspire beekeepers of Lamjung, 2025

PMAMP'S top priority to inspire beekeepers		
Priority	Frequency	Percent
Subsidies	26	28
Increased training opportunities	33	35
Marketing facilities	34	37

(Source: Field survey, 2025)

4.7.2 Categories of beekeepers based on training status

Study revealed that out of total respondents practicing beekeeping, 12.90% respondents were deprived of trainings provided by governmental bodies such as AKC, PMAMP, RCDC, etc. 88.10% respondents who reported the access to training had an opportunity to take part in basic beekeeping trainings, only few were a part of queen rearing, Packaging and labeling trainings.

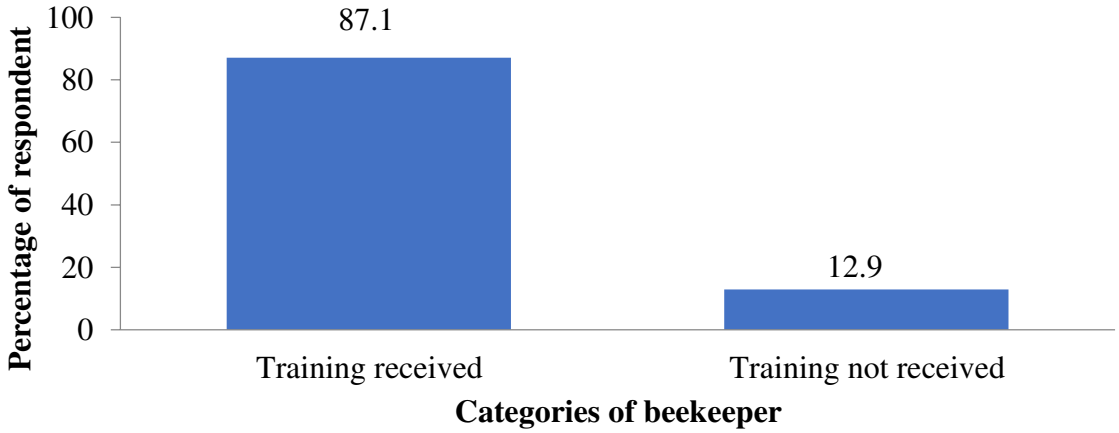


Figure 4. Categories of beekeepers of Lamjung based on training status

(Source: Field survey, 2025)

4.7.3 Evaluation of effectiveness of training

From the study, the effectiveness level of trainings was analyzed with the help of sample population. Only 11.72% of sample population responded that the trainings taken by them were very effective. 74.02% respondents found the trainings effective. Most of the sample population, 11.83% responded that the trainings provided were neither effective nor ineffective followed by 2.43% respondents who marked the trainings were not effective. Majority of the sample population evaluated trainings as medium because the trainings provided to the beekeepers were not practical.

Table 19. Evaluation of effectiveness of training of beekeepers of Lamjung, 2025

Level of effectiveness	Frequency	Percentage
Very effective	11	11.72
Effective	69	74.02
Medium	11	11.83
Not effective	3	2.43
Total	94	100

(Source: Field survey, 2025)

4.7.4 Types of training needs of beekeepers

In the study area, out of total respondents only, 13.83% sample didn't expect any type of training in future because of their old age and experience. Majority of the sample population

57.44% felt the need of basic training on beekeeping. Similarly, 14.89% of sample population felt the need of training on queen management followed by 10.64% sample population who felt the need of training on disease management. 3.2% of respondents felt the need of other training programs such as hive making, labeling and packaging, marketing, etc.

Table 20. Types of training needs of beekeepers in Lamjung, 2025

Training needs of beekeepers	Frequency	Percentage
No training needs	13	13.83
Basic beekeeping training	54	57.44
Queen rearing training	14	14.89
Disease management training	10	10.64
Others	3	3.2
Total	94	100

(Source: Field survey, 2025)

4.8 SWOT analysis of beekeeping in Lamjung district

SWOT analysis is a useful technique for understanding strengths and weaknesses and identifying both opportunities open to enterprise and threats the enterprise face. SWOT (Strengths, Weakness, Opportunities and Threats) was used to analyze the efficiency of beekeeping which are discussed below:

Table 21. SWOT analysis of beekeeping in Lamjung, 2025

Strengths: • Favourable climate and rich floral diversity • Growing number of trained and experienced beekeepers • Increasing support from PMAMP and agriculture offices	Weaknesses: • Lack of storage • Poor market access • Inadequate technical knowledge among small-scale beekeepers • Seasonal forage scarcity causing colony decline
Opportunities: • Scope to expand commercial Apis cerana farming • Market diversification (pollen, propolis, royal jelly) • High market demand for local and organic honey	Threats: • Diseases and pests • High production costs and unstable honey market price • Competition from foreign honey.

(Source: Field survey, 2025)

5. CONCLUSION

This study was conducted to assess the current artificial feeding practices in beekeeping in Lamjung district and to evaluate their relevance in relation to forage availability, feeding materials, colony performance, and honey production constraints. The findings clearly indicate that bee forage availability in Lamjung is highly seasonal. Autumn (Ashoj–Kartik) was identified as the major honey flow period, whereas Poush–Falgun and the rainy months (Ashad–Shrawan) were characterized by severe forage scarcity, making artificial feeding a necessary management intervention for colony survival.

The study revealed that artificial feeding is widely practiced by beekeepers in the district, with almost all respondents adopting this practice to overcome forage shortages. Sugar syrup was the most commonly used feeding substance due to its availability, low cost, and ease of preparation, followed by candy and limited use of pollen substitutes. A sugar-to-water ratio of 1:2 was predominantly preferred, and feeding was mainly carried out at regular intervals during dearth periods, indicating a relatively uniform and experience-based feeding practice among commercial beekeepers.

Evaluation of the impact of artificial feeding demonstrated its positive role in improving colony health and productivity. Artificial feeding significantly enhanced winter survival, brood development, colony strength, and honey production, confirming its effectiveness as a management strategy in Lamjung's climatic and ecological conditions. These benefits outweighed the associated challenges, such as robbing, aggressiveness, and potential disease risks, which were reported but managed through local practices.

Despite the advantages of artificial feeding, honey production in Lamjung district was constrained by several major problems, particularly pests and diseases, climatic stress, and high input costs. Predator pressure from species such as the Yellow-throated Marten, Asian hornet, and Bee-eater birds further affected productivity, with control measures largely based on traditional methods.

Overall, the study concludes that artificial feeding is a vital and effective practice for sustaining beekeeping in Lamjung district, especially during periods of forage scarcity. Strengthening practical training, improving pest and disease management, and promoting location-specific feeding strategies will further enhance colony performance and honey production, contributing to the sustainable development of commercial beekeeping in the district.

6. RECOMMENDATIONS FOR FURTHER RESEARCH

- Investigate long-term effects of different artificial feeding methods.
- Analyze nutritional quality and effectiveness of commonly used feeding substances.
- Study seasonal forage availability with detailed field assessments.
- Explore cost-effective, locally available alternative feeding materials.
- Assess links between feeding practices and colony diseases or pests.
- Conduct economic analyses to identify the most profitable feeding strategies.

Declarations

Funding:
The authors declare that no funds, grants, or other support were received during the preparation of this study.

Conflict of Interest:
The authors declare that they have no conflict of interest.

Clinical Trial Number:
Not applicable.

Ethics Approval and Consent to Participate:

The study was conducted in accordance with standard research ethics. The research protocol was reviewed and approved by the **College of Natural Resource Management, Agriculture and Forestry University, Purunchaur, Kaski**, **Nepal**, in coordination with the **Project Implementation Unit (PIU), National Agriculture Modernization Program (NAMP), Lamjung (Manang)**. Informed consent was obtained from all respondents prior to data collection, and confidentiality of the information was strictly maintained throughout the study.

Consent to Publish:
Not applicable.

Author Contributions:
Anil KC., and Arjun Subedi contributed to the study conception and design. Material preparation, data collection, and analysis were performed by Anil KC. The first draft of the manuscript was written by Anil KC., and Arjun Subedi reviewed and edited the manuscript. Both authors read and approved the final manuscript.

Data Availability:
The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

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APPENDICES

Appendices 1**.** Questionnaire

PRACTICES AND EFFECTIVENESS OF ARTIFICIAL FEEDING IN BEEKEEPING IN LAMJUNG DISTRICT, NEPAL

Dear respondents,

I am **Anil KC** LEE intern of College of Natural Resource Management, Kaski, AFU. I am doing my bachelor's thesis research **"PRACTICES AND EFFECTIVENESS OF ARTIFICIAL FEEDING IN BEEKEEPING IN LAMJUNG DISTRICT, NEPAL".** You being a beekeeper are selected as one of my respondents. It would be great help for me if you provide answers to the questionnaire. Your help will be highly acknowledged.

DATE: ……

RESPONDENT No: ……

CONTACT No: …….

A. PERSONAL INFORMATION

S.N.	Details	Response
1.	Name of Respondent	
2.	Address	
3.	Gender	Male Female Others…
4.	Age	
5.	Caste	a)Brahmin b) Chettri c) Dalit d) Janajati e) If other than specify……
6.	Family type	a)Nuclear b) Joint
7.	Family size	No. of male……. No. of female……

8.	Education status	a. Illiterate b. Primary c. Secondary d. Higher level
9.	Started bee keeping as:	a) Primary economic activity b) As an additional source of income. c) Only for subsistence
10.	Type of beehive	a) Modern Hive Newton A (8 frames) Newton B (10 frames) b) Traditional hive c) Others……..
11.	Number of hives	
12.	Years of Beekeeping	a) Less than 1 year b) 1-5 year c) 6-10 year d) More
13.	Individual involved in beekeeping	

B. INFORMATION AND APIARY MANAGEMENT PRACTICES

1) Do you inspect your beehive?

a) Yes

b) No

2) If yes, how often do you inspect your beehives?

a) Daily

b) Weekly

c) Every two weeks

d) Monthly

e) Rarely

3) What are the major things do you inspect in hives?

a) Disease incidence

b) Predator and parasite incidence

c) Queen condition

d) Brood and adult bee's number and condition

e) Brood base condition

f) Bee's activity at hive entrance

4) Do you use the beekeeping tools and equipment during hive inspection?

a) Yes

b) No

5) What is the situation of bee forage?

a) Insufficient

b) Sufficient

c) Sufficient only for few months

6) What is the bee flora available in your area?

S.N.	**Forage Plant**	**Month**
1.		
2.		
3.		
4.		
5.		
6.		

7) How do you manage the shortage of forage?

a) Migration of hives

b) Artificial feeding

c) Nothing

d) Others

8) Do you practice artificial feeding?

a) Yes

b) No

9) If yes, which routine do you follow for feeding?

a) Regularly

b) When possible

c) 2-3 days interval

d) When necessary

10) How often do you feed artificially in your colonies?

(a) Every 7 days

(b) Every 10 days

(c) Every 15 days

(d) Every 20 days

(e) Occasionally/when needed

11) What do you include in artificial feeding?

a) Sugar syrup

b) Candy

c) Pollen substitute

d) Others

12) Which technology do you follow during feeding?

a) Modern ……

b) Traditional …….

13) What materials do you used for preparing feeding?

a) …….

b) …….

c) …….

14) In which ratio do you prepare feeding?

Sugar syrup ratio (water : sugar)	Season
1:1	
2:1	
1:2	
Others	

15) Time to feeding?

a) Morning

b) Day time

c) Evening

d) Night time

16) What type of water do you use during preparing sugar syrup?

…….

17) Do you practice colony division?

a) Yes

b) No

18) If yes, how many times do you practice colony division in a year?

a) Once

b) Twice

c) Whenever necessary

19) Do you follow feeding during colony division?

a) Yes

b) No

20) What is the main aim of artificial feeding in your apiary?

a) …….

b) …….

21) Have you observed any difference in bee colony health after artificial feeding?

a) …….

b) …….

22) What improvements have you noticed? (Check all that apply)

a) Increased brood area

b) Higher honey production

c) More pollen collection

d) Stronger colony survival in winter

e) Others: _____

23) How do you evaluate the effectiveness of feeding?

……..

……..

24) Have you encountered any problem during feeding in your apiary?

a) Yes

b) No

25) If yes, what kind of problems have you encountered?

a) ……..

b) ……...

26) What is your experience, is the artificial feeding profitable?

a) Yes

b) No

27) During Feeding, which material do you use?

a) Frame feeder

b) Bottle feeder

c) Both

d) Others …….

28) What is the success rate of the acceptance of artificial feeding by bee?

a) 100%

b) 80%

c) Unsuccessful

29) Have you received any sorts of training?

a) Yes

b) No

30) What kind of trainings have you received?

a) Basic training on beekeeping

b) Queen production

c) Others…….

31) Do you practice seasonal management practices in your apiary?

a) Yes

b) No

C. INFORMATION ON PROBLEMS AND IT'S MANAGEMENT

32) Rank the problems in your beekeeping practices (1-very high,5-very low)

Problems	Ranking	Management
Absconding		
Egg laying workers		
Robbing		
Diseases		
Predators and parasites		
Climate related issues		
Inadequate knowledge on beekeeping practices		
Pesticide problem		
Others		

D. PRODUCTION OF HONEYBEE AND HONEY INFORMATION

33) What are the numbers of hives?

Year	2079	2080	2081
No. of hives			

34) How do you harvest honey?

a) Using honey extractor

b) Using hand

35) Honey production status

Year 2079	Year 2080	Year 2081

36) Do you sell honey?

a) Yes

b) No

37) What type of honey do you sell?

a) Raw honey

b) Processed honey

c) Others……

38) What is the price of raw honey?

39) Are you satisfied with the earning you make with beekeeping?

a) Yes

b) No

40) What is the main aim of your beekeeping?

a) Honey production

b) Colony multiplication

c) Production of other bee products

41) What are the constraints during adopting Artificial feeding? Rank. (1-very high,5-very low)

a) Inadequate trainings ( )

b) Cost of feeding materials( )

c) Disease transmission risk ( )

d) Robbing ( )

e) Aggresiveness ( )

E. OTHERS

42) To what extent the trainings provided by governmental organizations effective for your beekeeping practices?

a) 1-Very effective

b) 2-Effective

c) 3-Medium

d) 4-Not effective

43) Have you ever received any subsidy from any organization?

(a) Yes

(b) No

44) If yes, from which organization did you receive the subsidy?

a) PMAMP

b) AKC

c) NGOs/ INGOs

d) Others……

45) Do you have any linkage with honey processing unit?

a) Yes (If yes, mention….

b) No

46) Is the subsidy provided by government satisfying for your beekeeping operation?

a) Very satisfactory

b) Satisfactory

c) Supporting to somewhat

d) Not satisfactory

47) What type of trainings are you expecting in future from PMAMP?

a) Trainings on disease management

b) Trainings on queen rearing

c) Basic beekeeping training for a week

d) Others…….

48) What should be PMAMP's top priority to inspire beekeepers?

a) Subsidies

b) Increased training opportunities

c) Marketing facilities

d) Others……

GLIMPSES OF STUDY





Survey with local bee keepers of Besishahar municipality



Survey with local beekeeper of Rainas Municipality



Apis florea colony at Rainas Municipality



Candy feeding to bee colony



Bee colony after artificial feeding

BIOGRAPHICAL SKETCH

The author Anil Kc was born on 22nd November, 2002 at Parbat district as the eldest son of Mr. Man Bahadur Chhetri and Mrs. Hari Maya Acharya. He completed his Secondary Education Examination in 2018 A.D from Rudrepipal Secondary School in Baglung. He then joined Vidhya Mandir Secondary School and completed his intermediate level in science in the year 2020 A.D. He then enrolled in College of Natural Resources and Management, Puranchaur, Kaski, Agriculture and Forestry University to pursue B. Sc. Ag degree in the year 2021. He has a deep passion for agriculture and sustainable development. During the study period, the author received several trainings related to his study and participated in various seminars, workshops and educational tours. He has worked as an Agri-intern for 5 months in PMAMP, PIU, Lamjung. He is now on the brink of completion of his bachelor degree from the university.