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ASSESSMENT OF THE EXISTING STATUS OF THE BEEKEEPING SUB-SECTOR IN THE DANG DISTRICT, NEPAL

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ABSTRACT
The study highlighted the existing status of the beekeeping sub-sector in the Dang district. Out of 150 commercial bee growers, 61 beekeepers from Ghorahi, Tulsipur sub-metropolitan city, and Banglachuli Rural Municipality were selected based on a proportionate stratified random sampling method. Data were gathered through a structured questionnaire, personal interviews, focus group discussions, and key informant surveys and analyzed using descriptive statistics and scaling techniques. Results showed that 82% of Beekeepers use modern hives, and 18% still use traditional hives. Also, 77% of respondents were commercially rearing Apis mellifera, and 18% were rearing Apis cerana. The production of honey was increasing in modern hives due to the adoption of improved management practices, whereas production from traditional hives was fluctuating due to a lack of improved management practices. Overall, 80.3% of the respondents were expanding their beekeeping enterprise as a good source of income. A few respondents, i.e., 19%, were decreasing their enterprise due to the shortage of forage and other constraints. Analysis revealed that the unavailability of Bee forage for the whole season was the major constraint of beekeeping with a 0.89 index value, followed by pests and predators with a 0.88 index value. Also, Predatory Birds were found as the major predator and pest with a 0.86 index value, followed by mites with a 0.76 index value. Growing beekeeping trend for income faces obstacles, including forage, pests, and sales infrastructure, requiring management improvement.

KEY WORDS
Apiary sites, *Apis mellifera,* bee-forage, bee-keeping, pests.

Agriculture is the mainstay of livelihood in the Nepalese economy for approximately 60.4% of Nepal's population, with a 23.90% contribution to the national Gross Domestic Product (GDP) (MOALD, 2020). In Nepal, Beekeeping is a lucrative non-farm agricultural enterprise with its successful production from altitudes 70 to 4200 meters above sea level (Bhandari & Kattel, 2020). Due to the presence of diverse bee flora and favorable climatic conditions for the diverse honeybee, beekeeping has tremendous potential in Nepal, with a carrying capacity of one million bee colonies (Devkota, 2020). Nepal can produce more than 10,000 tons of honey annually (Bhattarai et al., 2021). Different types of bee products, such as honey, propolis, bee bread, and bee wax are reliable sources of earnings in rural areas. Beekeeping plays a vital role in agriculture, food security, biodiversity, and poverty alleviation to improve the livelihoods of rural people (Gupta et al., 2014). Bees are crucial pollinators in a variety of crops and also help to maintain the natural ecosystem (Bhattarai et al., 2021).

Asia is home to eight of the world's nine honeybee species. Eight out of nine honeybee species identified in the world live in Asia (Guerin, 2020). Among them, five economically important species are found in Nepal: *Apis cerana, A. dorsata, A. laboriosa, A. florea,* and *A. mellifera* (Thapa et al., 2018). Except *Apis mellifera,* the other four species are native to Nepal. *A. cerena* and *Apis mellifera* occupy 78 and 22 percent of domestic bee species, respectively, in Nepal (Kafle, 2019). *Apis mellifera* are reared widely in the Terai region, while *Apis cerena* are popular in the hills.

Both traditional log hives and modern bee hives are in practice for bee rearing. Scientific bee-keeping was started in 1989 with the introduction of an *Apis cerena* movable

comb hive. (Devkota, 2020). The *Apis cerena* is kept in traditional wooden log hives by farmers in the Himalayan regions, while both the *A. cerena* and *A. mellifera* are kept in modern beehives by urban farmers in the lowland Terai (Kafle, 2019).

Dang district is suitable for beekeeping in Nepal regarding the availability of bee-flora and pasture. The Government of Nepal has declared Tulsipur sub-metropolitan, Ghorahi Sub-metropolitan, and Banglachuli rural Municipality as bee zone under PMAMP.

Many researches have been conducted in Nepal on Beekeeping. However, Beekeeping faces challenges, including decreased bee pasture due to deforestation, lack of knowledge and training in beekeeping management, extreme pesticide use causing honeybee deaths, and issues with pests and predators leading to economic losses. Limited knowledge of valuable bee products beyond honey also hinders the potential production of honey (Bhattarai et al., 2021). So, the potential production of honey has not been achieved due to a lack of good management practices. The study analyzed the strengths, weaknesses, opportunities, and threats (SWOT) of beekeeping, assessed the farmer's knowledge and perception regarding the major types of pests, diseases, and predators of honeybees, and identified existing management practices adopted by bee-keepers.

METHODS OF RESEARCH

The Dang district lies in the Lumbini Province of Nepal at the latitude of 29°34'56.6"N and longitude of 80°30'42.6"E. The study was conducted in Ghorahi and Tulsipur sub-metropolitan cities and the Banglachuli rural municipality of Dang district. These areas were selected because they fall under the command area of the Bee-zone and are the major sites for Bee-keeping (PMAMP, 2019).

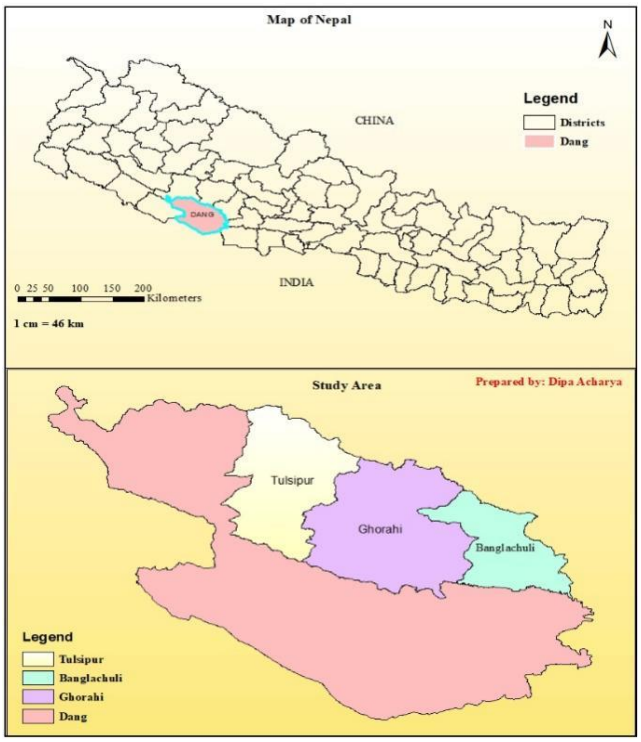

Figure 1 – Map of Nepal showing the study area

Out of 150 registered commercial beekeepers according to the Bee Zone program, 61 commercial beekeepers, 30 from Ghorahi, 20 from Tulsipur, and 11 from Banglachuli, were selected using the proportionate stratified random sampling method.
The sample size was estimated by using the following formula:

$$n = \frac{N}{1 + Ne^2}$$

Where n = sample size, N= Population size, e= margin of error (In this study, we used e=0.05, 90% level of confidence).

A structured and semi-structured questionnaire was utilized to collect both primary and secondary data sources, including qualitative and quantitative information. Primary data were gathered by Interview schedule, Key Informant Interview (KII), Focus Group Discussion (FGD), and Questionnaire Survey. Background data of each beekeeper was collected from secondary sources, i.e., different published articles, journals, books, internet materials, and reports issued from the Agriculture Knowledge Centre, PMAMP, ICIMOD, Federation of Nepal Beekeepers, Federation of Nepalese Chamber of Commerce and Industry/ Agro Enterprise Ministry of Agriculture and Livestock Development (MoALD), and papers published by PMAMP, PIU, Dang.

The collected data and information was recorded, processed, and analyzed using statistical packages like Microsoft Excel and Statistical Package for Social Sciences (SPSS). Descriptive statistical tools such as frequencies and the percentage were used to analyze different variables like the type of bee hive used, honey bee species reared, the experience of Bee-keeping, the trend of production, the situation of bee forage, and the situation of pest and predator effect on beekeeping. The analyzed data was presented by using text, Table, Bar-diagram, Graphs, and Pie charts with the help of MS Excel.

RESULTS AND DISCUSSION

Among sampled respondents, the findings showed that 82 percent of beekeepers used modern hives and 18 percent still used traditional hives. Almost all the beekeepers from Ghorahi and Tulsipur sub-metropolitan cities adopt modern movable frame hives due to the availability and accessibility of modern beehives and their packages accessories (honey harvesting and processing equipment like wax-stumper, queen excluders, honey extractors, bee smoker and others), subsidy, and other governmental allowances through PMAMP and AKC. Whereas there was the dominance of traditional hives in the Banglachuli rural municipality due to a lack of infrastructure and access to resources. Similar results were obtained by Gebiso (2015) in his survey report.

Among sampled respondents, it showed that 77 percent of the respondent were rearing *Apis mellifera* only,found in the plain area of Dang, whereas 18 percent were rearing *Apis cerana* only, found in hilly area of Dang and both *Apis cerena* and *mellifera* were 5 percent. This is due to the Agro-climatic differences of these two areas. The performance of *Apis cerana* is better in the Hilly region and *mellifera* in the Terai region. Similar findings were obtained by Aryal et al (2015) and Pokhrel (2009). In Nepal, the adoption of site-specific management techniques was regarded as an integral part of A. mellifera beekeeping. Similar findings were obtained by Neupane et al. (2012).

The farmers were interviewed on their expertise in keeping honey bees. Results showed that the respondent (73.77%) with experience of 5-12 years were found to be highest, followed by 12-19 (18.03%) years and 19-26 (8.2%) years. This would enable experienced beekeepers to leverage their past knowledge and experiences, enhancing their enterprise by adopting better management practices.

Of the total sampled respondents, figure 3 shows that 35% of respondents had started their beekeeping enterprise by buying the bee-colony hives, 28% had begun due to the subsidy gained from the governments, 22% had started due to their parents (i.e., handed by parents) and 15% had started by catching the swarms. Since farmers were aware of beekeeping as a profitable enterprise and recognized its economic potential compared to other agricultural operations, they have started engaging in beekeeping by purchasing modern beehives. The government also has started providing allowances on inputs (beekeeping equipment and hives), training on improved methods and management of beekeeping, subsidies, etc.

Of the total sampled respondents, 80.3% of the respondents were expanding their beekeeping enterprise. A small section of respondents, i.e., 19.7%, were contracting their enterprise. Respondents cited a good source of income as the main reason for expanding

their enterprise. Bee-keeping has been increasing tremendously as The business may be initiated with little capital, managed in a limited region, and generate a profit within the first year of operation (ICIMOD, 2012). The study revealed that the colony population of bees is declining over time due to factors such as deforestation for crop cultivation and various constraints, notably insecticides, predators, and bee diseases.

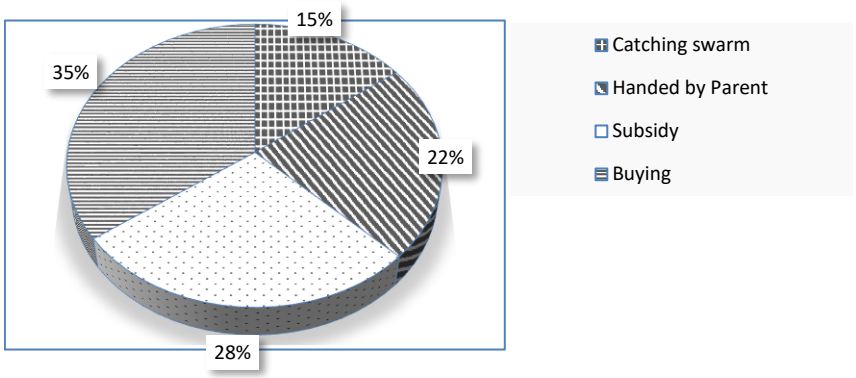

Figure 3 – Way of Bee-keeping by beekeepers in the study area

All the beekeepers have registered their enterprises with the Firms. Registration allows farmers to take the subsidies on inputs and training on improved management practices of diseases and pests at regular intervals to foster their business and other facilities at a cheaper rate from the governmental and non-governmental organizations enhancing their access to information, credit, and technologies. Similar findings were observed by (Ubeh et al., 2021).

For the production of honey, sufficient forage plants for honeybees are pertinent. Out of the total respondents, 90.2% of respondents responded that they have sufficient bee forage for a few months only, and 9.8% do not have access to sufficient bee forage. This means there is a shortage of bee-forages in the study area. For foraging, beekeepers take their bee hives outside the district (Banke, Bardiya, Kailali, Kapilvastu, Pyuthan, Kailali, Rupendehi), and within the district (western part of dang, Deukhuri) for foraging due to shortage of bee-fora. “Sal”, “Asare”, “Katke”, “Jamun”, “Tori”, litchi, buckwheat, “Masala”, “Rudilo”, “Chinese tori”, “Chiuri”, Berseem, etc. are the main bee-fora available for bee-foraging. The availability of variety of floral resources and their species concerning nectar, sugar contents, and pollen are very crucial for brood rearing (Wakgari & Yigezu, 2021). During the offseason, artificial feed provision is made, i.e., 15-20kg of sugar per hive per season as sugar syrup and candy and pollen supplement of 1.5- 2kg per season per hive made from soybean and chickpea. These findings were in line with the results of Kifle et al (2017).

Out of the overall sampled bee-keepers, 24.6 percent of bee-keepers responded that the use of agrochemicals by farmers had affected their bees during foraging, while 75.4 percent were unknown about the effect of agrochemicals on the bees. Few beekeepers know the negative effects of agrochemicals on the honeybee's health status, leading to a decline in yield. The effect of agrochemicals on beekeeping is increasing day by day in the study area. The main reported reason was the non-beekeepers who neglected to tell beekeepers of their plan to use agrochemicals. Overall, the level of coordination between beekeepers and non-beekeepers about the judicious use of agrochemicals was very weak in the study area. Also, when they detect the death of bees at the hive entrance, they cover the hive entrance being unknown about the death of bees. These results were in line with Ayele et al. (2020).

The findings of this study revealed that European foul brood (85.2%) was found as the major disease of the Beekeeping, followed by paralysis (81.97%), Nosema (73.8%), and Thai-sac (63.9%). Honey bee colonies become weaker as a result of the loss of strength and defense, poor hygiene, reduced body size, increased swarming, and frequent occurrence of

diseases and pests (KC et al., 2021; Shivakoti & Bista, 1998). Pokhrel (2008) concluded that Paralysis, foul brood, and Nosema disease were important diseases of honey bees in Chitwan. European foulbrood attacks mostly on *Apis mellifera* but also occasionally affects *Apis cerana* too. Nosema diseases mostly occur in the digestive system of the adult honey bee and cause diarrhea affecting all castes of bees like workers, drones, and queens. The bee hives were filled with thin, smelly feces both inside and outdoors. Thai sac brood virus was found attacking *Apis cerana*. Shrestha and Shrestha (1998) reported that Apis cerana colonies in mid-hills of Nepal were infected with the Thai sac virus. According to ICIMOD, the evidence of the abovementioned symptoms is the reason for infection with the deformed wing virus (ICIMOD, 2012). Muli et al. (2014) and Botías et al. (2013) reported a reduction in colony productivity due to honey bee parasites and pathogens.

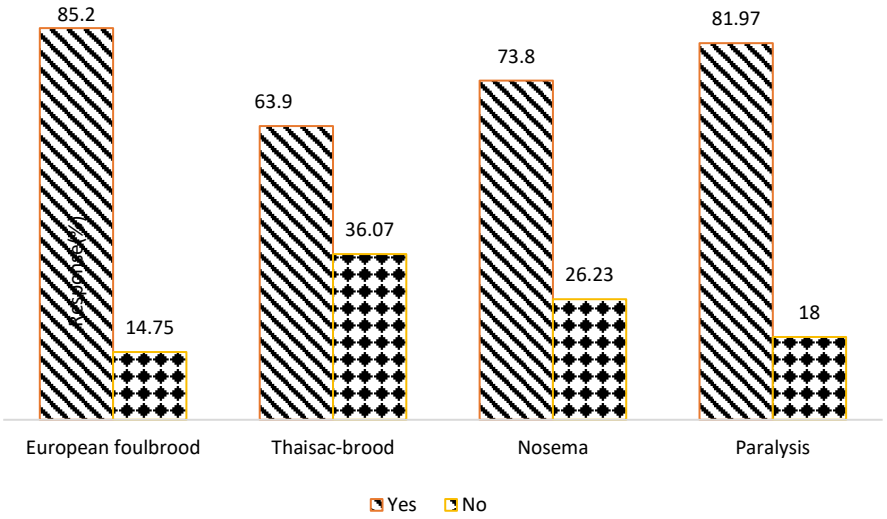

Figure 4 – Incidence of Diseases in Bee-keeping

Beekeepers of Dang manage the incidence of diseases of beekeeping using different local control measures like the use of Tite pati, Neem, Bojho, Garlic water, Bakaino, etc. By giving an artificial feed, Beekeepers try to keep their colony strong to make the bee resistant to different diseases.

Out of the total beekeepers, 93.4% of beekeepers responded that they have the problem of pests and predators in the apiary, while 6.6% do not have the problem of pests and predators.

The top seven parasites and predators that are contributing to the declining honey yield in the Dang district were identified and ranked. The major predator and pest of honey bees were found to be Bee-eater birds with a 0.86 index value, followed by mites (0.76), ants (0.74), hornets (0.72), wax-moth (0.54), predatory wasp (0.35) and honey bander (0.31) respectively.

Table 1 – Prominent predators and parasite of honey bee in the study area

Predators and pests	Index Value	Rank
Predatory Birds	0.86	I
Mites	0.76	II
Ants	0.74	III
Hornets	0.72	IV
Wax Moth	0.54	V
Predatory wasp	0.35	VI
Honey Bander	0.31	VII

Most beekeepers of the Dang district managed these predators like bee-eater birds, Asian hornets, lizards, wasps, and spiders with the conventional method. Similar honeybee pests and predator in the study area was reported by (Kc et al., 2021).

Table 2 – Control measures of major honey bee pests and predators in the study area

Major Honey Bee Pests and Predators	Control Measures
Ants	Hive stand, regular smoking, covering the hive stand with plastic, fumigating with local olum Africana/eucalyptus leaves, daily follow up and using hot water, using ash
Wax Moth	Hive-clearing, removing old comb, strengthening the colony, seasonal management, daily monitoring
Predatory Wasp	Nest burning and hitting with a wooden flapper
Hornets	Nest burning, beating, fencing with thorny plants, putting barriers
Mites	Apistan, sulphur dust, formic, Burning, Killing, removing their home.
Miniature hive beetles	Strengthening the colony or maintaining strong colonies, removing weak colonies, cleaning apiary site, Scavenge poultry, narrowing the hive entrance, Seasonal management and cleaning
Bee-eater Birds	Noise, Sound, creating the illusion of human beings close to the beehives using cloth and plastic

The average hive number was 16.27, 16.91, and 17 in 2019, 2020, and 2021 respectively, i.e., The average number of traditional hives increased from 2019 to 2021. The typical output per hive was 6.9 kg, 6 kg, and 7.9kg in 2019, 2020, and 2021 respectively. i.e., the average production per hive of traditional hives decreased from 2019 to 2020 and increased from 2020 to 2021. The price per kg of honey was Rs.810, Rs.880, and Rs.980 in 2019, 2020, and 2021 respectively, i.e., The price per kg of honey of traditional hives increased from 2019 to 2021. The increase in the number of traditional hives is due to increased awareness among the farmers about the importance of honey and its economy, which enables them to adopt a higher number of traditional hives. The decrease in production from 2020 to 2021 is due to fire in the forest and weather fluctuation. The increase in the price of honey is due to its increasing demands from the consumer realizing its importance in human health and consumers' preference towards local honey. As *Apis cerena* is the indigenous honey bee species, honey production from the traditional hive is lower compared to the modern hive. Also, Beekeepers do not adopt good management practices of beekeeping in the traditional hives of the Banglachuli rural municipality. The honey harvesting is done 3-4 times per year only. So, the production is lower as compared to modern hives.

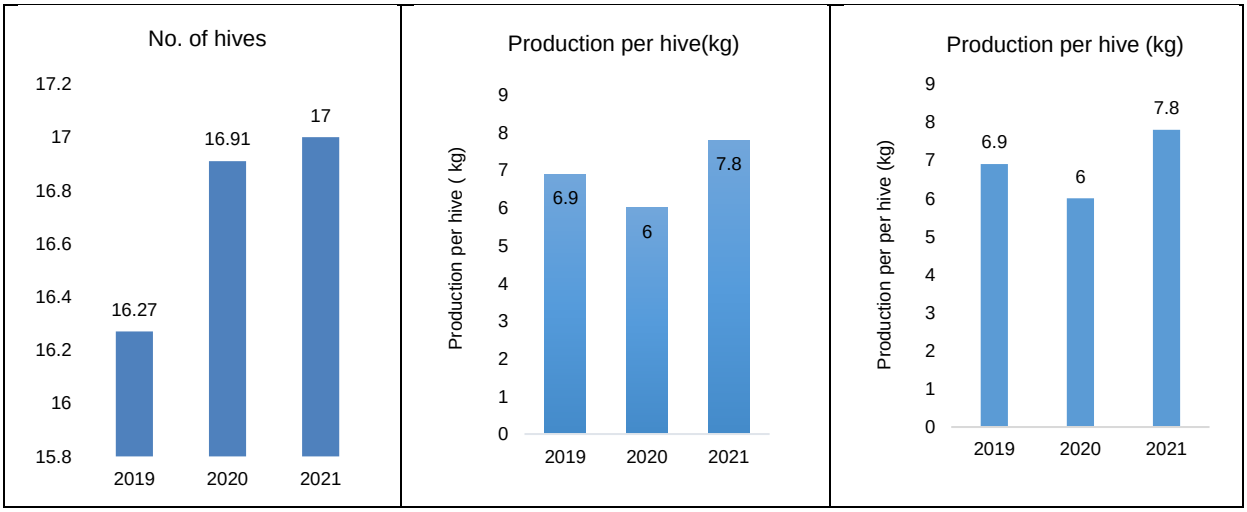

Figure 5 – trend of number of hives, production per hive, and price per kg of honey traditional hives

The average hive number was 105.6, 118.42, and 133.74 in 2019, 2020, and 2021, respectively, i.e. the average number of modern hives increased from 2019 to 2021. The typical output per hive was 21.9kg, 23.76kg, and 27.26kg in 2019, 2020, and 2021, respectively, i.e., The average production per hive of modern hives increased from 2019 to 2021. The price per kg of honey was Rs. 810, Rs. 880, and Rs. 980 in 2019, 2020, and 2021 respectively, i.e., The price per kg of honey of modern hives increased from 2019 to 2021. A similar trend of honey production and colony increase was shown by (Yemane & Taye, 2013). The high production in the modern hive may be a result of using better management

practiceslike the use of comb foundation, requeening, artificial queen production through grafting, colony union, and colony division. Also, *Apis mellifera* is an exotic species of honey bee, giving higher production of honey. The increased production was due to the adoption of improved practices of bee-keeping. The provision of artificial feed like sugar syrup, pollen supplements, and candy has increased the honey yield in modern hives. The adoption of disease and pest management practices in modern hives by bee-keepers has led to an increase in the production of honey. The honey harvesting was done 5-6 times per year. So, the production was higher in modern hives.

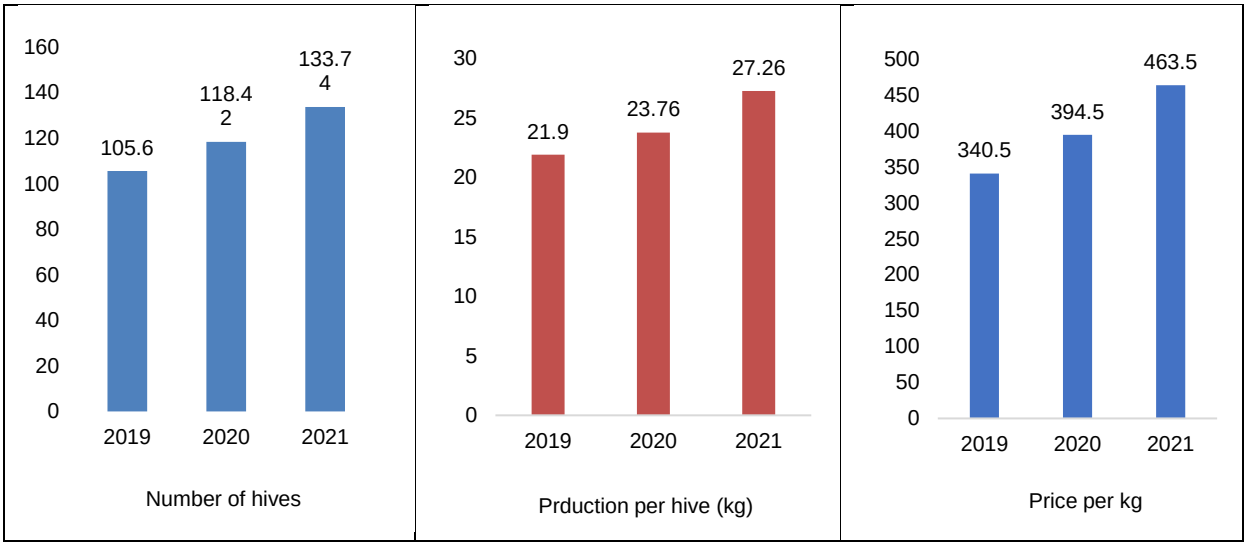

Figure 6 – Trend of number of hives, production per hive and price per kg of honey modern hives

The high degree of management practices followed by beekeepers enables them for higher returns and smooth running of the enterprise. In the study area, 82% of the beekeepers use comb foundations and have the provision of artificial feed in the bee-keeping, 77% of beekeepers change their bee-queen when necessary, 65.6% of respondents produce artificial queens for re-queuing the colony, colony division, and colony union were done by 49.2% and 41% respectively. Beekeepers were not using supers in their hives which is shown in Figure 7. Foundation gives strength to the comb and provides a starting point for the bees. The imprinted hexagons guide the bees with where to build comb. The foundation is mainly used in the brood chamber and in or just before the honey flow season.

Artificial feeding: Food resources are greatly decreased at specific seasons of the year, such as the winter or the dry season. Beekeepers use artificial diets to augment colonies' nutritional requirements and lessen the impact of food shortages during dearth periods. These supplements provide formulations that are nutritionally complete and balanced, assuring the bees' survival and the colony's success.

Artificial queen rearing is a process of rearing queens from young totipotent larvae in vitro. This method is significant for re-queuing the colony because the presence of a queen is essential for the regulation of a honey bee colony (Sharma & Lovleen, 2021). Colony division, or forming new or more colonies from a mother colony, is a technique for increasing the number of bee colonies. Colony division is used in commercial beekeeping to increase the number of colonies and to prevent swarming. A union of colony is done to increase the strength of the colony. The use of supers in the hive provides a better space. Bee hives need a space for the queen bee to lay her egg, a nurse bee to take care of them, and a worker to store honey and pollen. The hive needs to be big enough for the bees to move around freely without getting overcrowded but small enough for the colony to defend itself from attackers (Ecrotek, 2013).

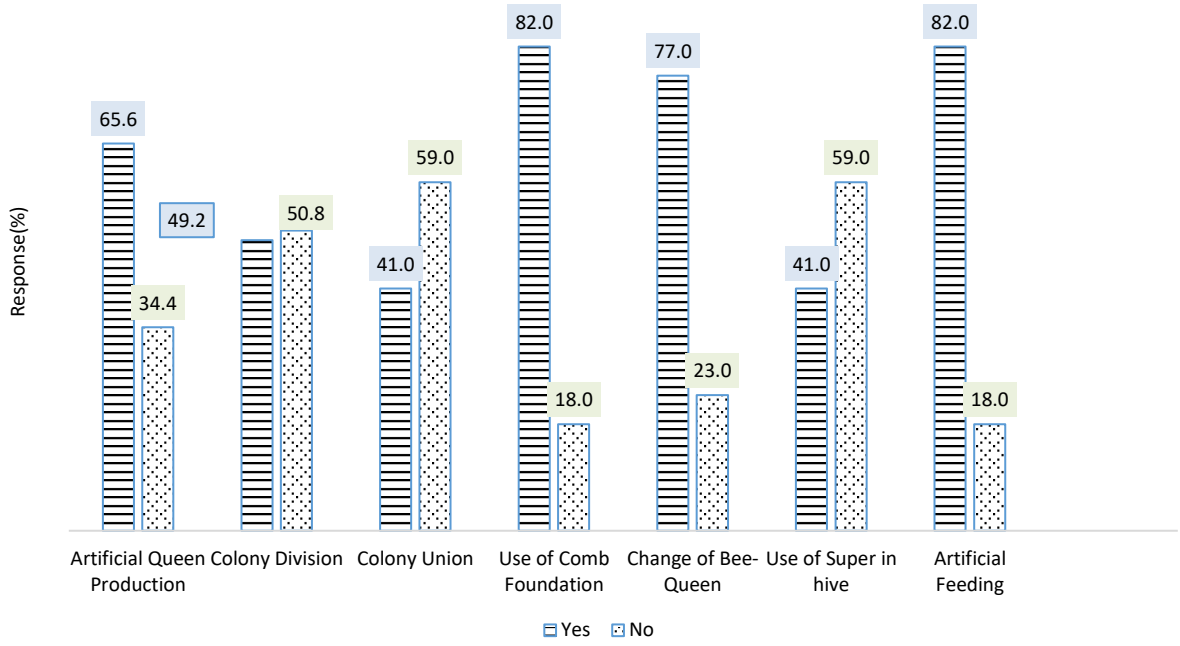

Figure 7 – Management Practices of Beekeeping

Beekeeping equipment like a hive, stand, veil, gloves, hive tool, feeder, knives, honey - extractor, etc., were available at Ghorahi and Tulsipur. But at Banglachuli, there was no availability of modern beekeeping equipment and materials. Among sampled respondents, 82% of respondents responded that they have bee-keeping equipment and protective materials, whereas 18% do not have bee-keeping equipment and protective materials.

Out of total respondent, 41% of the respondent visit/ inspect their hives, when necessary, 27.9% visit/ inspect their hives every month, followed by every two weeks (19.7%) and always (11.5%). Respondent cleaned their apiary and add ash (cinder) to prevent insects like ants and termites from climbing the tree. Internal hive inspection is totally unknown by beekeepers. At least during the honey harvesting season, farmers check whether their hives are colonized with bees. The frequent inspection helps to prevent the loss of honey colonies and the value obtained from honey rearing due to the pests of honeybees such as predator mites, insects (ants, bugs, beetles, etc.), birds, rodents, mammals, pathogens, and environmental conditions like rainfall, drought, abnormal temperature, etc. It also helps to strengthen the honey colony, the status of increase in the amount of honey to produce, number of broods, etc. per hive. The importance of inspection and visiting was also mentioned by Begna (2015).

Out of the total respondents, 100% of beekeepers responded that they produce honey as the main hive product. Along with the production of honey, 34%, 82%, and 11% of beekeepers responded that they also produce bee frames, bee wax, and propolis, respectively. The attraction of farmers to the honey only without considering the other bee-hive products is due to a lack of knowledge among the farmer about the medicinal and cosmetic importance of other hive products like bee wax and propolis. Also, they lack training in the production of bee wax, propolis, and other byproducts.

Out of the total respondents, 65.57% of the beekeepers responded that they sell their hive product (honey) to the wholesalers, whereas 26.23% sell to the retailers and 8.25% at Farmgate. The spread of more advanced agricultural technology is fueled by the existence of a viable market. Poor marketing structure impacts the rise of beekeeping sub-sectors. The high proportions of beekeepers supplying their honey directly reaching customers might cut marketing expenses and avoid intermediary actors. But in the study area, there is the lowest number of consumers directly in contact with the beekeepers for honey. So, there is a need for profitable market channels in the study area. Similar results were presented by Al-Ghamdi et al. (2017).

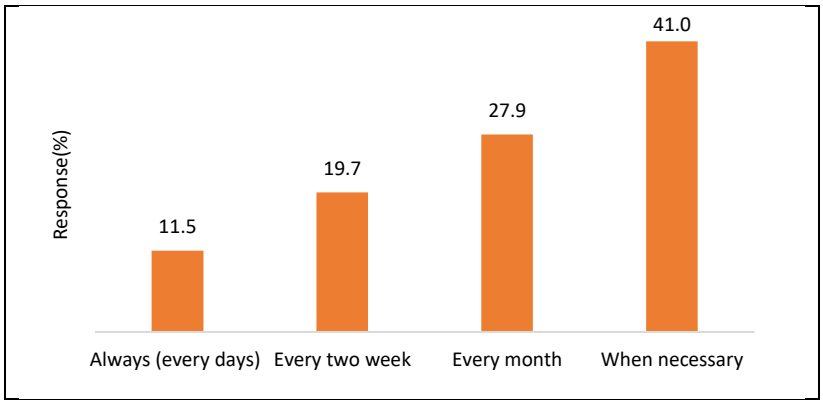

Figure 2 – Frequency of inspection/ visiting of apiary site

In the study area, the farmers were facing several problems related to Beekeeping. Based on the perception of farmers, the scaling technique (indexing) was used to rank problems.

Among the beekeepers, the unavailability of bee forage (I= 0.89) was identified as the major constraint, followed by the problems of pests and predators (I= 0.88), problem of marketing (I= 0.66), Bee-keeping equipment/ materials and storage facilities (I=0.46), death of colony (I=0.41) and pesticides and herbicides problems (I=0.40), absconding (I=0.306).

These problems may be due to a lack of knowledge among the farmers about modern techniques of Beekeeping. These necessities are needed for proper extension services and training facilities.

Table 3 – Major Constraints of Bee-keeping in the research site

Constraints	Index Value	Rank
Unavailability of Bee forage for the whole season	0.89	I
Pests and predators	0.88	II
Marketing	0.65	III
Processing and storage facilities	0.46	IV
Death of colony	0.41	V
Pesticides and herbicides problems	0.40	VI
Absconding	0.31	VII

Table 4 – SWOT Analysis of Beekeeping in the Dang District

Strengths • Suitability of climatic conditions for Beekeeping • Diversified businesses like wax (candle) production, colony production, queen production, production of beehives, and other beekeeping gears • Deep attachment of buyers to the locally produced honey	Opportunities • Availability of technical and economic support from government and non-government organizations. • Financial assistance provided by the government for Beekeeping • Bees assist in agricultural production through pollination • Accessible market due to high demand of honey • High quality and organic honey fetch a higher price
Weaknesses • Regulations and strategies to promote Beekeeping • No schemes to provide loan/credit to beekeepers • Inadequate processing facilities	Threats • Changes in local weather induced by global climate change affect Beekeeping • Diseases, Pests, and parasites attack Beekeeping • Effect of chemical fertilizers and insecticides applied on crops on the health bee colony • Declining productivity of queen due to inbreeding and improper cross-breeding

These constraints account for a huge loss in total honey production. The availability of various floral resources and their species concerning nectar, sugar contents, and pollen are very important for brood rearing. The strength of the colony becomes weak due to the lack of sufficient bee forage, ultimately leading to a reduction in honey yield. Also, pests and predators contribute to a considerable reduction in the honey yield due to huge damage to the bee colony.

Improper marketing facilities emerged as crucial factors affecting the sustainability of beekeeping business in the area. Various problems were faced by beekeepers related to the

marketing and sale of the produce. The most important and prioritized problem was the fluctuating price of raw honey. This reduced the beekeepers' confidence to expand their business. The government does not show interest in fixing the minimum support price for honey.

Non-availability of standard storage containers in the locality forced beekeepers to sell their produce during limited months at low prices, and the honey got damaged due to the lack of storage facilities for the lean season. Also, they lack processing facilities. Similar constraints were reported by Gidey Yirga (2012). Pesticide and herbicide problems were also a constraint faced by beekeepers as bees got infected because of the pesticide and herbicide sprays in the crop field. It causes death to honey bees. Similar problems were reported by Aryal et al (2015). Lack of feed, honey bee pests, and drought are the main problems that may cause absconding. The scarcity of bee forage causes the honeybee colony to abscond to areas where resources are available for their survival. Moreover, different researchers identified these problems as a constraint in the beekeeping sector in different parts of the world (Gebremeskel et al., 2015; Wakgari & Yigezu, 2021).

CONCLUSION

A study was conducted to study the existing status of the beekeeping sub-sector in the Dang district. A pre-structured questionnaire was used to conduct an individual farmer survey in Tulsipur and Ghorahi (sub-metropolitan cities) and the Banglachuli rural municipality of Dang. It was found that 77 percent of them were rearing *Apis millifera* only, which was found in the plain area, whereas 18 percent rearing *Apis cerana* only, found in the hilly areas. Overall, 80.3% of the respondents were expanding their beekeeping enterprise, and a good source of income from Beekeeping was found as the major reason. A little of the respondent, i.e., 19%, were contracting their enterprise due to the shortage of forage and other constraints:

- Few beekeepers from the hilly regions of the Dang district are still using traditional hives with the unavailability of beekeeping equipment and protective materials;
- production of additional hive products like propolis, wax, royal jelly, bee venom, and pollen, and the sale of bee colonies should be encouraged for additional returns;
- Awareness creation and assistance are needed to empower women in beekeeping activities;
- The production of honey is increasing in modern hives due to the adoption of improved management practices, whereas production from traditional hives is fluctuating due to a lack of improved management practices;
- Bee-eater birds and European foul-brood are considered the major predators and Diseases, respectively;
- The major constraint of Beekeeping was found to be the Unavailability of forages for the whole season.

Further studies on the economic analysis of traditional and modern beekeeping, assessment of economic losses caused by diseases and pests in beekeeping, Income diversification, disseminating information about honeybee insurance, and conducting the analysis of the honey-value chain in the research site can be done.

ACRONYMS AND ABBREVIATIONS

%	Percentage
AKC	Agriculture Knowledge Centre
ICIMOD	International Centre for Integrated Mountain Development
Kg	Kilogram
MoALD	Ministry of Agriculture and Livestock Development
PIU	Project Implementation Unit
PMAMP	Prime Minister Agriculture Modernization Project
SPSS	Statistical Package for the Social Sciences

EDITORIAL NOTE

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