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# TRADITIONAL MANAGEMENT PRACTICES AND PRODUCTION POTENTIAL OF BEEKEEPING IN ERER ZONE OF SOMALI REGIONAL STATE, ETHIOPIA

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**ABSTRACT**: The study was carried out in Erer zone, Somali Region of Ethiopia, to assess beekeeping practices and production. A total of 156 respondents were selected randomly from two purposively selected localities based on beekeeping potential and interviewed using semi-structured questionnaire. The study revealed the majority of the respondents (85.9%) practiced traditional beekeeping system and hung their hives on trees away from the homestead in dense forest. The honeybee flora of the area consists mostly of nectar and pollen-producing trees and shrubs including *Grewia tenax*, *Grewia penicillata*, *Acaciamellifera*, *Acaciareficiens*, *Acaciatortilis*, *Acaciasenegal*, and *Acaciahorrida*. The average honey yield from traditional beehives was 4.85 kg, which is less than the national average yield (5 kg). The average honey yield from modern beehives, on the other hand, was 7.29 kg which is lower the amount obtained from other parts of the country. The major constraints of beekeeping are the high cost of modern hives and accessories, pests and predators of honey bees, water scarcity, shortage of bee forage, bee absconding and marketing. Birds, ants, spiders, wax moth, mice, lizards, and honey badgers were identified as the major honeybee pests and predators based on beekeeper responses. Pests and predators (37.8%), destroying nests during honey harvesting (26.9%), water scarcity (21.2%), and shortage of bee forage (14.1%) were the most common reasons for honeybee absconding. Beekeeping production remains low due to these constraints and traditional practices in the area. However, there is enormous potential and opportunity to increase honeybee production in the area. To improve the quantity and quality of honey yield in the area, significant extension and technical intervention, use of locally available beekeeping technologies, appropriate measures to manage honeybee pests and absconding, and training to enrich beekeepers' knowledge are necessary to be implemented.

**Keywords:** Bee forage, Beekeeper, Beekeeping practice, Hive, Honey production.

## INTRODUCTION

Beekeeping is an important component of agriculture and rural development program of many countries. It helps to provide security in nutrition, economy and ecology (Jeil et al., 2020; Güler, 2021). Besides, it does not compete with other resources in the farming system, it is income generation activity and supplement annual income for the beekeepers through sell of bee products (honey, beeswax, and bee colonies). It also serves as a healthy food for consumers (FAO, 2015).

Ethiopia is the home of diverse fauna due to its varied ecological and climatic conditions (Beyene et al., 2016). This is the prime reason for the availability of large colony numbers in the country. In Ethiopia, three types of beehives (traditional, intermediate, and improved) are known, with more than 10 million colonies, from which more than 90% are traditional hives (CSA, 2021). Ethiopia is endowed with diverse agro-climatic zones, which are suitable for honey production.

The total annual honey production in the country is estimated about 129 million kilograms of which the greater portion is harvested from traditional beehives (CSA, 2021). Thus, while the country is a principal producer of honey, it has the potential to improve yields and harvest more if existing beekeepers are able to overcome significant issues regarding inputs, technical skills, and climate change adaptation (Dong et al., 2016; Gratzer et al., 2021). In order to exploit the country's production potential, the government has given consideration to developing the beekeeping subsector as a strategy for the reduction of poverty and the diversification of export commodities (Shapiro et al., 2015).

Attention is also given to upgrading the knowledge and skill of developmental agents and beekeepers so that they can develop better apicultural knowledge and skills that enable them to improve traditional beekeeping and increase the production of hive products (Girma et al., 2008). Furthermore, various non-governmental organizations intervene to assist



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the poor and the formation of beekeepers' cooperatives and unions in order to bring about significant changes in the increased supply and consistent quality of honey and beeswax, allowing smallholders and the country to benefit from the sub-sector (Reda et al., 2018). Besides, the federal and regional agriculture and livestock bureaus have improvement strategies aimed at increasing the quality and quantity of hive products (MoA and ILRI, 2013).

Despite the long tradition of beekeeping in Ethiopia, having the highest bee density and being the leading honey producer as well as one of the largest beeswax exporting countries in Africa, the contribution of this sector is very low. In Somali Region, large proportion of inaccessible lands for agriculture are covered with various types of trees, shrubs, bushes, and field flowers that make this part of the regions still to be potential for beekeeping. However, these resources are not being utilized and efforts must be made to address some of the major problems of beekeeping and to keep it productive in the sustainable manner. Erer zone is one of the potential areas in beekeeping and supplies the most beehive products in the region, such as honey and beeswax. However, there is no compiled and reliable information on beekeeping practices and its production potential. Therefore, this study was carried out to assess beekeeping practices and identify challenges and opportunities of honeybee production.

## MATERIALS AND METHODS

### Description of the study area

This study was conducted in Lagahida and Fiq districts of Erer zone of Somali Regional State, Ethiopia. Fiq district is bordered on the south by Hamero, on the western by Qubi, on the west by Mayamuluka, on the north by the Jigjiga Zone, on the east by the Jarar Zone, and on the southeast by Sagag. The elevation of this woreda is 1035 m. It has a weather of 32 ºC and 27% humidity. It has a latitude and longitude of 8°8'16" N and 42°17'36" E. Lagahida district is bordered on the south by Salahad, on the west by the Oromia region, on the north by Mayumuluka, and on the east by the Erer which separates it from Hamero.

### Sampling technique and sample size

Multistage sampling technique was applied in this study. At the first stage, two districts namely Fiq and Lagahida were purposefully selected based on their beekeeping potential in consultation with pastoral development focal of the zone. At the second stage, a total of six kebeles (three from each district) were selected based on beekeeping potential. Lastly, a total of 156 beekeeping households (2 districts *3 kebeles *26 households) were selected for this study based on their willingness to participate.

### Data collection and analysis

Semi-structured questionnaires, field observations, interview with key informants and focus group discussions were applied to collect the required data for this study. The data were analyzed using SPPS (Version 26.0) and were presented in the form of tables and figures.

## RESULTS AND DISCUSSION

### Household characteristics

Table 1 shows the household characteristics of the respondents. Majority of the respondents (96.8%) were men, with the remaining (3.2%) being women. This indicated that higher proportion of beekeeping activities are left for male, with no female participation. The age characteristics indicated that most of the respondents fell within the range of 31-45 years (55.2%), followed by 28.6% (46-55 years), 23.7% (<30 years) and only (14.3%) of the respondents were aged above 55 years. Peoples in the aforementioned age do have the ability, skill and strength to climb large trees and uplift the hive to hang on branches of large trees. This result demonstrates people in the most productive age engage in the beekeeping activity. The survey also revealed that the vast majority of respondents (96.8%) were married. Marriage fosters synergy within a farm family and serves as a custom for dealing with life's challenges in the rural community.

Out of the total number of beekeepers interviewed, approximately 80.8% were illiterate, while the remaining (19.2%) could read and write. Traditional practices predominate in the study area because the majority of respondents hardily understand and accept new technologies. The educational level of farming households is critical for understanding extension packages and the adoption of improved technologies, which in turn determines the community's development. For more advanced beekeeping, a good understanding of bee biology and behavior is necessary for better colony management. In general, education is an important tool that determines the level of transformation of knowledge to improve beekeeping practice.

### Beekeeping practices

#### *Type of beekeeping*

Table 2 shows the types of beekeeping practiced by respondents in the study area. According to the investigation, three distinct types of beekeeping were used by the sample respondents in the study area based on their level of technological advancement. As a result, a large proportion of respondents (85.9%) practiced only traditional beekeeping,


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and the remaining (14.1%) practiced both traditional and movable frame hive beekeeping concurrently. It has also been observed that beekeepers constructed traditional hives using locally available materials and indigenous knowledge. The current study supported Getachew's (2018) report, which stated that a large proportion of sampled households in the Gesha district of Keffa zone practiced traditional beekeeping. The findings of the investigation are also consistent with other findings done in the Central, Northern, and South Western parts of Ethiopia, where traditional beekeeping systems predominate in rural areas (Getachew, 2018; Reda et al., 2018; Gratzer et al., 2021).

**Traditional beehives construction**

Traditional beehives were made of wood trees and hung from forest trees. Xagar (*Commiphora gileadensis*), Xoday (*Commiphora hodai Sprague*), and Barde (*Ficus glumosa del.*) were the most commonly available trees made from traditional hives in the study area.

**Source of honeybee colony**

The respondents in the study area own bee colonies from different sources. As indicated in Figure 1, the majority (84%) of the respondents obtained bee colonies by catching swarms whereas 8.3% and 7.7% obtained their colony from parents as a gift and by buying, respectively. This finding is in agreement with the report of Weldearegay and Anja (2017) who reported that majority (72%) of the respondents in Sude Woreda of Arsi Zone Oromia obtained bee colonies by catching swarms whereas 21 and 7% obtained their colony by buying them and from parents as gift, respectively.

**Table 1 – Characteristics of the sampled households (%)**

| Variables | | Fiq (n=78) | Lagahida (n-78) | Overall (n=156) |
|---|---|---|---|---|
| Sex | Male | 97.4 | 96.1 | 96.8 |
| | Female | 2.6 | 3.9 | 3.2 |
| Age (years) | <30 | 25.6 | 21.8 | 23.7 |
| | 31-45 | 51.3 | 58.9 | 55.2 |
| | 46-55 | 20.5 | 15.4 | 17.9 |
| | >55 | 2.6 | 3.9 | 3.2 |
| Marital status | Married | 96.1 | 97.4 | 96.8 |
| | Divorced | - | 1.3 | 0.6 |
| | Widowed | 1.3 | - | 0.6 |
| | Single | 2.6 | 1.3 | 2 |
| Educational status | Illiterate | 76.9 | 84.6 | 80.8 |
| | Read and write | 23.1 | 15.4 | 19.2 |

**Table 2 –Type of beehive (%) in the study area**

| Type of beehive | Fiq (n=78) | Lagahida (n-78) | Overall (n=156) |
|---|---|---|---|
| Traditional beehive | 82.1 | 89.7 | 85.9 |
| Traditional and modern | 17.9 | 10.3 | 14.1 |

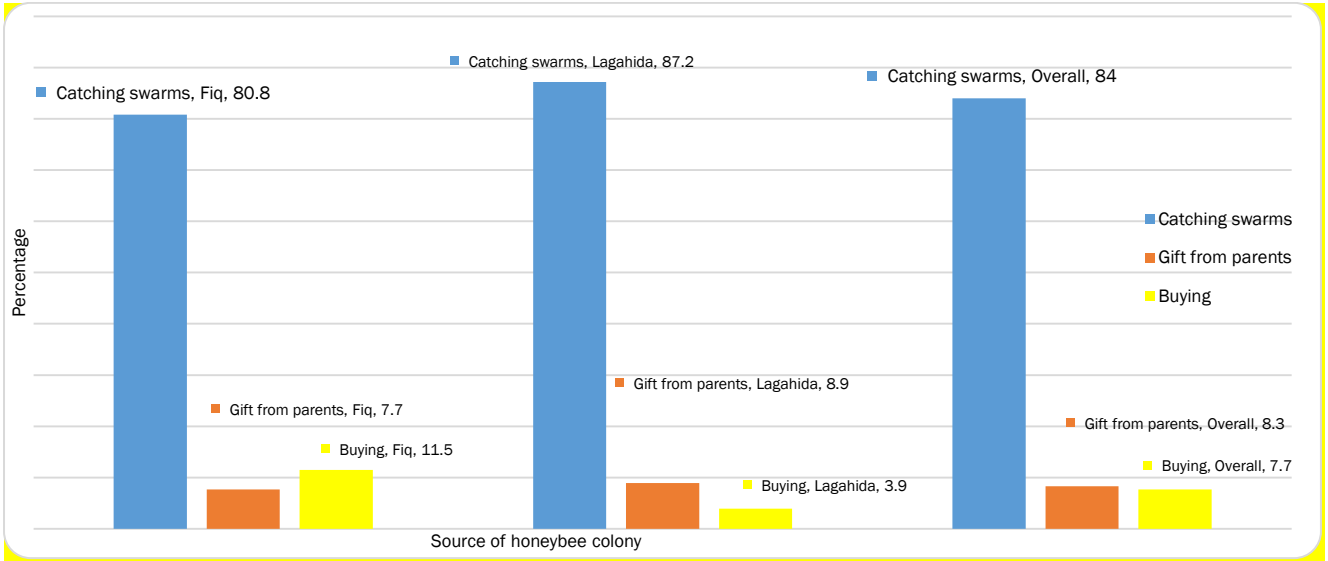


**Figure 1 - Source of honeybee colony in the study area**



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**Placement of the beehive**

The placement of beehive of sample respondents in the study area is presented in Table 3. According to the study, majority of beekeepers (73.1%) in the study area hang their hives on trees away from the homestead in dense forest. Considerable portion of the respondents (17.3%) kept their beehive in the backyard. Only a small percentage of respondents (9.6%) kept their hive in the backyard as well as hang on trees. The predominant honey production system in the study area is based on traditional beekeeping techniques dominated by forest and backyard beekeeping. Beekeepers in the study area prefer to hang their beehives in dense forest far away from residential areas, where there is plenty of bee forage and bee swarms are plentiful. The current findings are consistent with those of Fikru et al. (2015), who discovered that beekeepers in Jigjiga zone hang their beehives on trees and used a traditional beekeeping system.

The result of the current study is substantiated by Getachew (2018) who reported that about 55% of beekeepers in Gesha district of Southwest Ethiopia placed their beehives on branches of tree in the dense forest far away from their residential areas whereas the 23.1% of the respondents' hang on trees near homestead and about 1.9% of beekeepers kept beehives in an enclosed area. Hanging and keeping beehives in the dense forest which are mostly far away from residential areas might have limited beehive visit to only one or two times until harvesting and unawares about the condition of the site.

Table 3 – Placement of hive(%) by sample households

| Placement of beehive | Fiq (n=78) | Lagahida (n-78) | Overall (n=156) |
|---|---|---|---|
| Hanging on trees | 69.2 | 76.9 | 73.1 |
| Backyard | 18 | 16.7 | 17.3 |
| Both | 12.8 | 6.4 | 9.6 |

**Honeybee flora**

Table 4 lists some of the major honeybee floras in the study area, along with their botanical names. According to the sampled respondents, the major honey bee floras were Dhafaruur, Hobhob, Bilcil (*Acacia mellifera*), Qansax (*Acacia reficiens*), Qudhac (*Acacia tortilis*), Cadaad (*Acacia senegal*), and Sarmaan (*Acacia horrida*). According to the study, the honeybee flora is primarily made up of trees and shrubs which provide nectar and pollen. This variation in vegetation characteristics of the area could be significant enough to ensure adequate pollen and nectar for bee reproduction and honey production.

Table 4 – Major honeybee flora (%) in the study area

| Local name | Botanical name | Type | Rank |
|---|---|---|---|
| Dhafaruur | Grewia tenax | Shrub | 1 |
| Hobhob | Grewia penicillata | Shrub | 2 |
| Bilcil | Acacia mellifera | Tree/wood | 3 |
| Qansax | Acacia reficiens | Wood | 4 |
| Qudhac | Acacia tortilis | Tree/wood | 5 |
| Cadaad | Acacia Senegal | Tree/wood | 6 |
| Sarmaan | Acacia horrida | Tree/wood | 7 |

*honeybee flora were ranked based on the number (frequency of respondents' prioritization and availability

**Water availability**

River and nearby ponds, which are primarily used during the dry season, were the primary water sources for honeybees in the study area. Beekeepers did not provide water for bees near their apiaries. Furthermore, the majority of respondents reported that there was a scarcity of water in the area, particularly during the dry season, which is one of the key constraints of beekeeping in the study area.

**Honey production**

Table 5 shows the average annual honey yield per hive from traditional and modern bee hives in Fiq and Lagahida districts. The average honey yield from the traditional beehives was significantly higher ($P$<0.05) for Fiq district (5.10±0.61) kg//hive and lower for Lagahida district (4.60±0.65) kg/hive. The average honey yield from modern beehives, on the other hand, was slightly higher ($P$<0.05) for Fiq (8.58±1.69) kg/hive and lower for Lagahida (8.00±1.66) kg/hive. The variation in average annual honey yield per hive from traditional beekeeping in the localities was attributed to differences in hive volume and beekeeper skill. The honey value obtained from traditional hives in the current study (4.85 kg) is less than the national average yield (5 kg). Yirga et al. (2012) reported that productivity and overall production increases with the level of management, experience and area potentiality.

The honey obtained from modern hives in the current study (8.29 kg) was higher than the 7.14 kg found by Fikru et al. (2015) for the Jigjiga zone of the Somali region. However, it was significantly lower than the average yield of 20 and 22



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kg in Keffa zone, SNNPRS and in Jimma and Illubabor Zone of Oromia Regional State, respectively (Kiros and Tsegay, 2017; Getachew, 2018).

Table 5 –Honey yield (kg) in the study area (Mean±SD) by sampled households

| Hive type | Fiq | Lagahida | Overall | *P*-value |
|---|---|---|---|---|
| Traditional hive | 5.10±0.61[a] | 4.60±0.65[b] | 4.85±0.68 | 0.001 |
| Modern hive | 8.58±1.69 [a] | 8.00±1.66 [b] | 8.29±1.70 | 0.03 |

*Means with different letter of superscripts in the same column are different significantly at *P*<0.05

**Honey harvesting and marketing**

According to the information collected from the respondents, honey is harvested two times per year and the price of honey in the area varied from 250 to 300 ETB/kg. However, the price of honey fluctuates with highest price in the dry season (January to April), and also during wet season (June to August) in the period when there was no honey production and lowest price during honey harvesting time (September to November and May). The general marketing of honey in the area was promising. They use honey as medicine, food and drinks. Almost all interviewed beekeepers did not harvest bee wax because of lack of awareness about the product.

According to respondent beekeepers and our observations at various levels, lack of appropriate hive products' marketing place, lack of market information, absence or lack of known market route or channel, buyer dependent price settings, lack or inappropriate functioning of marketing cooperatives, less awareness on post-harvest handling of their products have been identified as major constraints in the marketing system.

**Major constraints of beekeeping**

According to the information collected from the respondents, honey is harvested two times per year and the price of honey in the area varied from 250 to 300 ETB/kg. However, the price of honey fluctuates with highest price in the dry season (January to April), and also during wet season (June to August) in the period when there was no honey production and lowest price during honey harvesting time (September to November and May). The general marketing of honey in the area was promising.

According to respondents, the major constraints of beekeeping are the high cost of modern hives and accessories, pests and predators of honey bees, water scarcity, shortage of bee forage, bee absconding and marketing. The present study is supported by Yirga et al. (2012), who reported that bee pests, predators and absconding are major constraints affecting beekeeping sub-sector in northern Ethiopia. The current study is also consistent with Fikru et al. (2015), who reported that during the field survey, the interviewed beekeepers in Jigjiga zone responded that some bee equipment, such as modern bee hives, wax printers, and honey extractors, are very expensive, and thus farmers cannot afford to buy and use these equipment. As a result, there is a scarcity of appropriate technologies for production, collection, processing, packing, and storage in the area. Because the majority of the farmers in the study area lacked resources, they were unable to purchase and implement modern bee technologies to increase honey yield.

Table 6 –Major constraints of beekeeping in the study area

| Constraint | Rank | Measures |
|---|---|---|
| Beekeeping equipment | 1 | Use of locally available materials |
| Pests and predator | 2 | Hive cleaning |
| Water scarcity | 3 | Preparing water ponds |
| Shortage of bee forage | 4 | Increasing bee forage by cultivating different crops |
| Absconding of bees | 5 | Overall management practice |
| Marketing | 6 | Harvest and store |

*Constraints were ranked based on the number (frequency) of respondents prioritize the problems

**Pests and predators**

Honey bees, like all living organisms, are vulnerable to pests and predators at all stages of their life cycle. The study discovered that the presence of pests and predators was a major challenge in beekeeping. Birds, ants, spiders, wax moth, mice, lizards, and honey badgers were identified as the major honeybee pests and predators based on beekeeper responses. The study is substantiated by Fikru et al. (2015) who reported that mites, spider, bee-eater birds, lizard etc. are the most serious problems to beekeeping development in Jigjiga zone, Ethiopia. Furthermore, Amsalu (2020) identified ants, beetles, wax moth, honey badger, bee-eater birds, dead hawks moths, bee lice and some predators like, lizards, wasps and spiders as the major pests and predators considered as challenges ranked with their relative degree of importance. Similarly, Getachew (2018) reported that ant attack, honey badger, birds, wax moth, lizard, and wax moth are bee pests and enemies in Ethiopia that affect bees and beekeeping. Similarly, Shenkute et al. (2012) reported that


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ants, honey badgers, birds, and small hive beetles are the most common honeybee enemies in the Keffa, Sheka, and Bench-Maji zones. The author also stated that honeybee enemies are responsible for significant losses (40.7%) of total honey production per year. This indicates that honey bee pests and predators have a significant impact on beekeeping households' income.

**Absconding of bee colonies**

The study revealed that most of the respondents experienced absconding of bee colonies. Various causes of honeybee absconding were identified in the present study (Table 7). According to the respondents, the main reasons for absconding were due to pests and predators (37.8%), destroying nests during harvesting (26.9%), shortage of bee forage (14.1%), and water scarcity (21.2%). The findings of this study are consistent with those of Getachew (2018) and Kinati et al. (2012), who reported similar reasons for bee colony absconding in the Gesha and Goma districts, respectively. Similarly, Shibru et al. (2014) reported that honeybee absconding and migration as the main constraints of beekeeping in Gambella Zuria and Godere Wereda of Gambella Regional State, Ethiopia.

The presence of honey bee pests and predators resulted in frequent colony absconding and high migratory tendencies. During honey harvesting from traditional hives, beekeepers dismantle the hive, damage the brood, and abandon the colony, resulting in the colony's eventual disappearance. This is consistent with the findings of Shenkute et al. (2012), who reported similar results in the Keffa and Sheka zone. Due to shortage of bee forage, the honeybee colony migrates to areas where resources are available for survival. Bee forage scarcity is directly related to the off-flowering period of major honeybee plants. About 73.7% of the interviewed households stated that improving overall management (feeding bees, cleaning the hive, appropriate harvesting technique, etc.) as a method to avoid absconding. On the other hand, 26.3% of respondents believed absconding was unavoidable and thus did nothing to prevent it. These farmers believed that when the colony was disturbed for honey harvesting, the bees would flee and never return to the hive.

Table 7 – Causes of honeybee absconding (%) in the study area

| Variables | Fiq (n=78) | Lagahida (n-78) | Overall (n=156) |
|---|---|---|---|
| **Causes of absconding** | | | |
| Pests and predators | 35.9 | 39.8 | 37.8 |
| Shortage of bee forage | 16.7 | 11.5 | 14.1 |
| Destroying of nests | 28.2 | 25.6 | 26.9 |
| Water scarcity | 19.2 | 23.1 | 21.2 |
| **Control mechanism of absconding** | | | |
| Overall management | 76.9 | 70.5 | 73.7 |
| Do nothing | 23.1 | 29.5 | 26.3 |

**Opportunities of beekeeping**

Even though different constraints have been described for their possible effects exerted on the beekeeping subsector in the area, it has been an established fact that the area is endowed with different opportunities and immense potentials. Accordingly, some of the opportunities associated with the study area and described by the respondent beekeepers included increasing hive products' demand, availability of honeybee floral resources, and availability of honeybee resources.

## CONCLUSION

Beekeeping has been practiced as a sideline activity in the area by many rural farming communities as an income generation and livelihood activity. The prevailing honey production system in the study area is based on traditional beekeeping technique dominated by forest beekeeping which compromises the quantity and quality of honey. Furthermore, various constraints including pests and predators, absconding of bees, shortage of bee forage, water scarcity, and lack of appropriate knowledge to manage bees have hampered honeybee production in the area. Furthermore, Ants, honey badger, birds, spider, wax moth, and lizards are the major damaging bee pests in the area. Beekeeping production remains low due to these constraints and traditional practices in the area. Despite the numerous constraints, it is impossible to ignore the activity due to its contribution to the livelihood and food security of the farming community, as well as its vital role in maintaining the natural resources of the area. Moreover, there is enormous potential to increase the amount and quality of honey yield in the area in order to improve the communities' livelihoods in a sustainable manner. Therefore, all stakeholders in the area should collaborate for the improvement and development of the sub-sector in order to benefit farmers in particular and the country as a whole by raising awareness about good management practices of honeybee, introducing local made or least cost technologies and as well as the harmful effects and control measures of pests and predators.


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## DECLARATIONS

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**Authors' contribution**

**The author contributed on data collection, analysis and the write up of the manuscript as well.**

**Conflict of interests**

**The authors have not declared any conflict of interests.**

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