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# Opportunity and Constraints of Beekeeping in Horo District, Horo Guduru Wollega Zone, Oromia Regional State, Ethiopia

Alemayehu Tolera<sup>1</sup>, Desalegn Begna<sup>2</sup>

<sup>1</sup>Hawassa College of Agriculture, School of Graduate Studies, Department of Animal and Range Sciences, Hawassa, Ethiopia

<sup>2</sup>Ethiopian Policy Study Institute, Addis Ababa, Ethiopia

## Email address:

toleraalex@gmail.com (A. Tolera)

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**Abstract:** The study was aimed at identifying potential opportunities and constraints of beekeeping in Horo district, Horo Guduru Wollega Zone, Oromia regional state, Ethiopia. Formal and informal survey methods were used to collect information of secondary data and response on structured questionnaires. For the study 30 household beekeepers from each kebele at total of one hundred eighty households were selected randomly from both highland and midland agro-ecology. From 180 household head interviewed 98.9% were male headed and the rest 1.1% were female headed households. 90% of respondents attended primary and junior school level education. The major opportunities to engage on honeybee beekeeping were presence of governmental organization and Non-governmental Organization that works on beekeeping towards its improvement, readiness of beekeepers to accept new technology, presence of huge numbers of honeybee colony, availability of lending institutions, beekeepers' experience, soil and water conservation practices of the area, abundant honeybee forages, sufficient water sources for honeybees and marketing situation of honeybee products. Whereas, the major constraints that affects beekeeping in the district were pesticide and herbicide application (17.8%), pests (16.1%), beekeeping equipment (14.4%), shortage of bee forage (11.7%), lack of improved beehive (10%), migration (7.8%), Absconding (7.2%), lack of extension services (5.6%), swarming (3.9%) and dearth of bee colony (2.2%). Generally, the high potential is manifested with abundance of honeybees, availability of honeybee flora, demand of honeybee product in market and experience of honey beekeeper in the areas. These potentials were under exploited due to existence of constraints demanding immediate intervention, particularly on improved technology adoption and frequent improvement of beekeepers knowledge and skill is mandatory.

**Keywords:** Constraints, Honeybee, Horo, Opportunity

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## 1. Introduction

Ethiopia is endowed with diverse flora and fauna in Africa with various climatic conditions, topography and a wide range of altitude favoring the presence of different natural vegetation [10]. This makes the country highly suitable for sustaining a large number of bee colonies [20]. According to [6] about 6,523,969 million bee colonies are estimated to be managed in the rural sedentary areas of the country. From these total beehives, 3,185,361 beehives are from Oromia Region accounting about 49% of the country's bee colony population. With this bee colony population, the country is

the largest honey producer in Africa and 10<sup>th</sup> largest honey producers in the world [21]. An Ethiopian honey production accounts approximately 2.5% of world production and 21.7% of African honey production [17].

However, being the leading honey and beeswax producers, the contribution of the sub-sector to the agricultural GDP of the country were 1.3% [22] and which has never been corresponding with the huge numbers of honeybee colonies and the country's immense resources for beekeeping [2, 9]. Productivity of the sub-sector has always been low, leading to low utilization of hive products and relatively low export earnings. Furthermore, the beekeeping development of the

country and its benefit are currently challenged by many and interrelated factors like ecological degradation, recurrent drought, farmland expansion, recently emerging bee pest and diseases, indiscriminate use of agro-chemicals, low technology input, poor pre and post-harvest management, inadequate extension services and poor marketing infrastructure [14, 8]. Low productivity and quality of bee products are also among the major economic impediments for beekeepers [19].

Horo district is one of the districts of Horo Guduru Wollega zone of Oromia regional state. Like the other parts of the region, beekeeping is one of the traditional activities in the district practiced as side-line to other agriculture like crop production and animal husbandry. With its suitable agro-climatic conditions and biodiversity Horo district is highly suitable and very ideal place for beekeeping and hence, about 44% of the total households living in the district practices beekeeping [18]. However, the major constraints and potential opportunities of beekeeping in Horo district is not investigated and documented. Therefore, this study was aimed to investigate and document the existing major constraints and potential opportunities of beekeeping in Horo district.

## 2. Materials and Methods

### 2.1. Description of the Study Area

Horo district is one of the districts Horo Guduru Wollega zone of Oromia regional State, Ethiopia. The district is located at 340 km west of Addis Ababa with  $9^{\circ} 34' N$  latitude and  $37^{\circ} 06' E$  longitudes (Figure 1). The district consists 114,243 of human population of which 57,022 males and 57,221 females. The district is mainly characterized by two major agro-ecologies, namely; highland (49.8%) and midland (48.9%). Total land area of the district is 77,998 ha of which 71% of the area cultivated with crops, 8.3% used for pasture, 12% covered by forests, 6% swampy and the remaining 2.7% unproductive or degraded [13]. Mixed crop-livestock agriculture is the main stay of the farming communities and maize, wheat, barley, Teff, field peas and faba beans, potatoes, other fruit and vegetables are the major grown crops. Livestock species raised in the district include cattle, sheep, horses, poultry, goats, donkey, mules and bee colonies. The district have only one long rainy season from March to mid-October with mean annual precipitation of about 1800 mm [18], mean temperatures of  $22^{\circ}C$  [13].

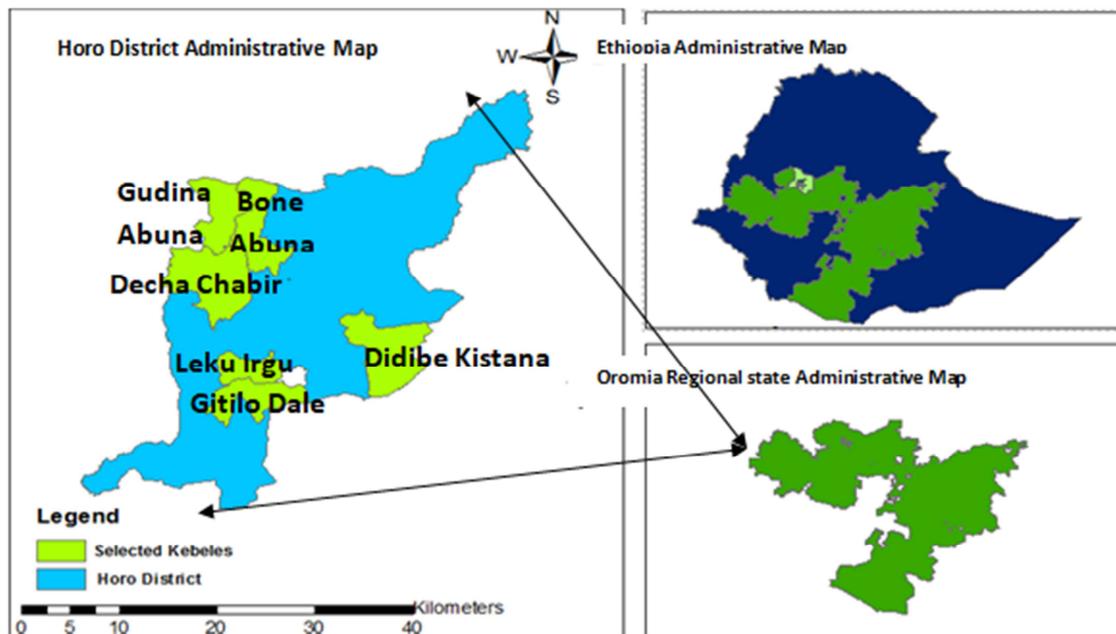


Figure 1. Location map of the study district.

### 2.2. Sampling Techniques and Sampling Size

For this study six kebeles were purposively selected based on their potentials for beekeeping and accessibility. From each kebele 30 in total 180 household beekeepers were randomly selected from based on owning bee colonies (minimum three bee colonies) using Kothari (2004), at 95% confidence levels.

### 2.3. Data Collection

Both primary and secondary data were collected to achieve

the objectives of the study. Primary data was collected through household interview key informant interview and focus group discussions. The primary data collections were run through household interviewing sample respondents on structured questionnaire. Pre-testing of the questionnaire was made as a pilot survey and modification was made on the questionnaire was done on the basis of information obtained during pre-testing. Single-visit-multiple-subject formal survey method [14] was also a part of data collection on various aspects of beekeeping production constraints and opportunities. Enumerators were recruited and trained to collect the data under the supervision of the researcher. Key

informant interview included district beekeeping expert, development agents (DAs) of the study area, farmer beekeepers and the focus group discussions included the purposively selected PA leaders, DAs and bee technicians, and some individuals who are believed to be knowledgeable on beekeeping. Whereas, Secondary data was obtained from reports of district Agricultural Development Office, Zonal Agricultural Development Office, NGOs and other published and unpublished materials.

All the collected data were coded, tabulated and entered into an excel data sheet and analysed using SPSS version 20. Descriptive statistics such as mean, percentages, frequency distribution, tables and standard error were considered as qualitative data output.

### 3. Results and Discussion

#### 3.1. Socio- Economic Characteristics of Households

##### 3.1.1. Sex of Respondents

From the total of 180 sample households interviewed, about 98.9% were male headed and the rest 1.1% were female headed households. The report shows that beekeeping activity is dominated by males and women are not allowed to involve in beekeeping activities in the study area. This study investigation is similar with the investigation at the various parts of the country illustrating that Ethiopia traditionally beekeeping is men's job in Sothern Ethiopia [15], beekeeping

is male headed households dominated activity in Tigray [25] and beekeeping as men's dominating practice in Bale [1]. Consequently gender prohibition remains decline productivity, given the well-known fact that the woman contributes more than half to the household's food and cash crop production and the fact that beekeeping can be done by any sex.

##### 3.1.2. Age of Respondents

Survey result showed that the beekeepers household head age ranges from 20-81 years old with mean age of 46.12 (Table 1) of which more than 86% of the respondents are less than 50 years. The finding shows that the majority of the beekeepers are in their active and productive age group and there was no significant difference ( $P>0.05$ ) in age between the studied peasant associations (PAs) (Table 1). This result shows that beekeeping can be performed by all age groups and reasonably without any difficulties and more actively performed by younger age groups. Similarly [5] reported the most productive age are actively involved, accommodating experiences from elders and finally become independent beekeepers. Additionally, [4] also reported similar results from Wonchi District South West Shewa Zone of Oromia.

##### 3.1.3. Family Size of the Respondents

The beekeepers that have different family size were engaged in beekeeping activity. The mean family size of the household beekeepers of the study area was 5.78 (Table 1).

Table 1. Socio-demographic characteristics of beekeepers in Horo district.

Kebeles		Leku Ergu (N=30)	Gitilo Dale (N=30)	Didibe Kistana (N=30)	Dacha Chabir (N=30)	Gudina Abuna (N=30)	Bune Abuna (N=30)	Overall mean
Age	mean	45.7	47.3	44.57	46.4	44.5	48.2	46.12
	Illiterate	13.3	6.7	6.7	6.6	20	6.7	10
Educational level	Grade 1-8	23.3	36.7	70	60	50	60	50
	Grade 9-12	46.7	50	20	26.7	30	33	34.4
	Level I-IV	16.7	6.7	3.3	6.7	0	0	5.6
Family size	Mean	6.3	5.33	5.33	6.3	4.9	6.5	5.78
Experience	Mean	11.8	9.33	12.03	13.03	9.46	20.6	12.59

##### 3.1.4. Education Status of Beekeepers

The educational status of sampled respondents showed that only 10% are illiterate and the remaining 50%, 34.4% and 5.6% are with elementary and junior school (grade 1-8), high school and preparatory school (grade 9-12) and middle level profession (level I-IV) respectively. In the study area educational level has a significant effect on technology adoption and it may have great importance in identifying and determining the type of development and extension service approaches in order to improve the livelihoods of small holder beekeepers (farmers). As the study result indicated, those beekeepers with an education category of grades 9 and above were adopting improved beekeeping technology, holds high number of honeybee colonies and practices good honeybee management. Similar reports were noted by [11, 25, 1]. It is also observed that education had significant effect on adoption of improved beekeeping technology, beekeeping

experience and number of bee colony holdings between illiterate and literate beekeepers. Similarly as study result showed that those beekeepers with in education category of grades (9-12) and hold TVET education certificate in Level I-IV had more bee colony with frame and transitional beehives of produced quality bee products and involved in bee product marketing. It is observed that literate beekeepers holds more honeybee colonies with improved beekeeping technology, practices better honeybee management and more involved in honeybee product marketing than illiterate beekeepers.

#### 3.2. Existing Opportunities and Potential for Beekeeping in Horo District

As the study result indicated that Horo has huge potentials and opportunities that encourage the beekeepers for sustainable beekeeping that leading to considerable gain through increases honey production as to improve the livelihood of the

beekeepers in the district. This finding revealed that the most significant opportunity for beekeeping in the study area includes the presence of governmental organization that works on beekeeping development (provide training and adoption of new technology), readiness of beekeepers to accept new technology, presence of huge numbers of honeybee colony, beekeepers' experience, abundant honeybee forages, sufficient water sources for honeybees, availability of lending institutions, soil and water conservation practices of the area, and marketing situation of honeybee products. These indicate that the area is potential and it has suitable climatic condition for production of many thousand kilograms of honey and beeswax every year. This all are the existing opportunities in the study area plays significant role for the development of sustainable beekeeping. In addition to this finding [1, 25, 24, 3] reported similar ideas for the development of sustainable beekeeping from different parts of the country. Accordingly, exhaustively to utilize the existing potentiality of the area, adoption of improved technology and providing technical training on honeybee management for the beekeeper is mandatory.

### 3.3. Honeybee Forage and Water

Horo is endowed with diverse plant habitat that flower throughout the year and which is very favourable for beekeeping. Due to this reality, Horo has abundant honey bee foras which are unexploited resource for beekeeping. However the beekeeping productivity does not commensurate with available resources. According to the study result, honeybee plants of the area includes cultivated crops, trees, shrubs, herbs and vegetables which are used as source of nectar and pollen.

The quality and quantity of honey production is determined by the presence of diverse foras or ecological suitability of an area. Similarly [20] found that, the number of honey bee colony and their productivity are mostly influenced by the

nature of honeybee flora of an area. Since, bee forages are used as sources of nectar, pollen and propolis for honeybees for preparing hive products as a whole. The amount of honey yield was determined by the available resource of diverse bee foras coupled with other factors that are suitable for honey production. Horo has different honeybee flora density and composition including natural forest/trees, shrubs/bushes, herbs and field crops which play significant role for beekeeping. As a result, this difference in honeybee flora type of the study area might be due to different flowering season and thus it reflects the potential of the area for efficient honey production at different seasons of the year. Accordingly, the study result showed that, the most important and known honeybee foras include tree type: Heexoo (*Hagenia Abyssinica*), Botoro (*Sterospermum kunthianum*), koshomi (*Dovyalis Caffra*), Somboo (*Ekbergiacapensis*), Walensu (*Erythrinia abyssinica*), Wadeessa (*Cordia Africana*), Gatama (*Schefflera abyssinica*), and Baargamoo (*Eucalyptus camaldulensis*). Horticultural crop: Buna (*Coffea Arabica*), Koki (*Prunus persica*) and Apple (*Malus sylvestris*). Shrub type: Gulo (*Ricinus Communis*), Demekese (*Ociman Lamiiifolium*), Ebicha (*Vernonea Omygdolina*) and Goraa (*Rubus spp*). Herb type: Siddisa (*Trifolium Quartinianum*), Hadaa (*Guizotias cabrascabra*), and Oil crop: Nuugii (*Guizota Scabra*), Field crop type: Atara (*Pisumsativum*), Baaqelaa (*Vicia faba*) and Vegetable and fruits: Birtukana (*Citrus spp*), Raafuu (*Brasica Integrifolia*) were identified as honeybee flora in the study area. Among factors challenging beekeeping, presence of potential bee forages and ample water sources for honeybees are proven as an area were potential for beekeeping. Regarding water availability in the study area, majority 97.7% of the beekeepers replied that as water available for beekeeping throughout the year. As the study result indicated that the main water sources found in the study area were lakes, streams, rivers, ponds and water harvesting structure. Similarly, [1, 3] reported similar results from different part of the country.

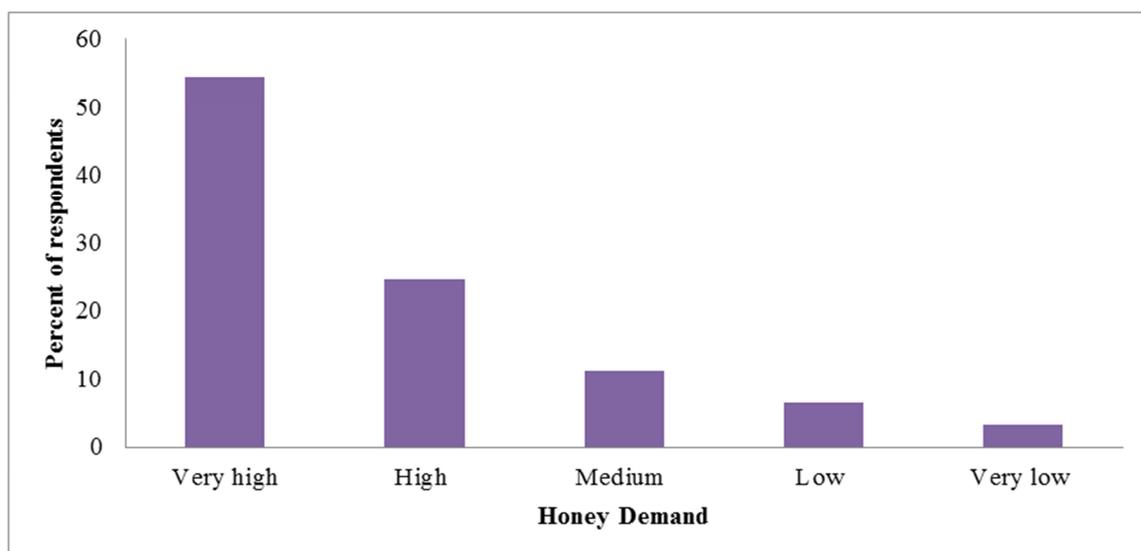


Figure 2. Honey demand in Horo district.

### 3.4. Market Demand of Honey Bee Product in the Study Area

As the study result indicated that 54.4% of household beekeepers replied that the honey demand was very high in Horo (Figure 2). These in turn will create good opportunities and encourage the beekeepers to expand beekeeping activities. Similarly, [4, 3] also reported similar results from Wonchi District South West Shewa Zone and Gimbi District, West Wollega Zone of Oromia Regional state respectively.

### 3.5. Major Factors Affecting Beekeeping in Horo District

Recently beekeepers are facing a number of interrelated problems that affect productivity and production of honey. The major constraints identified in study area are application of pesticide and Herbicide such as 2,4D, Round up, Malathion, Topic pests and pests such as ants, honey badgers, birds and small hive beetles (Table 2). According to the result of the study, next to application of pesticide and herbicide, incidence of pests is major problems to honeybees and their products. According to this study, ants attack was a serious problem as regards the pests to be number one honey bee enemy of the area. About 86.5% honey production system in the study area is vulnerable and easily attacked by ants for being poor management and inspection. As a result of the ants attack a considerable amount of honey and other hive products was lost and bees absconded. Following ants' honey badger, spider and bee-eating birds with, 16.6%, 10.6 and 9.4% took the second, third and the fourth most serious bee enemies that indicated in the area (Table 2). Similarly [16] reported that 40.7% loss of total honey production per annum can be caused by honeybee enemies mainly by pest. Additionally, [9, 7] reported that ants attack is the most serious problem in

beekeeping sector. Furthermore, [12] found that bee pests, predators and absconding are major constraints affecting honey sub-sector in northern Ethiopia.

Table 2. Identified major factors affecting beekeeping in Horo district.

Total sample size (N=180)		
Major beekeeping constraints	Percent	Rank
Pesticide and herbicide application	21.1	1 <sup>st</sup>
Pest	16.1	2 <sup>nd</sup>
Bee equipment	14.4	3 <sup>rd</sup>
Shortage of bee forage	11.7	4 <sup>th</sup>
Lack of improved beehives	10	5 <sup>th</sup>
Migration	7.8	6 <sup>th</sup>
Absconding	7.2	7 <sup>th</sup>
Lack of extension services	5.6	8 <sup>th</sup>
Swarming	3.9	9 <sup>th</sup>
Dearth of bee colony	2.2	10 <sup>th</sup>

#### 3.5.1. Honeybee Pests

As the study result revealed that 42.8% of household beekeepers replied that Ants (*gonda*) (*Dorylusfulvus*) is the major potential honeybee pests that affect honeybees and their products in the study area. (Table 3). Similarly, [9, 7] reported that ants attack is the most serious problem in beekeeping sector.

Table 3. Major honeybee pests found in Horo district.

Pests	Frequency	%	Ranks
Ants ( <i>gonda</i> ) ( <i>Dorylusfulvus</i> )	77	42.8	1 <sup>st</sup>
Honey badger ( <i>Mellivoracapensis</i> )	30	16.6	2 <sup>nd</sup>
Spiders ( <i>Cheiracanthium punctorium</i> )	19	10.6	3 <sup>rd</sup>
Bee-eating birds	18	10	4 <sup>th</sup>
Wasps ( <i>Vespula germanica</i> )	16	8.9	5 <sup>th</sup>
Bee beetles	9	5	6 <sup>th</sup>
Wax mouth ( <i>Galleria mellonella</i> )	6	3.3	7 <sup>th</sup>
Monkey	5	2.8	8 <sup>th</sup>

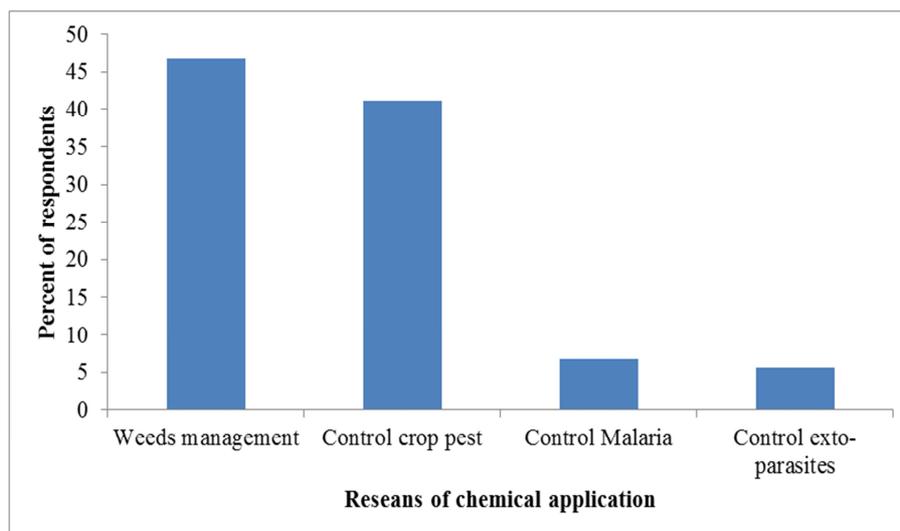


Figure 3. Reason of chemical applications in Horo district.

#### 3.5.2. Agro-chemicals Application

As the study result revealed that 98.2% of household

beekeepers replied that honeybee production and a number of honeybee colonies were decreasing from time to time in all

study areas due to agro-chemicals application. The most important agro-chemicals used in the study area were 2,4D, Round up, Malathion, Topic and other Fungicides types. As beekeepers reported, these agro-chemicals kill honeybees directly on the fields when the honey bees collect nectar and pollen to the hive and also affect the flowers that used as major food sources of honeybees. As the study result showed that the main seasons of agro-chemical applications in the study area were in September (38.4%), October (8.7%), November (0.7%), August (43.6%), April (0.5%), May (2.2%), June (0.6%), and July (5.3%). The finding shows that the main reason of agro-chemicals applications in the study area were mostly used for control of crop pests (41.1%), weeds (46.7%), malaria (6.7%) and ecto-parasites (5.6%) (Figure 3). Similarly, [23] reported that the use of agro-chemicals devastate honeybee production and bee colonies from Amhara regional state. Additionally, [8, 4, 3] also reported similar issues about effect of agro-chemicals from different parts of the country.

### 3.5.3. Honeybees Poisoning Plants in Horo Districts

The study result showed that, majority 91.8% of respondents replied that there were no toxic plants to honeybee in the study area. However, about 8.2% experienced beekeepers responded that Tamboo (*Nicotiana rustica*), Handode (*Phytolacca dodecandra*), Bakkanisa (*Croton macrostachys*), and *Sesbania sesban* are suspected as bee poisonous plants in the study area. However, identification of poisons plants needs to be confirmed by further research. Similarly, [15] also reported that Bisan (*Croton macrostachyus*), Endod (*Phytolacca dodecandra*) and *Susbania* species are suspected bee poisonous plant in Amhara Region.

## 4. Conclusion

Horo has huge beekeeping potentials and opportunities that encourage the beekeepers for sustainable beekeeping that leading to considerable gain through increases honey production as to improve the livelihood of the beekeepers in the district. This finding revealed that the most significant opportunity for beekeeping in the study area were the presence of governmental organization that works on beekeeping development, readiness of beekeepers to accept new technology, presence of huge numbers of honeybee colony, beekeepers' experience, abundant honeybee forages, sufficient water sources for honeybees, availability of lending institutions, soil and water conservation practices of the area, and marketing situation of honeybee products. However, recently beekeepers are facing a number of interrelated problems that affect productivity and production of honey. As the finding of the study indicated that application of pesticide and Herbicide, Pest, lack of bee equipment and accessories, migration and absconding of honeybee colonies, lack of improved beehives, and lack of extension services were identified as the major potential constraints that affect beekeeping in the study area. Therefore, exhaustively to

utilize the honey production potential and opportunity of the area, improving the low level of technological input utilization, addressing the skill gap on honeybee management and their enemies control mechanisms and how to control the application of agro-chemicals for household beekeeper is imperative to benefit large beekeeper of the district in particular and the country in general.

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