

# Survey on Trends, Challenges, and Opportunities of Honey Production and its Marketing System in Hawa Gelan District Kellam Wollega Zone Western Ethiopia

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**Abstracts:** *The study was conducted in Hawa Gelan District, Kellem Wollega of Western Oromia national regional state, Ethiopia to assess trends, challenges and opportunities of honeybee production and marketing systems. Structured questionnaire was employed for the study. The cross-sectional study design were carried out by using desk research, interviews, surveys and visual observation as methods in seeking answer to research questions. Purposive (district), simple random (Peasant Associations) and Census (beekeepers) sampling techniques were employed to select 96 beekeepers from two Peasant Associations. The collected data were analyzed by using SPSS version 20. In the study area, three types of honeybee production practices were identified, namely: Traditional, Intermediate and Movable frame hive honeybee production practices. The result shows most 69.79 % of beekeepers in the study area have owned only traditional bee hives. As a result the average annual honey produced per households was very low which estimated 93 kg in 2015. The average amount of honey harvested /hive/year from traditional hive, transitional hive and modern hive were  $4.32 \pm 0.042$ kg,  $9.83 \pm 1.05$ kg and  $14.2 \pm 2.52$ kg respectively. The mean yields obtained from the three hives were statistically significant at ( $p < 0.05$ ). From the beekeepers (64.6%) and (59.3%) have declared that decreasing trend of honey production and colony number from time to time respectively. Honey marketing participants were consumers (35%), retailers and consumers (31%), retailers (24%) and collectors (7.5%). The most important constraints, as beekeepers responded in their order of sequence were pests and predators (41.30%), poisoning of agro-chemicals (23.60%), high cost of modern hives and accessories (11.20%), shortage of bee forages (9.40%), low quality of honey products (7.20%), Poor infrastructure development (5.30%) and other factors (2.0%) were identified respectively. Despite of these, there are also future opportunities like presence of huge number of bee colonies (32.5%), availability of diverse vegetation plants and ample sources of water (21.70%), increasing demand of local honey (17.65%), presence of good government policy (9.0%) and others factors (19.15%). Further study is required to characterize honey bees of the area, quality of honey, major pests, predators and disease of economic importance. However, improving honey bee production techniques is important.*

**Key words:** Bee Keeping, Challenges; Hawa Gelan, Marketing, Opportunities, Trends.

## 1. INTRODUCTION

Ethiopia has a longstanding beekeeping practices that has been an integral part of other agricultural activities, where more than one million households keep honeybees. Ethiopia is known for its tremendous variation of agro climatic conditions and biodiversity which favored the existence of diversified honeybee flora and huge number of honeybee colonies. The country is the largest honey producer in Africa and ninth largest honey producers in the world [1].

It is one of the countries of the continent that has the largest honey bee population and owns a big potential of honey production owing to its varied ecological and climatic conditions. It has the largest bee population in Africa with over 10 million bee colonies, out of which about 5 to 7.5 million are estimated to be hived while the remaining exist in the wild. This makes Ethiopia a leading in Africa and ninth in the world in honey production, respectively. Similarly, it stands first in Africa and third in the world in beeswax production [2].

In Ethiopia, beekeeping is a promising non-farm activity for the rural households. It contributes to the incomes of households in particular and the economy of the nation in general. The direct contribution of beekeeping includes the value of the outputs produced such as honey, bee wax, queen and bee colonies, and other products such as pollen, royal jelly, bee venom, and propolis in cosmetics and medicine. It also provides an employment opportunity in the livestock sub-sector of the agricultural sector. The exact number of people engaged in the honey sub-sector in Ethiopia is not well known [3].

However, it is estimated that around one million farm households are involved in beekeeping business using the traditional, intermediate and modern hives. It could also be observed that a large number of people (intermediaries and traders) participate in honey collection and retailing (at village, district and zonal levels). Thousands of households are engaged in Tej-making in almost all urban areas, hundreds of processors are emerging and exporters are also flourishing [4].

Another very important contribution of beekeeping is through plant pollination and conservation of the natural environment. Beekeeping is environmentally sustainable activity that can be integrated with agricultural practices like crop production, animal husbandry, horticultural crops and conservation of natural resources. The contributions of beekeeping in poverty reduction, sustainable development and conservation of natural resources have been well recognized and emphasized by the incumbent government of Ethiopia and non-governmental organizations (NGOs) [5].

The major problems that affect apiculture in Ethiopia are lack of beekeeping knowledge, the unpleasant behaviors of bees (aggressiveness, swarming tendency, and absconding behaviors); lack of skilled manpower and training institutions; low level of technology used; high price of improved beekeeping technologies; drought and deforestation of natural vegetation; fires, poor post-harvest management of beehive products and marketing constraints; indiscriminate application of agrochemicals; honeybee disease, pest and predators; poor extension services; absence of coordination between research, extension and farmers; absence of policy in apiculture; shortage of records and up to date information and inadequate research institutions to address the problems. As a result, the roles of beekeeping as income generation or diversification for subsistent farmers and generating foreign exchange earnings have been very minimal [6].

The study area, Hawa Gelan is one of the district of Kellelem Wollega Zones of Oromiya Regional State with a high potential for development of apiculture. The Hawa Gelan has 59185 honeybee colonies. It is very special for its diversified natural and planted trees and shrubs spp., and cultivated crops which flower at different times of the year that provide sufficient forage for bees [7].

Despite the large number of honey bee colonies and diversified and huge honey flora resources in the country in general and the study area in particular, production and productivity of beekeeping is below its potential. Moreover quality and postharvest handling of bee products are relatively low. In addition to this fact, adoption of improved honey harvesting, processing and storage systems are limited contributing to poor quality marketable products. Thus, the beekeepers in particular and the country in general are not benefiting from the subsector as expected. This is because apiculture is one of the sub-sectors of agriculture that received limited attention in the areas of research and development interventions [8].

Even though Hawa Gelan is believed to have diversified type of vegetation and cultivated crops and expected to have good potential for beekeeping activities, so far little is known about the existing type of honeybee production practice, potential, trends, challenges, opportunities and marketing for the development of apiculture in the district. Identifying and prioritizing honeybee production status in the study area are very valuable tool for producers and other stakeholders involved in the business so as to make an improvement in the subsector.

This study was conducted with an aim to identify trends, challenges and opportunities of honeybee production and marketing in the selected district and to suggest possible intervention measures for future improvements. Therefore, this study was conducted to assess the overall beekeeping and honey bee production system in the study area with the following specific objectives:

- (1) To assess honey bee production practices in Hawa Gelan district.
- (2) To identify major constraints of honey production and its marketing in the study area

## **2. MATERIAL AND METHODS**

### **2.1 Description of Study Area**

This study was conducted in two Kebeles of Hawa Gelan district (Ifa Jiru and Hawa Moyi), Kellelem Wollega Zone, of Western Oromiya. Hawa Gelan is located at a distance of 652 km away from Finfinne, the capital city of the

country. Astronomically, the district is located between 8°10'58"N-9°21'53"N latitude and 34°07'37"E-35°26'53"E longitude. The average altitude of Hawa district is range from 1100-2100m above sea level. The average annual temperature and rainfall ranges from 17.5°C and 1700mm, respectively. The human population of the district are estimated to be 175879. The livestock populations of the district are estimated to be 189069. Honeybee potential of the area has estimated to be about 60, 000 honeybee colonies those have been hived by beekeepers [7].

The vegetation type of the area is characterized by Common River in vegetation. The area has reserved vegetation until the settlement program was practically applied. The areas are rich with wild game animals in main river system and savanna [9].

There are different types of hives which includes traditional, intermediate and movable frame in the study area. These types of hives contain number of colonies with 57255, 975 and 955 for traditional, intermediate and movable frame hives, respectively. Gross honey produced in 2015 production year of the study area was 286, 275, 9,750 and 33, 975kg from traditional, intermediate and movable frame hives, respectively. Totally, Hawa Gelan has 59, 185 colonies of bees and produced 330, 000kg of honey [7].

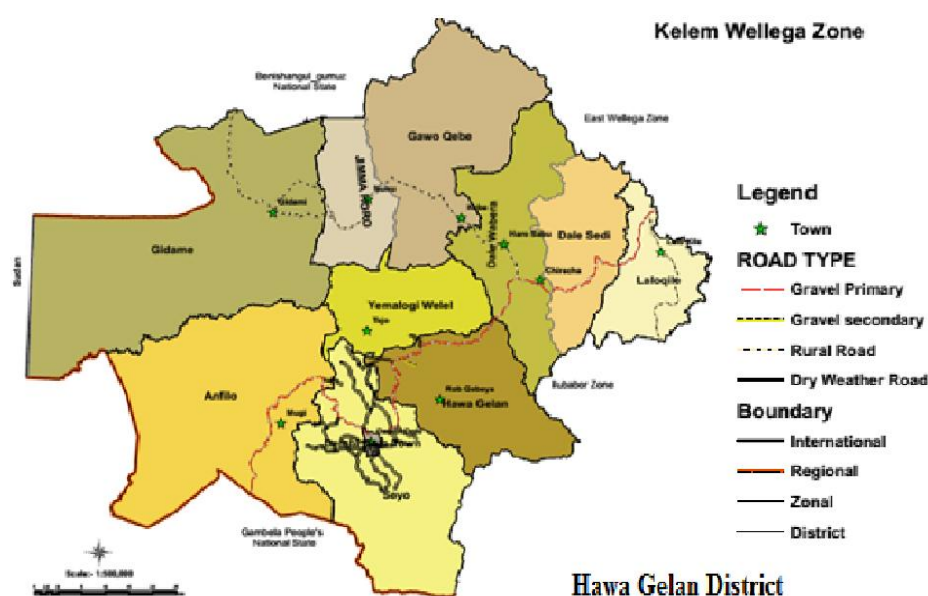


Figure 1: Map of study area

## 2.2 Study Design

Cross-sectional types of studies were conducted to collect data using questionnaire survey, observation and group discussion. The sampling units were households keeping honey bees. Beekeepers in the two Peasant Associations (PAs) represented the study population.

## 2.3 Sampling Techniques

A purposive sampling procedure was applied for the study districts. Based on agro-ecological condition of the study areas, 14 PAs from Kola and 18 PAs from Weina Dega were grouped, 1 PA from each agro-ecological condition was selected using simple random sampling techniques (Ifa Jiru and Hawa Moyi). The whole honeybee keepers were interviewed from both selected PAs. A total of ninety six (96) sample households were interviewed by well-trained enumerators using a semi-structured questionnaire prepared by English and translated to local language (Afaan Oromo) and group discussions were made with beekeepers, PAs leaders and district experts.

## 2.4 Methods of Data Collection

The study used both primary and secondary data to come up with reliable information on the trend in honey production and colony number, opportunities and major constraints of selected potential areas. Primary data were collected on the following aspects: socio-economic, demographic data, current practices and placements of bee

colony, types of hives, honey produced per year, inspection of honeybee colonies, honey harvesting, major honeybee flora, honey storage practices, average costs of honey, costumers', opportunities and major constraints of beekeeping. Secondary data were used to select potential localities based on number of honeybee colonies and honey production information acquired from district livestock and fisheries development and Zonal office of livestock and fisheries development.

## 2.5 Statistical Analysis

All the collected data were entered into Microsoft excel 2007 spread sheet and descriptive statistics such as mean, frequency, percentage were used by applying Statistical Package for Social Science (SPSS) version 20 to analyze the data.

## 3. RESULTS

### 3.1 Beekeeping Practices

Beekeeping practice observed during this study was undertaken by three types of bee hives (traditional, intermediate and Movable Frame hives) in the study area.

#### (1) Distribution of bee hives

In this study, about 69.79 %, 18.75%, 7.29% and 4.17% of respondent were kept their honey bee colonies in Traditional hives, Traditional and Transitional, Traditional and Movable frame and Traditional, Transitional and Movable frame, respectively (Table 1).

**Table 1:** Different types of beehives in Hawa Gelan district

Types of hive	Percentage (%)
Traditional	69.79
Traditional and Transitional	18.75
Traditional and Movable frame	7.29
Traditional, Transitional and Movable frame	4.17

#### (2) Annual average honey produced per house hold and productivity per hive in the study area

The survey result shows that honey production per households ranged from 60 to 750 kg, and about 4.20% of respondents reported that their annual production during this study period was  $\leq 100$ kg. While, 94.8% of them reported that their annual production was between 101-300 kg and about 1.00% of informants replied that their annual production was  $\geq 301$ kg per year, respectively. The annual average honey production of the respondents was 93.85 kg in the 2015.

On the other hand, average production of traditional, intermediate and movable frame beehives was 4.32, 9.83 and 14.27 kg, respectively (Table 2). This result indicated that, the existence of an appropriate site to increase the performances of these beehives through better management practices coupled with the existing favorable beekeeping environment in the study area. This also shows the presence of underutilized apicultural development potential in the study area.

**Table 2:** Percentage of Annual Average Honey Produced Per House Hold in the Study Area

Annual Honey Produced in Kg	Percentage (%)	Annual average honey produced (Kg)/HH
Small producers $\leq 100$	4.2	93.85
Medium producers (101-300)	94.8	
High producers $\geq 301$	1.0	
Total	100.0	

**Table 3:** Honey yield from traditional, intermediate and movable frame hives in Kg per year of the study area

No.	Type of hive	District	Mean +SD
1	Traditional	Hawa Gelan	4.32 $\pm$ 0.042a
2	Intermediate	Hawa Gelan	9.83 $\pm$ 1.05b

3	Movable Frame	Hawa Gelan	14.27±2.52c
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The mean in table having different superscript are show statically variation at  $p < 0.05$ .

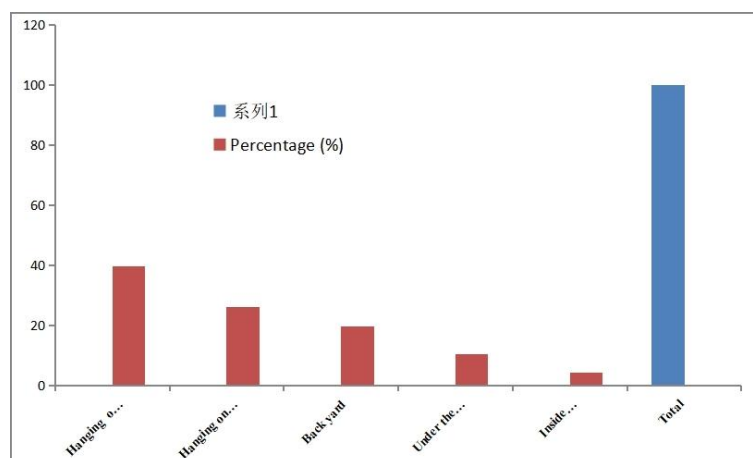


Figure 2: Types of hive placements in Hawa Gelan District.

### 3.2 Trends of Honey Production and Colony Number

Table 4: Percentage of trends in honey production and colony number

Variables	Categories	Percentage (%)
<b>Honey Production</b>	Increase	21.9
	Decrease	64.6
	Stable	13.5
	<b>Total</b>	<b>100.0</b>
<b>Colony Number</b>	Increase	24.0
	Decrease	59.3
	Stable	16.7
	<b>Total</b>	<b>100.0</b>

The majority of respondents (64.6%) were responded that there was decreasing trend of honey production. On the other hand about 21.9% and 13.5% of them replied that honey yield in the given years have increased and constant trends, respectively. Majority of the respondents (59.3%) declared that as the colony numbers are decreasing from time to time. In contrary to this, about 20.0% and 16.7% of them have responded as colony number is increasing and stable, respectively (Table 4).

### 3.3 Colony Placement in the Study Area

The majority of the respondents were keeping their hives on trees in forests and on trees near home stead, which accounts for 39.60% and 26.00%, respectively. Such Apiary sites are not appropriate for daily follow up activities of beekeeping by the farmers. Whereas, some of them were (19.80%, 10.40% and 4.20%) keeping in backyard, under the eaves of the house and in separate house constructed for bee colonies. This is closest to their home and helps them for regular inspection of colony and other hive managements as compared other practices (Figure 2).

#### Main Colony Management Methods

Honeybee hive management issues include providing with supplementary feeds, placement of bee colonies in appropriate site, colony inspection, keeping them disease free; guarding the hive from external predators; Colony transfer and maintaining or increasing bee population and honey production. Disease and predators can be prevented with proper hive inspection and approved treatments. About 11.5% of the respondents carried out colony transfer, 5.2% supplementary feeds, 4.2% colony inspection and 20.8% all types while the majority of respondents, about 58.3% were not undertake any colony management methods for their colony until the time of study (Figure 3).

Main Colony Management Methods

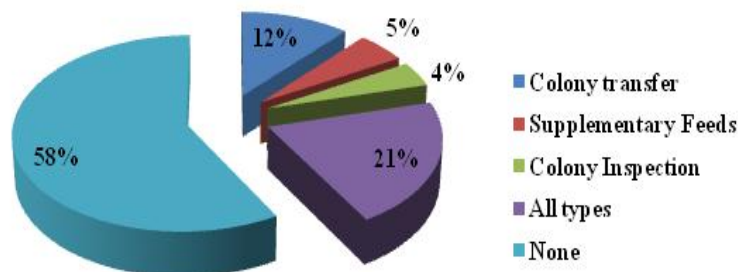


Figure 3: Percentages of Colony Management Methods

### 3.4 Marketing Systems

#### (1) Marketing of hive products

In the study area, about 83.82% of the respondents were produced honey for sell, about 14.65% were used for household consumption and 1.53% was kept either for medicinal purposes or as gift for relatives. In this study, different honey marketing participants were identified. Honey marketing participants in the study area includes producers/farmers, honey collectors/assemblers, retailers and final consumers of the product. Majority, 35% of the respondents sold their honey directly to end consumers. About 31% of them sold to both retailers and consumers. Retailers account for 24% of sales, 7.5% of them sales to collectors/traders. The remaining 2.5% of them sold to traders and Consumers. Majority, 46.21% of the beekeepers sale their honey at local market and 17.21 % of them sell honey at farm gate. While, 36.2% of them sale their produce at markets found in nearby town and at farm gate (Table 5).

Table 5: Honey marketing channels and utility shares in the study area

Description	Response	Percentage (%)
Honey utility share	Sold	83.82
	Gift	1.53
	Total	100
Customers	Retailers	24
	Wholesalers/traders	7.5
	Consumers	35
	Retailers and Consumers	31
	Wholesalers and Consumers	2.5
	<b>Total</b>	<b>100</b>
Place of hive product sale	At market found in nearby town	46.21
	At farm gate	17.59
	At market found in nearby town and at farm gate	36.20
	<b>Total</b>	<b>100</b>

### 3.5 Major Beekeeping Problems in the Study Area

Almost all of the beekeepers declared as the sector is potential and profitable in the district due to high bee colonies, availability of potential flowering plants, availability of different water sources and increasing support by the government to the beekeeping sector. However, the district has the potential for beekeeping, there are some constraints. Informants replied that pests and predators (41.30%), poisoning of agro-chemicals (23.60%), high cost of modern hives and accessories (11.20%), shortage of bee forages (9.40%), low quality of honey products (7.20%), Poor infrastructure development (5.30%) and other factors (2.0%) were the most important challenge to in the area (Table 6).



**Table 6:** Percentage of major constraints of beekeeping in the study area

Constraints	Percentage of respondents	Rank
Pests and predators	41.30	1
Poisoning of agrochemical	23.60	2
High cost of modern hives and accessories	11.20	3
Shortage of bee forage	9.40	4
Low quality of honey product	7.20	5
Poor infrastructure development	5.30	6
Other factors	2.0	7
<b>Total</b>	<b>100</b>	

### 3.6 Opportunities of Apiculture in Hawa Gelan District

Some of the opportunities which were identified in the study area, based on respondents answer, were presence of huge number of bee colonies (32.5%), availability of diverse vegetation plants and ample sources of water in the area (21.70%), steadily increasing the demand of local honey (17.65%), presence of good government policy toward the sub-sector (9.0%) and others factors (19.15%) those were availability of micro finance institution for small scale credit facilities like Oromiya Credits and savings Associations to run beekeeping activates and farmers of the study area are currently obtaining educations based on beekeeping by the livestock resource and fishery development office of Hawa Gelan District.

Currently there is a high market demand for crude honey for domestic consumption and export by different customers and organizations. There is a year round availability of bee forages in most parts of the study area and many numbers of local bee hives and suitable environment with different agro ecology. Also there were farmers having indigenous knowledge and skills who are motivated to adopt improved technologies and undertake beekeeping intensively.

## 4. DISCUSSION

The present study was conducted at Hawa Gelan district of Kellem Wollega Zone, Oromiya Regional State, and Western Ethiopia from November 2015 to April 2016. This was aimed to assess honey bee production practices and identify major constraints of honey production and its marketing in the study area

A total of 96 beekeepers were interviewed during this study and they have replied that, the primary means of subsistence in the study areas is mixed crop-livestock farming. Beekeeping is an important old traditional agricultural practice in the mixed farming systems of the area. Beekeeping in the study area is still traditional. Based on their level of technological advancement, there were three types of beehives used for honey production in the study area. These are traditional, intermediate and movable frame beehives. The study has also tried to reveal that the type of beehive being used in honey production in the study area.

Most 69.8% of household heads owned traditional hives which is the dominant types of hives in the area. This finding is definitely different from national beehive usage status i.e. 95% of the beekeepers are traditional beehive owners but the rest are modern and transitional beehives owners [10] and that of [4] who had been deduced on central zone of Tigray, 27.7% household heads did own only traditional beehives and the rest are traditional, modern and transitional beehives. This difference is due to apiculture training extension developments which is the matter of time differences.

The survey result shows that average annual honey production per household, 93.85 kg and average production of traditional, intermediate and movable frame beehives was 4.32, 9.83 and 14.27 kg. The average honey output obtained from traditional hives (4.32kg), in this study is less than the result reported by [8] states the average amount of honey harvested per traditional hive in Silti woreda, Ethiopia ranged from 8.85 kg. But it is in line with [11] in Amhara Region also reported 4.1 - 9.8kg of honey per harvest per traditional hive. On the other hand, the survey result of annual average honey produced (93.85kg) greater than result reported by [8] annual average honey produced in Silti woreda 85.99kg/HH.

This difference is due to the favorable condition of the study area for Honeybee production. The maximum amount of honey harvested from traditional, intermediate and frame hive were 6kg, 12kg and 17kg, respectively and the

minimum outputs from all the three types of hives in the study areas were 3kg, 5kg and 10kg. These results are indicators of the absences of room for increasing performances of these beehives through better management practices coupled with the existing favorable beekeeping environment in the study area. This also shows the presence of underutilized apicultural development potential in the study area.

Ethiopia is the leading honey and wax producers worldwide for centuries. Ethiopia produce about 98% of it's from traditional hives [12]. For many farmers, beekeeping is one of their major activities in addition to livestock keeping and agriculture. Out of the total respondents, about 64.6% beekeepers were replied that honey yield in the district is decreasing over the years as a result of forest deforestation, agrochemical application, pests and predators attack. Similarly, a result reported by [13] in Burie district indicated that honeybee products production was in a decreasing trend due to shortage of bee forages, drought, pesticides and herbicide application, lack of water and poor management in order of importance.

In the present study the decreasing trend in honeybee products could due to Pests and predators, pesticides and herbicide application, drought and bee forages, due to decrease in the number of bee colonies and lack of using improved bee hive. On the other hand, majority (59.3%) of the respondent declared that colony number also decreasing from time to time. In addition to the above mentioned problems, this mostly due to lack skills how to harvest honey and by what materials to use when smoking, burning of colony, half or total destruction of colonies are the indicators, as bee keepers are the most enemies of honeybee.

Similarly, according to [11] most beekeepers of Amaro district in Amhara region, Northern Ethiopia keeps their bee colonies by hanging on trees near homestead and in forest areas. However, [14] most of the Beekeepers in Eastern zone of Tigray keep their bee hives at the back yard of the house. This result also definitely different from the apiary site reported by [15] as majority (62.8%) of beekeepers have keep their colony at back yard regardless of hive types in Gamo Gofa zone of southern Ethiopia. The difference could be from difference in awareness of beekeepers on honey managements between two study areas.

The study conducted by [16] [11] [13] revealed the same results. All these studies confirmed that internal hive inspection of traditional hive is not very common or nonexistent at all in their respective study areas. In the study area, the majority of respondents, about 58.3% were not undertaking any colony management methods for their colony until the time of study.

This is presumably because of fear of being stung, lack of accessory equipments, the risk of the colony absconding, lack of time and lack of awareness of the value of doing so. Moreover, almost all beekeepers in the study area perform external inspection and also clean their apiary to prevent ant and other insect's pests from getting access to hives. Similar honeybee pests and predator in the study area was reported by [14] in other parts of the country like in Tigray region, [1] in Gomma district of Jimma zone, South-west Ethiopia and [17] in Ada'a district of east Shoa Oromia region, Ethiopia.

Moreover, different researchers identified these problems as a constraint in beekeeping sector in different parts of Ethiopia [15]. This result agrees with report of [13] 'shortage of bee forage', 'threat of pesticide', 'honeybee pest and predators', poor infrastructure development, 'shortage of bee equipments which were reported as the major beekeeping constraints in Burie district, Amhara regional state [14] also reported that the main constraints in Ethiopia are lack of beekeeping knowledge, shortage of trained main power, shortage beekeeping equipment, pests and predators and inadequate research and extension services to support apiculture development programmes. The prevailing production constraints in the beekeeping sub sector of the country would vary depending on the agro ecology of the areas where the activities is carried out [4].

The interviewed beekeepers were mentioned the major beekeeping constraints in the district are: Pests and predators, Poisoning of agrochemicals, High cost of modern hives and accessories, Shortage of bee forages, Low quality of honey products, Poor infrastructure development and other factors. None of the beekeepers of the study area collect crude beeswax. On the other hand [18] reported that sometimes beekeepers buy beeswax from the wax collectors and/or processors to use as a starting input for honey production using intermediate and modern beehives in some parts of Ethiopia. This survey on the market for bee products showed that honey is the only product without any other products such as beeswax and honey bee colony. Two types of honey have been marketed in the district.



The first and the largest proportion are crude honey harvested from traditional and intermediate hives and sum-processed honey harvested from box hives. Data collected from sampled respondents indicated that most of the total honey produced in 2015 production year was supplied to the market and the rest is either used for household consumption or kept for medicinal purposes. The honey produced in the area is sold to consumers and collectors/traders who buy and sell honey to traders coming from neighboring towns (e.g. Dembi Dollo). Cooperatives have no role in the current honey chain in the area. According to results of this study; most of the beekeepers sale their honey at local market (e.g. Geba Robi and Mechara) and at farm gate for retail sales directly to the consumers.

## 5. CONCLUSIONS AND RECOMMENDATIONS

Generally the most widely used type of beekeeping in the study area was traditional in which beekeepers using local hives. The most important constraints of beekeeping in the study area were found pests and predators, poisoning of agrochemicals, high cost of modern hives and accessories, shortage of bee forages, low quality of honey products, poor infrastructure development, lack market, lack of beekeeping knowledge, shortage of trained main power and inadequate research and extension services to support apiculture development programs. In the area despite the presence of different challenges, there are high potential and opportunities to maximize the outputs of the resource to improve the livelihood of the communities in the sustainable ways, as the current government plan to develop apiculture as one of the strategies to reduce poverty, high demand for hive products and the establishments of beekeepers co-operatives at grass- root level.

Based on the above conclusions the following recommendations were forwarded:

- (1) Modern type of hive should be used by the beekeepers in the study area
- (2) Education based on beehive management (follow up, checking against enemy, cleaning the environment, supplying additional feeding, watering and honey harvesting) and market oriented production of honey should be given for the beekeepers in the area.
- (3) Awareness creation on how to use agro-chemicals like herbicides and other chemicals should be given to the community in the area.

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