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Assessment of Beekeeping Practices (Absconding, Bee Forage and Bee Diseases and Pests) in Jigjiga Zone, Somali Regional State of Ethiopia

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Abstract

The present study was conducted in Jigjiga zone of Somali regional state. The study intended to assess the challenges, limitations and opportunities existing in the area for honeybee production. 50 respondents were interviewed from three districts (20 from Jigjiga, 15 from Awbare and 15 from Kebribeyah). The collected data were analyzed using SPSS 10.0 version software and the results were interpreted and presented using Descriptive Statistics. Based on the results of this survey, all the three types of honeybee production systems were identified, namely: Traditional, Movable comb top-bar and modern honey bee production systems. Beekeeping in the study areas was dominantly a man's occupation (100%). The main Honeybee flora compositions of the study area were sunflower, maize and other flowering plants. Based on the result of this study, the major challenges were high cost of modern hive, lack of bee forage, pests and predators, lack of water, honeybee diseases, marketing problems, lack of honey storing facilities. The opportunities for beekeeping in the study area were the presence of numerous wild honeybee colonies and high demand of honey. There is no extension service from governmental sectors but some training for few farmers from NGOs.

Keywords: Absconding; Flora; Hive; Honey; Smoker; Swarming

Introduction

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 [1]. The diversified agro climatic conditions of the country create environmental conditions conducive for the growth of over 7000 species of flowering plants of which most are bee plants [2]. 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 exists in the wild [3,4]. The annual honey production of Ethiopia is estimated to be 45,300 metric tons which makes the country to rank first honey producing country in Africa and ninth in the world [5] accounting for about 23.58 % of total African and 2.13% of the world honey. The total bee wax production estimates about 3,800 tons per year. Such an amount puts the country 4th in beeswax production worldwide. Moreover, Ethiopia has the potential to produce up to 500,000 tons of honey and 50,000 tons of beeswax per year [6]. As noted by FAO [7] cited in Abebe [8] unpublished Data. Ethiopia is leading in Africa in honey production and in beeswax production. Honey and beeswax play significant role in the national economy of the country and support the national economy through foreign exchange earnings. It is also 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 the processors are emerging and exporters are also flourishing which indicate the role of the sub-sector in employment generation [9].

About 4,601,806 hives exist in Ethiopia out of which about 95.5% are traditional, 4.3% transitional and 0.20% frame hives [9]. The traditional beekeeping accounts for more than 95% of the honey produced and nearly all the beeswax produced in the country. The present study was undertaken to investigate beekeeping constraints and indigenous enemies and pest protection methods in Jigjiga zone selected district, East Ethiopia (Figure 1). By charring out integrated and multidisciplinary studies to emphasis on the major traditional aspect, therefore, this study was initiated to tighten the existing wide information gap and generating information that can be used for further development of the sector.

Beekeeping in Ethiopia is still very traditional which is carried out dominantly in forest/bushes, and only few in home gardens in all parts of the country. The bees and the plants are constantly under threat because of land degradation and removal of vegetation cover for increasing crop production. Thus, production, productivity and quality of honey produced in the country is generally poor and below national potential. In addition, the smallholder producers have currently limited access to market due to low level of productivity; poor product quality and market barriers, such as poor infrastructure, lack of favorable trade policy and shortage of finance and lack of collective bargaining power. Thus, there is a strong need to help small producers in Ethiopia to achieve sustainable and fair access to honey market in order to increase their income and secure their livelihoods [9].

In general, this action research aims at collecting data and providing analytical information that guide government organization in the formulation of public policies, institutions and infrastructural development affecting the sub-sectors, and the introduction of new honey production and processing technologies. The research also aims to assist government and non-government organization to design intervention strategies to help farmer and other business groups in meeting the increased demand for food and address the challenges

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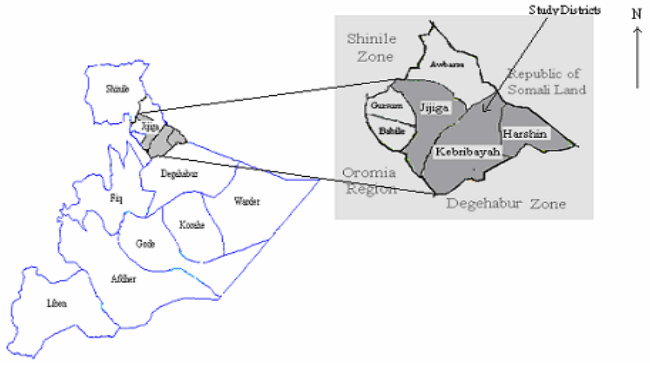

Figure 1: Map of Jig-Jiga zone.

existing across the value chain of honey that hinder smallholder producers and business groups from maintaining and expanding their market bases to increase their income from honey production. The general objective of this work was Assessing Beekeeping Practices (Absconding, Bee Forage and Bee Diseases and Pests) in Jigjiga Zone, Somali Regional State of Eastern Ethiopia.

Statement of the problem

It's known that Somali regional state in general and Jigjiga zone in particular is known for its potential for beekeeping production. There are a lot of resources; honey bee flora, honey bee colony. But use of such potential resources remained to be minimal in many aspects, Due to many challenges. So, this study identified a lot of bottlenecks, like Lack modern hive, lack of improved technologies, lack of institutional support, seasonal fluctuation of honey bee flora, occurrence of drought etc.

Materials and Methods

Description of the study area

Jigjiga zone is one of the nine administrative zones of the Somali Regional State, located 750 km southeast of Addis Ababa. The total land cover is 40,861 km^2 of which the rangeland extends over 36,629 km^2 [2]. About 52.6%, 31% and 7% of the landscape of the zone can be categorized as flat to gentle slopes, hills and steep slope, respectively [10]. Based on altitudinal classification, the midland (1500–2300 m.a.s.l.) agro-ecological zone constitutes about 95% of the Jigjiga zone [11]. Temperature in the Jigjiga zone is generally high all the year round where the mean minimum value is around 20^{o}C and the mean maximum around 35^{o}C. According to National Meteorological Service Agency [12] report, the mean annual rainfall is 660 mm. The rainfall condition in the zone has generally low, unreliable and an uneven distribution.

Sampling technique and sample size

To achieve the objective of the study, purposive sampling was applied on three districts among six districts which dominantly produce and based on abundance of bee keeping potential. Fifteen days before the start of the normal survey discussion with the agricultural extension staff especially livestock experts and development agents were done by using the open-ended discussion. The elders and those pastoralists who have better experience beekeeping participated in the discussion which helps to identify areas where beekeeping production is practiced. Based on the understanding and agreement with these officials, community elder and leaders; the real survey was conducted. From the selected districts the respondents was selected purposively who engaged in bee production. A total of 50 households who engaged in bee production were used for interview.

Data collection

Data was collected by interviewing the beekeepers and formal (diagnostic) survey by using semi-structured questionnaire. Data on bee hive production and management system, challenges and opportunities for beekeeping farming in the area, status of individuals and cooperatives involved in beehive farming, interest of the community and cooperatives toward bee keeping practice in the area were assessed. In addition, secondary information from office of agriculture and other organizations relevant for this study were collected. Enumerators, who can speak local language with a minimum of grade 9 to 12 educational backgrounds of total of 15 individual were employed and trained for at least three days on the objectives of the study, ethical issues, method and approach how to administer formal survey questionnaire and data collection.

Data Analysis

Data collected was managed in such a way that the qualitative as well as quantitative variables are selected. The data collected by using semi-structured questionnaire was entered in to MS-excel and imported to SPSS (version 20.0) software and also coded for analysis. Descriptive statistics were used to describe quantitative factors. Standard error of mean ± (SE) was used to describe means while percentage was used for describing qualitative characteristics. The results were expressed in percentage and mean ± SD of the results from the questionnaire.

Results and Discussion

Socio-economic characteristics of the households

Household characteristics: Table 1 shows the socio-economic status of the respondents in the study areas. All most all of the respondents were males accounting for 100.00% (n=50) of the sample. This indicated that higher proportion of beekeeping or all beekeeping activities are left for male no female participation in beekeeping activity. The age characteristics indicated that most of the respondents fell within the range of 46-65 years (57.10%) followed by 28.6% (16-45 years) and only (14.3%) of the sampled respondents were aged above 65 years. There was variation in education background, with the majority of 1-8 grades (44.00%), others illiterate (28.01%) and 9-12 grade (28.01%). Most of the beekeepers are muslins (85.7%) and only few (14.3) are orthodox. Regarding the marital status of the beekeepers in the study area, 85.7% are married while the rest 14.3% are single. The report indicates that marital status of the study area is greater than the marital status of national average which is 50 % for both sexes [13].

Land holding and allocation in hectare: Largest number of the respondents (44.00%) from the three selected woredas have more than 1.5 hectare of total land holding, followed by (42.02%) respondents having <0.5 hectare of total land holding. A few of them (14.3%) have a total land holding of (0.5-1.5) hectare. Regarding to the backyard land holding Largest number of the respondents (72.00%) from the three selected woredas have <0.5 hectare of land and equal number of the respondents (n=7) have a backyard area of (0.5-1.0) and >1.0 hectare.

44.05% of the beekeepers have a farm land area of (0.5-1.0) hectare. 28.14% of respondents have <0.5 hectare and similar number of the respondents, i.e., 28.14% have >1.0 hectare of farm land area (Table 2). 42.09% (n=21) of beekeepers have a grazing land for their animals

Variables	Frequency	Percentage (%)
Sex of respondents		
Male	50	100.0
Female	0.00	0.0
Age category of the house hold		
16-45	14	28.6
46-65	29	57.10
>65	7	14.3
Educational status of the respondents		
Illiterate	14	28.01
1-8 grade	22	44.00
9-12 grade	14	28.01
Religion of the house hold		
Orthodox	7	14.3
Muslim	43	85.7
Marital status of the house hold		
Married	43	85.7
Single	7	14.3

Table 1: Socio-economic characteristics of households in the three studied woreda are of Jig-jiga zone. (Based on data form of the selected study households).
Source: Field survey, September, 2014

in addition to their beekeeping activities. The minimum percentage of the respondents (14.03%) have (0.5-1.0) hectare of land for plantation while the higher percentage (44.09%) of the respondents have <0.5 hectare of plantation area which for growing flowering plants for their bee colonies.

Major crop types the beekeepers grew during the cropping season: As indicated in Table 3 above majority of the respondents (71.43%) were able to produce naturally growing flowering plants other than maize or sunflower by themselves. Only 28.58% of the respondents produce or grew sunflower and maize as a source of honeybee food.

Credit availability and their sources: As indicated in Table 4 below the chance to get credit for beekeepers is rare, only 14.3% (n=7) of the respondents got credit. 85.7% (n=43) of the respondents could not get the chance in one or another way. 4 beekeepers got the credit from individual lenders while three of beekeepers out of the seven beekeepers got the credit from their relatives. The major difficulty to get credit is inaccessible of credit agents (46.51% responded), unavailability of credit (30.23% responded) and late delivery of the credit (23.25% responded). All of the respondents in the study area used the credit they got to buy hive (n=3), to buy beekeeping equipments (n=3) and to buy bee colony (n=1).

Beekeeping practices

Under this section beekeeping practices, sources of bee colony, numbers and types of hives the beekeepers have, and apiary sites and the overall beekeeping activities in the honeybee production systems of the study areas are discussed.

Honeybee ownership

As indicated in Table 5, all the farmers in the study area started beekeeping activities *5.50 ± 0.48* years ago with tradtitional hive. All of the farmers 100% (n=50) started their beekeeping activities by using traditional type of hive. But currently only 28.12% (n=14) farmers have traditional one while 71.92% of the respondents have all the three types of hive (traditional, transitional movable hive and modern hive). Now all the respondents have an awarness on improved beekeeping technology especialy starting from the past 2 ± 0.31 years ago. Each and every respondents currently have 23 ± 3.75 hives. The price of one honey colony is 1171.43 ± 91.84 ethiopian Birr. The farmers sell 60.71 ± 15.94 kg of heney per year. The higher percentage of the respondents 57.75% (n=29) put their hives in the backyard areas, 28.01% put both in backyard area and hanging on the tree and only 14.3% hang their hive on the tree. Mostly the source of honey bee colony in the study area is by catching the swarms 71.43%, gift from parents 14.29% and by buying from the local sellers 14.29%. Every respondent in the study area own 8.71 ± 2.57 empty hives and 5 ± 6.8, 3 ± 1.67 and 5 ± 4.40 traditional, movable and modern empty hives, respectively.

Variables	Frequency	Percentage (%)
Total land holding		
<0.5	21	42.02
[0.5-1.5)	7	14.3
>1.5	22	44.00
Back Yard Area		
<0.5	36	72.0
[0.5-1.0)	7	14.3
>1.0	7	14.3
Farm Land area		
<0.5	14	28. 14
[0.5-1.0)	22	44.05
>1.0	14	28.14.
Grazing land holding		
<0.5	21	42.09
[0.5-1.0)	7	14.12
[1.0-1.5)	15	29.60
>1.5	7	14.13
Plantation Area		
<0.5	22	44.09
[0.5-1.0)	7	14.03
>1.0	21	42.09

Table 2: Land holding of households in the three studied woredas of Jig-jiga zone. (Based on data form of the selected study households).
Source: Field survey, September, 2014

Variables	Frequency	Percentage (%)
Sunflower	7	14.29
Other flowering plants	36	71.43
Maize	7	14.29

Table 3: The major crop types that the households grew during the cropping season.
Source: Field survey, September, 2014.

Variable	Frequency	Percentage
Obtaining Credit		
Yes	7	14.30
No	43	85.70
The purpose of credit		
To buy hive	3	42.90
To buy bee colony	1	14.30
To by beekeeping equipments	3	42.90
Source of credit		
Relatives	3	42.85
Individual lenders	4	57.14
Why not they get credit		
Unavailability credit	13	30.23
Inaccessible of credit agents	20	46.51
Late delivery	10	23.25

Table 4: Credit Accessibility.
Source: Field survey, September, 2014

Trends of beekeeping in the study area

Ethiopia is the leading honey and wax producers worldwide for centuries. Ethiopia produce about 98% of it is from traditional hives [14]. For many farmers, beekeeping is one of their major activities in addition to livestock keeping and agriculture. Not all round the year but sometimes, there is an increase in honey bee colony in each farmer's apiary site. As indicated in Table 6, this increment is because of availability of good market price. But sometimes the colony number decreases because of varies factors. As the data collected from the respondents show, most of the apiary sites face shortage of food for their honey bee colony.

Most of the respondents replied that honey is collected at end of rain season between October and December. From the total interviewed farmers, about 73.6% were harvesting honey only once time per year. It was observed that most of these beekeepers were used traditional hives for honey production. The reaming 26.4% of the respondents were harvesting honey twice per year. These respondents were able to harvest honey twice per year because of they are practicing provision of supplementary feed for their bee colonies during the dry season and also follow seasonal colony management practice.

Major constraints of beekeeping in the study area

Ethiopia has immense natural resource for beekeeping activity. However, like any other livestock, this sub sector has been ceased by complicated constraints. 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 [13,15].

High cost of modern bee hives and accessories

The interviewed beekeepers responded during the field survey that some of the bee equipments such as modern bee hives, wax printers and honey extractors are very expensive and thus farmers could not affordable to buy and use these equipments (Table 6). Currently, the cost of one modern bee hive ranges from 900-1000 Ethiopia birr, the cost of honey extractor is ranges 4,000-5,000 Ethiopian birr and the cost of wax printer is ranges from 5,000-6,000 ETB, [16]. As a result of these, there is a shortage of appropriate technologies for production, collection, processing, packing and storage in the area. As indicated in Table 4 Unavailability credit, Inaccessible of credit agents and late delivery of credits for those farmers who want to invest in modern honey production in the district. Most of the district farmers were resource poor and thus they are unable to buy and use modern bee technologies to improve honey yield (Figures 2A-2D).

Shortage of bee forage

According to the interviewed beekeepers, this problem is directly related with season. They faced shortage of bee forage at dry season. They get surplus bee forage at wet season i.e. summer, autumn and spring. So at time of dry season they supply additional feed source for their honey bee colony like sugar syrup, barley flour, honey, pea flour and chick pea flour (Figure 3).

Pests and predators

Ethiopia, as one of the sub-tropical countries, the land is not only favorable to bees, but also for different kinds of honey bee pests and predators that are interacting with the life of honey bees [17]. Pests and predators cause a serious devastating damage on honey bee colonies with in short period of time and even overnight. The interviewed beekeepers were stated the major bee pests and predators in the district were: mites, spider, bee-eater birds, lizard etc. are the most serious problems to beekeeping development.

Water availability

As illustrated in the chart below the higher percentage (37.5%) of interview responded that their source of water for their honeybee colony is the nearby pond. Followed by water harvesting structures (25.0%) as a Source of water for their honey bee colony (Figures 4 and 5).

Beekeeping equipment's and protective materials

Effective bee colony management requires the use of appropriate equipment and accessories, *e.g.,* modern bee hives, the protective clothing, bee smoker, bee brush and hive tools. Lack of these equipment and protective clothing has been a big hindrance to the adoption of beekeeping and the resultant low productivity. The experiences in the other part of the country have shown that growth of the apiculture sub-sector in terms of efficiency and productivity is mainly dependent on technology inputs. Moveable frame beehives and intermediate bee hives are an existing improved honey production technology, [16]. But these technologies have not been adopted adequately by many beekeepers in the study area (Figures 6A-6D).

Only 70% of the respondents use different types of beekeeping

Variable	Mean ± SEM	SD
When to start beekeeping (year)	5.50 ± 0.48	1.27
When to start improved Beekeeping technology (years)	2 ± 0.31	0.82
Price of one colony (in Birr)	1171.43 ± 91.84	242.99
Amount of hive they currently owned	23 ± 3.75	9.92
Amount of honey they sell per year (Kg)	60.71 ±15.94	42.17
Amount of Empty Hive the farmers have	8.71 ± 2.57	2.23
Amount of Empty traditional Hive	5 ± 6.8	1.52
Amount of Empty movable Hive	3 ± 1.67	0.51
Amount of Empty modern Hive the farmers have	5 ± 4.40	1.05
Variable	**frequency**	**percentage**
Awarness of improved beekeeping technology	50	100.00
Types of hive the farmers currently have		
1. Traditional only	14	28.12
2. All 3 hive types	36	71.92
Types of Hive They Used in First Time		
1. Traditional hive	50	100.00
Site or Placement of Hive		
1. Backyard area	29	57.75
2. Hanging on the tree	7	14.3
3. Both	14	28.01
Source of Bee Colony		
1. Gift from paraents	7	14.29
2. Catching swarms	36	71.43
3. Buying	7	14.29

Table 5: Type, amount and source of honey bee colony and hive.
Source: Field survey, September

Constraints	% of respondents	Rank
High cost of modern hives and accessories	44.30	1
Shortage of bee forage	23.50	2
Pests and predators	20.50	3
Poor infrastructure development	17.70	4

Table 6: Major constraints of beekeeping in the study area.
Source: Field survey, September, 2014

Figure 2a: Types of Beekeeping Equipments.

Figure 2b: Types of Beekeeping Equipments.

Figure 2c: Types of Beekeeping Equipments.

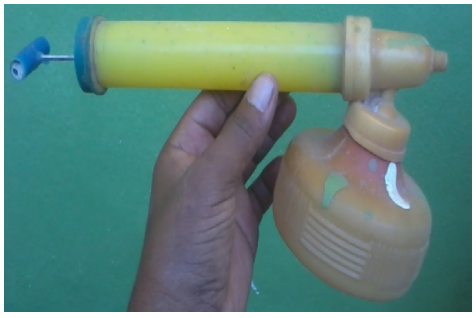

Figure 2d: Types of Beekeeping Equipments.

Figure 3: Feed Source of Honey Bee Colony.

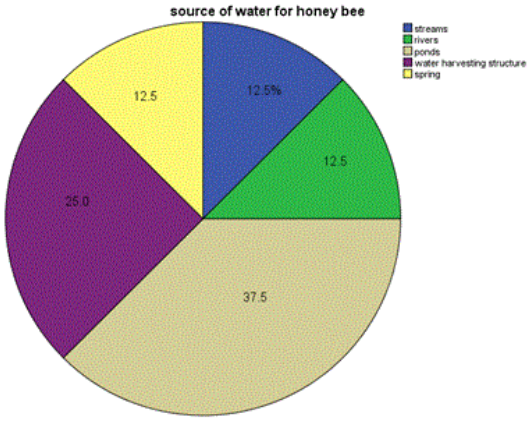

Figure 4: Sources of Water for Honey Bee.

Figure 5: Water harvesting structure.

equipment's like smoker, gloves, boots, water sprayer, bee brush, queen excluder, and knife and bee veil. The rest 30% of the respondents use no beekeeping equipment's. They use their bare hands for any kind of beekeeping activities. So this is one factor to hinder the sector in the study area.

Swarming

Reproductive swarming is a common phenomenon in honeybee

Figure 6a: Types and placement of beehive.

Figure 6b: Types and placement of beehive.

Figure 6c: Types and placement of beehive.

Figure 6d: Types and placement of beehive.

colonies. As indicated in the Table7 below, in all respondents' colony there is an occurrence of swarming. In 57.14% (n=29) respondents apiary site, swarming occurs in every season of the year while in the rest farmers apiary site (42.85%) it occurs every year that means once in the year. Respondents added that the seasonal swarming occurs every spring season this is the presence of surplus bee forage. Even though swarming is advantageous to the farmers, but most of the farmers are not capable of controlling swarming while a few of them are capable of controlling swarming. They can control swarming by removing queen cells, by using large volume hives, or by supplying empty hive. But those who fail to control swarming are due to lack of those listed techniques.

Inspection of honeybee colonies

Sample respondents were interviewed to describe the frequency of inspecting their apiary and honeybee colonies and 13.3%, 14.02% and 23.45% of the respondents replied that they take a look internally into the hives every week, every fifteen day and every month (Table 8) respectively. Moreover 15.23%, 23.21% and 37.6% of respondents inspect externally every week, every fifteen day and every month, respectively. Though, inspection of hives and apiary is indispensable to safeguard honeybee colonies from different natural disasters and various hazards (pests, diseases and chemical poisoning), respondent beekeepers believe in that visiting the apiary and the hive externally or internally during rainy season causes diseases. For this reason, during rainy seasons the apiary is covered with grasses which may intern serve as a hiding place of pests of honeybees. Experiences show that external colony inspection can be done at any season, however, caution is required in what season and at what frequency the internal inspection should be conducted. In this regard, training beekeeper farmers is essential.

Honey production and season

The amount of honey produced from one bee hive per year varies from places to places, which in most cases is determined by the existences of plenty pollen and nectar source plants and the level of management and input. The maximum amount of honey harvested from traditional, movable hive and modern hive were 7, 8 kg and 9 kg respectively and the minimum records from all three type of hives in the study areas were 4 kg, 4 kg and 6 kg (Table 9). These results are indicators of the existence of room for increasing performances of these beehives through improved use of hive. This also notes us that they are

Variable	Frequency	Percentage
Presence of swarming	50	100
Frequency of swarming		
1. Every season	29	57.14
2. Every year	21	42.85

Table 7: Swarming frequency
Source: Field survey, September, 2014

Total sample (N=50)		
	Types of inspection	
Inspection frequency	Internal (%)	External (%)
Weekly	13.3	15.23
Every 15 day	14.02	23.21
Every month	23.45	37.6
If necessary	35.46	19.6
Not at all	13.77	4.36

Table 8: Percent distribution of frequency of external inspection of apiary by farmers.
Source: Field survey, September, 2014

Total sample (n=120)				
Hive Types	min	max	Mean	S.D
Traditional hive	4	7	5.86	1.21
Movable hive	4	8	5.86	1.34
Modern hive	6	9	7.14	1.06

Table 9: Average Productivity of different hives.
Source: Field survey, September, 2014

Figure 7a: Honey before mixing.

Figure 7b: Honey after mixing.

still below the line of productivity what the beekeeping industry can perform. Based on the results of the current study, the average amount of honey harvested from traditional, movable and modern hive were 5.86 kg, 5.86 kg and 7.14 kg per hive, respectively (Table 9). The honey value obtained from traditional hive is almost equal to the national average yield (5 kg) and the result reported by [8] that states the average amount of honey harvested per traditional hive in West, South West and North *Shewa* zones to be 6.2 kg.

Storage (packing) practices of honey

The majority of the sample households responded that they do not store honey primarily because of high demand of honey in the study area and secondly because of lack of storage facilities. But Sometimes some beekeepers keep the honey for prolonged period when at the time of they could not get buyer or to get better price in off time. Nearly 73.4% of respondents sold their honey immediately after harvest. The remaining 26.6%, sold during one, two, three, four and five months after harvesting time. Because all beekeepers in the study area do not have any association (Honey Collection and Marketing Cooperative), which may give them an opportunity to benefit from rise in price in off-seasons, they sell their honey to other customers. Although honey is generally produced chiefly for sale, farmers do keep some amount for different purposes. In the study area, the harvested honey was used for income generating (56.9%), home consumption (22.4%), and cultural ceremonies (12.3%), as a medicine (8.4%) and as a beverage. As reported by the sample respondents, plastic bucket (100%) was used to store honey for short period.

Beekeeping extension

In the study area, some beekeepers got beekeeping extension service from NGO. There were no extension workers in the study area to encourage or to give advices for the farmers from governmental sector. Some of the respondents got training or experience from senior farmers or from neighbor farmers. From the foregoing analysis, it can be concluded that the respondents were not receiving any kind of extension support from extension workers. This would have negative contribution for apicultural sector in the study area. So the farmers should be offered effective extension service (Figures 7A and 7B).

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References

1. Adgaba N (2007) Atlas of pollen grains of major honey bee flora of Ethiopia, Holetta Bee Research Center, Holetta, Ethiopia.
2. Adgaba N (2002) Geographical races of the Honeybees (*Apis mellifera* L.) of the Northern Regions of Ethiopia. Ph.D dissertation. Rhodes University, Department of Zoology and Entomology, South Africa: 265.
3. Mo ARD (2007) Livestock development master plan study phase I report – data collection and analysis, volume N-apiculture, ministry of agriculture and rural development (MoARD), Addis Ababa, Ethiopia.
4. CSA (central statistical agency) (2013) Agricultural sample survey 2012/2013, Volume II, Report on livestock and livestock characteristics. Addis Ababa. Statistical bulletin: 570.
5. FAO (2010) FAOSTAT database on Agriculture and Nutrition. Food and Agricultural Organization of the United Nations, Rome, Italy.
6. GDS (Global Development Solutions) (2009) Integrated value chain analyses for honey and beeswax production in Ethiopia and prospects for exports the

Netherlands Development Organization (SNV).

7. FAO (2005) Statistical yearbook, FAOSAT.
8. Abebe W, Zuber S, Bashawurad E (2007) Documentation of indigenous knowledge for the development of improved beekeeping practices. Holeta, Ethiopia.
9. Tadesse B, Phillips D (2007) Ensuring small scale producers in Ethiopia to achieve sustainable and fair access to honey markets. Paper prepared for International Development Enterprises (IDE) and Ethiopian Society for Appropriate Technology (ESAT). Addis Ababa, Ethiopia: 1-64.
10. Hussen K, Tegegne A, Kurtu MY (2002) Resource Potential Assessments and Project Identification Study of Somali Region. Agricultural Resources. Industrial Projects Service, Addis Ababa 3: 401.
11. MOA (Ministry of Agriculture) (1996) Ruminant Livestock Development Strategy. Draft, Addis Ababa, Ethiopia.
12. NMSA (National Metrological Service Agency) (2000) National Metrological Service Agency (NMSA) Addis Ababa, Ethiopia. 152.
13. Kassaye A (1994) Beekeeping manual. Agri-Service Ethiopia, Addis Ababa. 57.
14. CSA (Central Statistical Authority) (2008) Agricultural Sample Survey: Report on Livestock, and Livestock Characteristics, Addis Ababa, Ethiopia: 26.
15. Negera E (2002) Survey on honey production system in West Shoa Zone (unpublished). Holeta Bee Research Center (HBRC), Ethiopia. 15.
16. Beyene T, Verschuur M (2014) Assessment of constraints and opportunities of honey production in Wonchi district South West Shewa Zone of Oromia, Ethiopia. American Journal of Research Communication 2: 342-353
17. Desalegn Begna (2001) Some major pests and predators of honeybees in Ethiopia. Proceedings of the third National Annual Conference of Ethiopian Beekeepers Association (EBA). Addis Ababa, Ethiopia 4: 59-67.