

Full Length Research Paper

Assessment of beekeeping production system and constraints in Sude Woreda, Arsi Zone Oromia Ethiopia

Alemayehu Weldearegay¹ and Abera Anja^{2*}

¹Sude Woreda Livestock and Fishery Office. Ethiopia.

²College of Agriculture, Woliata Sodo University, Ethiopia.

Received 1 August, 2017; Accepted 20 October, 2017

The study was conducted in Arsi Zone Sude Woreda, Oromia region, Ethiopia aims to assess beekeeping production systems and constraints. Totally, 90 households were selected for the study. Semi structured questionnaire was prepared to collect primary data. The collected data were analyzed using descriptive statistics and the results were organized by tables and graphs. Based on the survey result, about 97% of the respondents indicated there are different forage types of honey bees' floras like shrubs, bushes, cultivated crops herbs, weeds and some woody plants like Wanza, Koshem, Sesbania, Acacia and Tree Lucerne. The majority (72%) of the respondents obtained beekeeping by catching swarms. Honey was harvested twice a year from May to June and September to November. The survey result also indicated that beekeeping has a huge number of constraints that hinder honey bee production and profitability. The major constraints are shortage of bee forage, pests and predators, death of colony, swarming; bad weather and marketing. Lack of bee forage associate with deforestation is the main problem, and it ranks first from all the constraints. The major pests and predators are ants, rats, beetles wax moth, bee lice, spiders, birds, lizards, snakes, etc. The respondents indicated that, they have interest to improve beekeeping practices in the area. So the government and non-governmental organisations (NGOs) should support by training them on how to manage honey bee flora, and providing modern honey bee equipment to enhance the honey productivity is also very important to enhance the products of beekeeping in the study area.

Key words: Beekeeping practice, Ethiopia.

INTRODUCTION

The beekeeping sub-sector has been an integral part of agriculture in Ethiopia. It has been contributing to household income and national economy through export,

and also acts as poverty alleviation. The country has huge apicultural resources that made it the leading honey and beeswax producer in Africa (Fikru, 2015). According

*Corresponding author. E-mail: anjabisrat@yahoo.com.

to central statistics agency of Ethiopia (CSA, 2015a), a total of about 5.89 million hives were estimated to be found in the rural sedentary areas of the country. From these total hives, the greater part (96.23%) is reported to be traditional which is poor in quality and low in quantity of hive products.

Honey and bees wax are the major hive products which are widely utilized for different purpose throughout the country. The products may be used either for household consumption and/or sold to finance the purchase of basic household commodities such as coffee, salt, cooking oil, sugar, etc. The products are sometimes used as payments and gifts to others. The survey conducted by CSA (2015b) indicated that of the total honey production, about 41.22% was used for household consumption, 54.68% was sold, and less than 1% of the honey production was used as payment (wage) in the Ethiopia. On the other hand, 44.13% of the wax produced in the country was used as household consumption while 25.22% was used for sale.

According to the previous research conducted by Abera et al. (2016) in Damot Gale District, Wolaita Zone, Southern Ethiopia, most of the respondents (70%) practiced traditional beekeeping whereas 22 and 8% of the respondents practiced transitional and modern bee keeping system respectively. In a similar way, with regard to management of beekeeping, 62% of respondents (bee keepers) visit their bees' everyday while 18% of bee keepers visit and inspect their bees every three days in the study area.

Beekeeping provides different role in Ethiopia in general and in Sude District, Arsi Zone, Oromia Region, Ethiopia in particular. Since honey and hive products are important source of food and income, it creates job opportunity and keeps the environment in balance through pollination. Nevertheless of the huge potential of beekeeping and honey bee flora, beekeeping has not been fully exploited and promoted in the district. Although bee keeping practices are widely undertaken and have great economic value particularly in Sude District, Arsi Zone, Oromia Region, Ethiopia, its potential and constraints is not well identified and researched out so far. There are no documents in regard to bee keeping practice and challenges in Sude District, Arsi Zone, Oromia Region, Ethiopia. As a result, this study was aimed to assess the general points concerning the potential and constraints of bee keeping practice in Sude District, Arsi Zone, Oromia Region, Ethiopia.

Since assessing the existing practice of beekeeping enable one to identify the potential and constraints for beekeeping, and availing pertinent information is believed to help development experts and researchers who use the information generated for intervention purpose or make informed decisions.

Therefore, the overall objective of the study was to assess the production and constraints of bee keeping practices and its management in Sude District, Arsi Zone, Oromia Region, Ethiopia.

MATERIALS AND METHODS

Description of the study area

The study was conducted in Sude District of Arsi Administrative zone, South-Eastern part of Oromia Regional State. Sude is one of the Districts in the Oromia region of Ethiopia. Part of the Arsi Zone, Sude is bordered on the south by Robe, on the southwest by Tena, on the west by Dodotana Sire, on the northwest by Jeju, on the north by Merti, on the northeast by Chole and on the southeast by Amigna. The administrative center of the woreda is Kula (Ethiopian Disaster Prevention and Preparedness Agency, 2006). According to Gebiso (2015) the district is situated between 6°45'N to 8°58'N latitude and 38°32'E to 40°50'E longitude. It has a surface area of about 23,881km², and characterized by mixed farming system. The altitude of this woreda ranges from 1800 to 3500 meters above sea level. Rivers include the 40 kilometers of the Magha and 25 of the Goleand Dera. A survey of the land in this woreda shows that 37% is arable or cultivable, 27% pasture, 10% forest, and the remaining 26% is considered swampy, mountainous or otherwise unusable. Niger seed, khat, coffee, cotton and spices are important cash crops (Socio-economic profile of Arsi Zone, 2006).

Sampling techniques and sample size

The district has a total of 27 Kebeles (the smallest administrative unit) from which 20, 6 and 1 are highland ("Dega"), midland ("Woinadega") and lowland ("Kola") respectively. Based on the potential from highland (*Abukoy Burkitu, Cafako, Halilanegelle*), midland (*Caimoalola, Cimonegele*) and lowland *Halila Anolle*). Then 15 respondents were selected from each Kebeles purposively based on the experience and potentials of beekeeping activities. Thus, the total household selected for the study was 90 (6 kebeles x 15 respondents).

Data collection method

In this study, both primary and secondary data were used to generate qualitative and quantitative information about beekeeping practices. The primary data were collected by using semi structured and pretested questionnaires. In addition to this personal observation, discussion with key informants and focus group discussion was made. The secondary data were obtained from published and unpublished documents.

Data analysis

The collected data of both quantitative and qualitative were analyzed and summarized by using descriptive statistics such as mean frequency and percentage, and the results were organized by tables and graphs.

RESULTS AND DISCUSSION

Sex, family size and age group respondents

The socio- economic status of the interviewed households is presented in Table 1. Most of the interviewed respondents (68%) were male headed while the rest 32% were female headed. From the present study, it can be concluded that beekeeping was mainly

Table 1. Sex, family size and age group of households (years) of the respondents.

Variable		Number (N=90)	Percentage
Sex of household	Male	61	68
	Female	29	32
Family size	1-5	59	66
	6-10	31	34
Age (years)	1-20	25	28
	21-40	50	56
	40-60	16	16

Table 2. Religion of the respondents.

Type of religion	Abikoy	Calako	Halila nagele	Cimo alloge	Cino negele	Haliya anole	Total	Percentage
Orthodox	8	12	6	7	7	20	60	66.6
Muslim	9	3	4	3	4	2	25	27.8
Protestant	1	2	-	1	1	-	5	5.6

Table 3. Educational back ground.

Educational status	Total	Percentage
Illiterate	35	38
Read and write	30	34
Elementary school	15	16.7
High school	7	7.9
College/ University	3	3.4

practiced by males however, it can also be performed by females. The males’ participation in the present study is slightly lower than that of Malede et al. (2015) who stated that 87.5% of the respondents were male in and around Gondar in Ethiopia. However, the present study indicated that the participation of women in beekeeping is better than the previous finding by Malede et al. (2015). According to Table 2, the majority of respondents (66.6%) in the study area were orthodox religion followers whereas 27.8 and 5.6% were Muslim and Protestant religion followers respectively. The present finding showed that orthodox religion followers were lower than that of Taye and Marco (2014) where all (100%) respondents were orthodox followers even if, there was no impact of religion of respondents on beekeeping activity.

Educational back ground of respondents

Education is an important tool that determines the level of

transformation of knowledge to improve beekeeping practice. As indicated in Table 3, the higher proportion of the respondents were illiterate (38%) while 34% was able to read and write. The proportion of illiterate of the present study was slightly higher than the previous research conducted by Malede et al. (2015) who indicated that of the sample beekeepers, 15.6% of the respondents have not attended any education while 62.5 and 21.9% attended primary and secondary school, respectively in and around Gonder town of northern Ethiopia. As indicated in Table 4 in the study area, the majority (48.9%) of the respondents that participated in beekeeping production were married whereas 28.8, 13.4 and 8.9 % were single, divorce and widows respectively.

Source of honey bee colonies

The respondents in the study area own bee colonies from different sources. As it is indicated in Figure 1, the

Table 4. Marital status of respondents.

Marital type	Abukay	cafako	Haliya negele	Cimo alola	Cimo nagele	Halila anole	Total	Percentage
Married	12	7	8	9	5	3	44	48.9
Single	8	4	5	3	4	2	26	28.8
Divorce	2	3	1	1	2	3	12	13.4
Widows	1	2	32	1	2	1	9	8.9

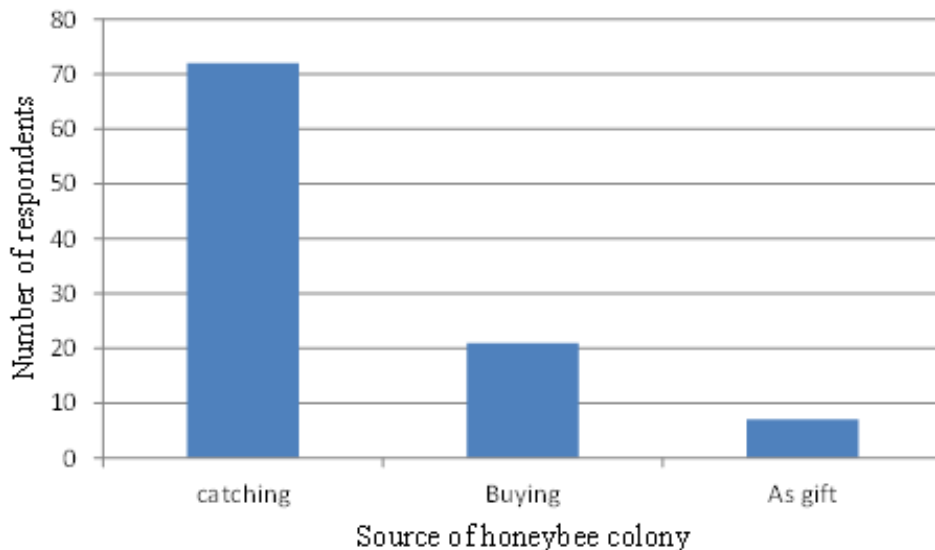


Figure 1. Source of honey bee colonies in the study area.

majority (about 72%) of the respondents obtained bee colonies by catching swarms whereas 21 and 7% obtained their colony by buying them and from parents as gift, respectively. This finding is lower than the previous finding of Tilahun et al. (2016) who argued that 17.6% of the respondents obtained it from parents as a gift in Tigray, Northern Ethiopia.

Honey bee flora

The respondents grow different forage types of bees' floras which serve as pollen, nectar or both pollen, and nectar sources, such as shrubs, bushes, cultivated crops herbs, weeds and some woody plants. Accordingly, all of the respondents indicated that they were growing different bee flora like acacia, wanza, koshem, sesbania, and treeleucerne. In the same manner, eucalyptus tree (Bahirzaf), vernom (girawa), bedensspp (addeyabeba) and guizotascabra (mech) are the major honey bee flora used by bees in the study area. The information collected from the respondents also indicated that even though, there are different types of bee floras in the area during wet seasons, there is shortage of bee flora during the dry

seasons. They also indicated that bee forage was found to be declining as compared with the past period due to deforestation and expansion of cultivated lands in the area.

Honey bee management practices

According to the information collected from the respondents, honey was harvested twice a year. This result contradicts the previous finding by Yetimwork et al. (2014) who indicated that only 1.90% of the respondents harvest up to three times a year whereas about 61.5 and 36.5% harvest once and twice a year, respectively in Tigray region, northern Ethiopia. According to Table 6, the average honey production was 13, 45 and 56 kg/hive/year from traditional, transitional and modern hives. This result is slightly in agreement with Gidey et al. (2012) who indicated that the potential productivity (the maximum yield) of the modern and traditional beehive was 45 to 50 kg/hive and 20 to 25 kg/hive, respectively. The respondents were also asked about the way they used to control absconding. According to the information collected, they control absconding by using different

Table 5. Types of hives.

Types of hives	Honey yield per year (kg)	Price per kg (in birr)*
Traditional	13	50
Transitional	45	70
Modern	56	70

*1 USD=approx.23.00 birr.

Table 6. Major constraints of beekeeping in the study area.

Challenges	Rank	What measures will be taken
Shortage of bee forage	1	Increasing bee forage by cultivating different crops
Honey pests disease and predators	2	Clean hives
Pesticides and herbicides application	3	During cold season or morning and afternoon
Death of colony	7	Find out poisoning plant and cut
Drought (lack of rainfall)	4	By fetching water
Absconding	6	Overall management practice
Swarming	5	Prevent unnecessary swarming by providing water, additional hives
Marketing	8	Harvest and keep
Bad weather	9	Make suitable condition for bees
Shortage of water	10	Prepare ponds

management system such as providing proper shelter, by protecting their colony from rodents, pest, and predators by using proper honey harvesting time and equipment.

Honey marketing

According to the information collected from the respondents, the price of honey in the area varies from 50 to 70 Ethiopian birr/kg based on the type of hive from which the honey was harvested (Table 5). In the same manner, the price of honey fluctuates with highest price in the dry season especially during the period of wedding ceremonies (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 food, drinks, medicine, and for cultural ceremony. Almost all interviewed beekeepers did not harvest bee wax because of lack of awareness about the product.

Major constraints of honey bee production

The prevailing honey production constraints in the beekeeping development are important issues to bring solution for the challenge. The interviewed respondents were able to lists the major beekeeping constraints in the district. According to Table 6, the major constraints are:

1. Shortage of bee forage.
2. Honey bee pest's disease and predators.
3. Pesticides and herbicides application, death of colony, absconding, swarming, marketing, bad weather and shortage of water.

According to the result of this survey, lack of bee forage associate with deforestation is the main problem. This finding is in line with Taye and Marco (2014) who indicated that shortage of bee flora ranks the second major constraints of beekeeping in Wonchi District South West Shewa Zone of Oromia, Ethiopia. According to the information collected from the respondents, the existence of pests and predators is seen as a challenge to the honeybees and beekeepers. Pests and predators cause devastating damage on honeybee colonies (Table 7). According to Table 7, ants rank first influencing the productivity of hive.

CONCLUSION AND RECOMMENDATIONS

The study conducted in Arsi Zone Sude District, Oromia region, Ethiopia aims to assess beekeeping production systems and constraints. For the present study, 6 kebeles from highland (Abukoy Burkitu, Cafako, halilanegele), midland (*cimoalola*, *Cimonegele*) and lowland (Halila Anolle) respectively, were selected purposively based on their beekeeping potential. The data were collected using both primary and secondary sources.

Table 7. Major pests and predators.

Pests/predators	Rank	Local control method
Ants	1	Destroying ants nests
Wax moth	2	Rubbing with recommended plant material
Beetles	4	Hand picking and kill
Bee lice	3	Cigarette
Wasps	6	Clean hive
Prey mantis	8	Cleaning hive
Lizards	7	Clean hive, use spin around and kill
Snake	10	Smoking with plant material and kill
Spiders	9	Removal of spiders web and killing
Birds	5	Killing using Wonchif*

*Wonchif is a locally made material from thread which holds stone to kill birds.

The primary data were collected by using semi structured questionnaire. Most of the interviewed respondents (68%) were male headed while 32% were female headed. About 72% of respondents obtained bee colonies by catching swarms whereas 21 and 7% obtain their colony by buying and from parents as gift respectively. The interviewed respondents indicated that, there is shortage of beekeeping forage during dry season.

The price of honey in the area varies from 50 to 70 Ethiopian birr/kg based on the type of hive from which the honey was harvested. In the study area, the price of honey fluctuates with highest price in the dry season especially during the time of wedding ceremonies (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).

Lack of bee forage associates with deforestation is the main problem. Honey bee pests and disease, shortage of beekeeping materials and accessories, death of colony, lack of adequate extension supports, and marketing problems of honeybee colonies were to be the order of importance.

Therefore based on the present study, the following recommendations were made: Beekeeping extension research and extension activity on management, developing technology from locally available materials and organizing apiary demonstration site; inadequate honey bee flora resources due to drought and deforestation is seen as a limiting factor to honey bee production in Sude District particularly during the long dry season. Therefore, selection of honey flora suitable for integrate agriculture program should be undertaken.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

- Abera A, Yakob H, Yasin G (2016). Assessment of Production System and Constraints of Bee Keeping Practices in Damot Gale District, Wolaita Zone, Southern Ethiopia. *J. Biol. Agric. Healthcare* 6(11).
- Central Statistics Authority (CSA) (2015a). The Federal Republic of Ethiopia Agricultural Sample Survey. Report on Livestock and Livestock Characteristics. *Statist. Bull.* 578(II):23.
- Central Statistics Authority (CSA) (2015b). The Federal Republic of Ethiopia Agricultural Sample Survey. Report on Crop and Livestock Product Utilization. *Statist. Bull.* 578(VII):91.
- Ethiopian Disaster Prevention and Preparedness Agency (2006). EDPPA: The northern part of Tena woreda, connected to the southern part by a narrow corridor, as a separate woreda named Diksis.
- Fikru S (2015). Review of Honey Bee and Honey Production in Ethiopia. *J. Anim. Sci. Adv.* 10:1413-1421.
- Gebiso T (2015). Adoption of Modern Bee Hive in Arsi Zone of Oromia Region: Determinants and Financial Benefits. *Agric. Sci.* 6:382-396.
- Gidey Y, Bethelhem K, Dawit K, Alem M (2012). Assessment of beekeeping practices in Asgede Tsimbla district, Northern Ethiopia: Absconding, bee forage and bee pests. *Afr. J. Agric. Res.* 7(1).
- Malede B, Selomon S, Zebene G (2015). Assessment of Challenges and Opportunities of Bee Keeping in and Around Gondar. *Acad. J. Entomol.* 8(3):127-131.
- Socio-economic profile of Arsi Zone (2006). Government of Oromia Region: Socio-economic profile of Arsi Zone (last accessed 1 August 2006).
- Taye B, Marco V (2014). Assessment of The Performance Of Wonchi Beekeepers' Association: A Case Of Wonchi District, South West Shoa Zone Of Oromia, Ethiopia. *European J. Phys. Agric. Sci.* 2(2):15.
- Tilahun M, Abraha Z, Gebre A, Drumond P (2016). Beekeepers' honeybee colony selection practice in Tigray, Northern Ethiopia. *Livest. Res. Rural Dev.* 28(83).
- Yetimwork G, Berhan T, Desalegn B (2014). Characterization of bee-keeping systems and honey marketing in Eastern zone Tigray, Ethiopia. *Livest. Res. Rural Dev.* 26(175).