European Journal of Biological Sciences 8 (2): 45-55, 2016
ISSN 2079-2085

DOI: 10.5829/idosi.ejbs.2016.8.02.23966

Assessment of Beekeeping Practices in Shabe and Seka Chekorsa Districts of Jimma Zone, Southwestern Ethiopia

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Abstract: The study was conducted in Shabe and Seka Chekorsa districts of Jimma Zone south western, Ethiopia to assess beekeeping practices. These two districts were selected purposively based on their honey production potentials and accessibility. The districts were stratified into highland, midland and lowland. From each agro-ecology, one peasant association was selected purposively based on beekeeping potentials. Random sampling method was used for selecting 30 individual households from each purposively selected PAs and thus a total of 180 households were selected for the study. Questionnaire based survey as well as PRA techniques were employed to collect the data. About 50%of the beekeepers had 11-15years of experiences of keeping honeybees. Catching swarms freely (71.7%) and gifts from parents (28.3%) were the sources of colony to start beekeeping. Income generation (63.4%) and simplicity (36.6%) of keeping bees were the reasons as to why the beekeepers appreciate beekeeping. The beekeepers construct hives from locally available materials such as bamboo (41.1%), false banana leaves (17.8%), logs (16.7%), hareg (15.6%) and bark of big trees (8.90%). The behaviors of the bees were docile (42.8%), aggressive (35.6%) and very aggressive (21.6%). As per the perception of the owners these bees were medium (72.8%), big (17.2%) and small (10.0%) in size. Mixture of black and yellow (82.2%) and black (17.8%) were the prevailing colors of the bees in the study areas. Both external and internal inspections of the hives were practiced. Swarming was reported to be common where October (38.9%), September (35%) November (21.7%) and August (4.4%) were the common months of swarming. Removing old combs (32.8%), queen cell removal (29.4%), suppering (26.1%) were the methods employed to control swarming. The rest (11.7%) had no control methods. Absconding from traditional hive (66.7%), modern hive (20%) and intermediate hive (13.3%) were common which was caused by pests and predators (56.1%), poor management (32.2%), bees poisoning (6.10) lack of forage (3.9%) and bad weather (1.7%). The households tried to control absconding through regular inspection (46.7%), reserving some honey (20%), transferring bees (7.80%), supplementing (3.9%). The rest (21.6%) had no control mechanism. Lower honey was produced by the traditional beekeeping practices.

Key words: Jimma · Honeybee · Swarming · Absconding

INTRODUCTION

The performance of the Ethiopian agriculture has been poor and the sector has not been able to feed the nation. To reduce poverty, focusing on high potential areas of agricultural sector and making them more productive is of paramount importance. Beekeeping is one sub sector where such potential exists. Ethiopia has a huge natural resource base for honey production having the highest number of bee colonies and surplus honey sources of flora. The country produces around 23.6% and 2.1% of the total African and world's honey, respectively. It is the leading honey producer in Africa and one of the ten largest honey-producing countries in the world. It is also one of the four largest bees-wax producing countries in the world [1]. The major honey supply areas in the country include places like Sidamo, Jimma, Gondar, Wollega, Illubabor, Bale and Gojjam [2].

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Beekeeping is traditionally well established household activity in almost all parts of the country that plays an important role for income generation [3]. Unlike cultivation of crops and animal husbandry beekeeping does not compete for resources with other agricultural activities and hence carried out by both farmers and landless people [4]. However, apiculture is still operating in traditional ways implying the need for modernization [2]. Out of the three types of beehives used in Ethiopia about 95.5% are traditional, 4.3% and 0.20% are transitional and modern hives, respectively. More than 95% of the honey and beeswax produced in the country is obtained from the traditional beekeeping whereas the remaining 5 percent comes from transitional and modern beekeeping [3].

The productivity of traditional hives is extremely low and the average yield is only about 5–8kg/per colony/per annum. The annual average of the honey yield obtained from intermediate hive is about 20kg, while that of the frame hive is about 30kg [5]. All the traditional hives are made locally and not appropriate to open for inspection and harvest honey as a result of which beekeepers failed to harvest sufficient honey from the traditional hive [6]. In addition to difficult to open the local hives are not durable. In general, apiaries are managed badly by the beekeepers: hives not placed properly, have no shades and poor hive sanitation [2]. This bad management would lead to absconding.

Inappropriate skill of bee management practices, colony absconding, poor design of modern beehives, low honey yields and bee pests are the main problems that impede the full use of apiculture resources. Interventions in modern beekeeping should be focused on empowering beekeepers with skills through ensuring availability of improved beekeeping technologies with standard seasonal bee management practices being strengthened [6]. In order to intervene, it is prudent to first identify the existing practices so as to target the real problem. There are indigenous and traditional knowledge based systems that parallel adaptive management on learning-by doing and the use of feedback from the environment to provide corrections for management practice [7]. In general improved beekeeping technology requires knowledge on the practical aspects where the knowledge source could be farm experience, research, extension and NGOs [6].

For a successful honey production, the quality and characteristics of bee colonies are also decisive. Beekeepers should keep non-aggressive and productive bees. Bee colonies with non-aggressive behaviour and good productivity can be obtained by catching swarms originated from colonies with known background or using colony splitting techniques. Also bee colonies in the apiary should be free from diseases and pests and this needs regular hive inspection [2].

In south and south west parts of the country where there is high vegetation coverage and high honeybee population density, apiculture production is a very important activity for the development of the region in general and the rural households in particular. Even though Shabe and Seka Chekorsa districts of Jimma zone are believed to have diversified type of vegetation and cultivated crops as potential for beekeeping activities, so far there is no research information on traditional beekeeping practices that could be baseline for further intervention. Therefore, this research was initiated with the objective of assessing beekeeping practices in the study areas.

MATERIALS AND METHODS

Description of the Study Areas: The study was conducted in Seka Chekorsa and Shabe Sombo districts of Jimma Zone of Oromia Regional State.

Shabe Sombo district is located at a distance of 375 km, South West of Addis Ababa. The major town is Shebe. It is situated at an altitude ranging from 1350 to 2800 meters above sea level and with an estimated area of 121.5km^2. The area receives an average annual rainfall ranging from about 900 to 1300mm. The minimum and maximum daily temperatures of the area are 20°C and 28°C, respectively. The livestock potentials of the district are cattle, sheep and poultry and equines, goats, respectively. The major crops grown in the district are enset, wheat, barley, haricot beans, pea, maize and sorghum, in addition to these, backyards vegetables and root crops (Potatoes, Carrot, Cabbages etc.) are also produced in the district.

Seka Chekorsa is one of the districts found in Jimma zone of Oromia regional state. It is located at a distance of 335 km, south west of Addis Ababa. Currently, the district covers an estimated area of 455km^2. It is situated at an altitude ranging from 1580 to 2560 meters above sea level. The district receives rainfall, ranging from 1, 200 to 2, 800 mm per annum. The minimum and maximum daily temperatures of the area are 12.6°C and 29.1°C, respectively. It was reported that the district is a potential for cattle, sheep, horses, mules, donkeys, poultry and beekeeping [8]. The major crops grown in the district are enset, maize, sorghum, teff, barley and the minor crops are haricot beans, wheat and sweet potatoes.

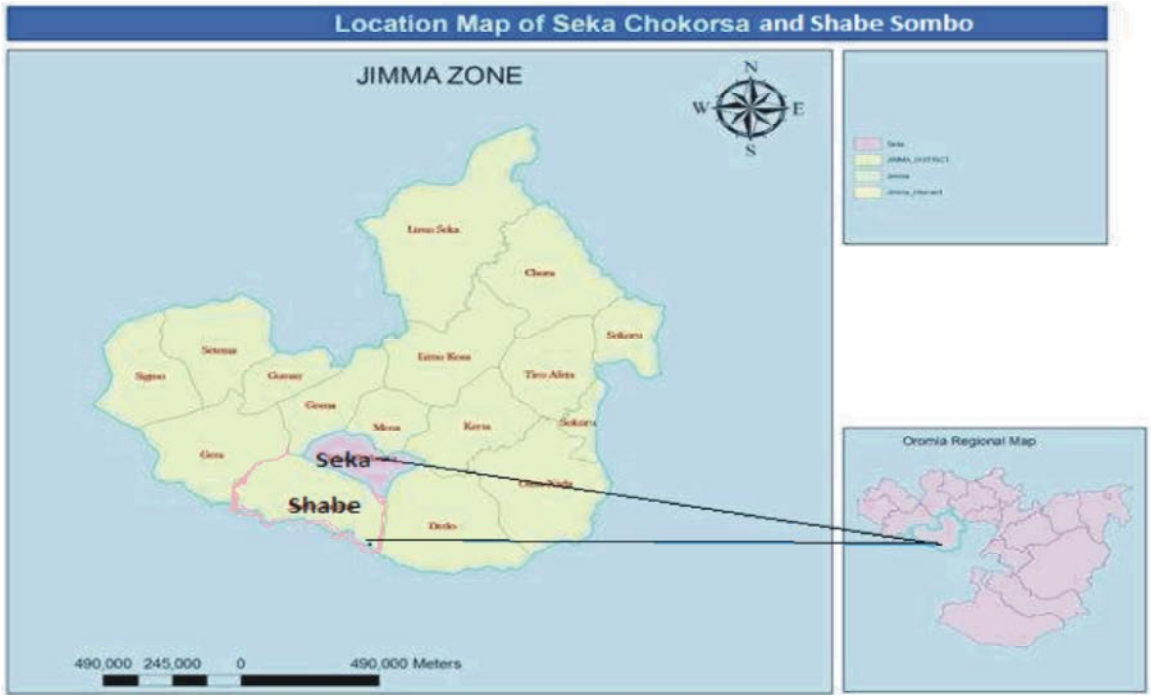

Fig. 1: Location map of the study districts

Sampling Techniques and Sample Size: The study was conducted in two selected districts of Jimma zone; namely Shabe Sombo and Seka Chekorsa. These two districts were selected purposively based on their honey production potential. Based on the information obtained from secondary data sources and altitudinal variations the districts were stratified into lowland, medium land and highland. From each agro-ecology, one peasant association was selected purposively based on beekeeping potentials; a total of six peasants associations for two districts were selected. Systematic random sampling method was used for selecting 30 individual households from each purposively selected PAs and thus a total of 180 households were selected for this study. The selected beekeepers were interviewed by using structured questionnaires which was pre-tested and translated into Oromifa language.

Methods of Data Collection and Data Sources: Both primary and secondary data were used to achieve the objectives of the study. Secondary data was obtained from reports of district Agricultural Development Office, Zonal Agricultural Department Office, Regional Bureau, NGOs and other published and unpublished materials.

In order to collect primary data, the Participatory Rural Appraisal (PRA) specifically Focus Group discussion (FGD) was used to undertake informal discussion with groups composed of key informants like; development agents, Expert in Rural Development of the respective districts. Based on the information generated through PRA, the questionnaire was developed for the formal interview. Then, the primary data was collected from sample respondents through structured questionnaire. Pre-testing of the questionnaire was made as a pilot survey and on the basis of information obtained during pre-testing, modification was made on the questionnaire. Single-visit-multiple-subject formal survey method was employed to collect data on various aspects of honey production and marketing system [9]. The enumerators were recruited from each selected study areas and made acquainted with the questions, trained on methods of data collection and interviewing techniques.

Collected Data: This study required a wide range of information with reference to honey production and marketing system. Both qualitative and quantitative data were collected using conventional survey method, which include the following major data types such as sex, age, family size, education level, experience of beekeeping, sources of starting colony, construction materials for hive, placement of hive, characteristics of bees, hive inspection, swarming and absconding incidences, honey harvesting, honey utilization, post-harvest handling, honey yield and honey marketing.

Data Management and Data Analysis: All the collected data were coded, entered into an excel data sheet and cleared before analysis. Descriptive statistics such as, frequency distribution, means, percentages were used to analyze qualitative data using Statistical Package for Social Sciences (SPSS) version 20 [10]. The descriptive statistics (mean, SE) for numerical survey data (quantitative data) was subjected to Analysis of Variance (ANOVA) using the General Linear Model (GLM) procedure of SPSS of the same version.

RESULTS AND DISCUSSION

Socio- Economic Characteristics of Households: Result of household characteristics is presented in Table 1 below. According to the survey result, out of the total 180 interviewed beekeepers about 77.2% were male headed and the rest 22.8% were female headed. The household age category indicates that the majority (31.7%) were within the age range of 26-35 years old which is said to be productive age category. The average family size of the beekeepers of the current study was 5.41 persons. No Significant variation was observed among agro-ecologies at ($p<0.05$) regarding family size. The majority of these households (83.9%) were married followed by 6.7%, 5% and 4.4% being single, widowed and divorced, respectively. With regard to religion of the respondent households, 73.3%, 18.9% and 7.8% were Muslim, Orthodox and Protestant, respectively. Regarding to educational level of the household 28.3%, 25.0%, 14.4% and 10% attended elementary school, basic education, junior and high school level. The rest 22.3 % were illiterates.

Similar to the current study Adebabay [11] reported that there was very limited number of female headed households in his study area. In Damot Gale woreda, Wolaita zone of Ethiopia, from the total of 60 sample households interviewed about 80% were male and the rest 20% were female headed which is in line with the current study [12]. According to Melaku *et al*. [13], the key informants of their study in Tigray region confirmed that females in the rural areas were dominantly burdened with indoor family management tasks and cultural stereotypes which hindered their participation in beekeeping farming. The family size of the current study is also in line with Chala [14] who reported the average family size of beekeepers to be 5.6 persons in Gomma Woreda, Oromia region. Workneh [15] also reported that mean family size in selected districts of Ethiopia to be 6.6 and 5.9 for adopters and non-adopters of improved hives, respectively.

Beekeeping Practices

Beekeeping Experience of the Respondents: The result is indicated in Table 2 below. About 50% of the beekeepers in the current study had been involved in beekeeping for about 11 to 15 years. Only few (7.8%) of the respondents had experience of more than 20 years in keeping bees. The rest of the respondents 28.9 % and 13.3% had experience of keeping bees for about 6 to 10 and 1 to 5 years, respectively. This implies that the respondents have rich indigenous knowledge with regard to beekeeping activities. It is possible to say that they were in a position to observe the behavior of bees, their products, their enemies, what is suitable and what is not suitable for the bees. The present result is higher than the experience reported in Gomma districts which is 5.66 years [15]. However, it is lower than the finding of Tewodros *et al*. [16] who found that majority of the respondents (57.7%) have an experience of 11 to 40 years in traditional beekeeping.

Sources of Honeybee Colonies to Start Beekeeping: As indicated in Table 3 below, the initial sources of bee colonies to start beekeeping were catching swarms and gifts from parents (71.7%) and (28.3), respectively. The respondents of the current study further reported that the reasons as to why they were involved in beekeeping include income generation (63.4%) and simplicity of keeping the bees together with other livestock (36.6%) by sharing labor, feed, housing and other management activities at a minimum level. The farmers' perception implies that honeybees give production simply by leaving and flourishing on the naturally available resources (honey plants), with added advantage of pollination to the plants they visited. Furthermore, no livestock is acquired freely like swarms of bees that one can get by simply hanging bait hive suggesting that beekeeping is an easy business that requires little initial capital.

Similarly, Chala [14] reported that in Gomma district of Jimma zone 87.8% of beekeepers started beekeeping by catching swarms. The current result agrees also with Kebede and Tadasse [17] who noted that 60.3% of beekeepers have got their colonies by catching swarms and the rest obtained from parents and buying. The majority of the respondents (93.3%) in Wolaita zone started beekeeping by catching swarms of honeybees whereas only 6.7% gained the honey bee from their parents as a gift [12] which is in concurrent with the current finding. Bekele [18] also indicated that 92.2% of the beekeepers in Bale zone started beekeeping by catching bee swarms, while the remaining get bee colonies through gift from parents, inheritance and both catching

Table 1: Household characteristics of respondents in the study area

		Agro ecology			
		HL (N=51)	ML (N=58)	LL (N=71)	Total (N=180)
Parameters (%)		N %	N %	N %	N %
Sex of HHs					
	Male	44(86.3)	48(82.8)	47(66.2)	139 (77.2)
	Female	7.0(13.7)	10(17.2)	24(33.8)	41.0 (22.8)
Age category					
	<16-25 years	2.0(3.30)	4.0 (6.70)	7.0(11.7)	13(7.2)
	26-35 years	14(23.3)	19(31.7)	24(40.0)	57(31.7)
	36-45 years	9.0(15.0)	13(21.7)	7.0 (11.7)	29(16.1)
	46-60 years	14(23.3)	14(23.3)	10(16.7)	38(21.1)
	>61 years	21(35.0)	10(16.7)	12(20.0)	43(23.9)
Marital status					
	Married	41 (80.4)	49(84.5)	61(85.9)	151(83.9)
	Single	4.0 (7.80)	4.(6.90)	4.0(5.60)	12.0(6.70)
	Widowed	3.0 (5.90)	3.0(5.20)	3.0(4.20)	9.00(5.00)
	Divorced	3.0 (5.90)	2.0(3.40)	3.0(4.20)	8.00(4.40)
	Total	51(100)	58(100)	78(100)	180(100)
Religion					
	Orthodox	22(36.7)	2.0(3.30)	10(16.7)	34.0(18.9)
	Muslim	34(56.7)	48(80.0)	50(83.3)	132(73.3)
	Protestant	4.0(6.70)	10(16.7)	11(10.0)	14.0(7.80)
Family size/hh (Mean±SD)		5.10±2.18[a]	5.64±1.59[a]	5.45± 1.48[a]	5.41±1.72

[a] Superscript across the row indicates no significant variation of family size (P<0.05)

Table 2: Beekeeping experience of the respondents in the study area

	Agro ecology			
Parameters (%)	HL(N=51)	ML(N=58)	LL(N=71)	Total(N=180)
1-5 years	13.7	6.90	18.3	13.3
6-10 years	29.4	31.0	26.8	28.9
11-15 years	47.1	51.7	50.7	50.0
> 20 years	9.80	10.3	4.20	7.80
Total	100	100	100	100

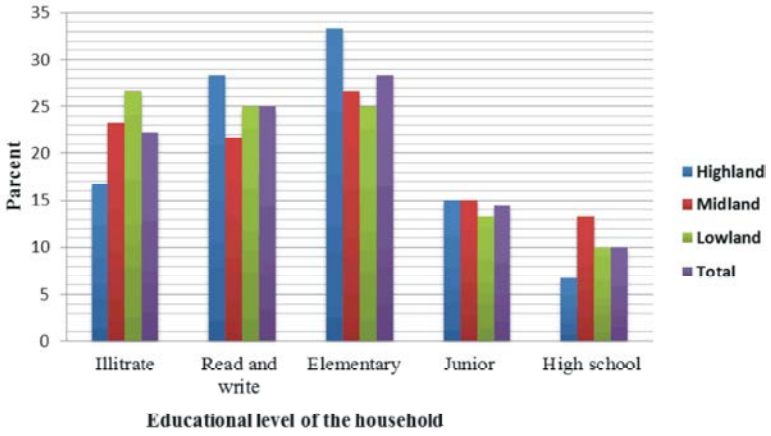

Fig. 2: Educational level of the household in the study area

Table 3: Sources of honeybee colonies and purpose of beekeeping in the study area

	Agro ecology			
	HL (N=51) N (%)	ML (N=58) N (%)	LL (N=71) N (%)	Total(N=180) N (%)
Sources of colony				
Catching swarm	43(84.3)	30 (51.0)	53 (80.2)	118 (71.7)
Gift from parents	8.0 (15.7)	28 (49.0)	18 (19.7)	62.0 (28.3)
Total	51 (100)	58 (100)	71 (100)	180 (100)
Reasons of beekeeping				
Income generation	25(49.1)	36 (62.1)	35 (49.3)	96.0 (63.4)
Simplicity	26(59.9)	22 (37.9)	36 (50.7)	84.0 (36.6)
Total	51(100)	58 (100)	71 (100)	180 (100)

swarm and gift from parents 5.0%, 1.1% and 1.7%, respectively. According to Gidey *et al*. [19] in Asgede Tsimbla district, Northern Ethiopia, means of colony getting for beekeepers were catching swarm, inheritance and purchasing. The current finding and the mentioned earlier works emphasizes that swarming is the major sources of honeybee colony. As far as reasons of keeping bees is concerned, in line with the result of Tessega [20] who reported that reasons for involvement of the farmers in beekeeping were income generating activity (79.2%) followed by easy to perform with other agricultural activities (10.0%).

Hive Construction and Placement: Respondents in the study area used different locally available materials to construct hives particularly traditional and transitional hives (Table 4). About 41.1% of the beekeepers construct hives from bamboo followed by false banana leaves (17.8%), logs (16.7%), harege (Solaneco angelatuse) (15.6%) and bark of big trees (8.90%) implying that except log all are cheaply available but not durable.

Regarding placement of hives, result is indicated on Table 5 below. Traditional hives (18.9%), intermediate (93.3%) and movable hives (82.2%) were placed in the backyard areas with simple shade on hive stands whereas traditional hive (3.3%), intermediate (6.70%) and movable (17.8%) were placed under the eave of the household house. Only traditional hive is placed on trees in the forest (36.5%) and on trees near the homestead (41.3%) suggesting that intermediate and movable hives were not suitable to hang on trees. Unlike the result in Gomma district, southwestern Ethiopia Chala [14] reported that 65.6 % of the beekeepers keep their traditional bee colonies in the forest, which is higher than current finding, whereas the majority of the beekeepers keep the transitional hives (97.3%) and moveable frame hives (98.3%) in the back yard. Similarly, Nebiyu and Messele [21] reported that most (57.7%) of the beekeepers in the study area kept the traditional bee hives at the back yard of the house, 21.2% kept inside a simple shed built for hive placement, 13.5% kept under the eaves of the house, 5.1% kept on trees in forests and 2.6% kept on trees near home stead.

Local Characterization of the Bees: Beekeepers had developed systems of classifying bees into different categories based on behavior, size and color of the bees (Table 5). According to respondents (42.8%), (35.6%) and (21.6%) of the bees in the study areas were reported to be docile, aggressive and very aggressive, respectively. Based on size the respondents reported that they classify the bees as big (17.2%), medium (72.8%) and small (10.0%). The prevailing colors of the bees as reported by the interviewed households were mixture of black and yellow (82.2%) and black only (17.8%). This result is in line with Tessega [20] who reported that honeybees had colors of black, yellow and both yellow and black in Burie district of Amhara region.

Hive Inspection Practices in the Study Area: Both external and internal inspections of hive were practiced by the beekeepers of the study areas. The majority (52.2%) of the respondents inspect their hive externally frequently. The rest 33.9% and 13.9 % inspect sometimes and rarely, respectively. Internal inspection is practiced rarely (46.1%) and sometimes (35.6%) and only 18.3% of the respondents inspect hives frequently. According to Sisay *et al*. [22] in Jigjiga zone of Ethiopian Somalia region 13.3%, 14.02% and 23.45% of the respondents replied that they take a look internally into the hives every week, every fifteen days and every month whereas 15.23%, 23.21% and 37.6% of respondents inspect externally every week, every fifteen days and every month, respectively.

Table 4: Hive construction in the study areas

	Agro –ecology							
	HL (N=51)		ML(N=58)		LL(N=71)		Total(N=180)	
Parameter	N	%	N	%	N	%	N	%
Bamboo	27	52.9	22	37.9	25	35.2	74	41.1
False banana leaves	6.0	11.8	14	24.1	12	16.9	32	17.8
Logs	9.0	17.6	11	19.0	10	14.1	30	16.7
Hareg (Solaneco angelatuse)	7.0	13.7	7.0	12.1	14	19.7	28	15.6
Barks of tree	2.0	3.9	4.0	6.90	10	14.1	16	8.90

Table 5: Placement of different beehives in the study area

Placemen of bee hive (N=180)	Traditional (%)	Intermediate (%)	Movable-frame (%)
Backyard with shade	18.9	93.3	82.2
Under the eave of the house	3.30	6.7	17.8
Hanging on trees in forest	36.5	-	-
Hanging on trees in homestead	41.3	-	-
Total	100	100	100

Table 6: Local characterization of the bees in the study areas

	Agro ecology							
	HL(N=51)		ML(N=58)		LL(N=71)		Total(N=180)	
Characteristics	N	%	N	%	N	%	N	%
Behaviors of the bees								
Docile	22	43.1	23	39.7	32	45.1	77	42.8
Aggressive	18	35.3	19	32.8	27	38	64	35.6
Very aggressive	11	21.6	16	27.6	12	16.9	39	21.6
Size of the bees								
Big	12	20.5	4.0	6.9	14	19.7	31	17.2
Medium	38	74.5	42	72.4	51	71.8	131	72.8
Small	1.0	5.0	12	20.7	6.0	8.5	18	10.0
Color of the bees								
Black	13	21.7	9.0	15.0	10	16.7	32	17.8
Mixture of black and yellow (Faki)	7.0	78.3	51	85.0	50	83.3	148	82.2

Table 7: Hive inspection practices in the study areas

	Agro ecology							
	HL (N=51)		ML (N=58)		LL (N=71)		Total (N=180)	
Parameters	N	%	N	%	N	%	N	%
Inspection frequency								
External								
Frequently	28	54.9	32	55.2	34	47.9	94	52.2
Sometimes	17	33.3	21	36.2	23	32.4	61	33.9
Rarely	6.0	11.8	5.0	8.60	14	19.7	25	13.9
Total	51	100	58	100	71	100	180	100
Internal								
Frequently	10	19.6	10	17.2	13	18.3	33	18.3
Sometimes	19	37.3	18	31.0	27	38.0	64	35.6
Rarely	22	43.1	30	51.7	31	43.7	83	46.1
Total	51	100	58	99.9	71	100	180	100

Swarming Incidences and its Managements: Result of swarming incidence is summarized in Table 8 below. According to the survey result, all respondents reported that swarming is common in the study areas. October (38.9%), September (35%), November (21.7%) and end of August (4.40% were the months of swarming as reported by the beekeepers which matches with honey flow seasons. This implies that when abundant pollen and nectar resources are available, the honeybee colony is stimulated to raise more brood and thus the colony population increases. The respondents considered swarming as beneficial behavior of the bees provided that the swarmed colony does not escape. According to the perception of the respondents increment of colony size (26.1%) and replacement of unproductive colony (73.9%) are the advantages of swarming. In the current study in order to control swarming queen cell removal (29.4%), removing old combs (32.8%) and suppering (26.1%) were the methods employed to control swarming of a colony. The rest (11.7%) reported that they do not have any controlling mechanism of swarming. With regard to months of swarming Nebiyu and Messele [21] reported that in Gamogofa zone the main months in which incidence of swarming occurred were September, October and November which is in line with the current finding.

Incidence of Absconding and its Management: The result of incidence of absconding is indicated in (Table 9) below. According to the results of the survey, 66.7%, 13.3% and 20.0% of absconding incidence of honeybee colonies occurred in traditional, intermediate and movable-frame hives, respectively. Absconding was highest in traditional hive implying its unsuitability for the bees which may be due to susceptibility to hive intruders. This is in line with Tessega [20] who noted that 75.0 % of absconding incidence of honeybee colonies was recorded in traditional hives. The author further indicated that the incidence from top bar and frame hives were 5% and 20%, respectively.

According to respondents, lack of forage (3.90%), pests and predators (56.1%), bees poisoning (6.1%), bad weather condition (1.7%) and poor management (32.2%) were reported to be the causes of absconding. This is in line with Chala [14] who noted that reasons for absconding of bee colonies were incidence of pests and predators (50%), harvesting of the entire honey (15.5%), hive sanitation problem (11.2%), bad weather condition (10.6%) bee diseases (5.5%) and other factors (7.2 %). Adebabay *et al*. [11] also supported that incidence of pest, poor management, bad weather and others are the main causes for colony absconding. Hence, farmers should consider feed supplementation and protection of colonies from natural enemies [22].

March-May (24.4%), June-August (38.9%), September–November (24.4%), December –February (12.3%) were the main months of absconding. This is in line with Tessega [20] who noted that absconding of bee colonies occurred from March to May (63.3%) followed by June to August (26.7%), September to November (5.6%) and December to February (4.4%). Within the range of the current result, Haftom *et al*. [23] also indicated that in two districts of Tigray region absconding is high in February. Absconding correlates with low flowering intensity and shortage of honeybee forage [24]. Similarly, in Adami Tulu Jido Kombolcha district all interviewed beekeepers responded that there was absconding and migration immediately following the main honey flow season and continued throughout the dry season (mainly from October-March) up to the next active period [25]. The months mentioned as the main time of absconding are known as dearth periods because in Ethiopia there is no available flower at those times. September and November are not categorized into dearth period and therefore the occurrence of absconding during these two months may be attributed to other reasons.

To control absconding, beekeepers used different mechanisms such as regular inspection (46.7%), not harvesting all honey (20%), supplementing feed during feed shortage (3.9%) and transferring (7.8%). The rest (21.6%) used no control mechanism at all.

Honey Yield from Different Types of Beehive in the Study Areas: The mean honey yield from traditional, transitional and modern hives in different agro ecology of the study areas was 5.28kg, 12.19kg and 29.98kg, respectively. Significant variation was observed between agro ecologies. All types of hives in the low land agro-ecology produced more honey significantly. Different authors reported different types of results with regard to honey yield from different types of honey. Similar to the current result Bekele [18] reported that the overall mean of honey yield harvested in Bale zone during study time was 5.70kg with minimum 1kg and maximum 20kg was recorded from traditional hives. Sisay *et al*. [22] reported a lesser result from Jigjiga zone than the current finding. These authors indicated that the maximum amount of honey harvested from traditional, movable hive and modern hive were 7kg, 8kg and 9kg, respectively with the minimum records from

Table 8: Swarming incidences and its managements in the study area

	Agro ecology							
	HL(N=51)		ML(N=58)		LL(N=71)		Total(N=180)	
Parameter	N	%	N	%	N	%	N	%
Swarming occurrence								
Yes	51	100	58	1100	71	100	180	100
Swarming months								
August	4.0	7.80	3.0	5.20	1.0	1.4	8.0	4.40
September	3.0	5.90	3.0	5.20	57	80.3	63.0	35.0
October	18	35.3	44	75.9	8.0	11.3	70.0	38.9
November	26	51.0	8.0	13.8	5.0	7.00	39.0	21.7
Total	51	100	58	100	71	100	180	100
Swarming advantage								
Increase of colonies	19	37.3	7.0	12.1	21	29.6	47.0	26.1
Replace nonproductive	32	62.7	51	87.9	50	70.4	133	73.9
Total	51	100	58	100	71	100	180	100
Methods of controlling								
Queen cell removal	16	31.4	13	22.4	24	33.8	53	29.4
Removing old combs	19	37.3	13	22.4	27	38.0	59	32.8
Suppering	11	21.6	24	41.4	12	16.9	47	26.1
No method	5.0	9.80	8.0	13.8	8.0	11.3	21	11.7
Total	51	100	58	100	71	100	180	100

Table 9: Absconding incidences and its management in the study areas

	Agro ecology							
	HL(N=51)		ML(N=58)		LL(N=71)		Total(N=180)	
Parameters	N	%	N	%	N	%	N	%
Occurrence of absconding								
Yes	51	100	58	100	71	100	180	100
Absconding from								
Traditional	42	82.4	39	67.2	39	54.9	120	66.7
iIntermediate	4.0	7.80	10	17.2	10	14.1	24.0	13.3
Modern-frame	5.0	9.80	9.0	15.5	22	31.0	36.0	20.0
Causes of absconding								
Lack of forage	2.0	3.90	2.0	3.4	3.0	4.20	7.00	3.90
Pests and predators	21	41.2	38	65.5	42	59.2	101	56.1
Bees poisoning	4.0	7.80	4.0	6.9	3.0	4.20	11.0	6.10
Bad weather	2.0	3.90	1.0	1.7	0.0	0.00	3.00	1.70
Poor management	22	43.1	13	22.4	23	32.4	58.0	32.2
Months of absconding								
March-May	14	27.5	12	20.7	18	25.4	44.0	24.4
June-Aug	20	39.2	23	39.7	27	38.0	70.0	38.9
Sept-Nov	10	19.6	16	27.6	18	25.4	44.0	24.4
Dec-Feb	7.0	13.7	7.0	12.1	8.0	11.3	22.0	12.3
Methods of prevention								
Regular inspection	25	49.0	23	39.7	36	50.7	84.0	46.7
Reserve some honey	9.0	17.6	20	34.5	7.0	9.90	36.0	20.0
Transferring	4.0	7.80	4.0	6.90	6.0	8.50	14.0	7.80
Supplement feeding	3.0	5.90	0.0	0.00	4.0	5.60	7.00	3.90
No measure	10	19.6	11	19.0	18	25.4	39.0	21.6

Table 10: Honey yield (kg) from different hive types in the study areas

	Agro-ecology			
Parameter (Mean +SD)	HL(N=51)	ML(N=58)	LL (N= 71)	Total (N=180)
Traditional	3.69±1.63[b]	4.42±2.45[b]	7.28±2.37[a]	5.28±2.75
Transitional	7.45±2.64[c]	11.59±3.25[b]	16.10±3.80[a]	12.19±4.90
Modern	19.73±9.09[b]	30.55±10.65[a]	34.35±12.08[a]	29.98±12.37

[a, b, c] means with different superscript across the raw indicates significant difference (P<0.05)

all three type of hives in the study areas recorded as 4kg, 4kg and 6kg. Taye and Marco [26] revealed that in Wonchi district of south west showa zone, the average amount of honey harvested /hive/year from traditional hive, transitional hive and modern hive were 5.22kg, 10.83kg and 15.2kg, respectively. Gidey *et al*. [19] reported a relatively higher value than the current finding. These authors reported a yield of 20-25kg/hive and 45-50kg/hive for traditional and modern hive, respectively. These all indicated that there is variation in honey yield in different agro-ecologies which could be attributed to variations in honey plants availability, climatic condition of an area, difference in management and other factors.

CONCLUSION

Different beekeeping practices which were developed from life time experience of the beekeepers were identified by this research. Some of the practices are useful. However it is important to merge and improve with scientific approach. By these traditional practices an average honey of 5.28kg, 12.19kg and 29.98kg of honey was able to be produced from traditional, transitional and modern hives respectively.

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