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Honey Production System in Buno Bedele and Ilu Abba Bora Zones, South Western Oromia, Ethiopia

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Research Article

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ABSTARCT

Beekeeping is rearing or keeping of bees to get its products such as honey, pollen grain, proplis and brood. This study was conducted in Buno Bedele and Ilu Abba Bora zone, with the aim to assess honey production system, identify opportunities of beekeeping and major honey production constraints in study area. Hence, 3 districts from each zone and 15 Kebele in 6 districts were selected by purposely sampling methods and also 270 households were selected. Semi-structured questionnaire data was generated by conducting household survey interview, focal group discussion, and direct field observation were applied. According to, the outcomes of this study have shown that, traditional beekeeping (47.3%), box hive beekeeping (30.1%) and transition beekeeping system (22.6%) are at beekeepers in study area. The result indicated that the productivity of honey yield from one traditional hive has average 7.98 kg/year, whereas 16.75 kg/year obtain from one transitional hive and average of productivity per Box hive was 21.23 kg/year at study area. Most beekeepers (61.5%) were harvest honey twice per a year in study area. The study shown that among ways of households started beekeeping practice are majority (68.2%) were started by learning from parent followed, learning from neighbour (20.7%), Through training (9.1%) and Self-initiative (2.2%). The major opportunity of beekeeping practice is Availability of flowering plants, demand of honey rise, government and non-government support natural resource conservation programs within beekeeping, a proper perception of the society of beekeeping, a suitable environment, Indigenous knowledge, availability of water and bee colonies. On the other hand, Pesticide and herbicide, Absconding, lack of bee forages and Disease were ranked as major constraints of beekeeping at study area. The study recommends that awareness should be created on all hive products through training for

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beekeepers specifically; on honeybee management, Pest and predator control methods and the research should be done on demonstrating of box hive on farmers.

Keywords: Honey production system; Beekeeping; Bee colonies; Pest control

INTRODUCTION

Apiculture or beekeeping is rearing or keeping of bees to get its products such as honey, pollen grain, proplis and brood [1]. Gebremichael B, et al., reported that apiculture is non-farming activities, directly and indirectly contributes to small holder's income in particular and nation's economy in general [2]. Ethiopia has a huge natural resource base for honey production and other hive products. Its topography is also complex and altitude varies from the lowest point 126 m below sea level (Dankil depression) to the highest 4620 meters above sea level (mount Ras Dashen) [3]. So, Ethiopia has variable agro ecological zones which lead to high diversification in fauna and flora species. Its forests and woodland contain diverse plant species that provide high amount of nectar and pollen for foraging bees [4].

Beekeeping is traditionally a well-established household activity in almost all parts of Ethiopia [5]. It is one of traditional agricultural practices in the country. Therefore, Ethiopia is one of few countries in the world with long beekeeping tradition that gave an opportunity that supply honey and bee wax to the international markets. The sub sector is still implemented with minimum improvement specifically for producing honey and some crude wax. However, the benefit from the subsector to farmers, traders, processor and exporters is not satisfactory.

Ethiopia have around ten million honey bee colonies which make the country to have the highest bee density and the leading producer of honey and bees wax in Africa. However, the production looks large enough, only small amount of these products is delivered to an export market item. This is because; the country itself has huge local market demand for honey and bees wax produced. More than 70% is used for making local drinking called tej and only 10% is used as table honey. Although Ethiopia has favorable agro ecology for honey production, level of honey production and productivity in the country is remain low. The prevalence of production constraints in the beekeeping sector would vary depending on the agro ecology of the areas where the activities are carried out.

The major constraints that affect beekeeping sub sector in Ethiopia are; lack of knowledge, shortage of skilled man power, shortage of bee equipment, pests and predators, pesticide threats, poor infrastructure development, shortage of bee forage and lack of research extension.

Beekeeping provides different role in the country and south western Oromia as general. West Wollega, Jimma and Ilu Abba Bora are the area of Oromia regions with high number of hives. Although apiculture resource is immense in Buno Bedele and Ilu Abba Bora zones, however the honey production system are not assessed and limited information currently on beekeeping in this sector. So the study was initiated with the aim to assess honey production system, identify opportunities of beekeeping and major honey production constraints in study area.

MATERIALS AND METHODS

Description of study areas

The study was conducted in Mattu, Didu and Yayyo districts of Ilu Abba Bora zone and Bedele, Chora and Dabo Hana districts of Buno Bedele zone of the Oromia Regional state, South Western Ethiopia.

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Ilu Abba Bora is location of the zone is located in the South Western part of the regional state of Oromia, Ethiopia. The capital town of the zone is Mattu, which is located at distances 600 km, South Western of Addis Ababa, the capital city of the country. It lies between 34o52'30"E-36o5'30"E longitudes and 7o27'30"N-8o49'30"N latitudes. The zone surrounded by two regional state and three zones of Oromia National Regional State.

The zones and regions bordering zone are in the West by Gambela region, in East and Southeast by Southern Nationals and Nationalities Peoples Zone (SNNPs), in the North and West Wollega, North-East by East Buno Bedele zone and in the South by SNNPs. The areal coverage of the Ilubabor zone is estimated to be 10,920 km^2 or (1,092,000 hectares). The zones contain highland (17%), midland (62%) and lowland (21%) agro-ecologies; and temperature range from 16°C to 26°C (zone physical and socio-economic profile, 2021-2022). The farming system of the zones are characterized by mixed farming system comprising both cropping and livestock production.

Buno Bedele zone is one of the zones of Oromia national regional state in Ethiopia and bordered on the South by SNNP, on the West by the Ilu Abba Bora zone, on the North by the East Wollega zone and West Wollega zone and on the East by the Jimma zone. The capital town of the zone is Bedele, which is located at distances 480 km, South Western of Addis Ababa, the capital city of the country (Figure 1).

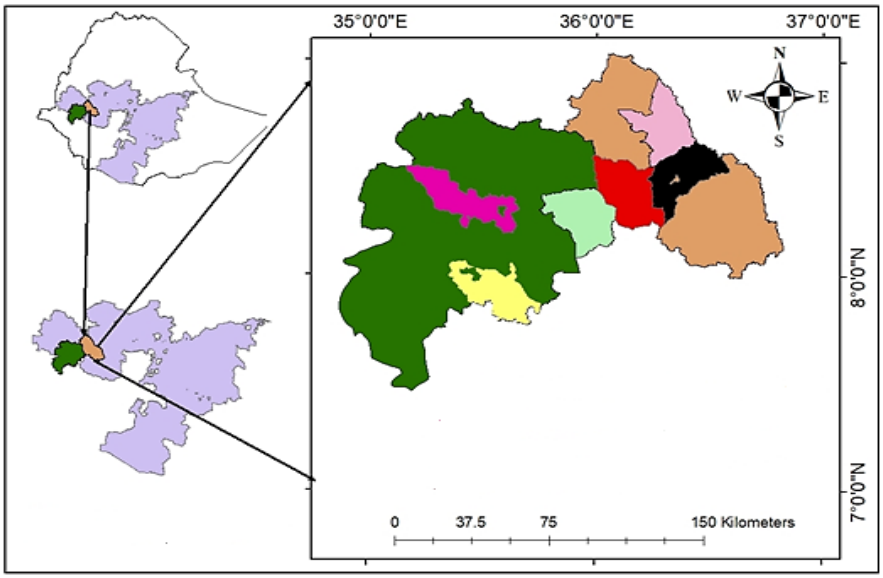

Figure 1. Map of study area. Note: ( ) Oromia; ( ) Ethiopia; ( ) Buno Bedele Zone; ( ) Dabo Hana District; ( ) Bedele District; ( ) Chora District; ( ) Ilu Abba Bora Zone; ( ) Yayo District; ( ) mattu District; ( ) Didu District.

Sampling techniques

From Buno Bedele zone three districts were selected purposively based on honey beekeeping practice and beekeeping potential namely; Bedele, Chora and Dabo Hana districts and similarly from Ilu Abba Bora zone three districts were selected by same procedure namely; Mattu, Didu and Yayo districts.

The discussion was made with all selected districts to select the potential kebeles by honey beekeeping practice. From each district the kebele were selected purposively based on honey beekeeping practice and beekeeping potential. Totally 15 kebeles nine from Buno Bedele zone (Gema Gemada, Abalo Sota and Teba Chabali Kebeles from Bedele district, Dabaso Soro, Shangala and Alelu Hadessa kebeles from Chora district and Loko, Gute Amuma and Lilo Sato kebeles from Dabo Hana district) and six from Ilu Abba Bora zone (Chogi and Tulube Kebeles from Mattu district, Achebo kebele from Yayo district and Gordomo and Gemachu Kebeles from Didu district) were selected

purposively based on representative of beekeeping potential. Accordingly, 150 households from Buno Bedele zone, 120 from Ilu Abba Bora zone and totally 270 households were selected purposively.

Data collection methods and analysis

Essential data were collected from both primary and secondary sources. Primary data were collected through semi structured questionnaires of selected households, focus group discussion and direct observation to gather information such as; general socio economics of household, beekeeping practices, number and types of beehive, honey harvesting, honey harvested per colony per different types of hives , and beekeeping potential, beekeeping opportunities and constraints, major bee flora and their flowering time, poisonous plants, honey flowing season, handling of bee products, and honey marketing condition.

Secondary data was collected from zonal and each districts agriculture office to select location with beekeeping potential and high number of hives and other additional information. The data collected from samples household responses were analyzed by using statistic, package for social science. Descriptive analysis employed the tools such, percentage, mean and frequency distribution.

RESULTS AND DISCUSSION

Out of 270 total households involving in this survey, the majority respondents about 258(96.3%) were male while 10(3.7%) were female. This indicates that majority of household head in beekeeping practice in zones were male and rest 3.7% were females observed at studies. This was line with the finding of Chimdessa M, et al., reported 99.2% male participated in beekeeping practice in Bako Tibe district [6].

The majority of the respondents were between 26-35 years' age group (32%), followed by age group 36-45 years' age group (31.5%) and low number of households were above 65 years which in percent 1.9%. This result showed that, the household interviewed about beekeeping practice were almost by working group and the farmers in study area were relatively medium age group. Majority of respondents (93.5%) were married whereas 6.5% were single.

Around 53.3% household respondents range between 1-5 members of families' size whereas, 38.9 % respondents between 6-10 members of families' size and rest respondents (7.9%) had above 10 family size members.

Regarding to education status the higher (90.7%) were educated and the rest (9.3%) were illiterate. The majority of the respondents (69.4%) had above 10 years' experience in Beekeeping practice. This could be aid to gained valued data about beekeeping practice from their experience (Table 1).

Table 1. Characteristics of the sample household.

Category	Variables	Buno Bedele Zone N (%)	Ilu Abba Bora Zone N (%)	Overall N (%)
Sex	Male	146(97.3)	114(95)	258(96.3)
	Female	4(2.7)	6(5)	10(3.7)
Age class	15-25	25 (16.7)	14(11.7)	39(14.2)
	26-35	46 (30.7)	40(33.3)	86(32)
	36-45	43 (28.7)	41(34.2)	84(31.5)
	46-55	24(16)	17(14.2)	41(15.1)
	56-65	9(6)	6(5)	15(5.5)
	>65	3(2)	2(1.7)	5(1.9)

Marital status	Single	7(4.7)	10(8.3)	17(6.5)
	Married	143(95.3)	110(91.7)	253(93.5)
Family size	1-5	66(44)	75(62.5)	141(53.3)
	6-10	69(46)	38(31.7)	107(38.9)
	>10	15(10)	7(5.8)	22(7.9)
Education	Illiterate	17(11.3)	8(6.7)	25(9.3)
	Grade 1-4	34(22.7)	29(24.2)	63(23.3)
	Grade 5-8	57(38)	54(45)	111(41.1)
	Grade 9-12	36(24)	26(21.7)	62(23)
	>Grade-12	6(4)	3(2.5)	9(3.3)
Experience of beekeeping	1-10 years	52(34.7)	32(26.9)	84(30.8)
	11-20 years	51(34)	33(27.7)	84(30.8)
	21-30 years	21(14)	42(35.3)	63(24.6)
	>30 years	26(17.3)	13(10.8)	39(14)

Beekeeping production system at study area

Based on the study there are three types of beekeeping practice used for honey production at study area. Majority of respondents (47.3%) in the study area practiced traditional beekeeping whereas 30.1% and 22.6% respondents practiced box hive and transition beekeeping system respectively (Table 2). In study assessment of beekeeping production system and constraint in Basketo special woreda southern Ethiopia reported that majority of respondents (60%) in study area practiced beekeeping activity using traditional hive whereas about 25% and 15% used modern and transitional bee hive respectively.

The number of traditional hive owned/respondent has average 12 with a maximum number of 130 hives while, transitional average seven with maximum 120 hives and box hive average was six with maximum 45 hives. Reason of more respondent's engagement traditional bee hive is easily constructed by individual from local material, however the other bee hives high cost to buy from market (Table 2).

Table 2. Honey production system within districts of the study area.

Category	Variables	Dabo-Hana	Chora	Bedele	Mattu	Didu	Yayo	Overall
Percentage of respondent's	Traditional hive	65.3	49	38.5	42.9	46.3	48	47.3
	Transitional hive	11.1	18.4	22.2	20.2	30.5	29.3	22.6
	Box hive	23.6	32.6	39.3	36.9	23.2	22.7	30.1
Mean of bee hives	Traditional hive	13	13	10	13	10	11	12
	Transitional hive	6	10	7	6	5	7	7
	Box hive	5	6	6	7	3	5	6
	Traditional hive	80	130	60	60	30	80	130

Maximum No. of hives/respondents	Transitional hive	25	120	40	20	28	10	120
	Box hive	18	45	26	37	10	12	45

Honey production in kg from one hive in year

The result indicated that the productivity of honey from one traditional hive has average 7.98 kg/year. Whereas 16.75 kg obtain from one transitional hive per year and average of productivity per box hive was 21.23 kg/year at study area (Table 3). These findings agree with the result of Asebu in reported Amhara region Ankober district of North Shoa zone indicated that the average amount of honey production per hive increase from traditional hive per year, transitional and box/modern hive was 7.83 kg/year, 9.52 kg/year and 12 kg/year respectively.

Table 3. Mean honey yield production/hive/year in kg.

Types of hive	Buno Bedele zone	Ilu abba bora zone	overall
Traditional	7.53	8.43	7.98
Transitional	16.24	17.25	16.75
Box hive	20.08	22.86	21.23

Frequency of honey bee harvest per a year

The result displayed that most respondents (61.5%) were harvest honey twice per a year and other (19.3%, 18.9% and 0.4%) were harvested once /year, three times/ year and four times /year respectively (Table 4).

Table 4. Frequency of honey harvest/year.

Frequency	Buno Bedele %	Ilu Abba Bora %	Overall %
1time	9.3	31.7	19.3
2times	64	58.3	61.5
3times	26	10	18.9
4times	0.7	0	0.4

Source of first honey bee colonies and ways of start beekeeping

The respondents were started beekeeping in different ways in study area. The result showed that among ways of households started beekeeping practice is majority respondent (68.2%) were started by learning from parent followed, learning from neighbor (20.7%), Through training (9.1%) and Self-initiative (2.2%) (Table 5). As the respondent reason out the study area was popular by beekeeping practice so most of family had bee hive and this motivated for started beekeeping.

The majority (87.2) of the respondents in study area get their first bee colony from catching swarming bees. This result line with the studies of Kebede H, et al., reported that majority (60.25%) of the respondents get the starter bee colony by catching swarming at Hadya zone [7]. On the other hand, (14.7%) of the respondents robbing from caves and forest colonies, 6.5% of the respondents get colonies from parents as a gift and 1.3% get bee colony by buying (Table 5).

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Table 5. Source of bee colonies and ways of start beekeeping.

Categories	Variable	Buno Bedele N (%)	Ilu Abba Bora N (%)	Overall N (%)
How start bee keeping	Learning from parent	93(62)	89(74.2)	182(68.1)
	Learning from neighbor	37(24.7)	20(16.7)	57(20.7)
	Through training	16(10.7)	9(7.5)	25(9.1)
	Self-initiative	4(2.7)	2(1.7)	6(2.2)
Source of first bee colonies	Gift from parent	17(11.3)	2(1.7)	19(6.5)
	Catching swarming bees	114(76)	118(98.3)	233(87.2)
	Robbing from caves and forest	22(14.7)	0	22(14.7)
	Buying	2(1.3)	0	2(1.3)

Placement of beehives at study area

Base on respondent's reply the common placement of bee hive was identified at study area specifically; back yard, under the eaves of the house, inside the house, hanging on trees near homestead and hanging trees in the forest. However, in outcome the beekeepers used hanging trees in the forest for only traditional hive. Accordingly, the result showed that major (25.5%) household use hanging on trees near homestead for traditional hive whereas, 16.6% box hive placed inside the house and 11.4% transitional hive similarly inside the house (Table 6). This displayed that the most respondents kept the traditional hive on trees around the home and also kept house for box hive and transitional hive. These results are in contrast with findings of Asebu, reported that majority (70.9%) respondent kept tradition [8].

Table 6. Placement of beehives at study area.

Types of bee hive	Placement	Buno Bedele N (%)	Ilu Abba Bora N (%)	Total N (%)
Traditional hive	Back yard	41(8.1)	5(1.6)	46(5.7)
	Under the eaves of the house	63(12.4)	6(2.0)	69(8.5)
	Inside the house	52(10.2)	19(6.2)	71(8.7)
	Hanging on trees near homestead	120(23.6)	87(28.6)	207(25.5)
	Hanging trees in the forest	29(5.7)	37(12.2)	66(8.1)
Transitional hive	Back yard	10(2.0)	7(2.3)	17(2.1)
	Under the eaves	17(3.3)	4(1.3)	21(2.6)
	Inside the house	44(8.6)	49(16.1)	93(11.4)
	Hanging on trees near homestead	12(2.4)	16(5.3)	28(3.4)
Box hive	Back yard	11(2.2)	6(2.0)	17(2.1)
	Under the eaves of the house	20(3.9)	3(1.0)	23(2.8)
	Inside the house	73(14.3)	62(20.4)	135(16.6)
	Hanging on trees near homestead of	17(3.3)	3(1.0)	20(2.5)

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Honey bee forages

The results from focal group discussion and household showed as different plants are flowering in different season of the year and assist the beekeepers to get honey in different seasons and help bees to sustain their life through dearth period. The survey showed that the bees get its forage from trees, Weeds and herbs and crops, fruit and herbs at study areas (Table 7).

Table7. Major Bee forage plants and their flowering period in the study area.

Scientific name	Vernacular name (Afan Oromo)	Peak flowering time
Trees		
Scheffleria abyssinica	Gatamaa	March- Apr
Cordia africana	Waddeessa	Aug-Nov
Syzygium guineense	Baddeessaa	February
Croton macrostachus	Bakkanniisa	June-July
Eucalyptus sp.	Baargamoo	Apr-June
Aningeria altissima	Qararoo	Feb-Jan
Vernonia amygdalina	Eebicha	Dec-Feb
Vernonia rueppellii sch.	Reejjii	Jan-Feb
Albizia gummifera	Ambabeessa	February
Acanthus seni	Kosorruu	Sept-Nov
Ficus sycomorus	Harbuu	March-Aug
Maytenus gracilipes	Kombolcha	Dec-Feb
Ekbergia capensis	Somboo	Dec-March
Combretum pariculatum	Baggee	December
Lepidotrichilia volkensii	Goraa	December
Brugmansia suaveolens	Abaaboo xurumbaa	Year round
Datura arborea	Mogn Ababa	Year round
Weeds and herbs		
Bidens pachyloma	Keelloo	Sept-Nov
Guzotia sp.	Tuufoo	Oct-Dec
Gizotia scabira	Hadaa	Nov-Dec
Trifolium sp.	Siddisa	Aug-Oct
Crops, fruits and Veg.		
Coffee arabica	Buna	Jan-March
Zea mays	Maize	June-Aug
Vicia faba	Baaqelaa	Oct-Nov
Pisum sativam	Atara	Oct-Nov
Mangifra indica	Maangoo	Sept-Febr
Persea Americana	Avokaadoo	Aug-Jan
Musa paradisca	Muuzii	Year round

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Brassica carinata	Raafuu	Aug-Nov
Cucuerbita pepo	Dabaaqula	Sept-Nov
Capsium spp.	Barbaree	Sept-Nov
Ocimum santum	Bassoobilaa	Sept-Nov

Hive products

In the study area only 6.4% of beekeepers producing wax in addition to honey while, 93.6% beekeepers are not producing other bee products. This is similar with finding of Gebrehaweria, et al., indicated that Beekeeping system in Afar Region bee wax and other product is not produced [9]. This is because of, lack of knowledge, skill and material.

Marketing of honey bee production

The majority (94.7%) of beekeepers at study area sold honey bee at local market while, 4.5% and 0.8% sold at farmers' cooperative market and national market respectively (Figure 2). Hence, the farmers at study area not sold by well price. These results are similar with the findings of Dinku and Bereket reported, that majority (92%), of respondent in Hawassa city administration sold honey at near market (local market) [10].

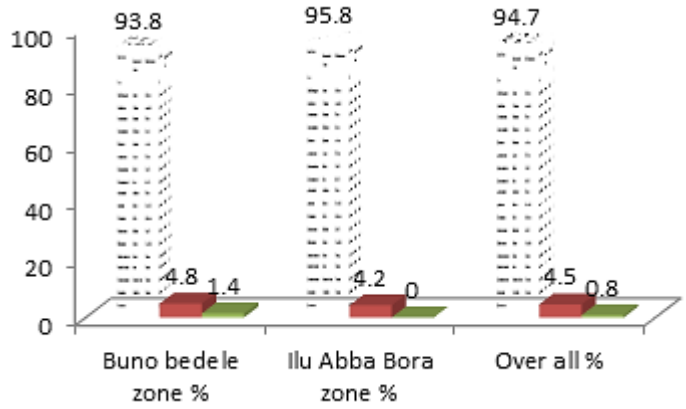

Figure 2. Marketing of honey bee production.

Note: ( ) Local market; ( ) Farmers' cooperative market; ( ) National market.

Opportunities of beekeeping in the study area

Availability of potential flowering plants, the demand of honey for domestic use and export market is constantly on the rise, government and non-governmental organizations largely support natural resource conservation programs within beekeeping is encouraged, a rich culture, a proper perception of the society of beekeeping, a favorable environment Indigenous knowledge, availability of water and bee colonies presence are opportunities for beekeeping in the study areas.

Major constraints of beekeeping at study area

All respondents who participated in study were listed the constraints in beekeeping. As a result, the major constraints in beekeeping at study area were pests and predators (27.5%), Pesticide and herbicide (25.9%), Absconding (17.2), Lack of bee forages (14.2%) and Disease (14.2%) were ranked respectively (Table 8). The result showed that pests and predatory was main constraints to the beekeepers and honey bee at study area. The major bee pests and predatory at study area are birds, wax moth, spider monkey, bee lice and ant. This study agrees with the finding of Seyoum E, et al., reported that the higher (35%) constraint of beekeeping were pest and predatory at Basketo special woreda southern Ethiopia (Table 8) [11].

Table 8. Major constraints in beekeeping practice at study area.

Variability	Buno bedele zone N (%)	Ilu Abba Bora N (%)	Overall N (%)
pests and predators	145(26.8)	120(28.3)	265(27.5)
Pesticide and herbicide	134(24.8)	116(27.4)	250(25.9)
Absconding	92(17)	74(17.5)	166(17.2)
Disease	90(16.6)	47(11.1)	137(14.2)
Lack of bee forages	74(13.7)	63(14.9)	137(14.2)
Lack of water	5(0.9)	2(0.5)	7(0.7)
Drought	1(0.2)	2(0.5)	3(0.3)

CONCLUSION

As a result of assessment of honey production system in the study area traditional, transitional and box hive production system were realized. Although traditional hive production system is dominant in the area little interventions were made to improve the existing very traditional honey production system. From the result it was assumed that the honey yield per hive in a year is increase from traditional hive to box hive. Beekeeping in the area is largely practiced by men and the involvement of women is very low. Although most of the beekeepers have 10 and more than 10 years of beekeeping experience, still traditional beekeeping is prevailing. Major constraints to the consideration of beekeeping practice mentioned by the respondents included: Pest and predators, pesticide and herbicide, absconding, lack of bee forage and bee disease. At study area only small number of beekeepers produces other product without honey from bee; this is due to lack of awareness of the importance of the product and absence of processing equipment and technical abilities.

Therefore, research should aim to address and raise awareness about all hive products, achieved through specialized training sessions adapt for beekeepers; on honeybee management, Pest and predator control methods and great emphasis should be given to dissemination and extension of modern beekeeping system to increase honey production as well as honey and other hive products quality in the study area. In present study the box hive the least practiced by farmers at study area. Therefore, the research should be demonstrating it on farmers.

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