Assessment of beekeeping practices in Eastern Amhara Region with emphasis on improved beekeeping technologies

Tessema Aynalem[1], Nuru Adgaba[2] and Zeleke Mekuriaw[3]

[1]Sirinka Agricultural Research Center, [2]Holleta Bee Rresearch Center,[3]Bahir Dar University

Abstract

This study was conducted in *Gubalafto Wereda* of North Wolo Zone, Amhara Regional State, Ethiopia with the objectives of assessing beekeeping practices using improved beekeeping technologies. Purpesive sampling technique was employed to identify the sample respondents. About 40 representative sample respondent beekeepers that own improved box hive with honeybee colonies at present or lost in recent due to various reasons were selected from each of the three agro ecologies. Based on the sampling technique, 120 improved beekeeping technology users were selected. The data were collected using structured and semi-structured questionnaires to interview respondents individually and were analyzed using descriptive statistical procedure of SPSS Version 12 software. Major problems for promoting improved beekeeping technologies were identified in the study area. Percentage ranking revealed that incompleteness of the box hive package, prevalence of honeybee pests and enemies, shortage of bee forage, pesticide application, absconding of honeybee colonies, honeybee disease and lack of beekeeping skill were found to be the major challenges for the improved beekeeping technology usage in the Wereda in their decreasing order of importance. Because of lack of proper technological inputs, trained manpower and prevalence of different bee enemies, the beekeeper households have not been sufficiently benefiting from the sub sector. There still exist enormous opportunities and potentials to boost the production and quality of hive products. Hence, it is recommended that beekeeping extension, research and NGOs should enhance research and extension activities on full packaged provision of box hive technologies: honey extractor, queen excluder, foundation sheet, protective clothes and developing protection methods of honeybee enemies, development of bee forage, management of pesticide application and absconding of bees and economically important honeybee disease control The emphasis should also be given to developing a technologies from locally available materials to ensure sustainability. Organizing formers' visit to apiary demonstration sites is also equally important.

Key words: Bekeeping, improved technologies, North Wolo.

Introduction

Beekeeping is long standing and deep rooted household activity for rural communities of Ethiopia where millions of honeybee colonies are kept in traditional hives in backyard and/or in forest. Honeybee colony management practice is different at different geographical locations (Ayalew and Gezahegn, 1991; Girma, 1998). Amhara Regional State is endowed with varied agro ecological zones that are suitable for apiculture, sustaining about 917,460 honeybee colonies (CACC, 2003), which is a real reflection of the potentiality of the region. However, the level of beekeeping remained traditional where more than 90% of honeybee colonies are still kept in traditional hives, with various limitations.

In spite of introduction of improved beekeeping since 1965, the development has not traveled long distance in the region. The regional government has recently put beekeeping as one of development strategies to reduce poverty and to diversify farmers' income as well as to diversify national export commodities. As the result, the extension service has aggressively disseminated thousands of improved beekeeping equipment, like frame hives, Kenyan top bar hives and other accessories. Despite the attempt of disseminating improved beekeeping technologies by Wereda Agriculture Office and different NGOs in *Gubalafto Wereda*, still over 80% of honeybee colonies are kept in traditional hives, indicating the less adoption of improved beekeeping technologies, which calls for further investigated.

There was little or no feedback study about challenges and opportunities to use improved beekeeping technologies. However, beekeepers complain that they failed to obtain the expected honey yield using box hive technologies. Identification of bottle necks is important for policy makers, extension workers, researchers, and non-governmental organizations involving in beekeeping development programs and helps modify their strategies by providing the information about types of challenges and identifying opportunities to use further. Hence, the study was aimed at contributing much to generate appropriate information on factors affecting the use of improved beekeeping technologies.

So far, there is no compiled and reliable information on the challenges of using frame hives, overall beekeeping activities and other associated constraints. Therefore, this study was undertaken to identify bottlenecks and opportunities for using improved beekeeping technologies in *Gubalafto wereda*, Amhara Region.

Materials and methods

The study area

The study was conducted in *Gubalafto Wereda* of North Wollo Zone, Amhara National Regional State. Agro-ecologicaly it has *Dega* (highland, about 37 %)*, Woynadega* (mid altitude, about 46%) and *Kolla* (lowland, about 17 %). In the highlands, the dominant honey plants are *Olea europea*, *Rosa abyssinica, Albizia gummifera, Guitozia abyssinica; Guizotia scabra* in the mid altitude, *Acacia abyssinica*, *Coffee arebica*, *Croton macrostachya*, *Guitozia abyssinica*; *Guizotia scabra*, *Trifolium species*, *Olea europea*, and *Vernonia amygdalina* and in lowlands, there are *Acacia abyssinica*, *Albizia gummifera* and *Croton macrostachya*. Generally, the topography of the woreda is rugged and chain of mountain terrains. The current rainfall either begins lately or quits early before the crops mature. The mean annual temperature of the area is 22 ^{O}C with the maximum and minimum averages of 25 ^{O}C and 7.5 ^{O}C, respectively. The livelihood of the people in the study areas is based on subsistence mixed farming system. Most of the sample households owned less than one hectare of land. About 5,803 honeybee colonies which account about 11% are kept in box hives (GWOARD, 2009).

Sampling procedure and data collection

Out of 32 *kebeles* that the *Wereda* has, about 20% was selected purpesively. Before commencing data collection, preliminary survey using a checklist (pre-testing questioner) was conducted to gather relevant information. Primary data were obtained from beekeeper household heads whereas secondary data were taken from the *Wereda* and Zonal Agriculture and Rural Development Offices and NGOs in the *Wereda.* The target sampling populations in the study wereda were farmer households who currently own honeybee colonies in the improved hives as well as those who recently lost their honeybee colonies

from their improved hives due to various reasons. To collect qualitative and quantitative data on improved beekeeping technology usage, six rural *kebeles* two from each agro-ecological zone (highland, mid altitude and lowland) were selected. A total of 120 beekeeper sample households (40 beekeeper households each from highland, mid altitude and from lowland) were interviewed using semi structured questioner. The household selection was carried out from the list of farmers registered as members of the rural *kebeles* using improved beekeeping technologies.

The study was designed to address determinant factors of using improved beekeeping technologies; such as beekeeping activities experience, apiary site location, awareness on improved beekeeping technologies, trend of using improved beekeeping technologies and labor division for beekeeping. The study has also addressed areas of credit access and beekeeping extension service, honey yield of different beehive types, marketing of hive products, honeybee ecotypes and management, availability of improved beekeeping equipments, honeybee diseases, pests and predators, honeybee flora of the study area, herbicides, insecticides and poisonous plants which all affect the usage of improved beekeeping technologies..

Statistical analysis

The data were analyzed using Statistical Package for Social Science, SPSS version 12 software (SPSS, 2002) and cross tabulation.

Results and discussion

Improved beekeeping experience and sources of honeybee colonies

Most of the respondents (49.2%) started to use improved beekeeping technologies during 2003 and 2004. Different sources of honeybee colonies to start improved beekeeping technology were assessed and identified during the survey (Table 1). To start improved beekeeping, most beekeepers practiced transferring the honeybee colonies bought and/or owned in traditional hives to transitional and box hives. Some farmers have developed the skill of rearing/multiplying honeybee colonies as one of the main sources of obtaining additional colonies for the intermediate and modern beehives.

This is encouraging trend for beekeepers in the area rather than waiting accidental swarm coming to their hives hanged on trees.

Table 1. Year of commencement and sources of honeybee colonies to start improved beekeeping.

Year commencement and percentage of farmers utilizing improved beekeeping technologies			
2003	2004	2005	2006
16.7%	32.5%	22.5%	28.3%
Sources of honeybee colonies to start improved beekeeping tech. and %			
Transferring from traditional Hive	Caching intentional swarm	Purchasing established colony	From family
63.3%	10.0%	22.5%	4.2%

Honeybee colony holding

In general, the beekeeping business was practiced at a very small-scale level in the study area. The average total honeybee colony holding was 4.6 in highlands, 2.8 in mid altitude, and 2.7 in low lands. The total honeybee colony holding has positive correlation with altitude ($P<0.01$). The availability of honeybee colonies positively affected utilization of improved beekeeping technologies.

When improved Zander frame hive is considered; out of 73.3% of total respondents who own box hives with honeybee colonies, about 80.7% of them (73.3%) have only one frame hive with honeybee colonies (41% at mid altitude, 29.5% at highlands and 29.5% at lowlands), 11.4% have two honeybee colonies (more in highlands) and 7.9% have three or more honeybee colonies (more in mid altitude) in box hives. Some beekeepers (41.7%) have also empty frame hives. About 74% of those who have frame hives without honeybee colonies (57% at lowlands, 27% at high lands and 16% at mid altitude) have one empty frame hive, 22% have two (45% from lowlands, 36% from mid altitude) and only 4% have

three frame hives without honeybee colonies (all from lowlands) because of absconding and death of the colonies due to different reasons (Table 2).

Table 2. Number and occupation of hive types per household.

	Traditional hives		Transitional hives		Improved box hives	
	With honeybee colonies	Without honeybee colonies	With honeybee colonies	Without honeybee colonies	With honeybee colonies	Without honeybee colonies
Mean	2.27	3.11	1.76	1.37	1.33	1.30
Std. deviation	1.73	3.49	1.03	0.72	0.80	0.54
Maximum	10	30	5	4	5	3

The high number of empty frame hives in the study area might be related to incidence of bee enemies like, bee-eater birds and wax moth. Moreover, unwise application of pesticides has also caused loss of honeybee colonies in the area. The cumulative effect of other factors has given the result of owning empty frame hives where honeybee colonies had either dead or absconded. The source of different hives is presented in the following table (Table 3).

Table 3. Source of different hives.

Source	Types of hives		
	Traditional hive	Transitional hive	Modern frame hive
Farmer	2.7	-	1.8
Own	85.7	77.6	1.8
Retailer	11.6	2.6	-
BOA	-	17.1	93.7
NGOs	-	2.6	0.9
Family	-	-	1.8

Trend of improved beekeeping technologies usage

According to the respondents, the trend of using improved beekeeping technologies over the last five years was generally decreasing, about 53.3% (48.4% from lowlands, 26.6% from highlands and 25% from mid altitudes in which one beekeeping cooperative is found).

members and other technical assistants to participate in the beekeeping activities accordingly. Consequently, women participation in beekeeping was limited compared to men as shown in Table 4.

Table 4. Improved beekeeping activities and labor participation.

Activities	Valid percentage of undertaken activities by				
	Household head	Wife	Children	Cooperatives	Development agent
Swarm catching	98.3	16.7	9.2	.8	.8
Colony Transferring	70.0	4.2	5.8	7.5	7.5
Colony Inspection	99.2	13.3	3.3	0	.8
Colony Feeding∗	62.5	9.2	6.7	0	0
Honey harvesting	80.0	1.7	8.3	6.7	24.2
Honey extracting∗∗	13.6	0	0	17.8	11.3
Apiary Sanitation	95.0	53.4	13.6		
Hive making•	82.5	25.0•			6.7
Hive sanitation	87.5	56.8	71.4		
Wax extraction	31.7	29.7			
Hive product selling©	92.5	31.4	3.4		

• Make traditional hive only © 7.6% do not sell honey, ∗37.5% do not practice colony feeding, ∗∗61.7% do not practice honey extraction. Sum of total percentage is more than 100% because of one activity is practiced in more than one household.

Access to credit and beekeeping extension

About 64.2% of improved technology users in the study area have access to credit to practice beekeeping activities whereas 35.8% have not used this access due to different reasons. About 46.5% have their own enough money to buy frame hive and accessories, 27.9% do not have awareness, 4.7% were not benefiting due to high interest rate of the loan, 9.3% discouraged due to late delivery of loan (out of the season of using for beekeeping purpose), 4.7% because of restrictive procedure and 7% due to personal problems. The utilization of credit service sharply declined from 2004 to 2007. This correlates with the decreasing trend of utilizing the improved beekeeping technologies in the study area. Thus, the Woreda Office of Agriculture and Rural Development (WOARD)

has to create favorable conditions such as awareness creation on usage of loan, timely supply of loan, revising the interest rate and facilitating those who have their own money. Even if it is encouraging, much has to be done to facilitate utilization of credit service to practice improved beekeeping in efficient and productive way.

Summary of challenges to use improved beekeeping technologies

Currently beekeepers that are using improved beekeeping technologies are facing a number of interrelated challenges that limited productivity and production of honey from improved hives. The major identified challenges include: lack of input to insure correct harvesting and processing, inadequate extension services and lack of trained manpower (experts) at the *Wereda* level, aggressiveness of honeybee species, high price for improved equipment, bee poisoning, lack of good beekeeping management knowledge, limited cultivated bee forage, shortage of honeybee colonies, absconding of the colonies and challenge on marketing of extracted / strained honey.

Summary of opportunities for improved beekeeping

Though there are many challenges in the study area, there is still huge potential to increase honey production using improved beekeeping technologies to improve the livelihood of the beekeepers. Thus, the major opportunities are: availability of credit service, beekeeping training, bee flora, road access, experience of beekeepers, and proximity to research center, good rainfall distribution, market access and high market demand for honey and honeybee colonies and encouraging policy on improved beekeeping practices.

Conclusion

Even though there are adequate natural endowments and a long tradition and culture of beekeeping practices in the study area, the beekeeper households have not been sufficiently benefited from the sub sector mainly because of lack of proper technological inputs, trained manpower and prevalence of different bee enemies,. Yet, despite all the challenges currently facing the beekeeping sub sector, there are still enormous opportunities and potentials to boost the production and quality of hive products specially honey in the area.

There is availability of natural honeybee flora from forest and shrub covered areas as well as biannually cultivated crops.

Recommendations

The major areas of intervention required to ensure the beekeepers to benefit from apiculture are presented as follows:

- The Zander frame hives should be provided with its full packages and all the required accessories; if not, encouraging increased use of transitional hives which do not need much input but provid good amount of honey production. The queen excluder should be inserted on recommended time scale and better to use plastic queen excluder than aluminum queen excluder as the later damages wings of the bees. The top bars for transitional hive should be provided or materials should be made available to produce them locally.
- Establishing on-farm demonstration site and supporting with sufficient and regular training programs for farmers about beekeeping management (feeding, watering, inspection, transferring, supering, multiplying, honey and wax harvesting and handling, bee forage gardening) and providing necessary technical supports, since majority beekeepers have not participated on improved beekeeping demonstration.
- Creating awareness and means of saving honeybee colonies from insecticides applied on cereals, pulses, legumes, and horticultural crops during flowering, and finding the local or scientific prevention and control methods for bee pests; like bee-eater birds, honey badger, wax moths and others.
- Strengthening the established cooperatives and establishing new beekeepers cooperative to facilitate farmer-to-farmer training, honey, and wax collection, primary processing and marketing of hive products. In addition to buying, packing, and selling, the cooperatives should also be able to manufacture their own simple beekeeping equipment such as protective materials from locally available materials, frames, top bars, foundation sheet, and others not to wait the hand of BOARD office in the future.
- To sustain improved beekeeping technology, local crafts men manufacturing top bars specified top bar hives, swarm boxes, protective, veils, smokers, queen cages and other

equipment should be facilitated and trained in addition to training beekeepers and giving loan to start their own hives.

- The beekeeping experts at *Wereda* should get proper training on beekeeping management to provide appropriate training and technical assistance for development agents at grassroots level.
- In addition to natural honeybee floras, improved beekeeping program should also focus on selecting, propagating, and planting of honeybee flora preferably multipurpose.

Acknowledgement

I wish to express my deepest appreciation and thanks to my advisors Dr. Nuru Adgaba and Dr. Zeleke Mekuriaw for their tireless assistance and guidance in the preparation and writing of this Thesis. I am grateful to the staff of Sirinka Agricultural Research Center, Directorate of Animal Technology Research. I also appreciate my friend, Ato Adebabay Kebede for his encouragement, moral and material support given to me during the study period.

References

Ayalew Kassaye and Gezahegn Tadesse. 1991. Suitability Classification in Apicultural Development, Ministry of Agriculture, Addis Ababa, Ethiopia.

CACC (Central Agricultural Census Commission). 2003. Ethiopian Agricultural Sample Enumeration 2001/ 02 Results for Amhara Region. Statistical Reports on Livestock and Farm Implants (Part IV), Central Agricultural Census Commission, Addis Ababa, Ethiopia, pp 45-46.

Girma Deffar. 1998. Non-wood Forest Products in Ethiopia, EC-FAO Partnership Programme (1998-2000), Addis Ababa, Ethiopia.

GWOARD. 2009. Gubalafto *Weredea* Agriculture and Rural Development Office 2009.