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Constraints and Opportunities of Honeybee Production and Honey Marketing Systems: A Case of Guji and Borena Zone of Oromia State

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Abstract

Assessment of Honeybee production practices and quality were undertaken using 120 beekeeping households and 21 honey samples to identify major constraints and potentials of honeybee production practices of honey of Guji and Borena district of Ethiopia with objective of; To study honeybee production systems, marketing, determine productivity, identify apiculture potential, constraints and opportunities of beekeeping of state. The households and honey samples were drawn from different locations and type of hives; honey samples were also collected from each type of hive. Household survey was conducted by semi-structured interviews and field observations were used as a main tool for data collection method. The survey data was analyzed by using SPSS. Beekeeping is dominantly practiced by male and about 36.8% of interviewed households were literate and the remaining (63.2%) was illiterate. Traditional and movable frame hive were the two types of honeybee production systems practiced in which 100% of bee hives owned by the beekeepers were traditional, while traditional and modern hives mix user accounts 20% and none of the beekeepers were practicing only movable frame hives. The main source of bee colony for beekeepers was swarm catching. The major constraints to exploit the untapped potential of beekeeping activity in the district were shortage of beekeeping equipment, incidence of pests and predators, agrochemical poisoning, lack of capital for improved beekeeping technological inputs, poor extension service and lack of knowledge on appropriate methods of beekeeping and institution linkage. Therefore, it's better to improve honeybee production system through providing a practical training to local beekeeper and facilitating supply of quality apicultural equipment. Therefore, to improve the low level of technological input utilization, exploit the existing opportunities and potentials of the district needs further consistent practical training on bee and bee products management for community is recommended.

Keywords: *Honeybee production system; Honey bee; Constraints; Opportunities*

Introduction

Of all the countries on the world, no country has a longer tradition of beekeeping than Ethiopia [1]. Despite its long history, beekeeping in Ethiopia is still an undeveloped sector of agriculture. However, the ideal climatic conditions and diversity of floral resources makes Ethiopia the home of most diverse flora and fauna in Africa [2]. Its forests and woodlands contain more than 7000 species of flowering plants that provide surplus nectar and pollen to foraging bees (Girma, 1998) which accommodate 10 million honeybee colonies. The country produces about 43,373 metric tons of crude honey per year, thus shares 23.5% of Africa and 2.35% of world's honey production.

Despite the long tradition of beekeeping in Ethiopia, having the highest bee density and being the leading honey producer as well as one of the largest beeswax exporting countries in Africa, the share of the sub-sector in the GDP has never been commensurate with the huge numbers of honeybee colonies and the country's potentiality for beekeeping [3]. It has been low due to drought, over-expanding population pressure and associated vegetation changes and indiscriminate applications of chemicals. Thus, the beekeepers and the country are not benefiting from the subsector [4].

Moreover, farming system approach to research and development is recognized as the most appropriate method used to describe, diagnose and gain knowledge of the technologies and factors affecting production at farm level [5]. Constraint and opportunities of honeybee production have been studied by different research [6-9] in different parts of Ethiopia. But, as far as my investigation none of compiled and reliable information on honeybee production and honey marketing system, and the potential and constraints were not studied. Therefore, this study was designed to investigate constraints and opportunities of honeybee production system, and marketing guji and borena zones area.

Materials and Methods

Sampling techniques and sample size

The study was conducted in beekeeping potential of Guji and Borena zones. Prior to the actual survey, information was gathered from secondary data and informal survey from key informants. Based on the information the representative study area had been selected with respect to agro-ecology, vegetation potential and honeybee colonies potential, four Woredas were selected and 7 Peasant Associations or Kebeles (Guji 4, Borena 3) were selected purposively. 20 beekeepers per kebele and a total of 120 respondents from two zones were randomly selected.

Data sources and methods of collection

Both primary and secondary sources of data were used in this study. Secondary data was obtained from reports of *Woreda* Agricultural Development Office, and other published and unpublished materials, and it was collected by using closed and opened questionnaire from development agents of Woreda. The primary data was collected from sample respondents through open questionnaire method and formal discussion. Single-visit-multiple-subject formal survey method was employed to collect data on various aspects of beekeeping production and management systems. The collection of information was made at household level. The researcher was adequately administer and supervise the collected data, process and checks the quality of the returns to avoid bias and errors on the spot.

Collected data

The study was requiring wide range of information with reference to beekeeping. Both qualitative and quantitative data were generated using conventional survey method like, source of income.

Data management and statistical analysis

The collected data was coded and tabulated for analysis. Methodology, descriptive statistics using SPSS version 16.0 was mainly applied such as mean and frequency.

Results and Discussion

Socio-Economic characteristics of the respondents

Household characteristics

Based on the survey result, of total sample households interviewed, all respondents beekeepers were male. This might be partly due to psychological fear exhibited by women towards the profession coupled with time of major activities, which are either late evening or early morning hours, which are not convenient for women due to household workloads.

In the sampled population, about 92.5% of household heads were in the active and productive age, range from 31 to 50 years and 7.5% of respondents were age above 50. The predominance of active and productive heads of households in the study area has direct bearing on increased availability of able-bodied labor for production and ease of adoption of apiculture related innovations which have great potentials for increasing apicultural productivity and production.

With literacy rate of sample respondent, 36.8% of the beekeepers in the study area have a better educational entitlement which is in-line with the national average, i.e., 35.5%. Thus, the result of this study indicates that most respondents of the study area cannot easily

adopt the extension services related bee technologies provided and difficult to convince the importance of technology and access relevant information that will stimulate honey production.

Crop and livestock production

Crop production

The most important crops cultivated in the study area are maize and wheat were the two top cereal crops grown by the sampled farmers. With regard to perennial crops enset, chat and coffee were the most important cash and food crops grown in the study area. Vegetables and various fruits were also grown for cash as well as for home consumption. The dominance of cereals in the area may be related to the food or dietary habits of the communities as well as the local climate, which favored the type of crop production.

Household livestock ownership

The average number of various animal species kept by the respondent households was also assessed. The mean TLU kept by the respondents during the study period was vary as per the agro-ecology where the respondents live. As an integral part of the mixed farming system, livestock production plays a substantial role in the household food security in the study area. It meets urgent financial needs, dietary requirements, loan repayment and overall cash security of the households.

Beekeeping Practices

The primary means of subsistence in the study areas is mixed crop-livestock farming. Beekeeping is an important old traditional agricultural practice and based on their level of technological advancement, two types of beehives used for honey production in the study area where practiced.

Traditional beehives used are mostly cylindrical , conical, having large and small openings in the two opposite ends which is not appropriate for rearing brood and as well as honey production. The internal parts of the hives are plastered with mud then with cow dung and the external part is covered with grass to protect the hive from rain.

Intermediate (Top bar) hive is effective type of bee hive which is easy to inspect, manage and check the ripening of honey, relatively cheap and simple to construct. This allows beekeepers to manage bees in a more efficient way than with traditional fixed-comb hives. According to the results of the study, none of the beekeepers were involved in intermediate beekeeping production practice. The low adoption rate of this type of hive may be due to inadequate promotion, educational background and dissemination efforts of the technology in the study area.

The main reasons for low adoption rate of modern bee hives in the study area were lack of finance to buy input and provide short training for farmers, shortage in supply of beehive accessory equipment, lack of knowledge/know-how on how to operate the box hive and inadequate promotion of technology in the study area.

Hive type	Guji(n= 60)		Borena (n= 60)		Total sample	
	n	%	n	%	n	%
Traditional	60	100.0	60	100.0	120	100
Mixed traditional and movable frame	4	6.67	8	13.33	12	20.0
Movable frame only	0	0	0	0.	0	0

n= number of sampled respondents

Table 1: *Percentage and types of beehives that are being used for honey production by sampled beekeepers in the district.*

Hive preparation for baiting

Method of fumigating the new hive is, digging the hole on the ground and making the smoke and digging another hole adjacent to the first hole then connecting the two holes internally by producing small hole which helps to pass the smoke and putting the new hive upside down on the hole to prepare hive for bee attracting. All the beekeepers practices catching of the swarms by hanging bait hive on the tree. The use of baiting hives to catch swarm is part of the traditional beekeeping practices which is prepared and smoked very well by using different parts (Table 2).

Description	Response	n	%
Swarm catching practice	yes	90	75
	No	30	25.0
	Total	120	100.0
Swarm attractant materials*	Wax	36	30
	Cow dung	24	20
	Cordia africana	18	15
	Eucalyptus	17	14.2
	Olea africana	14	11.6
	Corn cob	11	9.2
	Total	120	100

*Multiple responses were allowed, n= number of sampled respondents

Table 2: *Swarm catching experience of respondents and type of swarm attractants used (n= 120).*

Honey Bee management practices

Placement of honeybee colonies

The majority of the respondents were keeping their bees hanging on trees near homestead and their farm and forest, backyard, under the roof or in separate house constructed for bee colonies. Placing hive around homestead, under roof and in separate house apiary sites is appropriate for daily follow up activities of beekeeping and facilitates the day to day inspection of colony and other hive managements easier compared with that of "tree apiaries". Some of hive placement types exercised in the study areas are hanging backyard and forest trees (86.2 %), backyard (8.5 %), under the roof (5.3 %) and in the house (0 %).

Colony inspections

Almost all beekeepers perform external hive inspection at varied frequency for confirmation of hive occupation by bees and to check the bees' existence. However, internal hive inspection is limited to those honeybee colonies placed at backyard and under the eaves of the house, and in most cases for hives placed over large trees. In the study area, hive inspection by opening the hive is not a common practice. Internal hive inspection is undertaken by not more than 20% of beekeepers (mostly respondents using modern bee hive) during honey harvesting and when colonies attacked by pests.

Feeding honey bees and flora condition

Honey bee colonies naturally sustain themselves and produce honey by foraging from natural and cultivated crops in all possible radiuses from their nests and store honey for their own consumption during dearth period. Beekeepers are harvesting honey, which the honeybees stored for themselves. As a result, honeybees face starvation due to lack of feed. The management for honeybees is very minimal in the study area. During the survey period it was observed that some farmers who have modern beehives were managing properly (Table 3).

Description	Response	n	%
Existence of bee feeding	Yes	44	36.67
	No	76	63.33
	Total	120	100
Type of feed	Pea flour	20	16.67
	Sugar syrup	12	10.00
	Pea flour and sugar syrup	8.0	6.67
	Honey and Pea flour	4.0	3.33
	Total	44	36.67

n = number of sampled respondents.

Table 3: *Honey bee feeding practices and types of feed supplemented by the respondents.*

Swarming incidence and management

Migration from one place to another in response to lack of honey flow or drought which is a typical behavior of honeybees of tropical Africa where a dry season pronounced and neither nectar nor water available to the bees and the colony appears to be migratory. Moreover, migration behavior has a genetic foundation (Smith, 1960). Swarming is the natural means of propagation of honey bee colonies. A bee swarm is a cluster of bees containing a queen that has split from an established colony to start a new colony. Poor ventilation of the hive and weather conditions positively affecting the nectar flow may contribute to swarming [15]. The reasons for absconding of bee colonies as indicated by respondents were lack of bee forage (80.3%), incidence of pests and predators (10.6%), bee poisoning (1.4%), bee diseases (0.5%), poor management (7.2%) and migration of bee colonies occurred from early April to late June and early November to late January. Based on the survey result all most all beekeepers of the district did not control swarming.

Hive products harvesting

The frequency and amount of honey harvested varied depending on flowering condition of major bee forage, colony management practices and number of beehive. In the study area, there are two honey harvesting periods; March to April and July to August, which depends on the nature of yearly rainfall. The harvesting periods correlate with availability of moisture and peak flowering period for many honey plants including the large amounts of enclosure areas planted in multipurpose honey floras, vast amounts of flowering pulse, vegetable and fruit plants.

Most traditional beekeepers identify honey harvesting period by the experiences they developed in their respective areas like smelling of honey, accumulation of bees around the entrance of hives, end of flowering season, assessing weight and knocking the outer side of hive. Honey harvesting takes place at night to avoid the aggressiveness of the honeybee during day light. During honey harvesting from traditional hives, beekeepers cut and pull the fixed combs one by one. Pollen, brood and honey combs were removed, and kept in a container and covered with a lid. While, in case of movable frame hives, beekeepers indicated that during honey harvesting, frames are removed from the boxes and uncapped with the fork honey then placed in an extractor by the help of development agent and spun so the honey can drip to the bottom of the tank, pass through a sieve and then collected into a storage tank. Materials that the respondents were used during honey harvesting are listed in (Table 4).

Honey production and yield

In this study, accurately determining honey production and yields proved to be a difficult exercise, as most of beekeepers were unable to quantify correctly the harvesting in kilogram or any other weighing scale. Nevertheless, based on beekeepers estimation, the number of kilograms taken per hive per harvesting was ranging from 10 kg up to 150 kg of crude honey. Average honey yield per colony for tradi-

tional was 80 kg and modern hives were found to be from 5 kg and 16 kg crude honey. Based on this study, the average honey yields per hive per colony in the district were above the National average of 5 kg [10,11] for traditional hive; this is mainly due to forest beekeeping with extensive management practice and high forest (honeybee forage plant) availability. However, the absence of feeding and watering practices during the dearth periods, and lack of close supervision of colony result in low productivity of honey from movable hives.

Description	Response	%
Types of smoker fuels	Cow dung	48.7
	Worn out cloths	7.0
	Weira (*Olea Africana)*	5.7
	Corn Cob	7.6
	Straw/Grass	9.5
	Vernonia/Gerawa	0.6
	Nech bahr zaf (*Eucaliptus globules*)	10.1
	Kacha	1.9
	Wanza (*Cordia africana*)	1.3
	Koseret (*Lippia adoensis*)	7.6
	Total	100
Harvesting method	Harvested all of the honey comb	-
	1-2 honey comb left	100
	Removed all of the brood comb	-
	Total	100
Type of hive products harvested	Honey	92.40
	Beeswax	7.60
	Total	100
Reason for not collecting wax	Lack of know-how to harvest and use	90.00
	Lack of know-how about its market value	10.00
	Total	100

Multiple responses were allowed for types of smoker fuels used, n= number of sampled respondents

Table 4: *Proportions of materials used for smoking and hive products harvested by respondents (n= 120).*

Post-harvest handling of honey

The majority of the sample households responded that, they store honey primarily even if there is high demand for cash and lack of storage facilities. Some beekeepers that have no pressing problems keep the honey for prolonged period to get better price in off time. Nearly 34% of respondents sold their honey immediately after harvest and the remaining (66%) of the respondents were sold after certain months storing time. Although honey is generally produced chiefly for table, they keep some amount for different purposes like generating income, cultural ceremonies, as a medicine and as a beverage. According to Gichora (2003), plastic container is the ideal one for the quality of honey. The containers are returnable after selling of the honey or their price will be added in addition of the honey cost. According to respondents report, plastic bucket and plastic sack were highly used, and in some case they use nickels to store honey for

both short and long period. Based on the result of this study, the tin containers in most cases result in rusting, hence it deteriorates the honey which are technically not appropriate storage facilities as they result in serious quality deterioration.

Description	Response	n	%
Honey straining	Yes	45	37.8
	No	75	62.2
	Total	120	100
Reason for not straining	Lack of straining materials	12	10.0
	Lack of knowledge as to how to strain	36	30.0
	Consumers do not prefer strained honey	23	19.17
	Lack of materials and lack of knowledge how to strain	49	40.83
	Total	120	100

n= number of sampled respondents.

Table 5: *Post harvest handling activities undertaken by respondent beekeepers.*

The favorable point of flavor and desirability of well-ripened honey are obtained when honey is in its' comb state. Beekeepers efforts to convert it to their use must inevitably result in some deterioration, but whether it is significant or not depends on the treatment subjected to a honey in the hands of the beekeeper and subsequent handlers. Although honey is generally regarded as a cash crop and produced mainly for sale, beekeepers do keep some amount for different purposes.

Description	Response	n	%
Honey storage length	Consumed/sold during harvesting	9	7.5
	1 - 6 months	83	69.2
	7 – 12 months	26	21.7
	1 - 2 years (maximum storage period)	2	1.6
	Total	120	100
	Earthen pot	32	26.7%
	Plastic	78	65.0%
	Nickel	10	8.3%
	Total	120	100

n= number of sampled respondents; * multiple responses were allowed; ** only those who stored honey considered.

Table 6: *Honey utilization, and storage in the district (n= 120).*

Ripened honey from pure honeycombs stores better and in the long term is used for sale, as food or medicine in the home. Respondents indicated that there is lack of appropriate honey container and processing equipments in the area.

Marketing of honey in the study area

The emphasis given for honey production is as table food. Although the potential for honey production in study area is high, there is a limited supply of honey due to high yield with poor quality production practice. A survey on the market for bee products in the district showed that honey is the major product to a lesser degree other products such as beeswax and honey bee colony. The types of honey which have been marketed in the district are crude honey harvested from traditional hives mixed with unripe and brood honey/comb.

The honey produced in the area is sold to consumers and collectors/traders who buy and sell honey to traders coming from neighboring towns. According to results of this study, the main buyers were said to be 'tej' houses, consumers, middlemen, and retailers. About 70% of the respondents indicated that they sell their honey directly to end consumers and the remaining (30%) of the respondents sold to both traders and consumers.

Honey Bee flora

Beekeeping is more dependable on ecological suitability of an area than any other livestock production [4] and, honeybee population and their productivities in general are mainly influenced by the nature of honeybee flora of an area. Vegetation characteristics of the study areas are considered to be an important indicator for the potentialities of the area for beekeeping. Survey conducted in the study district showed that, the cultivated and natural honey flora potential of the area makes it very favorable for beekeeping. Naturally growing plants occupies quite large in variety proportions to cultivated crops [12]. The scientific names were determined using reference books of [13] and [14].

The study district is known for its cash crop (coffee) production which has been grown at the backyard of every homestead and on large farm for both cash and consumption purposes. All these plants were regularly visited by honeybees at different season.

Bee Diseases, Pests and Predators in the District

Based on information collected from the respondent, the pest and predators that attack honeybees and their hives in the study area were identified by beekeepers. It shows the major pests and predators ranked depending on the extent of damage caused to the honey bee colonies. Like all living things, honeybees are attacked at all stages of their development by various enemies either directly as predators, or indirectly, by disturbing the life of the colony in various ways. The most important of these enemies are those that destroy the combs, the stores, the hive itself and some predators that attack foraging worker bees as they leave the hive. These include ants (50.1 %), wax moth (15.6 %), spider 9.5 %), lizard 8.9 %), birds (11.7 %) and honey badger (shelemtemate in Amharic) (4.2 %).

According to [16] the economic lose incurred every year via lose of honeybee colonies and their products due to ant attacks was estimated to be over 3,839,810 Birr. In the current study area, some of the methods used by the respondents to prevent predators are keeping the apiary tidy and clean from under growth, avoiding throwing/scattering combs around the apiary site, application of ash around the hive stand, plastering the hive stand with plastic materials, finding and killing predators like bee eater birds and the queen of ants.

Constraints and opportunities of beekeeping

In order to utilize the beekeeping sub sector, identifying the existing constraints and searching for solutions are of paramount importance. Based on the knowledge of the sample respondents the major challenges and opportunities for beekeeping in the study areas were identified. All problems cannot be solved at once because of time, capital and lack of skilled manpower. As a result, prioritization of the problems was made to identify the most important constraints that hinder the development of beekeeping sub sector in the study area. According to the response of the beekeepers and available information on major challenges of the beekeepers, the first constraint of honeybee production is lack of beekeeping equipment and financial problem for training. The other problem was shortage of bee forage as which is resulted from expansion of farm land and deforestation, over-gazing and lack of attention to introduce potential bee forage plants. These institutional changes will give a good opportunity to create increasing demand for honey and competitive market in the region and to promote export of hive products, which will in turn result in endogenous technological change and overall development in the sub-sector for the district.

Major opportunities to apiculture development

Potentialities of the study areas for beekeeping

Based on the result of respondent and assessment of the area, the potentialities of the district for beekeeping in terms of different aspects were evaluated. Gichora (2003) described there is no a single type of hive, bee race and variety of forage or management system

that suits all possible situations. According to HBRC [17] potential areas for beekeeping are categorized in to different groups and for intensive apiculture production. However, experiences have shown that beekeeping activity is carried out with substantial results in most parts of Ethiopia with the exception of extreme hot or cold areas.

Availability of feeds and water

The Zones are very special for its diversified acacia, shrubs spp. and there are also different kinds of forage trees (Wanza, Girawa, Eucalyptus tree) which flower at different times of the year that assures a constant supply of feed for bees. There are also enough water supplies in the district.

Availability of strong colonies and good yield

During the survey, it was noted that there are a lot of beekeepers in the zones with good numbers of traditional beehives (30-140 per household) full of strong bee families and modern hives (1-6/household) with some of them were full of colony, indicating that the area is very suitable for bee business development with poor awareness and adoption of modern technology.

Diversity and seasonal availability of bee forages

Seasonal weather impacts upon nectar and pollen resources, which in turn impact on the colony performance. It also important to understand how bee colony changes throughout the year as the conditions for bees can vary widely throughout the country and the management depends on where they are found. Most of the major bee forage plants identified are forest reserves that allow the expansion of apiculture development found in the study area. There are also areas allocated for forest development and soil conservation, in addition many cultivated crops and coffee production in the area also serve as pollen, nectar, or both pollen and nectar sources. Thus, integration of apiculture development in the agriculture production system has a huge advantage for pollination to boost agriculture production and beekeeping system.

Traditional know-how

In the study area, beekeeping practice has a long history, as a fact that, the beekeepers have developed indigenous knowledge which was passing from generation to generation. The main areas of indigenous beekeeping knowledge are hive construction from locally available materials, swarm catching; hive fumigation, honey and swarming season identification, different medicinal values of honey, identification of important honeybee floras and identification of adulterated honey. This familiarity and pride with bee-keeping can support rapid uptake among additional beneficiaries.

The attention of the government to improve beekeeping

The government has increased its attention to develop the apiculture subsector as one of its strategies for poverty reduction and diversification of export commodities. Recent initiatives taken by the public is in the right direction towards improving the possibility of exploiting the potential of the apiculture subsector, and increasing its overall competitiveness through the introduction and promotion of modern hives in order to obtain honey of good quality for industrial processing. This opportunity will give a chance to get support to alleviate major constraints hindering apiculture development in the area.

Challenges to beekeeping in the study areas

Like any other agricultural sub-sector, beekeeping in the study areas is affected by recurrent drought, which directly or indirectly affects the honeybees and their products. Even though drought is beyond the beekeeper control, it might be aggravated by human activities and interferences. Even if the study area is potential for beekeeping, bee forage associates with drought and deforestation important problem. Due to population pressure and lack of land use policy most of the foraging areas and natural environments cannot be protected and destroying of forestland for expansion of farmland could trigger a reduction of honeybee floras.

The existence of pests and predators are nuisances to the honeybees and beekeepers. Pests and predators cause devastating damage on honeybee colonies with in short period of time and even over night. [18] stated that as Ethiopia is one of the subtropical countries, the

land is not only favorable to bees, but also for different kinds of honeybee pest and predators that are interacting with the life of honeybees.

Limited knowledge on the potential of the area for beekeeping and beekeeping practice is challenge. It was learnt that almost all the beekeepers in the study area did not get any formal and informal training in modern beekeeping technologies before the interventions. This is linked with lack of formal established systems on the sector from office down to role players.

Market access is the main part not only beekeeping but also for any agriculture and industry. According to the results of the study, beekeepers have problems with honey marketing in the district. Produced honey mainly sold in the area is at village level and the rest is sold in the market of their town of merchant, Diller at much lower price and sometimes between each other in cash and exchange.

Lack of linkage of office of the *woreda* with different institution and organization suffer the beekeepers to produce high products. There were no trained beekeeping experts or extension workers who can render important advisory services to the farmers. Having institutional linkage is other way of developing information about the sector and reduces information gaps.

Some of interviewed farmers and/or their neighbors had used herbicides and/or pesticides to control crop and livestock pests and diseases. The applied chemicals affected some of the respondents, by causing a decline up to one quarter of honey bee colony population and honey flora resources and productivity. Majority of beekeepers appeared to be aware of the toxicity of insecticide and herbicides to bees but none of the beekeepers had taken any measure to protect their bees from the sprayed chemicals.

Conclusion and Recommendation

This survey has revealed the existence of many opportunities and constraints for beekeeping in the area. The presence of government attention in beekeeping and diversification of hive products activity are opportunities of the area. It is better to improve the honey quality defects need to provide a practical training to local beekeepers about proper ways of harvesting, managements and sale of honey; moreover, facilitating supply of quality apicultural equipment is crucial. Therefore to improve the low level of technological input, exploit the existing opportunities and potentials of the district needs further consistent practical training on bee and bee products management for community is recommended.

Bibliography

1. Ayalew K and Gezahegn T. "Suitability Classification in Agricultural Development". *Ministry of Agriculture Addis Ababa Ethiopia* (1991).

2. Desalegn Begna. "Honeybee pest and predators of Ethiopia". *Proceedings of the third National Annual Conference of Ethiopian Beekeepers Association (EBA)* (2004): 59-67.

3. Kerealem E., *et al.* "Constraints and prospects for apiculture research and development in Amhara region, Ethiopia". *Livestock Research for Rural Development* 21.10 (2009).

4. Nuru Adgaba. "Geographical races of the Honeybees *(Apis mellifera L.)* of the Northern Regions of Ethiopia. PhD dissertation. Rhodes University, South Africa. Paterson PD. 2006. Beekeeping. The Tropical Agriculturalist". *The Technical Center for Agriculture and Rural Cooperation (CTA), International Bee Research Association (IBRA) and Macmillan. Malaysia* (2002).

5. Amir P and Knipscheer HC. "Conducting On- Farm Animal Research: Procedures and Economic Analysis". *Win rock International Institute for Agricultural Development USA and International Development Research Centre, Canada*. Singapore National Printers Ltd, Singapore (1989).

6. Kerealem Ejjgu., *et al.* "Honeybee production systems, opportunities and challenges in Amaro special Wereda and Enebse Sar Medir Wereda". *Proceedings of 1st Research Review Workshop of Agri Service Ethiopia* (2006): 65-185.

7. Kebede Tesfaye and Lemma Tesfaye. "Study of honey production systems in Adami Tulu Jido Kombolcha district in mid rift valley of Ethiopia". *Livestock Research for Rural Development* 19.11 (2007).

8. Nuru Adgaba. "Atlas of pollen grains of major honey bee flora of Ethiopia". Holleta Bee Research Center, Oromia Agricultural Research Institute, and the Netherlands International Development Organization (2007).

9. Tessega Belie. "Honeybee Production and Marketing Systems, Constraints and Opportunities in Burie District of Amhara Region, Ethiopia". *MSc Thesis Presented to the School of Graduate Studies of Bahir Dar University* (2009): 131.

10. Gezahegne Tadesse. Beekeeping (In Amaharic) Mega Printer Enterprise, Addis Ababa, Ethiopia (2001a).

11. EARO (Ethiopian Agricultural Research Organization). Apiculture research strategy, Ethiopian Agricultural Research Organization, Animal Science Research Directorate (2002): 45.

12. Amsalu Bezabih. "Preliminary study on honey plants around Holeta". *Holleta Bee Research and Training Center Holeta Ethiopia* (1996).

13. Fichtl R and Admasu Addi. "Honeybee Flora of Ethiopia". *Margraf Verlag, Germany* (1994).

14. Azene Bekele., *et al.* "Useful trees and shrubs for Ethiopia, Identification, propagation and management for agricultural and pastoral communities". *Swedish International Development Authority Nairobi Kenya* (1993): 474.

15. James E Tew. "Back yard beekeeping. Alabama Cooperative Extension System". *Alabama A and M University and Auburn University. Alabama* (2004): 54

16. HBRC (Holeta Bee Research Center). Beekeeping Training Manual, HBRC, Holeta, Ethiopia (1997).

17. Desalegn Begna. "Honeybee pest and predators of Ethiopia". *Proceedings of 3rd National Conference of Ethiopian Beekeeping Association Addis Ababa, Ethiopia* (2001): 59-67.

18. Desalegn Begna Sr. "Assessment of Ant effects on honeybee colonies and their products in West Shewa Zone". *Bee protection Holeta Bee Research Center Holeta Ethiopia* (2006).

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