

*Research Paper*

# Review of Opportunity and Challenges of Beekeeping in Ethiopia

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This review paper was prepared with the objectives of to revise the various published and unpublished research results and reviews in the subject of the apiculture about beekeeping, constraints and opportunities in Ethiopia. The country has huge apicultural resources that made it the leading honey and beeswax producer in Africa. Moreover, Ethiopia is a country where apicultural research is being conducted in a coordinated manner under the national agricultural research system. Hence, a lot of information has been gathered on the opportunity and constraints of the beekeeping in Ethiopia. It has been revealed that the opportunities for beekeeping were the existence and abundance of honeybee, availability of potential natural forest with adequate apiculture flora, ample sources of water for bees, beekeepers' experience, availability of eager beekeepers to accept new technology, and practices and socio-economic value of honey and demand for honeybee products. However, honey bee disease, lack of sufficient number of well skilled manpower, lack of cultivated bee forage, insufficient market facility, weakness of the government policy on the apiculture sector, chemicals application, presence of pests and predators, lack of credit service for the beekeeping sector, high cost and limited availability of modern beekeeping equipment's and accessories, absconding and migration of bee colonies, attempts of traditional beekeeping system and deforestation and recurrent drought are the major pain to beekeeping sector development in Ethiopia. But all these problems may not be constraints to all parts of the country and may not be equally pressing to every place.

**Keywords:** Opportunity; Constraints; Beekeeping; Honey; Bee forage

## INTRODUCTION

Ethiopia is home to some of the most diverse flora and fauna in Africa. Its forests and woodlands contain diverse plant species that provide surplus nectar and pollen to foraging bees (Girma, 1998). The country is the largest honey producer in Africa and 10<sup>th</sup> largest honey producers in the world (Rivera *et al.*, 2007). Although thousands of tons of honey have been produced every year, the products obtained from the subsector have been observed to be still low as compared to the potential of the country (Edessa, 2005). Ethiopia is endowed with various climatic conditions;

topography and a wide range of altitude favoring the presence of different natural vegetation's that include forests, bushes, herbs, weeds and undergrowth. The flowering plants known in Ethiopia are between 6 and 7 thousand species (Edwards, 1976). The presence of this natural vegetation made the country the best home for honeybees. The forests and woodlands contain diverse species that provide surplus nectar and pollen to foraging bees (Ayalew, 1990). Beekeeping has been and still is widely spread, economically important

and integral part of the life of the farming communities of Ethiopia (Fichtl and Admasu, 1994).

There are an estimated 5.89 million beehives out of which farmers keep about 5.66 million traditional, 71,900 intermediate and 149,871 modern beehives (CSA, 2015) and this represents the highest bee density in Ethiopia. Apiculture is one of the options that help to promote forest conservation and improve crop yield because of cross-pollination services rendered by honeybees (Fichtl and Admasu, 1994). The income supplement at local level from apiculture is also very significant (Ayalew, 1990). In rural areas, any source of food or income that does not need land is potentially important. Apiculture is such an undertaking because beehives occupy minimal space and they can be placed on wastelands. So in relation to agriculture small holders or even landless peasants can do beekeeping. Besides these, beekeeping does not compete with other branches of agriculture for resources because bees collect pollen and nectar from wild and cultivated plants to make honey and such resources would be important if honey bee hive colonies are established to forage on them (Drescher and Crane, 1982).

In Ethiopia beekeeping subsector is dominantly for small-scale farmers and is contributing significantly to the increment off-farm income and toward poverty reduction in rural areas (MoARD, 2007). Honey is considered as a cash crop and only about 10% of the honey produced in the country is consumed by the beekeeping households (MoARD, 2003). The remaining 90% is sold for income generation (Hartmann, 2004). Beeswax was also in the list of Ethiopian agricultural export commodities, though it was only in 2008 that the country got the EU accreditation to export its honey to EU market. Export of honey and bee wax contributes an average of 1.6 million USD to the annual national export earnings (Ethiopian Customs Authority and Export Promotion Agency, 2006). The beekeeping subsector is also creating job opportunities in both rural and urban areas (Mengistu, 2011). Recently, the Ethiopian government is intensively working on organizing jobless urban and landless rural youth and women to involve in them in bee equipment production and beekeeping activities. A Significant number of people are currently engaged in honey and beeswax collection, “*Tej*” making, honey and beeswax processing and marketing (MoARD, 2007).

To date, over 10 million of bee colonies are in the country, which include both feral and hived ones (Ayalew, 2001). However, like any other livestock sector, this sub sector has been ceased by complicated constraints. The major constraints in Ethiopia are lack of beekeeping knowledge, shortage of trained manpower, shortage of beekeeping equipment, pests and predators

and inadequate research and extension services to support apiculture development programmes (SOS–Sahel-Ethiopia, 2006). The prevailing production constraints in the beekeeping sub sector of the country would vary depending on the agro ecology of the areas where the activities is carried out (Edessa, 2002). The beekeeping research so far conducted in the country is although encouraging but did not cover the specific issues of various regions and means of utilizing the opportunities in potentially productive regions. However, the great majority of beekeeping production is based on traditional production systems where the results of on-station research may not often be applicable to the local conditions. Likewise, it was not implemented on the basis of identification of potentials, constraints, attitudes and economic level of the communities and as such, it is very essential to identify the potential development constraints.

An investigation indicated that the number of the honeybee colonies in the country has been declining (CSA, 1995). Thus, it requires making efforts to address some of the major problems of beekeeping to keep it productive in a sustainable way. Still, the country has potentials with enormous nectar and pollen resources.

In Ethiopia, a lot of research activities had been conducted and data regarding, honeybee production and marketing system, opportunity and constraints of honey bee production, honey production, physical and chemical characterization, processing and value addition and marketing and problems related to marketing are documented. However, the progresses in different aspects of research in opportunity and constraints of beekeeping in Ethiopia have not been reviewed and all the available information are found scattered and in inaccessible situation. Therefore, this review was designed with objective of to review the available scientific information on constraints and opportunity of beekeeping in Ethiopia.

## **OPPORTUNITY AND CONSTRAINTS OF BEEKEEPING IN ETHIOPIA**

### **Overview of Beekeeping in Ethiopia**

In Ethiopia, beekeeping has been a tradition since long before other farming systems (Gezahegne, 1996). Even though it is one of the important and the oldest farming activities in the country, there are no available records, which confirm when and where beekeeping was first started. However, the Hieroglyphs of ancient Egypt refer to Abyssinia (ancient name of Ethiopia), as source of honey and beeswax and Abyssinia has been known for its beeswax export to Egypt for centuries when other items were not exported. It is, thus, assumed that the

keeping of bees in baskets may have started about 5000 years ago in the northern regions along with the early settlements. No countries in the world may have ancient beekeeping as Ethiopia (Fichtl and Admassu, 1994; Gezahegne, 2001b). Moreover, the oldest basket hive in the International bee museum is from Ethiopia.

### **Opportunities of Beekeeping in Ethiopia**

As reported by Gallmann and Thomas (2012), currently Ethiopia is listed as a third Country permitted to export honey by the European Commission (EU COMMISSION DECISION, 2010). The direct contribution of beekeeping includes the value of the outputs produced such as honey, bee wax, queen and bee colonies, and other products such as pollen, royal jelly, bee venom, and propolis in cosmetics and medicine (Gezahegn, 2001).

In Ethiopia, beekeeping is an integral part of the life style of the farming communities, and except for a few extreme areas, it is a common practice in every place where humankind has settled. In addition, Ethiopia has probably the longest tradition of all the African counties in beeswax and honey marketing. The time is immemorial as to when and where marketing of honey and beeswax has been started in the country (Beyene and David, 2007).

### **Availability of Eager Beekeepers to Accept New Technology**

The small scale farmers in Ethiopia are so eager to access improved technologies. Almost all farmers in Ethiopia possess traditional hives with limited number of improved hives. Scientific way of keeping honey bees, and access to improved way of beekeeping was not common in the specific area. They haven't been updated training and promoted to keep honey bee, rather they had been more following the traditional system of beekeeping that learned from their passed families. Hence introduction of improved honey production technologies, (Teklu and Dinku, 2016) management system and training could make to boost the apiculture production and productivity.

### **Availability of Natural Forest with Adequate Apiculture Flora and Water Resource**

Ethiopia is home to some of the most diverse flora and fauna in Africa. Its forests and woodlands contain diverse plant species that provide surplus nectar and pollen to foraging bees (Girma, 1998). Ethiopia is

endowed with various climatic conditions; topography and a wide range of altitude favoring the presence of different natural vegetation's that include forests, bushes, herbs, weeds and undergrowth. The flowering plants known in Ethiopia are between 6 and 7 thousand species (Edwards, 1976). The presence of this natural vegetation made the country the best home for honeybees. The forests and woodlands contain diverse species that provide surplus nectar and pollen to foraging bees (Ayalew, 1990). This assisted to exist more than 12 million honey bee colonies in the country (Gezahegn, 2001). Beekeeping has been and still is widely spread, economically important and integral part of the life of the farming communities of Ethiopia (Fichtl and Admasu, 1994). Currently, more than 7000 species of flowering plants are estimated to be found in the country, of which most of them are honeybee plants (Girma, 1998). The variety of landscape from raggedness to undulating plain, with north-south latitude and east-west longitude differences, has given the country a contrast in climate and consequently a variety of seasons (Gebreyesus, 1976).

Plentiful forage availability coupled with favorable and diversified agro-climatic conditions of Ethiopia create environmental conditions conducive for the growth of over 7000 species of flowering plants which has supported the existence of large number of local bee colonies in Ethiopia. It is estimated that over two million bee-colonies in the countries exists in the forest and crevices. The density of hives occupied by the honeybees on the land may be the highest, at the present moment, of any country in the African continent (Ayalew and Gezahegn, 1991).

### **Existence of Strong Bee Colonies and a Number of Colonies**

Ethiopia, having the highest number of bee colonies and surplus honey sources of flora, is the leading producer of honey and beeswax in Africa. Ethiopia 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. This makes the country rank 1<sup>st</sup> in Africa and 10<sup>th</sup> in the world (AMP, 2007). The ideal climatic conditions and diversity of floral resources allow the country to sustain around 10 million honeybee colonies, of which 7 million are kept in local beehives by farmers, and the remaining exist in the forests as wild colonies. This makes the country to have the highest bee density in Africa (Ayalew, 2001; Nuru, 2002).

### **Demand for the Honeybee Products**

Honey and beeswax also play a big role in the cultural and religious life of the people of Ethiopia. Another very important contribution of beekeeping is through plant pollination and conservation of the natural environment. Beekeeping is environmentally sustainable activity that can be integrated with agricultural practices like crop production, animal husbandry, horticultural crops and conservation of natural resources. Thus, it would be one of the most important intervention areas for sustainable development of poor countries like Ethiopia (Gibbon, 2001). The contributions of beekeeping in poverty reduction, sustainable development and conservation of natural resources have been well recognized and emphasized by the incumbent government of Ethiopia and non-governmental organizations (NGOs).

### **Challenges of Ethiopian Honey Bee production development**

Despite the high potentiality of the country for beekeeping and its extensive practices, beekeeping research conducted in the nation so far did not cover to characterize and document the apicultural resources and associated constraints of the sector for its proper intervention and utilization to specific potential regions (Chala *et al.*, 2012). According to HBRC (1997), Ayalew (2001) and Edessa (2002), the major constraints in the beekeeping sub sector are the following: the unpleasant behaviors of bees (aggressiveness, swarming tendency, and absconding behaviors); lack of skilled manpower and training institutions; low level of technology used; high price of improved beekeeping technologies; drought and deforestation of natural vegetation; poor post-harvest management of beehive products and marketing constraints; indiscriminate application of agrochemicals; honeybee disease, pest and predators; poor extension services; absence of coordination between research, extension and farmers; absence of policy in apiculture; shortage of records and up-to-date information; and inadequate research institutions to address the problems. But all these problems may not be constraints to all parts of the country and may not be equally pressing to every place. So it requires characterizing the constraints in their respective places to take an appropriate development measure.

### **Application of Chemicals**

Application of chemicals such as fungicides, pesticides and herbicides hinder the productivity and

production of honey bee colonies. Therefore, focus should be given to those chemicals, which are not harm full to honey bees and the application should not match with flowering seasons to minimize the poisoning effect on honey bee (Malede *et al.*, 2015). Investigation indicated that the number of the honeybee colonies in the country has been declining (CSA. 1995) and consequently the honey and beeswax production as well as export earnings fell down (Gezahegne, 2001b). This is attributed to drought, ever-expanding population pressure and associated vegetation changes and indiscriminate applications of chemicals.

### **Bee Disease**

Like all living animals, honey bees were infected with disease and attacked by parasites and pests endangering their health and life (Morse, R.A. and R. Nowogrodzki, 1990 and Al Ghzawi, 2009). These diseases of honey bees impose serious problem on honey bee production and productivity. The bees and their products are vulnerable to various diseases, parasites and pests. The existences of two adult honeybee diseases namely *Nosema apis* and *Melipighamoeba mellificae* and their distribution was studied and reported by Gezahegn and Amsalu (1991); and Desalegn and Amssalu (1999). The occurrence of brood disease known as Chalk brood in Ethiopia for the first time was reported by Desalegn (2006). Some major types of honeybee pests and predators, magnitude of their damage, and some possible solutions to minimize the damage they cause on bees and their products were discussed by Desalegn (2001). Moreover, the occurrence of small hive beetle (*Aethina tumida* Murray; Coleoptera: Nitidulidae) in honeybees was assessed by Desalegn and Amssalu (2006) and recently the effect of ant (*Dorylus fulvus*) on honeybee colony and their products in West and Southwest Shewa zones was examined by Desalegn (2006). The most commonly kown honeybee diseases reported to exist in Ethiopia are *Nosema*, *Amoeba* and Chalk brood diseases (Gezahegn and Amssalu, 1991; Desalegn and Amssalu, 1999; Desalegn, 2006).

### **Ineffectiveness of Government Policy in Apiculture Sector**

The livestock sector has probably suffered more than crops and crops sectors from inappropriate government policies and the apiculture sub sector is no exception. So to improve and sustain apiculture sector the government give special attention to it (Malede *et al.*, 2015)

### Market Accessibility

The major constraint to increasing the welfare of smallholders is their inability to access markets. Enhancing the ability of poor smallholder farmers to reach markets and actively engage in them is one of the most pressing development challenges. Remoteness results in reduced farm-gate prices, returns to labor and capital, and increased input and transaction costs. This, in turn, reduces incentives to participate in economic transactions and results in subsistence rather than market-oriented production systems. Sparsely populated rural areas, and high transport costs are physical barriers to accessing markets; lack of negotiating skills, lack of collective organizations and lack of market information are other impediments to market access (Jones, 1999).

### Prevalence of Pests and Predators

The prevalence of pests and predators are interesting with life of bees (Malede *et al.*, 2015). As reported by Adeday *et al.* (2012), the honeybee pests and predators are ant, insects, spiders, monkeys, snakes and lizards, wax moth (*Galleria mellonella*), bee-eater birds, bee lice (*Braula coecal*), honey badger (*Mellivora capensis*), monkey and small hive beetles (*Aethina tumida*).

### Absence of cultivated bee Forage

Cultivation of bee forage is not practiced in the country. This problem results in critical honeybee forage scarcity and hinders the production and productivity increment of honeybee in the country. Absence of the bee flora calendar in most parts of the country is another severity to the development of honeybee feeding development strategies. In a review of the state of resource for beekeeping in Ethiopia, (Deffar, 1998) describes the degradation of natural resource and bee forage in Ethiopia. Ethiopia is suffering from the ecological deterioration of its natural resources and this means the basis of any honey production is threatened. (Elfring *et al.*, 2005).

### Lack of Credit Service for the Beekeeping Sector

There is little or no involvement of official lending institutions in apiculture production in Ethiopia.

### Lack of Well Skilled Manpower

Ethiopia is one of the developing countries. As a result, it is constrained by trained human power to assist beekeepers in the areas of modern beekeeping.

### High Cost and Limited Availability of Modern Beekeeping Equipment's and Accessories

The equipment's include box hive, casting mold, frame wires, honey extractor, and containers. In some parts of the country reported that the modern hive constructed by some private companies and cooperatives are of poor quality that is with wrong dimensions and made of poor quality timber. As a result, migration rate of honey bees in modern hive is very high (Alemayehu *et al.* 2016).

### Lack of Honey Processors Organizations

In most parts of the country neither large scale nor small scale honey processors which may lead to poor quality honey consequently with low price for the producers. In addition lack of processing honeybee products into different honeybee by-products another bottleneck for the honeybee outputs price and proper use of apiculture sector.

### Deforestation and Recurrent Drought

In some parts of the country drought occurs repeatedly and this is one of the problems hindering the beekeeping practice in such areas. Although, deforestation is under way in some parts of the country which is contrary to the government policy.

### Attempts of Traditional Beekeeping System

Since the late 1970s, attempts have been made to improve the productivity of beekeeping of the country through introduction of improved technologies. Moreover, since 1993 strategies on "bee honey source development package" have been formulated and are under implementation in most regions of the country. Nevertheless, the level of beekeeping still remains in the traditional system and more than 99% of bees are still kept in traditional hives with its various limitations (Gezahgn and Tadesse, 2001). Because of this and other reasons, the country could not produce adequate



table-honey for local and export markets. This indicates that the efforts of made to exploit the apicultural resources potential of the country are not satisfactory. Therefore, the products obtained for this subsector are still low as compared to the potential of the country (Amsalu *et al.*, 2004). Traditional hive honey is of good quality as long as it is in the hive, faulty handling, from the time of its harvest until it reaches to market is responsible for its inferior quality. The type of hives used the methods of removing and storage of honey play a vital role in the quality of honey (Crane 1970, as cited by Edessa Negera, 2005). Despite the favorable agro ecology for honey production and the number of bee colonies the country is endowed with, the level of honey production and productivity in the country is remain low. One of the prominent factors for this low honey and productivity is traditional hives. Ethiopia has the potential to produce 500,000 tonnes of honey per year and 50,000 tonnes of beeswax per annual, but currently production is limited to 43,000 tonnes of honey and 3,000 tonnes of beeswax (MoARD, 2008).

### Absconding and Migration

Honeybee colonies abandoned their hives at any season of the year for different reasons. Accordingly, reasons for absconding of bee colonies were lack of forage, incidence of pests and predators, during harvesting, sanitation problem, and bad weather condition and bee diseases. The reason why there is high migration could be associated with lack or scarcity of bee forage in the area.

### CONCLUSION AND RECOMMENDATION

Ethiopia has huge potential for honey production which is clearly observed in the last few years with significant increment, even though the subsector is still practicing with traditional low productive systems. Bee farming provides supplementary and sometimes major source of income to the farmers, especially to the small farmers in the country. In conclusion opportunities for beekeeping were the existence and abundance of honeybee, availability of potential natural forest with adequate apiculture flora, ample sources of water for bees, beekeepers' experience, availability of eager beekeepers to accept new technology, and practices and socio-economic value of honey and demand for honeybee products.

The major constraints in the beekeeping sub sector are the unpleasant behaviors of bees (aggressiveness, swarming tendency, and absconding behaviors), lack of skilled manpower and training

institutions, low level of technology used, high price of improved beekeeping technologies; drought and deforestation of natural vegetation; poor post-harvest management of beehive products and marketing constraints; indiscriminate application of agrochemicals, honeybee disease, pest and predators, poor extension services, absence of coordination between research extension and farmers, weakness of policy in apiculture, shortage of records and up-to- date information, and inadequate research institutions to address the problems. But all these problems may not be constraints to all parts of the country and may not be equally pressing to every place. Generally, beekeeping sub sectors has role on economically and environmentally for a country. Some of the major possible intervention areas are recommended here below:

- Designing effective honeybee pests and predators controlling methods.
- Introduction of full package improved beekeeping technologies with adequate practical skill training on all bee keeping trends and queen rearing practices on which farmers get and enhance a bunch of queens and new colonies without climbing trees to get colonies.
- Promoting beekeepers important indigenous knowledge and promoting the construction of non-timber hives with low costs
- Multiplying areal major honeybee plants in large scale and distributing to farmers of the area in a package form with a respective seasons.
- Availing the strategies to support farmers with beekeeping business through credit availability, cooperative formation, input supply and market facilitation should be put in place with value chain approach.
- Improving pre- and post-harvest handling of bee products
- Improve the utilization of stingless bee's resources: effort should be made how to identify, domesticate, document and utilize stingless bee resources without damaging the colony.

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