COLLEGE OF AGRICULTURE ND NATURAL RESOURSE
DEPARTMENT OF ANIMAL PRODUCTION AND TECHNOLOGY

ASSESSMENT ON ECONOMIC IMPORTANCE OF BEEKEEPING IN ABESHEGE DISTRICT OF GURAGE ZONE, SOUTHERN ETHIOPIA

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A SENIOR RESEARCH PROJECT SUBMITTED TO DEPARTMENT OF ANIMAL PRODUCTION AND TECHNOLOGY, FOR THE PARTIAL FULFILLMENT OF BSC DEGREE IN ANIMAL PRODUCTION AND TECHNOLOGY

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DEDICATION

This work is dedicated to our families for their great sacrifice, ceaseless prayers, support and encouragement

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Above all, we would like to thanks the Almighty **GOD** who gives us the strength, patience and endurance throughout our life. Next we would like to express our special thanks to our advisor Mosa Mitiku (*MSc*) for his kindly and supported their patience guidance, comment and indispensable advice in our entire research. We would like to express the deepest love appreciation and gratitude for our family for their financial and moral support from the starting up to now. Finally we would like to thank to for our friends who constructive idea and material support.

LIST OF ABBRAVATIONS

AMP	Apiculture Master Plan
EARO	Ethiopia Agricultural Research Organization
FGD	Focused Group Discussion
HBRC	Holeta Bee Research Center
KII	Key Informant Interview
NGOs	Non-Governmental Organizations
SPSS	Statistical Package for Social Science

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ABSTRACT

The research was conducted in Abeshege district. The aim of the research is to assess the economic importance of beekeeping in the district. In the study area beekeeping is wide spread practice but beekeepers have not got the expected economic contribution from beekeeping sector .This is due to the presence of factors that affect the productivity of beekeeping. The study used both probability and non-probability sampling method to select 60 respondents from the total beekeepers found in the selected Kebeles. For this study both primary and secondary data were used. Primary data was collected from respondents and secondary data was collected from documents, books and websites. The analysis was under taken using SPSS (version 20) the descriptive statics such as percentage and frequency through tabulation, graph &charts was done. In the study area majority of farmers involve in beekeeping to produce honey and some produce other products like beeswax. In the study area also majority of farmers were use the products for consumption purpose and the few farmers use for commercial purpose. The study recommends some possible Solutions to increase the productivity of beekeeping in study area.

Key Words: *Beekeeping, Economic importance, Gurage Zone*

1 INTRODUCTION

1.1 Back Ground of the Study

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 1st in Africa and 10th in the world (Alemayehu *et al*., 2016). Currently, more than 7000 species of flowering plants are estimated to be found in the country, of which most of them are honeybee plants.

Ethiopia is endowed with divorced agro-climatic zone that is sustainable for beekeeping. Due to this chance it is leading honey producer with 10million honey bee colonies (Ayalew K, 2012). Ethiopia ranked first in Africa and tenth in the world with production of 23.6percent and 21percent respectively the production is less and the system is traditional in that many farmers participate at the different parts of the country. In addition to this Ethiopia have the highest bee density and being the leading producer as well as one the largest bee wax exporting countries in Africa (Nuru A, 2008). From this production small amount of honey marketed (Amsalu B and Betre A, 2011). The products obtained from the sub sector are still low as compared to the potential of the countries.

Apiculture is a promising off-farm enterprise, which directly and indirectly contributes to smallholder's income in particular and nation's economy in general. It has significant role in generating and diversifying the income of subsistence Ethiopian smallholder farmers mainly the small land holders and landless (Adebabay *et al*., 2012). Ethiopia is known for its tremendous variation of agro-climatic conditions and biodiversity which favored the existence of diversified honeybee flora and huge number of honeybee colonies (Adgaba N, 2014).

Beekeeping is a long lasting practice in Ethiopia. As a result, beekeepers have developed indigenous technical knowledge on traditional hive construction from different locally available materials, on honeybee management practices like honey season identification, swarm catching and attractant methods, swarm control method, honeybee enemy protection; traditional methods of sting protection and reduction of pain (Adeday *et al*., 2014). More than one million households are estimated to keep bees using traditional, intermediate and modern hives (Gidey

and Mekonen, 2010) “unpubl data”. 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 K, 2010; and Nuru, 2012).

CSA (2011); (2012) Reports indicate that colonies in traditional beehives account for about 97% of the total hived honeybee population. The productivity of traditional hives is extremely low and the average yield is only about 5–8kg/per colony/per annum (MoARD, 2013). However, with this existing practices the annual honey production in the country is increasing and has reached quite higher than 53 thousand tons in 2012 (FAOSTAT data 2010; CSA, 2009; 2011, 2012). In Ethiopia, there are generally two honey harvesting seasons: the major one that lasts from October to November and the secondary one from April to June. However, in addition to these major harvesting periods, there are many small harvesting periods which depend on the type of flowering plants and rainfall patterns in different agro ecologies (Adgaba N, 2014), which experienced beekeepers and local people easily associate the harvesting season with the botanical origin of honey in their locality (Legesse G, 2013).

The most important honey production regions in Ethiopia are Oromia (about 46% of total production), Southern National Nationalities People Regional state, SNNPR 22% and Tigray 5%.Owing to varied ecological and climatic condition Ethiopia is home to most diverse flora and fauna in the continents. Its forest and weed lands contain divers plant specifies that provide surplus nectar and pollen to foraging bees (Workneh A, 2011).

The products obtained from this sub sector are still low as compared to the potential of the country. Although thousands of tons of honey are produced every year, it is usually poorly managed and unattractive in appearance. Because of this its place in the local market is being taken by imported honey. 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 (Edessa N, 2010).

Bee keeping is very long standing practice in the farming communities of the Southern region and it plays significant roles as source of cash income and nutrition for many subsistence farm-

ers. It is an integrated part of the small holders farming system in the southern part of the region, in spite of scarcity of natural vegetation, large area of inaccessible land for cultivation and live-stock grazing are covered with various types of bushes and makes this part of the region still to remain poetical for beekeeping. Besides, beekeeping potential of the region is partly attributed to the various cultivated oil crop, pulse and field flowers which are very important source of source forage and other uses (Assefa M, 2011). The presences of the above potential beekeeping the study area is suitable for apiculture practice in addition with farmers.

1.2 Statement of the Problem

Beekeeping is one of the important economic activity in Ethiopia. It employs a number of peo-ples and provides an opportunity for rural families to the support their income by marketing their bee products such as honey and bee wax at local markets (Destag, 2013).

In the country, in average of 420milions Ethiopia birr obtained annually from the sale of honey (HBRC, 2010). The study area, Abeshege District is suitable for beekeeping as there is a suitable agro-ecological condition for beekeeping. Even if the study area has potential for beekeeping, Beekeepers have not get expected economic contribution from beekeeping, since, beekeepers uses traditional beekeeping hive which makes low and poor quality of honey products, the mar-kets are far away from beekeepers, lack of training institution and government support. Follow-ing this problem, the study was trying to identify the most important factors that affect the bee-keeping in the study area.

1.3 Objectives

1.3.1 General objective

- To assess the economic importance of beekeeping in the study area

1.3.2 Specific objective

- To study the role of beekeeping for farmers' income in study area
- To study importance of beekeeping in study area.

1.4 Research Questions

- What are the roles of beekeeping for farmers' income?
- What are the factors that affect the productivity of beekeeping?

1.5 Significance of the Study

The study is significance to identify economic importance of beekeeping and the result of research provide various purpose for individuals, NGOs, government and the general public that engaged in beekeeping. Even though the study is not wide due to time and resource shortage, it will serve as a base for other who works on a research on beekeeping and Abeshege district Agricultural sector was primarily benefited from the study.

1.6 Scope and Limitation of the Study

The research was conduct in Abeshege district of Gurage Zone to see the economic importance of beekeeping. Due to some constraints we limit our study; only two Kebeles (Gibebare and Boketena Serete).When doing the research; there were different constraints such as: shortage of finance, time limitation, inaccessibility of internet and lack of transport.

2 LITERATURE REVIEW

2.1 Origin and Evolution of Bees and Beekeeping

Bees likely evolved from wasp like ancestors, contemporaneously with the angiosperm plants towards the end of cretaceous period, 60 to100 million years ago (Tesfaye *et al*., 2017). According to Dietz, (2004) the present bee fauna probably originated more than 70 million years ago. The majority of bee species are 'solitary' while the minorities are social (bumble bees and stingless bees), and only a few species of social bees, are kept in hives by beekeepers. There are three families of social bees, which produce honey. These are: the Bombidae, Meliponidae and Apidae (Kebede B and Lemma T, 2007).

The Bombidae are found mainly in temperate climates. Their nests are very small, often in the ground and are of no commercial importance except as pollinators of certain plants. The Meliponidae, or stingless bees, occur throughout the tropical regions of the world. Their nesting places may be holes in the ground, in hollow trees or small cavities in walls and on the underside of branches. The family Apidae, to which the honeybee belongs, is indigenous only to Europe, Africa and Asia (Birhanu T, 2016).

Beekeeping, which is today practiced over a greater area of the earth's surface than perhaps any other single branch of agriculture, passed through different stages of development: honey 6 hunting, traditional (forest and backyard) and improved (movable-frame and movable top-bar) methods of beekeeping. It is likely that man hunted for wild nests of bees and looked for their honey during the whole of his existence. Early man probably took honey from bees' nests wherever he found them, and the collection of honey from wild nests continued except in some regions where it has been entirely superseded by beekeeping (Tessega B, 2009).

There are many references to honey in ancient records and literature, but most of them gave no clue as to whether the honey was obtained by honey hunting or beekeeping. Wherever writing was known, honey was mentioned so many times in the Holy book of the people, and it often held a place of honor in their rights by (Amsalu B and Betre A, 2011).

Honey hunting has been a very common practice even up to present generation in many parts of Africa, including Ethiopia. In southwestern parts of Ethiopia, some households entirely depend

on honey hunting and forest beekeeping for their entire livelihood. Honey hunting is also common in pastoral communities in which beekeeping seem impossible. Beekeeping properly started when man learned to safeguard the future of the colonies of bees he found in hollow tree trucks, rock crevices or elsewhere, by a certain amount of care and supervision. Chala K, (2012) reported that by 2500 BC, before forest beekeeping is known to have existed, fully fledged beekeeping was being practiced in ancient Egypt and the earliest written records that relate to the keeping of bees in hives are from about 1500 BC. Generally, the earliest known evidence of beekeeping has been found in the Africa continent (Gebremedhn B, 2015).

Between 1650 and 1850 AD many hives with top-bars and frames were invented, but after these two centuries of effort there was still failure on the fundamental point: whatever bars or frames were used, the bees attached their comb to the walls of the hive as well, and the combs could, therefore, only be removed from the hive by cutting them out. Lorenzo Lorraine Langstroth made the step, which changed this, in 1851 when he discovered practical movable-frame hives with an appropriate 'bee-space'. The pattern of modern beekeeping was thus established between 1850 and 1900 AD. Different equipments were invented in this period, but Langstroth is advance in 1851 remains the basic principle of the box hive, and thus of our beekeeping today (Meixner *et al*., 2011).

2.2 Over View of Beekeeping in Ethiopia

In Ethiopia, beekeeping has been a tradition since long before other farming systems (Demisew W, 2016). 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.

In Ethiopia, beekeeping has been a tradition since long before other farming systems (Jaco W, 2013). 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 (Tesfaye *et al*., 2017). Moreover, the oldest basket hive in the International bee museum is from Ethiopia.

2.3 Types of Beekeeping Practice

2.3.1 Traditional beekeeping

In Ethiopia, traditional beekeeping is the oldest and the richest practice, which has been carried out by the people for thousands of years. Several million bee colonies are managed with the same old traditional beekeeping methods in almost all parts of the country (Workneh A, 2011).Traditional beekeeping is of two types: forest beekeeping and backyard beekeeping. In some places, especially in the western and southern parts of the country, forest beekeeping by hanging a number of traditional hives on trees is widely practiced. In other most parts of the country backyard beekeeping with relatively better management is common (Demisew W, 2016).

Traditional beekeeping is mostly practiced with different types of traditional hives. The most universal type of traditional hives, known to have been in use is simple cylindrical type. Bee-keeping started with traditional or fixed comb hives, so called because the combs are attached to the top and sides of the hive itself and the beekeeper cannot easily remove and replace them. Based on locally available materials used for construction of hives, environmental conditions and positions used to keep bees, the following variants of basic design are found throughout the country: hollowed logs, bark hive, bamboo or reed grass hive, mud (clay) hive, animal dung (mixed with ash) hive, woven straw hive, gourd hive, earthen pot hive and so on. The beekeepers that are experienced and skilful in using these hives could do many operations with less facility. Beyene T and Phillips D, (2013), Stated that under Ethiopian farmers management condition, the average amount of honey harvested, from a traditional hive on average was reported to be 6.1 kg/hive/year. This harvest is achieved with minimal cost and labor, and it is valuable to people living a marginal existence.

2.3.2 Transitional system of beekeeping

This involves low cost traditional technology often using mud top bar hives. Management of these hives is much easier and allows the hives products to be harvested more efficient (Adeday *et al*., 2014).

Top bar hives are a comprehensive between a traditional beehive and movable frame hive (MF). They normally just have one box, not two. Horizontal bars are placed along the top of the box,

covered with a lid. The bees are intended to build their combs on these bars, with the comb extending down into the box (Birhanu T, 2016).

Transitional hives in ideas condition can yield 50 kg of honey per year in Kenya (Beyene T and Phillips D, 2013). But under Ethiopia farmer condition, the average amount of crud honey produced per hive per year would be 12-15 kg (Haftu B and Gezu T, 2014) and it may reach up to 18 kg (IVCA, 2010).

2.3.3 Modern system of beekeeping

Modern beekeeping methods aim to obtain the maximum honey crop, season after season, without harming bees (Demisew W, 2016). Modern movable- frame hive consists of precisely made rectangular box hives (hive bodies) superimposed one above the other in a tier. The number of boxes is varied seasonally according to the population size of bees. Practical movable- frame hive was invented in 1851 by Lorenzo Lorraine Langstroth in U.S.A. (Gemechis L, 2015).

Later on different countries developed their own movable frame hives (for instance Zander, Dadant) and Langstroth was the prototype of movable frame hives used today. In many countries Langstroth hive boxes have proved to be convenient for handling and management. In Ethiopia, about 5 types of movable frame hives were introduced since 1970 (HBRC, 2010) and the most commonly used are: Zander and Langstroth style hives. Based on the national estimate, the average yield of pure honey from movable frame hive is 15-20 kg/year, and the amount of beeswax produced is 1-2% of the honey yield (Gezahegne, 2010).

To keep bees form building unwanted comb between vertical combs, or to the side of the hive, the spacing of the top bars is of primary importance; it must give the correct bee space which is precisely 32 mm for tropical A. Mellifera (Jaco W, 2013). However, in potential areas, up to 50-60 kg harvest has been reported (HBRC, 2010). Movable frame hives allow colony management and use of a higher level of technology, with larger colonies, and can give higher yield and quality honey but are likely require high investment cost and trained man power.

It is currently being promoted vigorously by the government and a number of private sector processor who has integrated farms (IVCA, 2010). Modern frame hive consisting precisely made rectangular box hives superimposed one above the other in artier. The number of box varied sea-

sonally according to population size of colonies. This type of hive is important for obtain maximum honey crop season after season without harming bees (Adebabay *et al*., 2012).

2.4 Economic Importance of Beekeeping

Beekeeping is one of the important economic activities in Ethiopia. It employs a number of people and provides an opportunity to rural families to supplement their income by marketing their bee products such as honey and bee wax at local market. In recent years due to the opening of large European market for bee products, there are some export opportunities which could use effectively and improvements in honey production and an increase in productivity would help to the country to meet the increasing demand for bee products in European market and generate export revenue. For many small households such as low income families with very small farm land, providing improved beekeeping equipment, productive clothing, and training extension services for beekeeping increase productivity (Destag, 2013).

The commodities have long shelf life and can be marketed locally or abroad, the amount of time involved can differ according to the bee keeping interest for leisure time, side line of full time involvement. No matter at which level of intensity a bee-keeping operates honey and bee-wax can be harvested, the whole family can become involved since men, women or elder children can do the work in most case at home. That means, it can help efficient utilization of family labor, A bee-keeping can develop knowledge and skill which is rewarding and generate self-reliance, Other local traders benefit by making live and equipment and from using and selling the products (Masuku, 2013).

Beekeeping has been part of the farming system in Ethiopia since time immemorial. It has been a tradition since long before other farming systems. Beekeeping is a very long-standing and deep-rooted practice in the rural communities of the country and around one million farmers are estimated to keep bees (Mammo, 2011). Beekeeping has been and still plays a significant role in the national economy of the country as well as for the subsistence smallholder farmers. The contribution of bees and hive products, though difficult to assess, is probably one of the most important small-scale income generating activities for hundred thousands of farmer beekeepers. Beekeeping also plays a significant role in the country food production through honey bee pollination service of major cultivated crops. Moreover in the country, many people are engaged in

honey trading at different level and also in production and selling of honey bees test (MoARD, 2011).

Beekeeping has many advantages that help farmer beekeepers to improve their well-being. The socio-economic impact of beekeeping and the main Hive products and importance of beekeeping are summarized as follows:

2.4.1 Honey Production

Honey, the natural product of honeybee, has many times been described as man's sweetest food. It is an excellent energy source because it contains simple sugars that are ready for assimilation immediately on reaching the intestine. Honey contains more than 180 elements and it has several uses (HBRC, 2010).

There is a strong, local demand for honey, due to its use for the production of traditional beverage '*Tej' (*honey mead). In Ethiopia, much honey has traditionally been fermented to make *'Tej* and according to Edessa N, (2002) 85 percent of the total honey estimated to be brought for market is used for '*Tej'* production and 15 percent of the total honey produced is consumed at home. Moreover, from the total honey produced in the country beekeepers are estimated to earn about 360-480 million Birr per year (Legesse G, 2014). The current annual honey production of Ethiopia is estimated to be about 43,373 tones (AMP, 2010).

Beekeeping is an important agricultural activity in Ethiopia. It is practiced as an integral part of farming activities. It is also a source of additional income for urban communities. Other than areas with extreme climatic conditions; beekeeping is common in every village and at virtually all small holder farms (Brad B, 2013). This makes the country the leading honey producer in Africa and one of the ten largest honey-producing countries in the world.

2.4.2 Source of immediate cash income

Beekeeping is believed to play a significance role and one the possible option small holder farmers in order to sustain their livelihood. It does not only serve as a source of additional income, but also quite a number of people entirely demand on beekeeping and honey selling for their livelihoods. Teweldemedhn G and Alem T, (2016), indicated that honey bee and their products provide direct cash income for beekeepers. In area where honey production is not attractive bee-

keepers can sell their colonies in the market. In these regard honey bee serve as near cash capital in beekeeping, which generate attractive money.

2.4.3 Bee wax production

In several region of the country, bee wax collections are not significant and the bee wax produced bees, which could harvest by keepers, don`t bother to collect it. Since, it is little practical value for beekeepers and the people do not know the local bee wax is generating attractive money. Nevertheless, the annual bee wax production of the country is estimated 3658 tones (AMP, 2010); this makes Ethiopia the fourth largest bee wax producing country in the world, after China, Mexico and Turkey. Bee wax supports the national economy through exchange earning. The annual average value of bee wax for Ethiopia is estimated about 125 million birr (MoARD, 2011). It has the largest bee population in Africa over 10 million bee colonies, one the importance steps in honey processing is preparation of pure honey. They also have low business concept or marketing information gathering and analysis. (Legesse G, 2014).

In Ethiopia, wax is largely collected from traditional hives rather than the modern hive. The wax yield from traditional hives is estimated to be 8-10%of the honey yield, compared to 0.5-2%from frame hives (Gibbon, 2011). Bees wax from honey consumed at the house hold level of bee keepers (includes their relatives and friends) and individual buyers of crude honey is generally discarded (MoARD, 2013).

The prospect for helping peasant farmers of third world and raising their living standard through the development of beekeeping activities are bright (Shire *et al*., 2016). Beekeeping has many advantages that help farmer beekeepers to improve their well-being. Its advantages can be itemized for the socio-economic impact of beekeeping. For instance, successful beekeepers raise their socio-economic standing in areas with subsistence agriculture, and farmers in developing countries can substantially supplement the family income, sometimes even double it. This means the family can be food secured. Furthermore, some of the importances of beekeeping are the following:

• Bees are cosmopolitan: they adapt to wide range of environment. In much of lower land, at altitudes below 400 m a.s.l. where cattle rearing may be severely constrained due to *tsetse* or other reasons, harvest could be obtained from beekeeping.

• Smallholders and landless peasants can practice beekeeping. The hive occupies very little space and bees can collect nectar and pollen from anywhere they can get; so wild, cultivated and wasteland areas all have value for beekeeping.

• Beekeeping does not compete for resources with other agricultural endeavors and can be run with other agricultural activities: Man cannot utilize nectar and pollen in the absence of beekeeping.

• Bee culture does not disturb ecological balance, as cultivation of crops and practices of animal husbandry.

• The investment and running costs are relatively low with minimal risk. Beekeeping is possible even for people with few resources; bees can be obtained from the wild, equipment can be made locally, and in most cases bees do not need the beekeepers' help.

• Globally, the honeybee provides pollination service. This is an indispensable activity in the crops and fruits production process. So that beekeeping plays significant role to the agricultural economy at large.

• The honeybee produces honey and beeswax. These commodities have long shelf life and can be marketed locally or abroad.

• The amount of time involved can differ according to the beekeepers interest for leisure time, sideline or fulltime involvement. No matter at which level of intensity a beekeeper operates; honey and beeswax can be harvested.

• The whole family can become involved since men, women, or elder children can do the work in most cases at home. That means, it can help efficient utilization of family labor.

• A beekeeper can develop knowledge and skill, which is rewarding and generate self-reliance.

• Other local traders benefit by making hives and equipment, and from using and selling the products.

2.5 The Importance of Beekeeping for Rural Development

Beekeeping is the good and useful source of supplementary income for farmers to pay expenditure like school fees, medical expenses for the family and other socio-economic costs in life.

These hence speeds up people`s development with (Stagey *et al*., 2017). Honey has antibiotic properties; it is highly acid and also contains enzymes that kill bacteria. Honey is good for healing wound, skin treatment (Tesfaye *et al*., 2017). Beekeeping is believed of play a significant role and one of the possible options to the smallholder farmers in order to sustain their livelihood. It does not only serves as source of additional income, but also quite a number of people entirely depend on beekeeping and honey selling for their livelihood,(Teweldemedhn G and Alem T, 2016). It indicated that honeybee and their products provide direct cash income for beekeepers. In areas were honey, production is not attractive, beekeepers can sell their colonies in the market. In this regard honeybees serves as "near cash" capital which generate attractive money (Latham, 2010).

The majority of population in developing countries lives below subsistence level manly in rural area. These include landless people and farmer. Beekeeping has great self-help potential for rural people's developing countries. It can make a significant c0ntribution to the economic improvement of small and marginal farmers (Assefa M, 2011).

And beekeeping has been expend as an effective ways for the poor peoples to improve their lively food through increasing income and also beekeeping is a good source of income and food to rural communities and providing being supporting the rural poor and secure themselves and their families from anger and send the children's to school using the extra income from honey sold. By providing beekeepers in developing countries with advises about simple, sustainable method. It helps them to increase their income without destroying the environment (Serda, 2015).

2.6 Factors that Decrease Productivity of Beekeeping

The production of constraints in beekeeping development for the countries complex and too large extent varies between agro-ecological zone and production system. Variations of production constraints also extend socio economic condition, cultural practice, climate and the behaviors of bees (Mulisa F and Fekadu B, (2017).

2.6.1 Honey bee disease and pests

Ethiopia is one the sub-tropical countries, the land are not only favorable to bees, but also for different kind of honey bees pests and predators that are entreating with the life of honey bees. The existence of pests and predators has negative effects to the honey bee and beekeeper. Pest

and predators causes damage on honey bee colonies with in short period of time (Desalegn B and Amsalu B, 2010)

2.6.2 Shortage of bee forage

Shortage forage due to population, luck land use policy and the high demand of farm land put pressure in forest areas to use for crop production and livestock grazing. Thus creates deforestation, soil erosion and irreversible ecological degradation. More over burning and destroying of forest for expansion of farm land good trigger redaction of honey producing flora and foraging area. The elimination of good nectar producing tree makes it difficult to maintain beekeeping without feeding (Serda *et al*., 2015).

2.6.3 Other constraints in beekeeping

Ethiopia has a potential for promoting beekeeping: both for local use and export purpose. However, like any other livestock sectors, this sub-sector has been caused by complicated constraints. The prevailing production constraints in the beekeeping sub-sector of country would vary depending on the agro ecology of the area where the activity carried-out (Edessa N, 2016). Constraints also extend in socio-economic conditions, cultural practices, climate and behavior of bees. According to Adebabay *et al*., (2012), the major constraints in the bee keeping sub sector are; the aggressiveness of behavior of bee, lack of skilled man power and institutions, low level of technology used, low improved beekeeping technology, drought and deforestation of natural vegetation, absence of policy in apiculture, inadequate research institution to address the problem. Ethiopia has been amongst the principle of honey and bee wax producers to understanding of the constraints and opportunities facing the Apiculture sub sector...socio-economic importance of beekeeping in the Ethiopia Economy (Kerealem E, 2009).

3. MATERIALS AND METHODS

3.1. Description of the Study Area

This study was conducted in Abeshege district, located in Gurage zone of Southern Nations, Nationalities and Peoples Region (SNNPR), Ethiopia. Abeshege district is bordered on the South by the Wabe River, on the West and North by the Oromia region, and on the east by Kebena district. The agro-ecology of the area is classified into two agro-ecological zones (midland and lowland areas). The district has generally a midland climate with an altitudinal rage of 1100–2300 masl, although there are some lowland areas (1100–1500 masl). It covers an area of 61,016 ha of which the mid- and lowlands constitute roughly 85 and 15 %, respectively. Based on the 2015 Census conducted by the CSA, the total population of the district, which constitutes two urban and 26 rural Kebeles, is 72,917 of which 37,187 (51 %) and 35,730 (49 %) were females and males, respectively. Based on information obtained from the Abeshege district Agriculture and Rural Development Office, the area is characterized by a heavy rainfall pattern with heavy and erratic distribution. 'Kiremt', the main rainy season, extends from June to September with the peak rainfall occurring during July and August. The short rainy season called 'Belg' stretches from March to May. The mean annual rainfall is 801–1400 mm. However, the short rains are highly erratic in nature that farmers do not rely on them for grain production. Its mean annual temperature is 23.2°C, with mean annual minimum and maximum temperatures of 18.0 and 28.3°C, respectively.

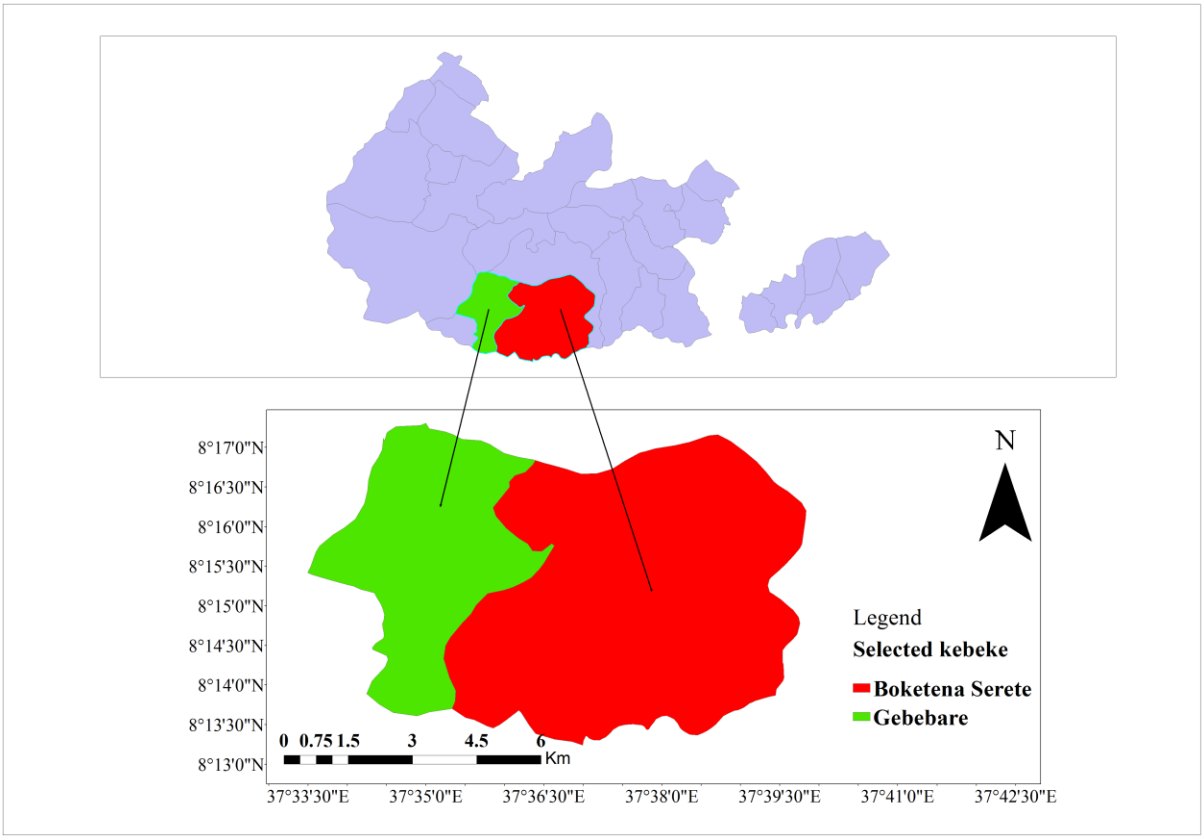

Figure 1 Map of the study area

3.2 Data Sources and Data Collection

The data was collected from both primary and secondary sources. Primary data was collected from respondents that are selected by purposive sampling techniques to provide data and to respond by preparing questionnaires. Secondary data was collected from different sources such as written documents, research papers, books, internets and periodic reports in the office of the district.

3.3 Sampling Procedure

Based on availability of beehive and the productivity of honey, two Kebeles (Gibebare and Boketena Serete) from the total 26 Kebeles in the district was selected by using purposive sampling technique. By using these techniques 60 beekeeper households (30 from Gibebare and 30 from Boketena Serete) was selected. During data collection 10 households (5 from each Kebele) for focus group discussion (FGD) and 6 key informants (3 from each Kebele) for key informant interview (KII) were included.

3.4. Method of Data Analysis

The collected data was coded and tabulated for analysis. Descriptive statistics were analyzed by using SPSS (version 20). So, frequency and percentage were used for analyzing the data. Frequency and percentage analyzed, the interpretation was expressed in clear, precise and meaningful way.

4. RESULTS AND DISCUSSION

4.1 Socio-Economic and Demographic Characteristics of the Respondents

Table 1 Socio- economic characteristics of the households (N=60)

Characteristics	Item	No of respondent	Percentage (%)
Sex	Male	47	78.3
	Female	13	21.7
Age	≤18	0	0
	18-35	18	30.0
	36-45	23	38.3
	≥46	19	31.7
Marital status	Married	51	85.0
	Single	9	15.0
	Divorced	0	0
	Widowed	0	0
Household size	1-4	15	25.0
	5-7	25	41.7
	>8	20	33.3
Religion	Orthodox	17	28.3
	Muslim	35	58.3
	Protestant	6	10.0
	Catholic	2	3.3
Education level	illiterate	33	56
	Grade 1-4	10	16.7
	Grade5-8	9	14
	Grade9 and above	8	13.3
Land size in hectare	≤0.5	16	26.7
	0.5-1	30	50.0
	≥1	14	23.3

Source: survey result, 2019, N represents number of respondents

From the above table "1" shows that 47(78.3%) of the respondents are males and 13(21.7%) are females. This shows that the females involvement in beekeeping were small comparing with males. The majority of the respondents were from age of 18-45 years. This shows that the majority of the respondents are found in productive age group, because in this age the respondents are responsible for agricultural activities. From above tables 85.0% of the respondents were married which means the respondents have their own family participate in beekeeping activities. The above table implies that the majority of respondents have their own family who involved in beekeeping. Household size 1-4 accounts 25.0%, 5-7 accounts 41.7% and household size ≥8 accounts 33.3%. From the above table 28.3% of the respondents are orthodox, 58.3% of the respondents are Muslim, 10% of respondents are protestant and 3.3% of respondents are catholic. Regarding education status, among the respondents 56% had not received any education, while 16.7% could only receive basic education. The rest were at stage of literacy ranging from elementary to high school level. More specifically, 14% and 13.3% of the respondents had attended 5-8 and grade 9 and above respectively. According to the results of the study the level of high illitares (56%) in the district limits the effectiveness of formal training programs, this leads to the problem on adoption of modern beekeeping technologies. The above table shows that the majority of respondents 50.0% have 0.5-1 hectare of land and 23.3% and 26.6% have <0.5 hectare and >1 hectare respectively. From this land the little portion is used for beekeeping. In some cases the farmers placed their hives on long trees around their farm land and under the eaves of the house in order to save their hive from various damages and thieves.

4.2 Importance of Beekeeping for Farmers in the Study Area

In the study area the farmers involved in beekeeping for many purpose as the respondents answer the farmers involved in beekeeping for the following reasons. As shown from the figure (2) the majority of respondents (61.3%) produce honey products for the purpose of consumption, because they do not produce much beyond their consumption. This is due to that, most of the farmers in the study area are using the traditional beekeeping hive, and also the occurrence of various factors that affect the beekeeping. Among respondents 13.7% of them involved in beekeeping for commercial purpose, and 25% of respondents involved in beekeeping for both consumption purpose and commercial purposes.

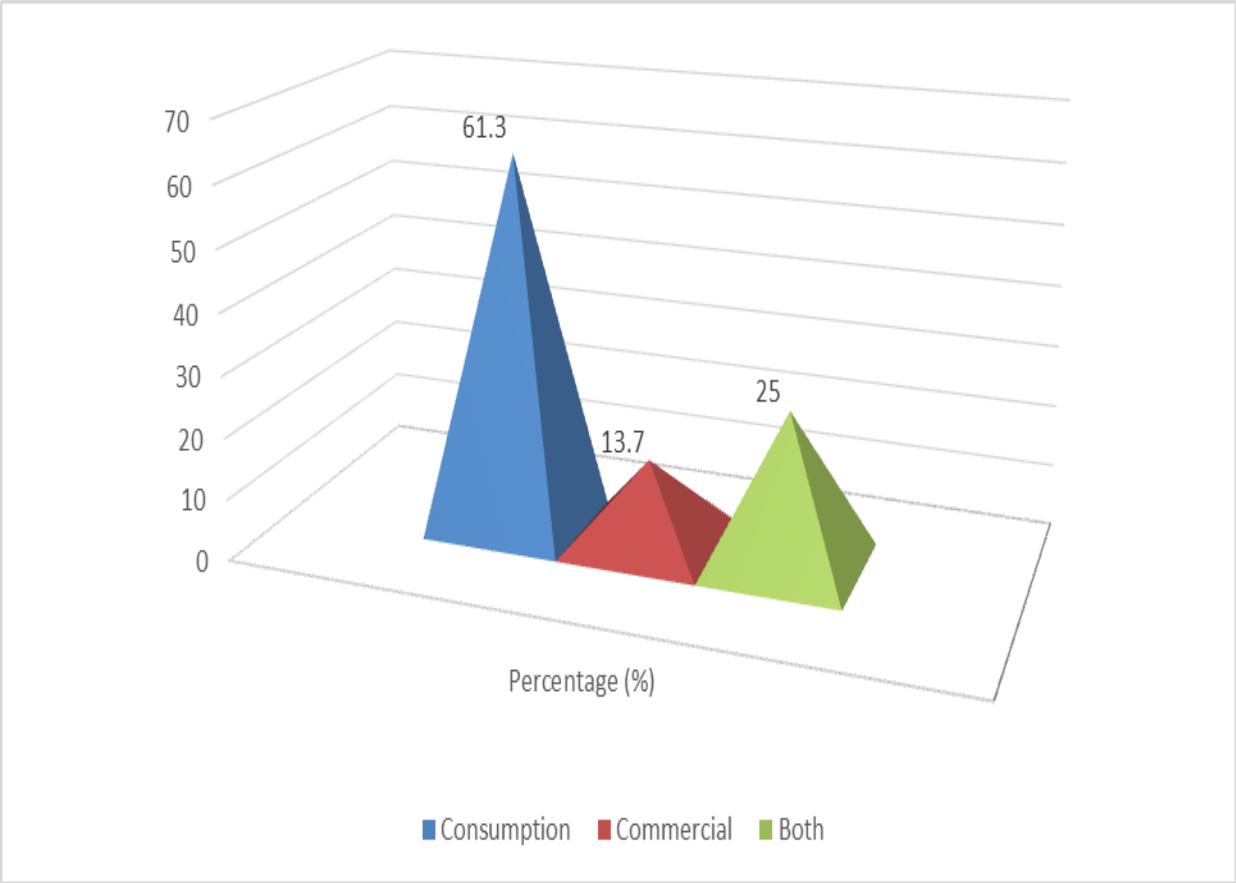

Figure 2. Importance of beekeeping for farmers in the study area (N=60)

4.3 Use of Income Generated from Beekeeping to the Farmers

Beekeeping is a good and useful source of supplementary income to farmers to pay expenditures like school fees, medical expenses, land tax, to purchase in organic fertilizer, and to cover other household expenses. From the figure (3) below 50% of the income generated from beekeeping for household expenses followed by for school fees, for land tax and for medical expenses. Each item accounts 23.3%, 13.35%, and 13.35% respectively. So, bee keeping have various advantages for beekeepers in order to sustain their livelihood.

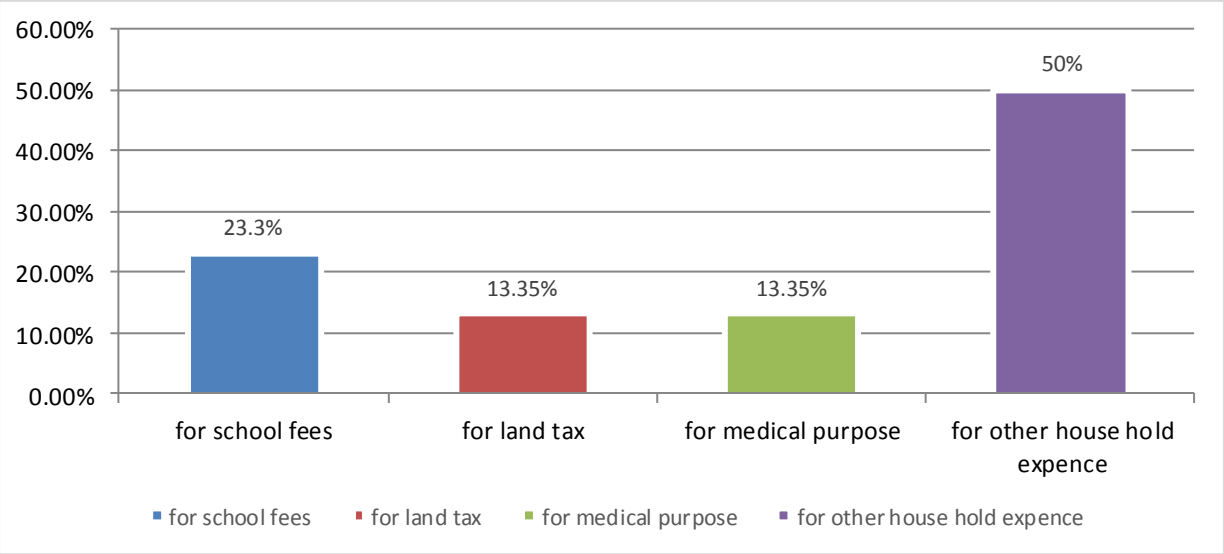

Figure 3. Expenditure of income generated from beekeeping to the farmers (N=60)

4.4 The Contribution of Beekeeping for Farmers' Income

In the study area beekeeping have a greater contribution for the farmers. The figure below shows that the existing income of the respondents per season they get from beekeeping. As shown the figure (4) below 34.6% of the respondents get 1600-2000 birr per season. While the rest 19.5%, 27.4% and 18.5% of the respondents get income of <1000, 1000-1500 and >2000 birr per season respectively. This income used to pay expenditures like school fees, medical expenses, lands tax, to purchase in organic fertilizers and to cover other household expenses.

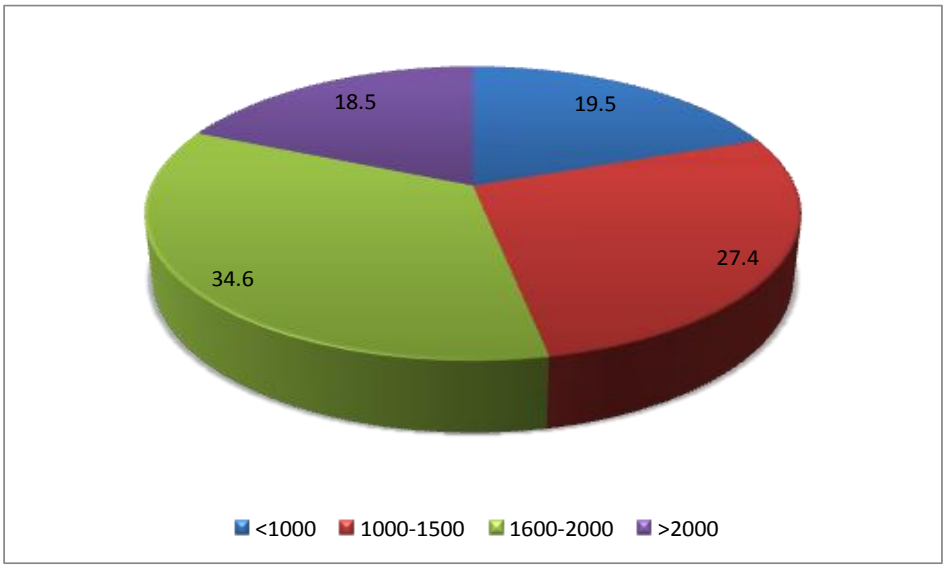

Figure 4. The contribution of beekeeping for farmers' income

4.5 Types of Beekeeping and Hive Used by the Farmers

In the study area both traditional and modern beekeeping hive were used by the farmers. As shown in the figure (5) 56.7% of the respondents are using traditional beekeeping , because traditional hive made from local available materials and its cost effective comparing with modern beekeeping hive and 20% of the respondents use modern beekeeping hive. The rest of 23.3% of the respondents use both types of hive. This was the reason for why there is low productivity in the study area.

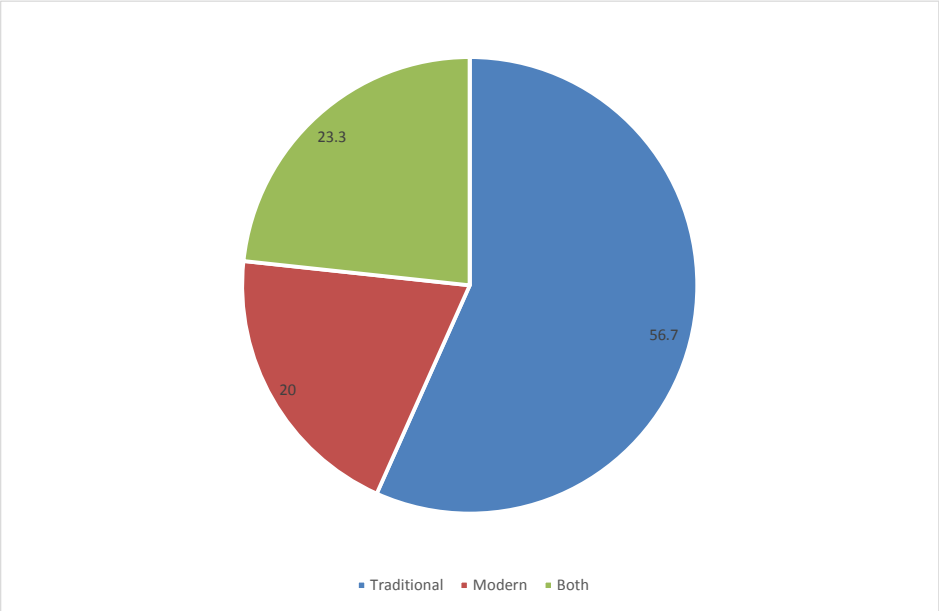

Figure 5. Types of beekeeping hive used by the farmers

4.6 Credit Access, Extension Services and Experiences in Beekeeping

The presence or the absence of credit access, extension services and experience in beekeeping are the determents for the protection of beekeeping in the study area. As shown in table (2) 55% of the respondents have an experience in beekeeping ≥11 years, this shows that beekeepers in the study area know about beekeeping practices from experience. As table shows 25% of the respondents have an experience of 6-10 years and the rest 20% of the respondents have an experi-

ence of ≤5 years. From the table 18.3% of the respondents answer "yes" question "do you use credit access for production and expansion of the beekeeping"? This shows that 11(18.3%) of the respondents use credit access for production and expansion of beekeeping. The majority of the respondents (81.7%) did no use credit access. This is due to the presences of limited credit access in the district.

In the same table (2) 8.3% of the respondent's answers "yes" for the question "do you use extension services?" Whereas, 91.7% of the respondents were did not use extension service for beekeeping activities. This implies the majority of the respondents did not use extension services due to shortage of extension agents in the study area.

Table 2: credit access, extension services and experience in beekeeping

Determinants		**No of respondents**	**Percentage (%)**
Experience in year	≤5	12	20
	6-10	15	25
	≥11	33	55
Extension services	Yes	5	8.3
	No	55	91.7
Credit Access	Yes	11	18.3
	No	49	81.7

4.7 Constraints Faced in Beekeeping

In the study area, the farmers who are practicing in beekeeping have some constraints which are factors of low productivity of beekeeping. From the figure (6) below shows that, the most serious problems faced by the respondents are drought followed by lack of beekeeping equipment, Honey bee colony, Thieves and Migration of bee. Drought is the main constraints in beekeeping activity as identified by the farmers in the study area. The study indicates that the second major problem of beekeeping is migration of bees, which accounts 20% of the total constraints that decrease the productivity of beekeeping. The third constraint is lack of beekeeping equipment to undertake the production. The market of the study area is far from the production area, due to this beekeepers travel on foot for several hours to sell their bee productions. The other factories

pest and diseases, shortage of honey bee colony and thieves are other factors of honey bee production.

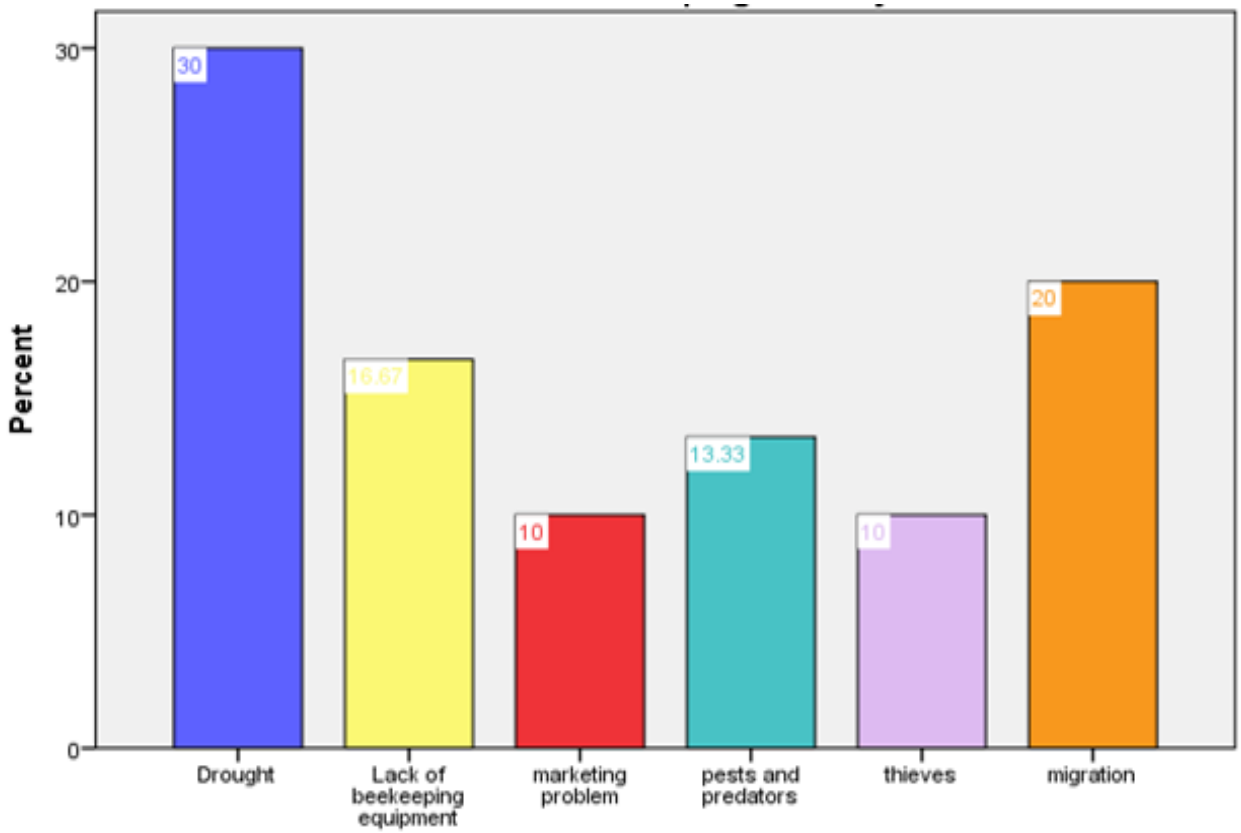

Figure 5. Constraints faced in beekeeping

4.8 Factor Affecting Adoption of Beekeeping Technologies

In the study area several factors are found to be affecting the adoption of beekeeping technologies. As indicated by the respondents those factors affect adoption of beekeeping technologies in the study area. Figure (7); indicate that inadequate skill and knowledge is the major factor which affects the adoption of new beekeeping technologies in the study area, which accounts 33.3% from other factors. The absence of credit access and extension service are the second and third factors that accounts 26.7% and16.7% respectively from the total factors. The problem of credit access increases in the study area the adoption level is decrease. The age farmers are inversely related with adoption of beekeeping technologies, which accounts 13.3% from other factors. Experience in beekeeping for long years is the best teacher that as it increases so does the adoption

of beekeeping technologies. The rest factor is farm size which accounts 10.0% from other factors.

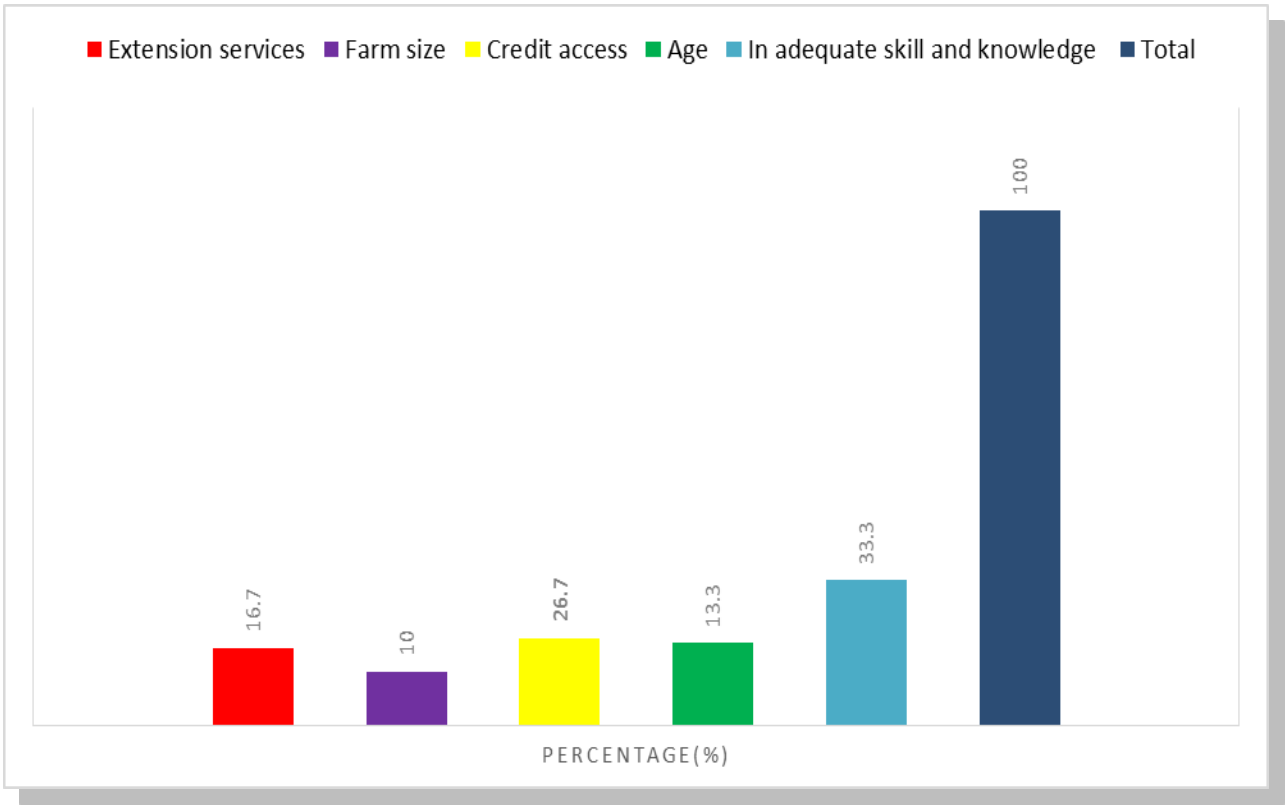

Figure 6. Factors Affecting Adoption of beekeeping Technologies

5. CONCLUSION AND RECOMMENDATOIN

5.1. CONCLUSION

Beekeeping is one of the important economic activities in the study area. In the study area majority of farmers produce honey and some others produce other products like beeswax. Beekeeping has been identified in the district as a major income generating activity with covering household expenses including medical expense, school fees, land tax and purchasing in organic fertilizer. Even if beekeeping provides the above benefits to the farmers, the presence of constraints that affect beekeeping including drought, shortage of honey colony, beekeeping equipment, pest and disease, thieves, marketing problem and migration of bee.

It also found out that beekeepers still own traditional beekeeping hive in study area, due to the reason that traditional hive can be constructed by beekeepers from locally available materials and its convenience to construct, cost effective and less dependent on external inputs. Their tendency to adopt modern beekeeping technologies is influenced by factors like extension service, farm size, credit access, age, inadequate skill and knowledge and experience in beekeeping.

5.2 RECOMMENDATIONS

Beekeeping is an important economic activity, which have higher contribution to the livelihood of farm households in the study area. Therefore to increase the productivity of beekeeping the following measures should be taken.

- The government must give training to farmers about modern beekeeping technologies. Most of the households have no knowledge and skill about modern beekeeping technologies.
- The government should organize beekeepers into cooperative, this helps them to have a power involving their problems and having better market opportunity towards the export market.
- The government or other concerned bodies should give an incentive to encourage the beekeepers in the production through extension service.

- There should be awareness creation programs concerning beekeeping practice and its importance to livelihood of farm households.
- Appropriate involvement in disease, pest and predator control should be strength by extension agency to reduce colony disturbance and to improve overall productivity.

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6. APPENDIX

Annex I Questionnaires

Questionnaires for economic importance of beekeeping in the study area

Part one: Socio economic and demographic information

1. Name of household head----------

2. Kebele: A. Gibebare □ B. Boketena Serete □

3. Sex: A. Male □ B. Female □

4. Age: A, ≤18 □ B, 18-35 □ C, 36-45 □ D, ≥46 □

5. Marital status; A, single □ B, windowed □ C, divorced □ D, Married

6. House hold size A, 1-4 □ B, 5-7 □ C, ≥8 □

7. Religion; A, orthodox □ B, Muslim □ C, catholic □ D, protestant □ E, others (specify) ------

8. Educational level of households head

A, Illiterate □ B, Grade 1-4 □ C, Grade 5-8 □ D, Grade 9 and above □

9. Land size in hectare A, <0.5 □ B, 0.5-1 □ C, >1 □

Part two: Beekeeping related questions

10. Types of production do you practice A, traditional hive □ B, modern hive □ C, both □

11. In which type you are more advantageous? How?

12. Experience in beekeeping A, ≤5 year's □ B, 6-10 years □ C, ≥11 years □

13. Do you use extension service when under taking the production? A, yes □ B, no □

14. What advantage you get from extension services? _____

15. Do you get beekeeping training? 1. Yes _____2. No_____

16. Do you use credit access for production and expansion? A, yes □ B, no

17. If yes, for what purposes you get credit? _____

18. How you start beekeeping (source of bees and type of technologies used for the first time).

1 Gift from parents_____ 2 Catching swarms_____ 3 Buying_____ 4 Trained _____ 5 Interest_____ 4 others (specify) _-_____

19. If the answer for question 18. Is buying, does the bee colony sale in your locality?

1. Yes _____ 2. No_____

20. If yes, what is the price of one colony? _____ ETB.

21. How many honeybee colonies you owned? _____

22. Where did you keep your bee colonies?

1. Backyard__ 2. Under the eaves of the house__ 3. Inside the house__ 4. Hanging on trees near homestead__ 5. Hanging on trees in forests__ 6. Others (specify) __

23. What are the constraint /problems you face in the production of honey bee?

24. In what mechanism you solve this problem?

25. Does your involvement in honey bee production have a contribution on your income?

A, yes □ B, no □

26. What are the factors that affect the adoption of bee keeping?

27. Did your colonies abscond? 1. Yes_____ 2. No_____

28. What are the reasons for bees absconding hive? _____

29. If drought is a problem how is its frequency of occurrence? Every year(s)

30. What are the major pests and predators found in the area that threat your colonies?

1 Ants__ 2 Wax moth__ 3 Bee lice__ 4 Beetles__ 5 Spiders __6 Wasps__ 7.Lizard__ 10 Snake__ 11__ Monkey__ 12 Birds__ 13 Hamagot /Shelemetmat__14 Others (specify) _____

31. Do you observe any honeybee diseases in your apiary? 1. Yes____ 2.No____

32. If yes, what are the diseases you observed?

33. In which hives your colonies do more likely affected by the diseases?

1. Traditional_____ 2. Intermediate_____3. Movable-frame_____

34. What are the smoking materials you are using? (Rank)

1. Dry grass_____2. Straw _____3. cow dung_____

35. What kind of beehive products you produce?

1 Honey_____ 2 Crude beeswax_____ 3 Propolis_____ 4 Others, specify_____

36. While harvesting does you remove all honeycombs? 1. Yes _____ 2. No___

37. Do you harvest all brood combs? 1. Yes _____ 2. No_____

38. If no how much honey /no of combs/ left? _____

39. List the home use of honey.

1. as a food_____ 2. As a medicine_____ 3. For beverages _____
4. Others (specify):_____

40. Do you collect crude beeswax? 1. Yes__2.no__

41. If yes, why you are collecting crude beeswax?

1. for income generation___ 2. Candle making __ 3. Foundation sheet making_____
4. Religious and cultural use_____5. Others, specify:_____

42. If you don't collect/produce beeswax what is (are) the reason (s)?

1. Lack of market_____ 2. Lack of knowledge____ 3. Lack of processing skill___ 4. Lack of processing material_____ 5. Others specify: _____

43. Do you collect propolis? 1. Yes _____ 2. No_____

44. If yes, for what purpose you are using the propolis?

1. for sale (marketing) _____2. As a medicine _____ 3. Others specify: _____

45. If your response is no, what is (are) the reason (s)?

1. Lack of market_____ 2. Lack of knowledge_____

3. Others specify: _____

46. Does beekeeping profitable to the area? 1. Yes _____ 2. No_____

47. If yes, how? _____

48. If no, why? _____

Annex II: Summary of SPSS tables

Age of house hold

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-35	18	30.0	30.0	30.0
	36-45	23	38.3	38.3	68.3
	>46	19	31.7	31.7	100.0
	Total	60	100.0	100.0	

sex of house hold

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	47	78.3	78.3	78.3
	Female	13	21.7	21.7	100.0
	Total	60	100.0	100.0	

marital status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	9	15.0	15.0	15.0
	Maried	51	85.0	85.0	100.0
	Total	60	100.0	100.0	

education level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Illitrate	34	56.7	56.7	56.7
	Grade 1-4	10	16.7	16.7	73.3
	Grade 5-8	8	13.3	13.3	86.7
	Grade 9 and above	8	13.3	13.3	100.0
	Total	60	100.0	100.0	

religious of house hold

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Muslim	35	58.3	58.3	58.3
	Orthodox	17	28.3	28.3	86.7
	Protestant	6	10.0	10.0	96.7
	Catholic	2	3.3	3.3	100.0
	Total	60	100.0	100.0	

house hold size

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-4	15	25.0	25.0	25.0
	5-7	25	41.7	41.7	66.7
	>8	20	33.3	33.3	100.0
	Total	60	100.0	100.0	

land size in hectare

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<0.5	30	50.0	50.0	50.0
	0.5-1	16	26.7	26.7	76.7
	>1	14	23.3	23.3	100.0
	Total	60	100.0	100.0	

types of beekeeping hive

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Traditional	40	66.7	66.7	66.7
	modern	6	10.0	10.0	76.7
	both	14	23.3	23.3	100.0
	Total	60	100.0	100.0	

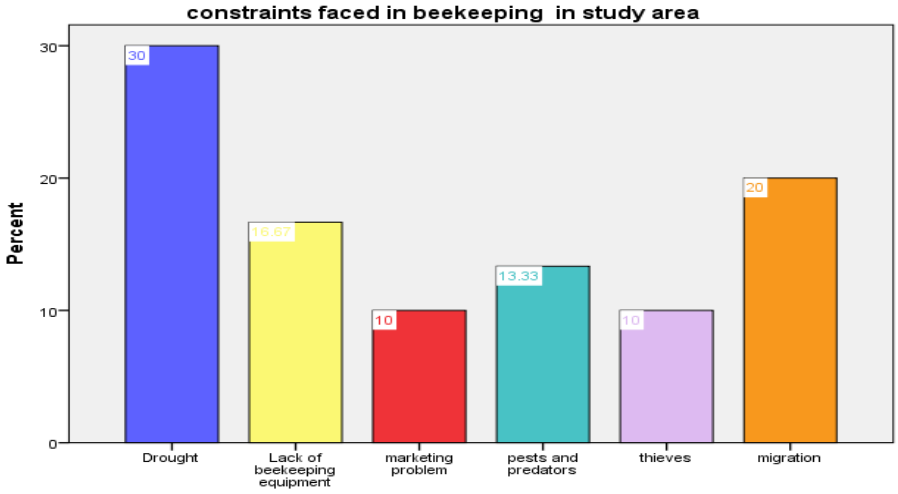
Credit Access

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	11	18.3	18.3	18.3
	NO	49	81.7	81.7	100.0
	Total	60	100.0	100.0	

extension service in beekeeping

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	5	8.3	8.3	8.3
	NO	55	91.7	91.7	100.0
	Total	60	100.0	100.0	

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Drought	18	30.0	30.0	30.0
	Lack of beekeeping equipment	10	16.7	16.7	46.7
	marketing problem	6	10.0	10.0	56.7
	pests and predators	8	13.3	13.3	70.0
	thieves	6	10.0	10.0	80.0
	migration	12	20.0	20.0	100.0
	Total	60	100.0	100.0	



Footnote

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Extension service	10	16.7	16.7	16.7
	Credit access	16	26.7	26.7	43.3
	Farm size	6	10.0	10.0	53.3
	Age	8	13.3	13.3	66.7
	inadequate skill & knowledge	20	33.3	33.3	100.0
	Total	60	100.0	100.0	

PICTURES