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MSc Thesis Report

Assessment of Factors Affecting Honey Production in Tole District, South West Shewa Zone, Oromia Regional state, Ethiopia

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Assessment of factor affecting honey production in Tole district south west Shewa Oromia Regional state Ethiopia

A Thesis submitted to the college of natural and computational sciences of Addis Ababa University in partial fulfillment for the requirements of the degree of Master of Science in General Biology

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THESIS APPROVAL SHEET

As member of the Board of Examiners of the Master of Sciences (MSc) thesis open defense examination, we have read and evaluated this thesis prepared by Hana Getahun entitled " **Assessment of factor affecting honey production in Tole district south west shewa Zone Oromia Regional State, Ethiopia "**

We here by certify that, the thesis is accepted for fulfilling the requirements for the award of the Degree of Masters' Science in General Biology

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DEDICATION

This thesis is dedicated for my daughters, my husband and the rest of the family including the late Ato Mamo Abebe who is my father in-law.

DECLARATION

I declare that this thesis is my original work. It has never been submitted to any institution and all sources of materials used for the thesis have been acknowledged. This thesis has been submitted in partial fulfillment for the requirement of MSc degree in Biology at Addis Ababa University.

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This thesis has been submitted for examination with my approval as

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LIST OF ABBREVIATIONS/ACRONYMS

AGRDO:	Agricultural and Rural Development Office
CSA:	Central Statistical Agency of Ethiopia
DA:	Development Agent
FGD:	Focal Group Discussion
HB:	Honey Bee
MOA:	Ministry of Agriculture
MOARD:	Ministry of Agriculture and Rural Development
NHB:	National Honey Board
PA:	Peasant Association

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ABSTRACT

Honey production in Ethiopia exists in many areas. Ethiopia as the country contains a bit of natural forest, optimal environmental condition and different species of flora which are high potential for honey production. However, deforestation and expansion of exotic plants hinders beekepers to benefit from honey production. This study was conducted in Tole district south west shewa , Ethiopia to asses the factor affecting honey production in 2024. The primary aim of this study was to identify factors affecting honey production in three randomly selected kebeles including Tulu Taji, Gonana Bubbisa and Bantu of Tole District. Data were collected from the total of 138 respondants that is 46 from each kebele. Primary and secondary sources of data were used for this study. Both qualitative and quantitative data were collected. The semi structured interview and structured questioniare were employed. Focal group dicussions and formal field survey method were used to collect the primary data.The data collected were analyzed using descriptive statistics using statistical package for the social science (SPSS) version 23 . Results of house hold survey showed that the dominant honey production practice in the study area was the use of traditional hive. The cost of traditional hive was cheaper than and modern hive . Major factors affecting honey production include cost of modern hive (86.23%) expansion of exotic plant species (79.71%), deforestation through climatic change (87.68%), agro chemical (60.15%), pest and predators (60%), lack of awarness (83.3%) and aggressive properties of honey bee (70%). However, deforestation and expansion of exotic plant species by large affected honey production in the study area. The expansion of this exotic plant species decreased biodiversity significantly and directly affect the quantity and quality of honey production in the area. Regarding cost of modern hive the policy should focus on creating access to modern honey bee techologies. It is good if awarness will be given to the community on ways of optimal honey production by minimizing the factors affecting the business which can be done by organizing training either by government extension office and/or NGO.

Key word /phrase – Honey production, Exotic species, Deforestation Green legacy, Awareness

CHAPTER 0NE

INTRODUCTION

Honey is a natural substance of sweet flavor and produced by honey bee especially by the species *Apis melifera L.*. But, first sweetener discovered by man and its use date back to the origin of man kinds itself (Havsteen, 2002). Honey gets its sweetness from the monosaccharide fructose and glucose (National honey board June, 2012) when used a sweater it has attractive chemical properties for baking and a distinctive flavor. Honey's use and production has long and varied history. In ancient time people of Egypt use honey to produce sweeter cakes and biscuits from honey (Mielidautore, 2013) which indicates human began using honey at least 100000 years ago (Bogdanov, 1999). Aristotle says that ''eating honey prolongs life'' while Hippocrates says'' I eat honey and use it in the treatments of many diseases because honey offers good food and good health''. Pedanius Dioscoride a Roman surgeon in army has wrote in his book that 'honey could be used as treatment for stomach diseases, wound with pus, hemorrhoids and treatment to stop coughing'' (Martosetal, 2000). Honey contains antioxidants, minerals, vitamins, proteins and a high calories value which present attractive ingredient that do not occur in artificial sweeteners (Alkire and Foster, 2011) consumption of honey improves food assimilation reduce infective intestinal problems such as constipation, duodenal ulcer and liver disturbances which increases proper food utilization (Krell, 1996). Sealed honey does not spoil even after thousands of years because most microorganisms do not grow in honey (Geiling, 2013). Honey primarily used in traditional medicinal system as it had curative properties because honey is made from particular medicinal plants (FAO, 2009). Bacteria *streptococcus progenies* that causes sore throats can be inhibited from growth by the use of honey. Bees wax has antibiotics properties and used for arthritics and nasal inflammation (FAO, 2009).

Honey bee is any member of the genus Apis primarily distinguished by storage of honey and the construction of perennial, colonial nests from wax, currently only seven species of honey bee recognized with 44 sub species. The best known honey bee is the western honey bee that has domesticated for honey production and crop pollination (Michael and Engel, 1999). Chinese went a head of the rest of the world in terms of preserving the honey consuming and collecting it as they were first to begin beekeeping (Fanli, 2006) Africa is blessed with numerous types of wild honey bee Ethiopia has huge potential for honey production which is clearly observed in the last few years. The south western part of Ethiopia which is endowed with dense natural forest, appropriate environmental condition and different species of flora and faunal has a prominent potential for honey production (Adjare etal., 1990).

In Ethiopia, honey production is present in many parts of the country. Simplicity of the production system, low costs and favorable conditions resulted in production processes that appear everywhere. Especially, for resource poor farmers with no or little land, this activity is a main source of income. In addition to their financial value, honey and beeswax have many cultural values and form part of ceremonies for birth, marriages, funerals, Christmas and other religious celebrations in many societies. Beekeepers are generally respected for their craft. All of these aspects are Livelihood outcomes from the activity of beekeeping. While some may be difficult or impossible to quantify, they are real outcomes that strengthen people's livelihoods and therefore should be acknowledged by a beekeeping intervention (Brad Bear, 2009). Apart from enhancing food security, beekeeping and honey production provides employment especially in areas where there was population pressure on the land (Illgener *et al.*, 1998).

This helps households manage economic shock. Which lead to the reduction of vulnerability among these households. Since honey production is a traditionally well-established household activity in almost all parts of Ethiopia including Tole district, it significantly contributes to rural employment. The employment effect of honey production reflected on farmers, traders, bee equipment producers, local tej makers and processors among others. The exact number of people engaged in the honey production is not well documented. However, it is estimated that around one million farm households are involved in honey production in Ethiopia (MOARD, 2005/06). Ethiopia has huge potential for honey production which is clearly observed in the last few years with significant increment, eventhough the subsector is still practicing with traditional low productive systems. Research and extension made so far have tried to improve this scenario in the country. Various investigations in particular have identified the problems in the production of the Ethiopian honeybee. The countries apicultural research is not only focusing on the challenges and opportunities of honeybee production, but also it is acquiring the developing arm to investigate and analyze the quality and characteristics of honey produced from different plant species and different seasons. But, this is not to mean that it is efficient, it is apparent that a lot more is to be done to improve the quality of the honey produced.

The major constraints in the beekeeping sub sector in Ethiopia are the behaviors of bees including aggressiveness, swarming tendency and absconding. 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 postharvest management of beehive products and marketing constraints, indiscriminate application of agrochemicals, honeybee diseases, pests and predators, poor extension services, absence of coordination between research, extension and farmers, shortage of records and up-to- date information, and inadequate research institutions to address the problems are other problems affecting honey production significantly (Edessa:2005.)Nevertheless, all these problems may not be constraints to all parts of the country and may not be

equally pressing to every place. (Ayalew:2001). Different studies were conducted on honey bee in the south west Ethiopia on honey value chain, honey production systems, technology adoption and market outlet selections of honey (HBR :1997). But, none of these studies addressed factors affecting high honey production system and marketing particularly in the study area. Hence, the current study was initiated to know honey production systems and pin points factors affecting the sector.

1.2 statement of a problem

Africa is blessed with numerous types of wild honeybees (Adjare.*etal*, 1990). Ethiopia is one of the countries in the continent which possess huge honey production potential. Owing to its varied ecological and climatic conditions, Ethiopia is the home of diverse flora and fauna in Africa. Since, it had ideal climatic conditions and diversified floral resources which allow the country to sustain around 10 million honeybee colonies (7million were kept in local beehives by farmers and the remaining exist in the forests as wild colonies) and makes the country to have the highest bee density and the leading producer of honey and beeswax in Africa (Ayalew *et al.*, 2001; Nuru *et al.*, 2002). Therefore, Ethiopian annual honey production was estimated to 43,373 metric tons which is 23.5% and 2.35% of African and world's honey production, respectively. This makes the country ranked 1st in Africa and 10th in the world (CSA, 1995). Because, of the existence of more than 7000 species of flowering plants which most of them are pants on which honey bee forage to collect pollen and nectar to make honey (Girma,1998). Moreover, a variety of landscape differences has given the country better potential for honey production (Gebrayesus,2001). Nevertheless, productivity has always been low, leading to low utilization of hive products domestically, and relatively low export earnings. Moreover, the products obtained from this sub sector are still low, poorly managed and unattractive in appearance as compared to the potential of the country. The type of hives used the methods of removing and storage of honey play a vital role in the quality of honey (Edesa,2005).

Bee keeping by its nature does not need large size of land, but there are common obstacles in honey production system such as climate change, deforestation, use of agro- chemicals, lack of skilled man power and awareness in the community, weak access to profitable export markets due to low productivity and lack of connection with processors. But, none of these studies addressed factors affecting high honey production system and marketing particularly in the study area. Hence, the current study was initiated to know honey production systems and pin points factors affecting the sector.

1.3 Research questions

1. What kinds of hives do people use and what are their effects on honey production?

2. What is the effect of agrochemical use and honey bee pests on honey production?

3. Does reforestation of exotic woody plant species affect honey production?

4. What has been the driving force that makes honey production low?

1.4 Objective of the study

1.4.1 General objective

To assess factor affecting honey production in Tole districts

1. 4.2 Specific objectives improve all

1.To identify types of hives used in the study area

2.To assess the agrochemicals used and types of pests affecting honey bee

3.To assess effects of deforestation and climatic change

4. To determine impacts of exotic wood plants species on the honey production

5. To evaluate the community altitude and awareness towards honey production

1.5. Research Hypothesis

$H_{o:}$ There are constraints in honey production in Tole District

1.6 significance of the study

In most of the rural Ethiopia honey production is a supplement to the main agriculture that involve crop production and livestock raising mainly to generate cash which the producers use for different purposes such school fee payment, purchasing of food supplement and so on. Hence, doing research such as the current one will give information to improve the quality and quantity of honey production.

CHAPTER TWO

LITERACTURE REVIEW

2.1 Honey production System in Ethiopia

Honey hunting has been a very common practice even up to present generation in many parts of Africa including Ethiopia. In some parts of Ethiopia, some households entirely depend on honey hunting and forest beekeeping for their entire livelihood. In places where wild colonies of bees living in hollow trees and caves found, honey hunting is still a common practice in Ethiopia (Tessega, 2009).

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 around 23.6% and 2.3% of the total African and world's honey, respectively. It is the leading honey producer in Africa and one of the 10 largest honey-producing countries in the world (CSA, 1995).

Honey in Ethiopia is generally produced as a cash crop, with yearly sales amounting to 90 to 95 percent of total production. Currently, the majority of honey produced (about 70 percent of the 90 to 95 percent designated for sale) is sold to tej houses. The remaining portion is marketed as table honey for general consumption (Tadesse and Phillips, 2007). The same trend to in this study area tej is cultural drink and most honey produced was solid for tej house next to home c According to Ayalew (2008) reported that currently in Ethiopia, beekeeping practiced in three types of production systems namely; traditional, transitional and frame beehive beekeeping modern.

2.1.1. Traditional Beekeeping

Traditional beekeeping is the oldest and the richest practice, which has been carried out by the people for thousands of years in Ethiopia. This beekeeping practice is extensive and closely tied to swarm management: beehives are hung up in trees to catch swarms and are then transferred and placed in the backyards with some kinds of hive sheds that protects them from the hot temperature and rain. Traditional beehives (30-40 cm across and 1 m long) are crafted by creating a tube-shaped structure using branches, straw, cow dung and clay. But sometimes hives can be made from soft logs of a cactus tree (Gallmann and Thomas, 2012). As reported by, Beyene Tadesse and David (2007) under Ethiopian

farmers' management condition, the average amount of crude honey produced from a traditional beehive is estimated to be 8 to 15 kg per harvest/beehive/year in which about 8-10% of its weight is beeswax. However, this harvest is achieved with minimal cost and labor, which is valuable to people living a marginal existence (Tessega, 2009). This beekeeping practice may differ from place to place and beekeeper to beekeeper based on the resources and knowledge in the area. Accordingly, two types of traditional beekeeping practices are found in the country (forest beekeeping and backyard beekeeping). In some places, especially in the western and southern parts of the country, forest beekeeping is widely practiced by hanging a number of traditional beehives on the trees.

In the other most parts of the country, backyard beekeeping with relatively better management is the common and dominant type of beekeeping (Nuru and Adgaba, 2002); However, traditional beehives in this system have their own disadvantages on colony management and honey harvesting activities including: difficulty in colony inspection for brood diseases, difficult to work with open hives in the night, not appropriate for artificial queen rearing, higher chance for a number of bees and a queen to be killed during operations, very difficult yield and behavior targeting selection. Furthermore, colony feeding during times of food shortage is not easy and appropriate, difficult to judge ripeness of honey before harvesting, low quality honey harvest, brood, nectar and pollen storing combs will be destroyed during harvesting(Nuru and Adgaba, 2002).

2.1.2. Transitional (intermediate) Beekeeping

Transitional system, which has been speculated to be started in Ethiopia since 1976, is a type of beekeeping which is between traditional and modern beekeeping. Transitional (intermediate) beekeeping practice has different advantages over traditional system. These include: hives can be opened easily and quickly, the bees are guided to building parallel and unattached combs following individual top bars, top bars are easily removable and this enables beekeepers to work fast, top bars are also easier to construct, honeycombs can be removed from the hive for harvesting without disturbing combs containing broods, beehives can be suspended with wires or ropes and this gives protection against pests (HBRC, 2004)..

However, transitional beekeeping has its own disadvantages such as top bar hives are relatively more expensive than traditional beehives, and combs suspended from the top

bars are more apt to break off (HBRC, 2004). Thus, as reported by, HBRC (1997) the types of beehives used more frequently in this system are the Kenyan top-bar hives (KTBH), Tanzania top-bar hives (TTBH) and Mud- block hives (MBH). Among these, KTBH is widely known and commonly used in many parts of the country. Currently, intermediate or transitional beehives that are either the Kenyan top bar hives or the locally made "chefeka" hives. According to Workneh *et al.* (2008) the honeybees have accepted the Chefeka hive made from locally available materials.

2.1.3. Frame Hive Beekeeping

The main purpose of frame hive beekeeping method is to obtain the maximum honey crop, season after season, without harming bees (Nicola, 2002). Accordingly, it uses different types of frame hives (Zander and Langstroth hives being common in the country, Dadant, Modified Zander, and foam hives are also found). However, these hives basically differ in the number and size of frames. Generally, frame hive consists of a precisely constructed rectangular boxes (hive bodies) superimposed one above the other in a tier. Similarly, the number of boxes (suppers used) varies with season, population size and activities of bees. As reported by, HBRC (1997) these box hives have an advantage over the others in the volume and quality of honey harvested (averagely 15-20 kg/year and in potential areas up to 50-60 kg harvested). Moreover, the hives allows swarm control through spurring and colony management, it is easy to transport and allows the use of higher-level technologies. However, equipment in this beekeeping system are relatively expensive, require skilled manpower, very less wax production only 1-2% of the honey yield (Gezahegne and Tadesse, 2001). High cost of modern bee hives: Some of the bee equipment's such as modern bee hives, wax printers and honey extractors are very expensive and thus farmers could not affordable to buy and use this equipment. Currently, the cost of one modern bee hive ranges from 900- 1000 ETB. The cost of honey extractor is ranging 4,000-5,000 ETB and the cost of wax printer is ranges from 5,000-6,000 ETB. As a result of these, there is a shortage of appropriate technologies for production, collection, processing, packing and storage in the area. Improved bee equipment's to the district farmers are beyond their buying capacity and even is not easily available for those beekeepers who are afford to buy it.

2.2 Climate change impacts on honey bee

A climate changes are affecting the relationship between plants and their pollinators to decline honey bee population. Numerous studies have already shown advanced flowering times (Abu-Asab *et al*., 2001), and other pollinators, such as butterflies, are also peaking earlier in the season (Roy and Sparks, 2000). Honeybees forage in extreme weather conditions; however, the level of pollination has recently dropped as a result of honeybee population decline (often associated with CCD). In some cases, the flowering period of a plant may not correspond to the peak or emergence of its corresponding pollinator (Jump *et al.*, 2002). How honeybees might be affected by such changes remains unknown. Although, honeybees are generalists, and forage on many plant species, and display remarkable plasticity to various environmental conditions. For example, honeybees found in the oases of the Sahara are able to thrive in hot conditions by collecting water for evaporative cooling to thermo regulates the colony. Under cold conditions, honeybees will form tight clusters inside the hive and create heat by isometric ally contracting their thoracic muscles (Seeley, 1996). Climate change creates an opportune condition that favors the spread of pests and diseases outside their known active range. Modeling climate change scenarios is oftentimes useful tool to assess the climate analogues to unveil the potential risk of spreading suitability conditions for pests and diseases and hence allows development of appropriate responses to address the impending challenge. In the current study, we modeled the impact of climate change on the distribution of Varro a destructor, a parasitic mite that attacks all life forms of honey bees and remains a significant threat to their survival and productivity of bee products in Tanzania and elsewhere. (Giliba etal.2020)

2.3.1. Pest and predators of honey bee

Ethiopia, as one of the sub-tropical countries, the land is not only favorable to bees, but also for different kinds of honey bee pests and predators that are interacting with the life of honey bees In honey bees, evidence of predation or a direct attack can decrease recruitment dancing and thereby magnify the effects of individual predation a Honey badger is a small strong mammal that caused considerable damage to beehives, honey, and other hive products attempts at a colony level. However, actual predation attempts and successes are relatively rare. Birds, wild animals, and other vectors that scavenging honeybees like the skunks and bears predators. Skunks are insectivores and often attack beehives and consumes large quantities of honeybees during the night (Mayer, 2019). The rodents such as mice,

rats, and squirrels, shrews, moles, skunks, raccoons, and opossums were the pests of a honeybee (MAAREC (Atlantic Apiculture & Extension Consortium), 2004; BMPHH (Best Management Practices for Hive Health), 2019). Amphibians, reptiles, birds and mammal feed on honey and honey bee considered the most damaging group of pest (Sarwar,2016) Honeybees and colonies have lacked the immunity used against their predators which caused predation, destruction of the combs, physical dismember ships, and colony hungry. The principal method of damage prevention is the use of electric fencing for bears and traps for skunks as well as establishing the apiary at safe sites where they are not able to climb and drop inside the fence Wakgari & Yigezu, Cogent Food & Agriculture (2021)

Lice are known to infect honey bees in hive. Bee louse are wingless ectoparasite fly which causes significant damage bee colonies. Bee lice larvae feed on honey and pollen by tunneling under the cell capping (Morse and Nowogrodzki, 1990). In Ethiopia infestation of lice in honey bees was reported from the western region of Shoa, Oromia regional state with overall prevalence rate of 42% with highest prevalence rate 70.8% in Gemechis, 50% in Holeta and 17.1% in Jaldu (Gizachew et al., 2013). And also in Tigray regional state reported an overall prevalence 4% in brood and 5.5% adult bees (Adeday et al., 2012). Small hive beetle is native to Africa, where it is considered as a minor pest of honey bees. Both adults and larvae are able to be serious pests that weakened honey bee colonies or honey supers. The beetles multiply to vast numbers, their larvae tunnel through comb to eat brood, damage stored honey, and ultimately destroy infested colonies or cause them to abscond. The beetle also defecates in the honey, causing it to ferment and run out of the combs (Lundie, 1940). In Ethiopia the small hive beetle was reported in the south and South-West parts of the country with prevalence rate of 10 % (Amsalu and Desalegn, 2001). The small hive beetle was reported in the Oromia regional state; 60% Jimma and 1.1% in Horo Guduru walaga (Amsalu and Desalegn, 2008) likewise it was reported Southern parts of Ethiopia with prevalence rate ranges from 21% in Konso to 66% in Teltele (Amsalu and Desalegn, 2006) Ants are most worrying to honey bees and bee keeping sector. Ant eats or carries off any comb contents iike honey, pollen and brood (Smith, 1953). Ant (Dorylus fulvus) was one of important honey bees' enemies and causing a serious problem in West and south western Shoa Zones shows that 44 % of the colonies were attacked by Ants (Desalegn, 2001). Wax moths are serious pests causing damage on wax production in a given colony. The caterpillar of lesser wax moths feed on pollen, cast skins and cocoons, but don't destroy bee colonies. The wax moth pests infest stored equipment and weaken colony by 11 spending of time in comb maintenance (Amsalu, Desalegn, 2001). The wax moth in

honey bees was reported in the South and South West parts of Ethiopia (Amsalu and Desalegn, 2001). Similarly, wax moths were reported in Tigray regional state in three district Atsbiewonberta, Aheferom and Kelteawlaleo (Etsay and Ayalew, 2001). Varroa mites are ectoparasites that feed on the hemolymph of immature and adult honey bees The varroa mite, Varroa destructor, are the world's most devastating pest Apis mellifera. Although the varroa complex includes multiple species, V. destructor is the species responsible for the vast majority of the damage attributed to mites from this genus. Until 2000, it was believed that V. jacobsoni Oudemans was the mite responsible for widespread honey bee colony losses. However, taxonomic work indicated that a previously-unidentified species of varroa (V. destructor) was responsible for the damage, while *V. jacobsoni* was shown to be only moderately harmful to honey bees (Anderson and Trueman, 2000). In Ethiopia, the particular survey which was conducted in Tigray regional state revealed the occurrences of Varroa mite in the country and also established the distributions of the mite in the region (Desalegn, 2014).

2.3.2 Disease

Honeybee colonies and their products are also vulnerable to various pathogens and parasites such as viruses, bacteria, and fungi (Genersch, 2010b). Their infections were fatal to honeybees. Nosema APIs and *Melpighamoeba mellificaeare* is a common disease agent of honeybees in Ethiopia (Begna & Bezabeh, 1999; Gezahegn Tadesse & Bezabeh, 1991). A chalk brood disease affected the growth and development of brood (Begna & Bezabeh, 2006). FAO (2018) reported that the occurrence of diseases in honeybees depends on three factors. These are 1) honeybees (genetic): the hygienic behavior, the genetic heritage of the queen bees and ability of the colony to resistant to against various diseases, 2) Pathogens (presence, infectious load, and virulence), and 3) favorable environmental conditions (temperature, relative humidity, and presence of nectar plants). Factors that promoted the occurrence of honeybee diseases are weather-related seasonal, mobile, contact of healthy with infected and susceptible colonies, presence of infected native honeybee populations, malnutrition, water stress, harvest and gather wild honeybees during the night. In addition, crude processing of contaminated, poor disposal of infected materials, unregulated trades, contaminated of the beehive, inadequate of sanitary products, scavenged by birds, wild animals, and other predators, and inadequate surveillance, diagnostics, prevention, control, and treatment protocols, lack of pest assessments and reports (Brosi et al., 2017; Joseph & Joshi, 2019)

2.4. Deforestation

In Ethiopia, the honeybee flora resources have gone through large changes because of land use change and deforestation (Abebe *et al.,* 2008). Still deforestation was high in Ethiopia and it was a result of harvesting trees and shrubs for fuel wood, use of trees for house construction and selling trees for timber production (Lemenih and Kassa, 2014). Thus, increase in land use change and deforestation are inducing conditions that are hostile for sustainable beekeeping due to the destruction of natural honeybees' habitats, reducing forage and plant diversity and leading to insufficient nutrition and ultimate starvation of the honeybees. These situations are increasing, especially in the mixed crop-livestock production system. Deforestation contributed to losses of honeybee diversity, the value obtained from the honeybee, and floral plants. This is why the forest provides an excellent resource for honeybees and beekeeping in the ecosystems. Conservation of the forest is, therefore, an imperative for sustainable beekeeping and its valuable products (Mustafa et al., 2015). Nevertheless, the impacts of deforestation on honeybees are poorly considered. In the short forest, conservation helps to conserve honeybee and their values and vice versa. The forest ecosystem is a home or shelter, and sources of food where different indigenous honeybee races are found. Honeybee gets pollens, nectars, shelters, and water from the forest. However, in the past in general and recent decades in particular the overexploitation of tree resources had been caused by a significant reduction of honeybees elsewhere in the world (FAO, 2009). This is why deforestation highly treating to local honeybee populations and leads to excessive hunting pressure (Oldroyd & Nanork, 2009). In addition, the long-term decline of the honeybee colony caused the decline of pollinator ecology of the forests and exacerbates deforesting and wood harvesting

2.5. Impacts herbicides

Herbicides are toxic to bees, but also they disturb the environment in which bees and other pollinators live. Plant biodiversity, and its associated arthropod communities, have certainly decreased in areas that have been treated with herbicides for many years (Alaux *et al*., 2011). The lack of certain plant species, mainly weeds, implies an impoverishment of the natural environment that sustains pollinators, including honey bees. Consequently, bees find more difficult to collect the variety of pollen that is required for a healthy bee diet. Poor bee nutrition due to scarcity of flowers is the indirect result of continuous herbicide applications in crops and forestry areas over many decades. Herbicide exposure has been found to negatively impact different aspects of honey bee life, including drone sperm count, adult

worker survival, and larval midgut composition. Impaired honey bee metabolic activity has also been demonstrated following exposure to single herbicides and or combinations of herbicides + metal mixtures, the number of dead spermatozoa significantly increased with both exposure time and glyphosate concentration. Hoopman et al. (2018). Honey bee consumption of sugar syrup laced with bentazone and metamitron leads to a daily mortality of bee and low to moderate levels of increased bee aggression and mobility. Several projects have also demonstrated the impacts of herbicides on impairing honey bee learning, sensory abilities, and navigation. . For example, in analyzing the effects of chronic exposure to field-realistic concentrations of imidacloprid + glyphosate on honey learning, (Mengoni Goñalons and Farina, 2018) show reductions in sucrose responsiveness and impaired olfactory learning. Glyphosate concentrations affect honey bee homeward foraging and navigation, that oral consumption of field-realistic doses of glyphosate (simulating that found in nectar) can impair the ability for honey bee foragers to learn a navigational task such as flying back to their hive. Balbuena et al. (2015)

2. 6. Impacts of pesticides

Pesticides are substances used to eliminate unwanted pests. Unfortunately, honeybees are insects and are greatly affected by insecticides. Pesticides have received much attention by beekeepers as the primary cause of colony declines (Doucet-Personeni *et al*., 2003). There are several ways honeybees can be killed by insecticides. One is direct contact of the insecticide on the bee while it is foraging in the field. The bee immediately dies and does not return to the hive. In this case the queen, brood and nurse bees are not contaminated and the colony survives (Vidau *et al.,* 2011). The second, more deadly way is when the bee comes in contact with an insecticide and transports it back to the colony, either as contaminated pollen or nectar or on its body. Honeybee colonies that are exposed to pesticides typically have a large number of dead bees in close proximity to the hive. Another symptom is a sudden loss of the colony's field force. Exposure to pesticides may make them more susceptible to other diseases, such Nosema (Alaux *et al*., 2011). In addition to food, bees also drink water to keep their body temperature under control (Schmaranzer, 2000). Pesticide residues in soil eventually move into the water and appear in the stream. Creeks and ponds of agricultural areas beyond which are thus contaminated with a mixture of agrochemical Honeybees play an essential economic role in the pollination of crops. Farmers were buying, storing, and use pesticides on cultivated plants with no or little consideration of the effect on honeybees. In Ethiopia, pesticide poisoning of honeybees has

increased from time to time, and beekeepers also lose their colonies due to unwise use and improper practice of pesticides. Ethiopia has developed a legal framework on pesticide registration, distribution, and use. But regulations are not strictly implemented by the farmers, and it needs enforcement. Farmers use pesticides on crops with no or little consideration of their effect on honeybees, also the use of pesticides is harmful to pollination service, behavior, communication, forage resource, poisoning, and contaminated hive products. The Effective communication between beekeepers and crop growers is important because spraying pesticides is required to minimize the impact of pesticides on honeybees. The present review should focus on the effects of pesticide use and the means of reducing its impact on honeybee colonies. International Journal of Tropical Insect Science (2020) 40:473–48

2.7. Impacts of exotic woody plant species

Exotic tree plantations, though economically beneficial due to their fast growth habit, are imposing an undesirable effect on forest health and reduce the physicochemical quality of the soil (Shiferaw et al. 2018). Furthermore, they negatively impact the environment and are the major threats to the existence of native biodiversity (Bufebo and Elias 2018; Shiferaw et al. 2018; Solomon and Moon 2018). Previous studies have shown that exotic plant species compete with the native plants for nutrients, light and water. In addition, they also have an allopathic effect which is very detrimental for the life of the native species (Reigosa and González 2006; IBC 2014; Solomon and Moon 2018. It can also be imagined that the rise in the expansion of exotic woody plants would reduce the vegetation composition, density, diversity, biomass, and seedling density of native vegetation inside sacred groves. The result revealed that the percent abundance of exotic woody plants had a significant negative linear relationship with the amount of native plants biomass (ton) inside sacred groves. The expansion of exotic trees inside sacred groves reduced the total native trees' biomass. This probably is due to the impact of exotics on growth and development of native plants by altering the moisture level, nutrients availability, and photosynthesis by competing for light. Comparing with native trees exotic tree species deplete more nutrients from the soil i.e., soils under Cupressus and Eucalyptus generally had the lowest nutrient status with those soils under indigenous trees (FAO 2009; Shiferaw et al. 2018). Liang et al. (2016) found that the adjacent Eucalyptus plantation significantly reduced the mean of organic matter, nitrogen, and phosphorus contents of indigenous plots of sacred groves from 16.5 to 7.71%, from 34.4 to 14.9 mg/kg, and from 48.7 to 34.7 mg/kg respectively. This directly affects

honey production through make shortening of flowering plants as a result challenge for honey bee forage

2.8 Lack of skilled man power and awareness in the community

Majority of the beekeepers lack the knowledge of appropriate methods of beekeeping. In the district there is no concerned college or university which can provide diploma or certificate level course in beekeeping. Agriculture office of Tole woreda is the only institute that provides basic trainings to farmers, extension workers and experts. However, this doesn't meet the ever-increasing demand of trained manpower in the region: Beekeeping is one of the disciplines which suffered and is suffering from lack of skilled man power, training majority beekeepers of appropriate methods of beekeeping. Beekeeping is a widespread activity with a wealth of existing local knowledge and skills. The addition of a little technical information, however, can lead to greatly improved harvests of honey and beeswax. There are many ways to assist honey hunters or beekeepers to build on their resources to create more income by harvesting and processing honey more skillfully, and to obtain better prices by saving and selling beeswax and by making secondary products, (Shane, 2003). Beekeepers and trainers often lack appropriate training materials - most of the literature discusses keeping European bees in temperate zone conditions. Training is often theoretical rather than practical, placing emphasis on changing the type of hive used without providing practical guidance and follow up. New beekeepers need training in how to work with bees, how to maintain honey quality, how to separate honey from beeswax, how to render beeswax, how to manufacture secondary product

2.9 Poor marketing:

Access to finance is essential for further development of beekeeping enterprises: for example, successful marketing depends upon the purchase of containers for processing and packaging of products. Credit is necessary for beekeeping associations running collection Centre's, buying products from producers and selling honey in bulk. However, significant financial assets are not essential for beekeeping at subsistence level. In poor societies, lack of credit is a major constraint to everyone concerned with selling and buying honey. Beekeepers with honey to sell expect to receive cash from honey collection center or private-sector traders; otherwise they prefer to sell their honey in small quantities in markets to obtain an instant but low cash return. People buying honey need access to credit during the honey season. The lack of credit leads to insignificant volumes of honey being available for sale, no interest from traders and a stagnant industry (Nahapiet, 1998). Modern hives use bee waxed frames to attract occupation of bees and thus bee wax sometimes are very

difficult to get unless you purchase them from firms or bee farmers 35 that have semi-refined honey before delivery to the processing firms for further processing and all these needs initial capital for the industry to succeed. According to (Akdemir et al.,1993), the social capital is "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition". Because very often entrepreneurs do not have access to extensive information sources, they are backed up by actors in their environment who influence their decision-making process. Social capital contributes to the availability of information, and it has a positive impact on the innovative performance of small and medium-sized enterprises. Social capital fosters trust and decreases barriers to exchange and combination of new knowledge (Nahapiet, 1998).

2.10. Effect of Age and Gender on Honey Production

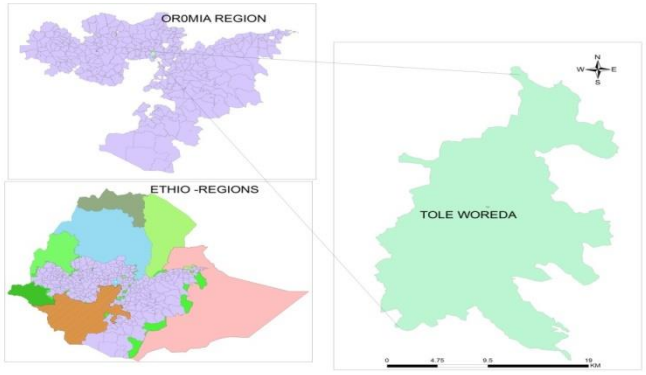
Age can be a factor in beekeeping, during harvest times or hard operations one may find that only young adults are able to do all operations requiring man-power. Some literature depicts that only those individuals who are still at average ages of 20-40 years can be able to harvest honey from trees as opposed to those above 50 years who are not able to do so. Gender is another factor that affects honey production in a country. Take for instance, a lot of women find it difficult harvesting their produce due to bees' stings; and may be the division of labor that exist may limit participation of women in beekeeping (Yahaya and Usman, 2008). Lack of education can be another factor in honey production in the sense that beekeeping is mainly practiced in rural areas. These areas have people who are less educated in agricultural practices due to the fact that they are unable to get funds for their education thus limiting the harvested honey yields (Yahaya and Usman, 2008)

CHAPTER THREE

MATERIALS AND METHOODS

3.1 Description of the study area

The study was conducted in Tole District. The District is found in Southwest of Shewa, Oromia Region of Ethiopia. This district in the Southwest about 83 km away from Addis Ababa to the southwest and 72 km away from capital city of the zone, Waliso town North. The district is surrounded by four Districts such that Kersa Malima to the East, Becho to the West, Seden Sodo to the South, Sebeta Hawas and Ilu to the North. The District has two urban and 25 rural kebeles (Hailu et al., 2020). The climatic condition of the district is 75% highland and 25% low lands. Tole districts is located at the altitude range of 2100-3080 meters above sea level. The annual rain fall approximately is 1200 mm per year. The coordinates of the District ranges between $8^{0}28^{1}$N-$8^{0}47^{l}$N and $38^{0}17^{l}30^{11}$ E-$38^{0}29^{l}$E.



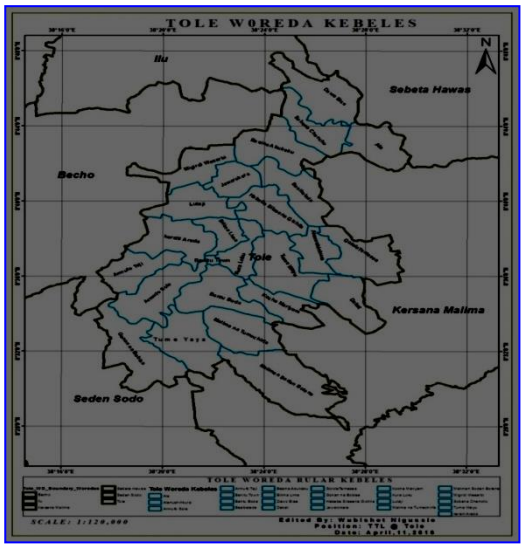


Figure-1: map of Tole District

3.1.2. Socio-economic and characteristic of the study area

The total estimated population of the Tole District was about 82,377 (44,653 males and 40724 females). It has 15,078 households. As in most parts of the central high lands of the country, the people in this district are practicing agriculture such as cultivation of cereal crops including Barley, teff and Wheat. The pulse crops such as Faba Bean and Soya Bean were also grown. Enset, and domestic animals such as Goats, Sheep, Oxen, Horses, and Donkey were also parts of their practice. The natural forest occupies a very small portion of the total landmass of the district. The traditional farming system which resulted in

deforestation and the fact that the area was suitable for agricultural practices made bee keeping a less focused sector.

3.2. Research Design

The research design is a plan of action that allows the researcher to know where they came from and where they are going (, 2009; Victor, 2013). Following Masuku (2013) a descriptive cross-sectional research design was employed in the study with the aim of describing the farmers' characteristics and identifying factors that influenced honey production. Preliminary survey was conducted in the study area from the first week of September 2015 to December 2015 E.C in order to collect important information such as rain fall, soil type, temperature, topography, agricultural status and the actual size of the study area which helps to select the representative study sites. Mixed or the combination of both quantitative and qualitative research technique were used in the study. Tole District has 25 kebeles, of which 23 of them were rural (Peasant Associations) and two Urban administrative kebeles. The district has the total population of 82,377 (44,653 males and 40, 724 females). It has 15,078 households. The study kebels were purposively selected and they were Tulu tajii, Gonana Bubbisa and Bantu which were known for honey production in the District.

3.3. Sampling techniques and size determination

Two stage-sampling techniques were employed to select sample kebeles and respondent of beekeepers. The first stage was used to identify the study kebeles, from the large number of Tole district association based on their honey production and the second stage sampling techniques was used to identify sample households. In the second stage, the sample households (farmers) of about 1500 was selected sampling selection mathematical formulae.

3.3.1 Sample Size

The sample size employed was computed using the approach based on precision rate and confidence level (Kothari, 1990). The formula used is $N = \frac{Z^2 \; X \; P \; X \; Q}{D^2}$

Where N was the sample size, Z Was standard normal value of 1.96 for 5% significance level, Q =1 P proportion of population without characteristics of interest and D was statistical 5% level of significance = 0.05 ~ estimated error (μ) term acceptable within, of true value. The number of households in Tole district = 15,078. The selected kebele population has = 1500 house holders. Using the above formula, the sample size was therefore computed as follows;

P = 1500/15,078 P = 0.0995 Q= 1-P Q = 1 – 0.0995 = 0.9005

$N = \frac{(1.96)^2 \text{ X } (0.0995) \text{ X} (0.9005)}{(0.05)^2} = 137.68 \approx 138$

Therefore the sample size was = 138

3.4 Data Types and Sources

To achieve the objectives of the research, data was collected through primary and secondary sources. Both qualitative and quantitative data types were used in this study. The data sources were primary and secondary. Primary data were collected through a household survey by using questionnaires, focus group discussions, key informant interviews, and field observations. Secondary data was collected from official reports and published documents. Various published and unpublished documents such as reports, plans, and government documents were used as secondary sources of information for this study to make the study complete.

3.4.1 Primary Data Collection

The main data collecting instruments of primary sources were interview, standard questionnaire, Focal Group Discussion including village leaders, extension workers, and District agricultural officers. Household interview was used to select the sample households for this study and accordingly discussions were made with District experts,

cooperative members and model beekeepers. Accordingly, 46 beekeeper households were interviewed from each selected Kebels. Therefore, a stratified random sampling method was used to select the respondent households for the study. Focus Group Discussions were conducted in the study area with purposively selected PA leaders, DAs, and some individuals, who are believed to be knowledgeable about bee keeping.

Questionnaires: Questionnaires were used to collect data from a large number of the respondents at a time and easy to administer, follow up and enable to obtain qualitative and quantitative data. Closed and open ended (mixed) as well as simple and contingency items questionnaires were used to collect data. The response formats for close-ended data were multiple choices and 'yes' or 'no' types and open-ended questions were also enables the respondents to write achievable suggestions, which the respondents think, was included. Formal survey was carried out to collect data formally through structured questionnaires that were filled out through face to face and direct interview of respondents. Primary data were used in order to get first-hand information from respondents and it helped in providing information for specific purpose of addressing the issues needed, so that questionnaires were prepared and distributed to sample respondents to collect necessary information for the study. Therefore, the copies of questionnaires were distributed to 138 individuals.

3.4.2 Secondary Data Source

To obtain secondary data, documents analyses and reviewing of Agricultural office and different books to get in-depth information that were more related to the identified problems in relation to honey production.

3.5 Methods of Data Analyses

All the data were collected, organized and analyzed by using computer software known as SPSS version 23 and analyzed by running descriptive frequencies in relation to the distinct themes. The data were described in percentage to quantify numerical data relating to the study results and presented in the form of tables, chart and graphs

CHAPTER FOUR

RESULTS

4.1 Socio economic and demographic characteristics of respondents

Socio economic and demographic characteristic of respondents are shown in Table 1. In the study areas regarding to sex of the respondents about 94.93% were males and 5.07% were females. From sampled households' respondents 39.13% were in the age range of 15-30 years, about 31.16% were in the range of 31-45 years, about 18.12% were in the range of 45-60 years and about 11.59% were above 60 years old. The marital status of the respondents in this study area was about 85.5% of respondents were married and about 14.49% of the respondents were single. Out of the total respondents of house hold about 40.58% were illiterate and about 28.26% were able to read. About 15.94% respondents attended primary school, 10.15% were secondary school and 5.07% were above 12^{th} grade.

Table 1. Socio economic and demographic characteristic of the respondent

Item	Description	Frequency	Percentage
Kebele	Bantu	46	33.3
	Tulu taji	46	33.3
	Gonana bubisa	46	33.3
Sex	Male	131	94.93
	Female	7	5.07
Age	15-30	54	39.13
	31-45	43	31.16
	46-60	25	18.12
	>60	16	15.59
Education level	Illiterate	56	40.58
	Read and write	39	28.26
	Primary school	22	15.94
	Secondary school	14	10.15
	Above college	7	5.07
Marital status	Married	118	85.51
	single	20	14.49

4.2 Types and cost of honey bee hives

Types and cost of honey bee hives used in the area are described in Table 2. In the study area from house hold sampled about 78.26% respondents were using traditional hive for the production of honey bee, while 3.62% were using transitional hive. The modern hives were only used by 18.12% of the respondents. In this study area there is an alternative of hive for production of honey bee, but the choice was based on their economic status. Accordingly, the well to do responds say the modern hive was cheap who are 5.8% of the respondent, while 7.97%, 47.83% and 38.4% of the respondents' said fair, expensive and very expensive, respectively

Table 2. Types and cost of honey bee hives

Respondent categories		Frequency	Percentage
Kinds of hive for Honey production	Traditional	108	78.26
	Transitional	5	3.62
	Modern	25	18.12
The cost of bee hives in area	Cheap	8	5.8
	Fair	11	7.97
	Expensive	66	47.83
	Very expensive	53	38.4

4.3 Placement of hives for bee keeping and source of honey bee colonies

The placement of hives and source of honey bee colonies are shown in Table 3. In the study area data from field survey showed that about 94.93% of the respondents were kept their hive at back yard, while about 3.62% of the respondents were placed their hives under the roof and about 1.45% of the respondents placed the hives in the house. According to the survey results source of honey bee colonies were from forest (4.35%), about 34.78% were from the existing hives and about 60.87% were migratory bee.

Table 3. placement of hive beekeeping and sources of honey bee colonies

Respondent categories		frequency	Percentage
The placement of bee hive	Backyard	131	94.93
	Cave under roof	5	3.62
	In the house	2	1.45
Source of honey bee colonies	Forest	6	4.35
	Hive itself-	48	34.78
	Migratory bee	84	60.87

4.4 Plant species abundantly found in the area

Plant species abundantly found in the area are shown in Table 4. In the study area based on the response of the respondents and field observation the plant species abundantly found in the area were Bargamo (70.29%), Wadessa (9.42%), lafto (7.97%), Gatira (6.52%), Ebicha (2.9%), Mini (1.45%) and Garbi (1.45%). About 79.71% of the plant species were exotic.

Table 4. plant species abundantly found in the area

Local name	Scientific name	Exotic/native	Frequency	Percentage
Bargamo	Eucalyptus spp.	Exotic	96	70.29
Wadessa	*Cordian africana*	Native	9	6.52
Lafto	*Acacia* spp.	Native	11	7.97
Gatira	-	Exotic	13	9.42
Ebicha	*Vemonia* spp.	Native	4	2.9
Mini	*Azadirachata indica*	Exotic	2	1.45
Garbi	-	Native	2	1.45

4.5 Plant used by honey bee in the area.

Plant species used by honey bee in the study area are shown in figure 1. In the study area regarding plant used by honey bee according to the respondents were about 79.71% Bargamo, about 7.25% Lafto, about 5% Wadessa, about 5% Ebicha and 3% Aadaa. The area was dominated by one species significantly ($p<0.05$) affect not onlyhoney production, but also influencing the quality of honey produced because of the eradication of native plant species which may lead to the loss of the medicinal value of honey.

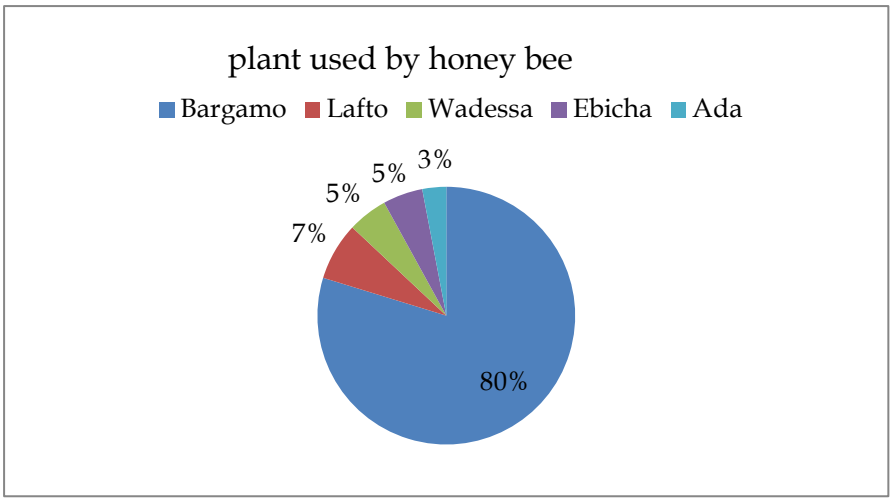


Figure 2. Plant species used by honey bee in the study area

4.6 Effects of climatic condition on honey bee

Effects of climatic condition on honey bee are shown in Figure 2. In the study area according to response of the respondents about effects of climatic condition on the honey bee was low temperature especially in the evening which was mainly in Autumn accounted for 12.32% of the effect of climate. About 17.39% of the respondents mentioned that high wind pressure in winter also another climatic challenges to honey bee which may lead to changes in direction when they fly back to hive from foraging. About 50% were because of deforestation which made honey bee shade less which otherwise protects honey bee from sun light when the heat is maximum mainly in Spring. About 20.29% of the respondents indicated that in Spring wilts and death of plants like herbs were prevailing. Climatic change which came through deforestation (87.68%) significantly ($P<0.05$) lead to colony death and migration.

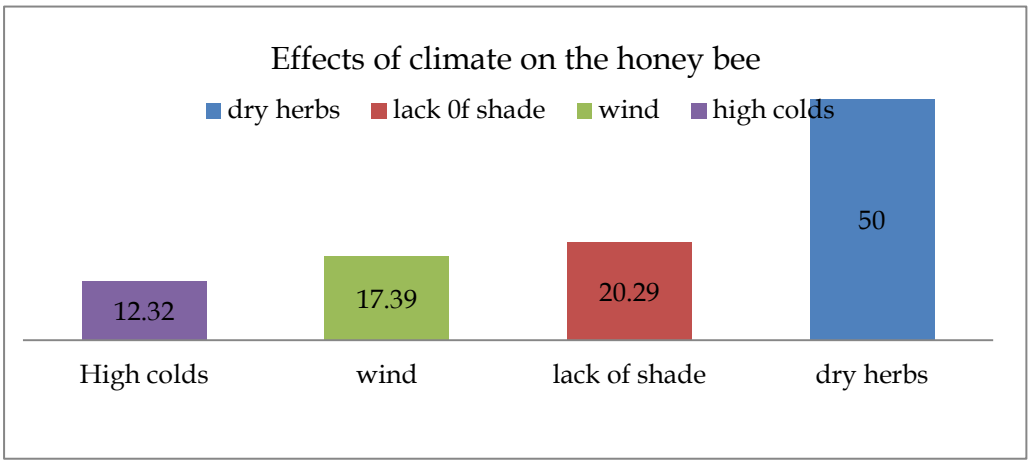


Figure 3. Effects of climate on honey bee

4.7 Agro chemical used in Tole District

Agrochemicals used Tole district are shown in Figure3. In the study area from the total respondents about 60.15% use herbicide in the field frequently and about 34.78% used insecticides in the field, while about 5% of the respondents' used fungicide in the field. The application of pesticides significantly ($p < 0.05$) affected honey bee by directly poisoning it. Moreover, the herbicide eradicated the flowering plants like herbs on which the honey forage.

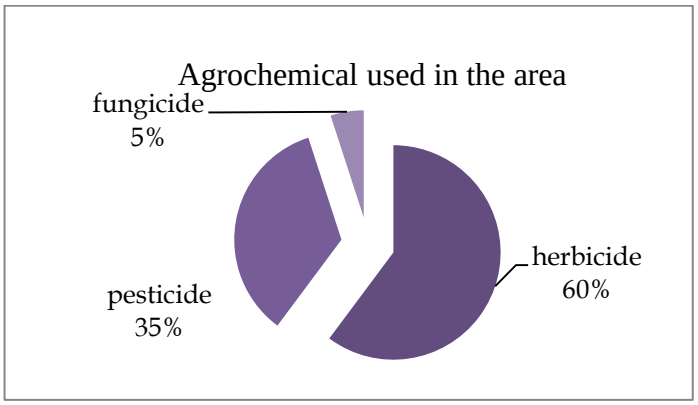


Figure 4. Agrochemical used in Tole districts

4.8 pest of honey bee in Tole districts

Pests of honey bee in Tole district are shown in Figure 4. In the study area according to the survey and field observation results the pest challenges for beekeepers were ants (60%), wasp 25%, spider 8%, birds 5%were and beetles 2%. The pest problem can be solved by hanging the hives on big trees particularly where deforestation activities are low.

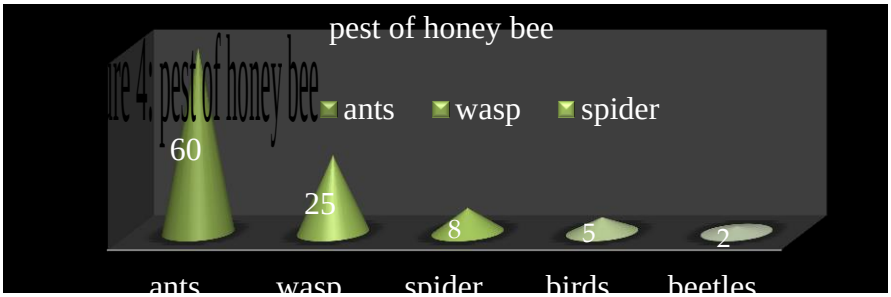


Figure 5. Pests of honey bee in Tole District

4.9 Awareness of community toward honey production

Awareness of community towards honey production are shown in Figure 5. In the study area data from house hold survey showed that about 83.3% of respondents indicated that they did not take any training on honey production by government or NGOs. However, about 9.42% of the respondents' that they got training by government, while the other 7.25% exposed to experience sharing from individual person in the community about honey production. This result reflected that lack of awareness in community significantly ($p<0.05$) affected honey production in the study area.

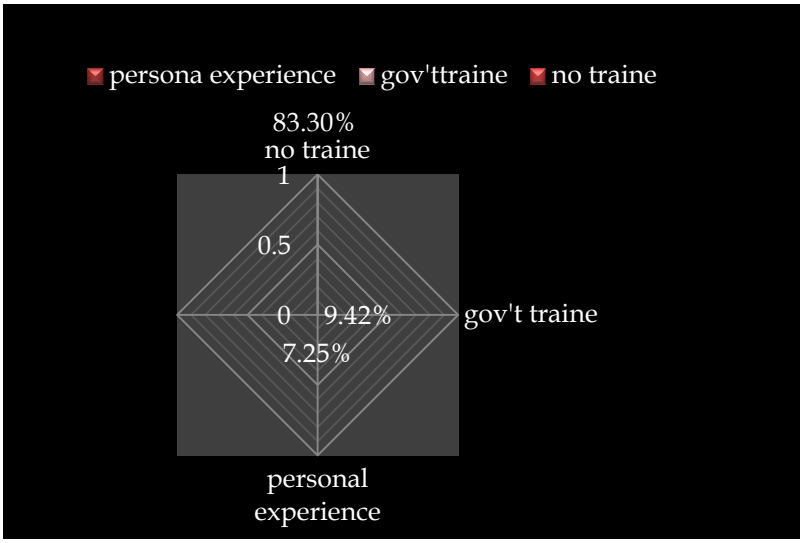


Figure 6. Awareness of community about honey production

4.10 Hive destruction by Beekeepers

The way beekeepers destroy their hives are shown in Figure 6. In the study area results of field observation indicated that some beekeepers destroy their bee colony because of the aggressive properties of honey bee which affect animals like livestock such as cattle and donkey among others. Accordingly, about 29.71% respondents destroyed colony by exposing them to rain, while about 39.86% of the respondents destroyed their honey colony by burning them. The remaining 30.43% adding to water bodies.

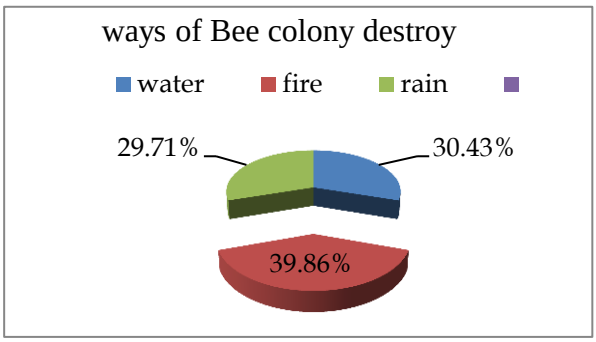


Figure 7. Colony destruction by beekeepers

CHAPTER FIVE

5.1 DISCUSSION

The participation of males in beekeeping activities in the study area was much higher than females. From 138 sample households interviewed about 94.93% were males' headed and the rest 5.07% were females' headed which might be due to the fact that traditionally cultural norm in Ethiopia consider beekeeping as mens' job only. The limited number of females' participants in beekeeping activity is agreed with Mujuni et al. (2012), Haftu and Gezu (2014) and Tsessega (2009) who described that participation of women in beekeeping activity is very low mainly because of fear of bee stings and lack of experience.

In this study, age of respondents was also considered as important factor and majority of the respondents (70.29%) were in age of 15-45 years which is the productive age. Report from wonchi district of south west Shewa zone agreed with the current findings in that farmers in the most productive age are actively engaged in beekeeping activities (Beyene and verschur, 2014).

The Educational status of respondents in the study area indicates the majority of the respondents (40.58%) who had been engaged with beekeeping were illiterate. However, education increases the access to information and there by possible knowledge of beekeepers which can modernize the business. The study results agreed with the findings of Dabase and Belay (2015) who reported 42.9% of beekeepers in Oromia special zone, Walmara District cannot read and write i.e they were illiterate. However, the current result is disagreed with the report of Tsegga (2009) which says most of the respondents were capable of reading and writing.

The Field observation result showed that traditional hive was the leading hive type (78.28%) that had been used in the Tole districts whereas only 3.62% was transitional and 18.12% was modern hives. Beekeepers preferred traditional hives for its convenience to construct and low cost and less dependency on external inputs. However, these findings dis agreed with the study of Haftu et al. (2015) in central zone of Tigray who reported 41% of the households used traditional, modern and transitional beehives.

According to the respondents' explanation about cost of modern hive in the study area, the majority (86.23%) of indicated that cost of the modern hive was expensive which forced the beekeepers to use the traditional hive. However, this traditional hive easily destroyed by

the rain and winds especially in spring when enough flowering plants for honey bee forage are available. This result agrees with Sahle et al. (2018) who stated that a major constraint of beekeeping in Ethiopia is high cost of modern beehives.

Larger part of the beekeepers (94.93%) in the study areas placed their honey bee colonies at back yard because of the fact deforestation lead to lack big trees on which the hive can hanged, so the community place their hive in back yard to escape from thief and lack of money to build house in which they possibly keep the hives. Keeping hives at backyard may lead to the expression of their aggressiveness to the people living in the house and the livestock which are kept around the house. To avoid this aggressiveness by honey bee the owners destroy the colony. This finding is agreed with the findings of Nebiyu and Messele (2015) and Niguse (2015) who reported that most beekeepers placed their honey bee colonies at the back yard and inside the house.

Regarding source of honey bee colonies most of beekeepers (60.87%) are got honey bee colony from migratory bee. This results agreed with the results of Haftu Kebede and Gezu Tadese (2015) report that most respondents (60.3%) replied they have got their colonies by catching swarms

The study results shows the majority of plant species abundantly found in area around (79.54%) are exotic plant species; this indicates the districts plant species dominated by exotic plant species. this results agreed with the study by Tilahun (2015) stated that native plants have been substituted by exotic tree plantation like Eucalyptus species for the log construction fire wood cash source and other economic uses. The genus Eucalyptus is the most abundant exotic tree plantation with (85.6%) of the total wood exotic Wassietal (2010). In contrast that the native plants species only were 20.4% from the total plant in the area. These expansions of exotic woody plants species significantly reduced the diversity density, biomass and regeneration of native wood plants .Because exotic woody plants have fast growth habit, survive a wide range of environmental condition, a high seed production with long dormancy period and they are less palatable for grazing and resist pest and disease (kumar and prasad2014). Exotic plant compete for native species for nutrients water and habitat they also alter the physical environment in a way that excludes native species (shiferawetal2018), in addition most of them inhibit the grasp and germination of native plant species by their allopathic chemicals (Reigosa and Gonzalez 2006)

In honey production honey bee need different types of flowering plants however our study showed that the area dominate by only one species special Eucalyptus around 79.71% .Only 20.29% of plant that honey bee can use are native that make Eucalyptus species to be used abundantly by bee . The expansion of these exotic Eucalyptus species impacts on the growth and development of native plants by altering the moisture level, nutrient availability and photosynthesis by competing for light deplete more nutrients from the soil. This results agree with the study by Websteretal…2006) stated that expansion of exotic plant reduced species richness, density and diversity of native plants. However the decline of biodiversity not only challenge on foraging of honey bee but also affect the quality of honey could be produced whereas the honey itself contain medicinal properties because the honey bee produced honey from diversified flora plant that use for medicinal value Although disappearance those native flora trigger honey produced lose its medicinal properties.

The effects of climatic condition on the honey production special in the spring is around 50% beekeepers challenge by high temperature in tolerance because lack of shade plants on the impact of deforestation 20.27% beekeepers responses reflect that dry and wilt herbs plants make shortage of flowering plants for honey bee forage .Also around17.39%of beekeepers response indicates there is wind pressure on the honey bee in the forage when they come back to hive change their direction and challenge honey bee in homing special in the winter season. Around 12.32% beekeepers' respond that there is very cold temperature in the autumn season that challenge for survival of honey bee colonies. These overall effects of climatic condition decline the honey bee colony as well as affect the honey production in the districts. This result agreed with the study by Hermando et al. (2018) states that the colonies with lower adult bee population are less likely to survive in unfavorable condition, as it happen in summer time.

The result showed that from agrochemical society frequently use herbicide in the field only are around 60.15%House hold use herbicide in the agriculture. Herbicide use only in the field make more dangerous than other pesticide. Herbicide use has become wide spread along with an agricultural intensification program and the need for increased food production for food security. Farmers use of these herbicides have both directly and in directly impacts on the bee. Directly herbicide exposure has been found to negatively impact different aspects of honeybee life including drone sperm count adult workers survival and larval mid gut composition also impaired honey bee metabolic activity. In

directly impacts of bees as results of decreasing weeds and other flowering plant serve as nutrient resource for foraging bees. This result agreed with the study by Bretagnolle and Gaba (2015) that showed weed is quantitative limiting resource for wilds bee that are special foragers. The study showed that around 34.78% house hold frequently used pesticides in the field for control insects' pest other used in the stored grain .However, lack of awareness farmers mostly use non target species insecticide in the field dangerous for beneficial insects like honey bee. Fungicide also applied in the field for increase crop production however this fungicide impacts on the honey bee through directly imposing toxicity and impairment of normal functioning to bees.

In the study area there are challenges from pest for beekeepers and the majority of beekeepers (60%) respondent that bee colony destroyed by ants and around 25%beekepers challenge by wax moth's. About 8% beekeepers' responded that spiders, birds and beetle affect their colony. This indicate the pest of honey bee make lower honey production in the districts. This results agreed with study by (Desalegn, 2001) state that Ants was one of important honey bees enemies and causing serious problem in west south western shewa zone wax moths are serious pests causing damage on wax production in a given colony. Beetles also affect honey causing it to ferment and run out of the combs (Lundie, 1940)

There is lack of awareness in the community regarding honey production in the districts. They are focused only crop cultivation and give less attention for honey production. The results of study shows that the majority of house hold (83.33%) are not trained honey production neither from NGO or Government organization, however few of them 9.42% house hold get training from government and about 7.25%house hold individual share experience from communities. This might be the reason for low honey production. Beekeepers themselves destroy their colonies by fire, add to water and live in the rain. Because of honey bee colony aggressive behavior. The aggressive behavior of honey bee affect their livestock.

5.2 CONCLUSSION

The findings illustrated that the participation of women in beekeeping activities in the study area was much lower than men. This study showed that honey production is hampered by several factors namely high cost of modern hive, deforestation of native plant species, expansions of exotic plant species, climatic change, improperly use of agrochemical, predators and parasites of honey bee and lack of awareness within community regarding honey production. The most widely used types of beekeeping hive in the study is traditional hive and it has very low production and it it is easily destroyed by rain. Deforestation of native plant species has affected naturel ecosystem. The expansion of exotic plant species decreases the area biodiversity affecting quantity and quality of honey production in the area. This study revealed that the colony population is decreasing from time to time due to un wisely use of agrochemical and predators and parasites of honey bee colonies. The agricultural extensions support is very weak and no training was given about honey production.

5.3 RECOMMENDATION

The following recommendations have been drawn from the study

- Government must non-governmental bodies should subsidize costs of modern hives and their accessories.
- Regarding the placement of hive because of disforestation there no big tree where the hive can placed so the community place their hive backyard to escape from thief However this contain side effects of aggressive behavior of honey bee challenges for both their families and horticulture therefore they obligate to eradicate the honey bee colonies that automatically decline honey production in the districts so they must be reforestation the land by native plants and place then hive in the that forest best way of solve problem.
- These exotic plants must be replaced by native species because these exotic plants have negative impacts on the honey production.
- The climatic effects on the honey production largely depend on the impacts of deforestation so to solve the problem we must reforestation of native species
- Agrochemical larger used in the area mostly affect honey production Thus I recommend to remove weeds by hand if possible
- Improve the honey production through special training either by government extension officer or NGO organization.

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ANNEXIES

QUESTIONNAIRE
Structured questionnaire prepared to gather data from household participants

Appendix I: Respondent categories

Date: Day ____ Month ____ Year _____

1. Keble: _____2. Sex:_____ 1. Male --------- 2. Female ---------

3. Age: 14-30 _____ 31-50_____51-65_____>65_____4. Marital status_____

4. Educational level: A. Cannot read and writes B. Reading and writing C. Attend primary school D. Attended secondary level E. College diploma and degree

5. Occupation_____

Appendix 2: Survey questionnaires

1. What kinds of hive do you uses for honey bee production? A traditional B transitional C modern

2. If answered question number 1 why you select_____

3 Did you believe types of hive you use can affect the hone production A yes B no

4. Which kinds of hive are more profitable and comfortable for bee? A traditional B modern C transitional D others

5. Which kinds of hive more faced with any problem? A Traditional B. Transitional C modern

6. What do you think the cost of modern bee hive A. Cheap B. Fair C. Expensive D. Very Expensive

7Where do you get honey bee colony? A. forest B. hive itself C. from caves D. migratory honey bee E. others_____

8Where did you keep your honey bee hives? A. Backyard B. Under the roof C. In the house D. In the closure areas apiary site

9. Do you participate in honey bee production? A Yes B No

10. If NO, questions number 9 fill the following question

a. Why you do not participate ? _____ b. What is you feature perception?_____

11. Did you economical beneficiary from honey production?

12.What attitude you have for honeybee production? Mention it._____

13.Did you get honey from market easily ?

14.Did you believe honey contain many advantage addition to food value? A. Yes B. No

15.If say yes what are there_____

16. Does our farmers time to time take training on the honey production A. Yes B. No

17. Does the community contain awareness about honey production? A Yes B. No

18. If yes where do you get sufficient information about honey production?

A. Government organization B. Skilled man like DA C. Both D. None

19. What do you think agrochemical can affect the honey production A. Yes B. No

20. If your answer yes how it can affect A. shortening flowering plants through remove herbs B. Poisoning to honey

21.What are effects of herbicide and pesticide on the honey production A They affect honey bee forage B. They pollute honey and their products C. They pollute the colony D. Directly kill honey bee E All

22Which one is mostly used in the district and highly affect honey production A. Pesticide B. Herbicides

23. What is the solution of the problem related agrochemical and honey production

……

24. What is the main reasons unable the districts to produce at high level honey production? Give rank for them

A. Deforestation B. agro chemical effects C. expansion of alien species D. lack of awareness of community E All

25. From no 17 question What has been the driving force that consequence of the other and make lower production honey production in Tole district mention, it driving force and consequence

26What is the reason that eradicate the natural forest? A. Agriculture B. fuel wood C. over grazing D Give rank for them

27. To cover the areas by forest several times reforestation influenced by governmental but the plant species supply by governmental is it comfortable for honey production A. Yes B. No

28What is the major feed source for honey bee? Mention it: A sugar B flower C fruit D others_____

Appendix 3: Focal Group Discussion

29.Lists the plants that used by honey bees

Lists of plants	Specify months in they flowered	Others remark

30. What is a species of the wood plants abundantly found in your area? A. exotic B. Native C. Both D. others

31. Does exotic woody plant species affects honey production? A. Yes B . No

32 If your answer is yes how could affect?

A. By decrease of bio diversity of plant species B. By limitation of native species growth E All

C Make shortening of flower plant used in honey production D Make challenge for honey bee forage

33. List species of the wood plants abundantly found in districts

Species of plants	**Their effect on other plants and honey production**

34 which types of wood plant species supply for reforestation purpose from market A Native species B. Exotic wood plants

35 What is the solution for challenge of those species related honey production mention it

36. Is climatic condition influence on honey bee production in your local area? A Yes B NO

A If yes, question number 35, in which season could be more affecting honey production fill the below table

Season	Specify month	Remark
Autumn		
Winter		
Spring		
Summer		

b. How climatic conditions affect honey production?-

_____

c. In what way the climatic condition influences honey production? Mention it:

d. How did you solve its problem?_____

37. Does the age and gender limited in the honey production? A. Yes B. No

38. Why our community does not highly participate in honey production

A. Lack of awareness B. Problem of finance C. Lack of interest D Other mention it

39. What about markets on the honey sale A Poor market B. Good market C. Modern inter linked market

40.In the your environments does the honey bee colony affected by the predator? A. Yes B. No

41. If your answer is yes what types of the organism influences on honey bee?

Types of the organism	**How they are affected**	**put in rank**	**methods to controls**