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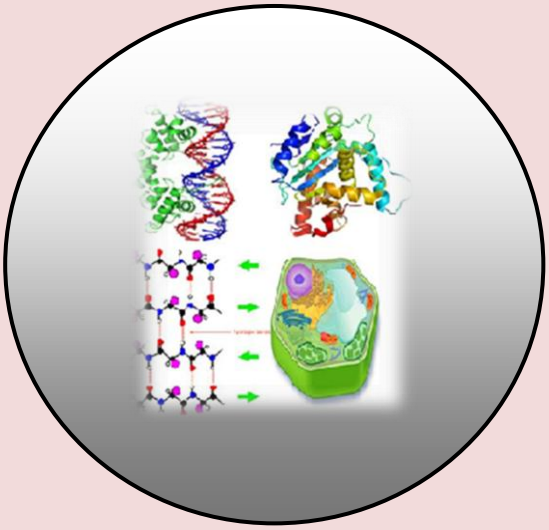

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RESEARCH PAPER

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# Factors Affecting Honey Production Status and Services in East Wollega Zone, Haro Limu District

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## ABSTRACT

***Honey production in Ethiopia is a common activity that many farmers engage in as an additional income-generating activity. However, inefficient agricultural marketing systems and traditional production systems prevent beekeepers from making the most of their honey supply. Therefore, this research was conducted Haro Limu Woreda, Tano Kebele. The purpose of this study is to examine factors that may be associated with honey production in the Haro Limu Woreda, Tano Kebele. Tano kebele was specifically selected for this study to focus on climate change and honey production. After discussion with experts, 30 respondents were selected as companies that make a living from honey production. Primary and secondary data were collected from respondents through surveys, questionnaires, interviews and observations. Data were processed and analyzed using computer software packages such as Excel.***

***Keywords: Hone production, honey bees, farmers, agriculture.***

## INTRODUCTION

Africa is blessed with many species of wild bees. Ethiopia is one of the continental countries with huge honey production potential. Due to its diverse ecological and climatic conditions, Ethiopia is home to a diverse range of African flora and fauna. In Ethiopia, the ancient tradition of beekeeping dates back thousands of years into the country's early history, yielding references to difficult times about the beginnings of beekeeping but confirming it began 5000 years ago. There are also reports that ancient Egyptian hieroglyphs mention Abyssinia, which was used as a source of honey and beeswax.

For example, Abyssinia has been known for centuries for its export of beeswax and could not export other items.

Since then, with ideal climatic conditions and diverse flower resources, the country has developed around 10 million bee colonies (7 million raised by farmers in local hives, the rest residing in forests as wild colonies) can be supported. He has the highest honeybee density in Africa and is one of the major producers of honey and beeswax (Nuru, 2007; Getachew et al., 2001). Ethiopia's annual honey production is therefore estimated at about 43,373 tones, which corresponds to about 23.5% and 2.35% of Africa's and the world's honey production, respectively.

Over 7000 species of flowering plants (mostly bee plants) and various landscape variations have improved honey production in the following seasons. In addition, Ethiopia has a long tradition of beekeeping, has the highest density of bees, is a major honey producer and is also Africa's largest exporter of beeswax. Still, productivity is always low, resulting in less domestic use of honeycomb products and relatively less export earnings. Therefore, beekeepers in particular and the country as a whole have not benefited from the sub sector.

Studies found that domestic bee colony numbers declined, resulting in reduced honey and beeswax production and export earnings (Kasaye et al., 1990; CSA, 2012; Debasa and Belay, 2015). This is due to drought, ever-increasing population pressures and associated vegetation changes, and the indiscriminate use of chemicals. Moreover, the products extracted from this sub-sector are still low, poorly managed and appear unattractive compared to the country's potential. It has been replaced by fresh honey. Hence, this study was conducted to identify the factors affecting the honey production status and service in East Wallaga Zone, Haro Limu Woreda.

## MATERIALS AND METHODS

### Study area

The present study was conducted in the Eastern Wollega zone of Halo Limu Woreda. Haro Limu Woreda is one of his districts in the East Worega Zone. Halo Limu Woreda District was established on December 21, 1998 (HLFFEDO, 2011). The district is bordered by Lim District to the east, Benshangur Gumuz Province to the west, Anger River to the south, and Ebantu District to the north. The district is 165 km and 488 km from the town of Nekemte. Today, for all administrative purposes, the district is divided into 15 farmers' unions and one city Kebele, with the capital at Haro.

### Study Area Population

Haro Limmu is one of the woredas in the Oromia national Region of Ethiopia. It is part of the East Welega Zone. It was separated from Limmu woreda. It is bounded by Limmu in the east, Benishangul-Gumuz Region in the west and Anger River in the south and Ibantu in the north. Haro is the administrative center. The 2007 national census reported a total population for this woreda of 52,163, of whom 26,052 were men and 26,111 were women; none of its population was urban dwellers. The majority of the inhabitants observed Protestantism, with 54.07% reporting that as their religion, while 28.79% observed Ethiopian Orthodox Christianity, and 9.21% practiced traditional religions (2007 Census).

**Study Design**

A cross-sectional study was carried out from November September 2021 to June May 2021 in East Wollega Zone, Haro Limu Woreda. Haro Limu District on honey bee colonies managed under traditional, transitional and modern beekeeping methods to investigate the honey production systems and identifying of the major type of pests & disease causes of significant economic loss in honey bees by observing and collecting samples from the colonies. Then, isolation and identification of bee diseases causing pathogens were conducted. Diagnosis was confirmed by integrating clinical and parasitological studies. Questionnaire survey was carried out during the study in order to determine honey production system and its constraint due to pests and predators.

**Sampling method and sample size determination**

Purposive sampling techniques was used to select kebeles base on accessibility to the road, population of the honey bee colony and honey bee colonies managed under traditional, transitional and modern beekeeping methods from the district. Finally, simple random sampling techniques were employed to select 30 bee colonies from each PA, and a total of 90 bee colonies from the three PAs.

**Sample Collection and questionnaire**

In this study, a structured questionnaire prepared and administered to collect information from the identified bee keepers. Both primary and secondary sources of data were used in this study. Secondary data were obtained from reports of Regional, zonal and district livestock and fishery resource development Office, NGOs and other published and unpublished materials. Primary data was collected using questionnaire.

**Data Analysis**

The collected data were cleared and stored into Microsoft Excel program for further analysis. Stata version 13 statistical package was used to analyze the data. Summarized data was presented in the form of tables and figures. The questioner survey data, obtained in this study were analyzed using descriptive statistics.

## RESULTS AND DISCUSSION

**Sex and age of households**

Of the households in the district sampled, 69.91% were male-headed and 30.09% were female-headed (Table 1). Findings indicate that beekeeping is dominated by men. In the district, honey production and beekeeping were mainly practiced using traditional methods of simply hanging hives on large trees had limited activities in and around the home. Women were not involved in beekeeping because beekeeping involved heavy work such as climbing large trees to hang hives. Furthermore, the main reasons women in the study area were not involved in honey production were cultural norms that neglected women in these activities and traditional practices of honey production in the region, which led to beehives being built into trees. It required strength and skill to hang. However, research has shown that beekeeping is one of the major income-generating activities in rural communities and also provides employment opportunities for many people (Girma et al., 2008 and Gebey et al., 2010). Regarding the age composition of the respondents, the majority of respondents (56.1%) were between her 18 and her 40 years. Approximately 38.8% of respondents were 40–60 years old and 5.1% were 60 years of age or older (Table 1). These findings indicated that district beekeepers were at the most productive age and likely to actively participate in beekeeping activities.

**Education Status**

Educational level of farmers was found to be relevant and positively influenced adoption of beekeeping too. This was attributed to increase knowledge access to related information such as the right time for harvesting and improved understanding of the related best management technologies. From household respondents 31.63% were able to read and write, 52.04% cannot read and write, 9.18% attended grade 5-8, 30 and 7.14% was grade 9-10 (Table 1). The current findings indicated that the large proportion of the beekeepers were illiterate which can be considered as a barrier to modernize beekeeping in the district. Gichora (2003) strictly stressed the need of knowing bee biology and behavior to become effective beekeeper. Further he noted the necessity of intensive training on bee keeping.

**Table 1. Socio demographic characteristics of the respondents.**

| S/N | Items | Description | Frequency | Percentage |
|---|---|---|---|---|
| 1. | Sex | Male | 28 | 93.33 |
| | | Female | 2 | 6.67 |
| 2. | Age | 18-40 | 17 | 56.67 |
| | | 40-60 | 12 | 40.00 |
| | | >60 | 2 | 6.67 |
| 3. | Education | Illiterate | 16 | 53.33 |
| | | Read and write only | 10 | 33.33 |
| | | Grade 5-8 | 3 | 10.00 |
| | | Grade 9-10 | 2 | 6.67 |

**Management of honey bee colony**

With regard to colony management practices, during harvesting of honey, 67.3% of the respondents replied that there was no nest prepared and 32.7% of the respondent agree that the can prepare nest or hang new hive after harvesting (Table 2). In open-ended Question they explain that most of the harvesting mechanism is traditional and farmers harvest honey by using fire at night time and they draw out the bees on the ground and collect their hive in small shelter they prepare until hive hanging period arrived. So it was during this time that mostly honey bees are attacked by predators.

Inspections frequency: In order to know the colonies were progressing, beekeepers open the hives and inspect each comb. This will let the beekeepers know whether the honey is being caped regularly, whether the colony was getting ready to swarm or the hive have been attacked by pests. Accordingly, 14.3% of the respondents inspect their colonized hive daily, 37.8% inspect once in a month, 1% inspects only during harvesting and 45.95% of the respondent inspect accidental (Table 2). From this result we can see that in this districts management of colonized hive and protection of apiary area was low. The result of expert and key informant interview farmer in the study area replied that beekeeper does not inspect internally and they check either hive has bees or not seasonally. However, the internal hive inspection was limited to colonies placed at back yard and under eaves of house. This result agrees with different pervious research (Kerealem, 2005) reported that farmers in Ethiopia do not commonly practice internal hive inspection due to difficulty of traditional hive for internal inspection.

**Table 2. Management of Honey bees hive.**

| S/N | Items | Description | Frequency | Percentage |
|---|---|---|---|---|
| 1. | Preparation of nest for honey bee | Yes | 10 | 33.33 |
| | | No | 20 | 66.67 |
| 2. | Frequency of hive inspection | Daily | 4 | 13.33 |
| | | Monthly | 11 | 36.67 |
| | | Accidently | 15 | 50.00 |
| | | During harvest | 10 | 33.33 |

**Descriptive Forces on Honey Production**

Driving forces in case mean any influencing factors that directly or indirectly bring change in the beekeeping. So this part of the study aimed to investigate the beekeeping dynamics and its driving forces of change in the mixed farming system. As far as the effect of land use change on honey production was concerned 78%, of the respondents agreed that the land use change have effect on honey production (Table 3). With regard to honey bees, habitat degradation and fragmentation lead to decrease in habitat quality for food and nesting sites. In Ethiopia the honey bee flora resource have gone through large changes as a result of land use change and deforestation (Abebe et al., and Girma et al., 2008); more or less agree with current finding.

In this study the survey result show that, 78 % of the respondents revealed that the effect of deforestation on beekeeping is high, 6.66% said low and 15% of the respondents said medium (Table 3). Similarly, Lemenih and Kassa (2004) reported still deforestation is high in Ethiopia and it is as a result of harvesting trees and shrubs for fuel wood, use of trees for house construction and selling trees for timber production. Thus, the increase in land use change and deforestation are inducing conditions that are hostile for sustainable beekeeping due to the destruction of natural honey bees' habitat, reducing forage and plant diversity leading to insufficient nutrition and ultimate starvation of the honey bees.

As far as variability of the climate was concerned, 85% of the respondents answered that climatic variability has effect on honey production (Table 3). With regard to honey bees, unfavorable weather conditions can influence both directly and indirectly (Alamu et al., 2014). It directly influences the honey bees foraging and flight activities; indirectly it influence honey bees through its effects on their resource base, disease, pests and predator occurrence. Similarly, according to Kulindwa (2010) whether condition not only influence the availability of forage plants but they also affect the average daily brood products, length of worker life and individual productivity of worker that were identified as the three primarily factors that interact together to influence the amount of honey produced.

As far as gender was concerned all most all 100% of the respondents answered that male are involved in honey production (Table 3). The survey result indicates that beekeeping activity in the study area was dominated by male. From the observation of the researcher and interview of experts in the districts beekeeping activity is mostly practiced by traditional method of honey production by using local bee hives. The traditional hives were hanged on big trees in which some of trees are as long as 50 meters and above. So, female cannot climb up big tree to hang and as a result female are not encouraged to participate in this activity.

Thus beekeeping is traditionally dominated by male in the study area. Similarly, Getu & Birhan (2004) also reported males engaged in beekeeping activity than females. This because, the fact that traditional cultural norms in Ethiopia consider beekeeping as men's job only. This finding contradicted with the results of Amsalu et al., (2004) and Gezahegn (2001) that pin point that honey production was one of the income-generating activities for resource of poor farmers including women, youth and the unemployed sectors of the community. Since traditional practice do not make all society to take part in.

**Table 3. Effects of physical stress on Honey production rate, 2021.**

| S/N | Items | Description | Frequency | Percentage |
|---|---|---|---|---|
| 1. | Effect pf land uses on honey production | High | 20 | 66.67 |
| | | Medium | 4 | 13.33 |
| | | Low | 6 | 20.00 |
| 2. | Effects of deforestation on honey production | High | 23 | 76.67 |
| | | Medium | 2 | 6.67 |
| | | Low | 4 | 13.33 |
| 3. | Does climate change has effects on honey production | Yes | 25 | 83.33 |
| | | No | 5 | 16.67 |
| 4. | Sex involvement in Honey production | Male | 30 | 100.00 |
| | | Female | 20 | 66.67 |

**Change in Honey Bee Flora Resources**

As the type and source of food determines the success of beekeeping, the respondents were asked to indicate the source of feed for their bees. Accordingly all of the respondents replied that in this study area bee gets food by foraging (Table 4). This contradicted with the idea of (Alaux et al., 2010) that stated the role of nutrient is so critical that the beekeeper often must provide supplement as sugar syrup or pollen supplement to prevent nutritional deficiency and colony failure. So the colony strength as well as honey bee product mostly depend on the availability and type of bee flora next to level of colony management practice (Bista and Shivakoti, 2010).

Most of the respondents, 80% replied that during hanging hive beekeeper do not consider flora source and 18.4% replied that they consider flower when the hung hive, Thus, current finding do not agree to the idea that apiary sites should be nearby the good bee forage plants to obtain good honey bee products and colony strength (Jacobs, 2006). As far as the availability of flora plant was concerned 80% of the respondents realized that flora plant decrease and 18% express it remains constant and 2% said increase (Table 4).

Though bee forage quality and availability are vital in honey production, these seem to continuously reduce over years due to changes in agricultural practices (Benton, 2006). These changes include the increased use of fertilizers that has reduced rotation of legumes in cropping systems and extensive use of herbicides that reduces weeds within the crops and at crop edges. Similarly, increased use of pesticides, reduced extensive grazing and harvesting of alfalfa before blooming to maximize protein content significantly reduce bee forage available for pollen and nectar collection by bees (Williams and Tang, 2008).

Sound utilization of honey bee for economic development cannot take place in absence of information and knowledge of important beekeeping resources. Unfortunately, most beekeepers have little information on important basic bee resource as such food plants and water. According to Heburn and Radloff (1997), detailed studies of honey bee plant relationship are still patchy. Also 76% of the respondents perceived that the availability of honey bee flora resource decreased. They perceived that the reasons for the reduction of honey bee flora resource are attributed by settlements, cutting trees for fuel wood, fencing and building (Table 4). Also from analyses interview of the extension worker they explained that the reduction in honey flora resource are due to land clearing for cultivation, human settlements particularly due to renascence dame around low lands and cutting trees for fuel wood, fencing building and use of herbicide on crop and pasture lands. They stated that the use of herbicides i.e. 2, 4-D and glyphostate contributed to the reduction in honey bee flora resource through damaging the weeds which are found in the head grow and inside crop land, crop after math and pastured land.

**Table 4. Effects of the flora sources on efficiency Honey bee production rate.**

| S/N | Items | Description | Frequency | Percentage |
|---|---|---|---|---|
| 1. | What are the common honey bee food sources | Foraging | 30 | 100.00 |
| | | Supplementary | 0 | 0.00 |
| | | Others | 0 | 0.00 |
| 2. | Do you consider flora when hang hive | Yes | 5 | 16.67 |
| | | No | 25 | 83.33 |
| 3. | Why the honey production decreasing in your area | Settlement | 0 | 0.00 |
| | | Fuel wood | 2 | 6.67 |
| | | Fencing and | 3 | 10.00 |
| | | Building | 2 | 6.67 |
| | | All | 23 | 76.67 |
| 4. | Pattern of plant species | Increasing | 0 | 0.00 |
| | | Decreasing | 0 | 0.00 |
| | | Constant | 5 | 16.67 |

**Change in Honey Bee Health**

Pesticide has become inevitable in modern agriculture with pesticide consumption increasing several folds during the last four decades, the side effects are also increasing and one of which is the toxicity to honey bees. Regarding pesticide use to control honey bee from predators like ants, 90% of the respondents agree that there is the use of pesticide and 10% do not agree on the use of pesticide to control predators (Table 5). Most of the respondents, 94 % replied that they do not understand the effect of pesticide used to control honeybee from the effect of predators on the honey production, 24% know its effect (Table 5). So from the observation of the researcher different pesticide beekeeper use and fire they use to control ants and predators also affect the honey bees.

With regard to agrochemical effect in honey production56 % of respondents replied that pesticide (Like insecticide, Herbicide and fungicide) affect honey bee health, 20 % of the respondents replied that herbicide affect honey bee health, 10% replied insecticide and 13% replied that fungicide affect honeybee health (Table 5).

Studies showed that the indiscriminate application of agrochemical has increased from time to time, especially in the- dominate farming system (Kebede et al., 2007; Girma et al., 2008). Majority of the respondent 93.9% replied that the trained of using herbicide was high, 3.33% replied medium and 3.1% said low (Table 5). From the observation of the researcher in the study area there is great use of herbicide on farm land and use of fungicide in wheat crop to control effects of weeds and fungus respectively. Study revealed that problem of pesticide and herbicide spray was faced by majority of beekeeping in the mixed crop – livestock production system, resulted in killing of honey bees, which caused great loss (Kebede et al., 2007). More over the use of herbicide in place of hand weeding can also affect honey bees negatively by damaging the forage

Honey bees are exposed to a broad range of various environmental stressors, which can be having an impact to apiculture. According to the respond of beekeepers, 58 %, 24 %and 17 % replied that the effect of honey badger was high, low and medium respectively (Table, 5). Accordingly, from the field observation of the researcher one of the most series problem that make most of the farmer not involved in honey production was the effect of ants and honey badger, Because their hive was hanged far from house where there are trees with available branches to hold many hives and in this situation it is very difficult to inspect daily. Also 50 % of the respondents replied that the effect of the spider on honeybee was high, 30% replied the effect of spider was low and 20% replied medium (Table 5).

**Table 5. Effects of pesticides and predator on honey bee production and honey bee health.**

| S/N | Items | Description | Frequency | Percentage |
|---|---|---|---|---|
| 1. | Do you use pesticides to control honey bee predator | Yes | 27 | 90.00 |
| | | No | 3 | 10.00 |
| 2. | What affect honey bees | Insecticide | 3 | 10.00 |
| | | Herbicide | 6 | 20.00 |
| | | Fungicide | 4 | 13.33 |
| | | All | 17 | 56.67 |
| 3. | Trends of using honey bees | High | 28 | 93.33 |
| | | Medium | 1 | 3.33 |
| | | Low | 1 | 3.33 |
| 4. | Effects of badger on honey bee | High | 17 | 56.67 |
| | | Medium | 5 | 16.67 |
| | | Low | 7 | 23.33 |
| 5. | Effects of spider on honey bee | High | 15 | 50.00 |
| | | Medium | 9 | 30.00 |
| | | Low | 6 | 20.00 |

**Analyzed Interview of Extension Workers**

In the study area most of the farmers are involved in mixed farming including beekeeping. In these agricultural activities only male are involved in beekeeping activities, because the traditional practices of hanging hives on trees need experience, technique and in culture females do not climb trees.

Also as stated by extension worker in this study area one of the basic problem for the reduction of honeybee colony and honey production is unmanageable traditional activities like using fire to feed on wild nest and burning the bees and nest of bee to harvest honey. Lack of skill full beekeeping experts, including the livestock development agents, districts and zone beekeeping experts is a problem for beekeeping and honey production. As stated by experts in this study area there was finical problem to support beekeepers, Due to this the technical advices that have been delivered to beekeepers is not satisfactory.

In this study area now a days there is much use of agrochemical like herbicide and fungicide to control the effect of herbs on farm land and fungi disease of wheat. Also the hive used in this study area is mostly traditional and the quantity and quality of honey produced is very low. Some of the modern hives that exist at FTC center are not functional due to effect of predator's particular ants and lack of skill to manage the colonized hive. The other main factor that is associated with reduction of honey production is human activities and climate change, i.e. human removed forest far farm land. Thus, reduce the flora source for bee foraging. Also climate change, change of rain seasons make the bees feed the prepared honey.

## CONCLUSION

Despite the importance of beekeeping for farmers in the study area, the finding of this study shows that the honey bee colony and honey production decreased.

These changes were due to various factors such as, lack of flora resources, agrochemical exposure, honey bee pests and predator and environmental changes. The trends show that the beekeeping system is highly at risk.

Developing environmental protection to conserve different vegetation that is the flora source of bees and continuous inspection of apiary area to manage and protect bee's from predators.

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