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Assessment of Honey Bee Production System, Honey Bee Flora and Poisonous Plants, Post-Harvest Handling and Marketing of Honey in South Omo Zone of SNNPR of Ethiopia

Adisu Tadele(1), Biniyam Eshetu(2), Dr. Senait Getachewu(2),Worku Bedeke(2),Bereket Zeleke(3)

Abstract
The survey was conducted in south omo zone to assess the production system, honey Bee flora, poisonous plants, post harvest handling and marketing of Honey Bee products.It covered four woredas namely, 'Debub Ari', 'Malee', 'Hammer' and 'Selamago'. Three to five PA's were selected from each woreda and the total number of PA's included in the study was sixteen. The total number of sample population was sixty-eight. Data collection methods used for the survey include interview by using a semi-structured interview schedule, group discussions and personal observations. The data collected was analyzed using SPSS. The study showed that, the production system of the area to be too traditional and backward. Almost all of the respondents were found to use traditional bee hives, 97.87% of the respondents keep (hang) their beehives in forests, 6-10 km away from their home, 38.25% have never tried to apply any pests and predators control. Almost all of the respondents have never tried to control swarming. However, some respondents 17.68% were found to have swarm catching experiences. The average amount of honey harvested per hive in the area found to be 6.91kgs, with a standard deviation of 3.64. The average amount of annual honey sell of the respondents was found to be 35.36kg, with a standard deviation of 45.53. In addition, the respondents' average annual income obtained from sale of honey was found to be 780.57 birr, with a standard deviation of 873.61.Much has to be done to improve the production system of the area and thereby enhance the production and productivity of the sector. Generally, it is advisable to establish a model apiary site in order to serve as a demonstration center for farmers and pastoralist and additionally, farmers, pastoralists and development workers need to get trainings about modern, improved honey beekeeping production systems.

1. INTRODUCTION

Ethiopia is an important honey and beeswax producing country, and the leading producer of honey and beeswax in Africa. According to report estimates, Ethiopia, with over 10 million honeybee colonies, is the country with the highest honeybee population in Africa. With a honey production estimated at 50,000 metric tons per annum and is said to represent only 10.7% of the country's production potential. The country is on a global scale, the 4th largest producer of beeswax and is the 10th largest honey producer in the world. Ethiopia produces around 23.6% and 2.1% 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 (Ayalew, 1990).

The wide climatic and edaphic variability have endowed Ethiopia with diverse and unique flowering plant that is highly suitable for sustaining a large number of bee colonies and the long established practice of beekeeping. Nevertheless, the bees and the plants like all renewable natural resources are constantly under threat from lack of knowledge and appreciation of these endowments (Girma, 1998). Honey is almost exclusively used for local consumption, mainly for the brewing of mead, also called Tej (Hartmann, 2004).

Even though the national honey production satisfies the local demand, it is so crude that it could not compete in the international market. Though Ethiopia has diverse and unique flowering plants suitable for beekeeping, the bees and the plants like all renewable natural resources are constantly under threat from lack of knowledge and appreciation of these endowments. The principal resource base for beekeeping has become seriously devastated in the course of time. The potential of the Ethiopian landscape for honey production does now, undoubtedly, only constitute a small fraction of its former wealth. Moreover, the destruction of the remaining resource-base can be observed as, going on at a steadily accelerating pace (Girma, 1998).

Beekeeping contributes to country's economy through export earning. Bee wax is one of the major exported agricultural products. Moreover, apiculture stabilizes and protects the fragile environment and increase the production of agricultural food and cash crops through pollination of honey bees. The contribution of beekeeping in poverty reduction, sustainable development and conservation of natural resource is very high and these have been recognized and well emphasized by the government of Ethiopia.

Though the current contribution of agriculture to the landless and farmer/pastorals beekeeping in particular and the national economy in general is not neglected, compared to the potential of the country, its contribution is far below anticipated. This could be attributed to many factories among which low production and productivity of apiculture, bee disease and poisons, post harvest handling of honey and poor marketing of honey bee products are the major one.

Objective

- ✓ To assess the production system, honey Bee flora, poisonous plants and post harvest handling and marketing of Honey Bee products of the study area.

2. MATERIALS AND METHODS

2.1. Description of the study area

South Omo Zone is one of the 13 administrative zones found in SNNPRS which covers an area of 25530 km2 and is located 4.43^0-6.46' N and 35.79^0-36.06'E, and has a human population estimated 472977. The population density of the zone is 21 persons per km2 it's bordering with Gamo Gofa Zone, Keffa Zone and Konta and Basketo special Woreda in north, Kenya in south, konso and Derashe special woreda in east and Sudan & bench maji Zone in west.

The Zone is divided into 8 woreda and 1 city administration. Generally the altitude of the zone ranges between 360 and 3500 m.a.s.l. The traditional agro-ecologies Dega, woina dega, kola and semi-arid cover 0.5, 5.1, 60, and 34.4 percent respectively of the total area. Rainfall pattern in the area is both unimodal and bimodal. The mean annual rainfall ranges between 400 and 1600 mm. The mean annual temperature ranges between 10.1 and 27^0c.

The zone has a huge animal resource with an estimate of about 906,442 cattle, 497,092 sheep, 846,611 goats, 311 camels, 453,366 chickens, 322,599 bee colonies and 87510 equines. Whereas Maize, Sorghum, Barley, Wheat, Teff, Godore, Millet, Cassava, Haricot bean and field pea are the major crops grow in the area.

Regarding the land use the proportion of cultivated land, grazing land, forest land, cultivated land and non-cultivable land and others are 11.22, 29.25, 12.55, 15.69, 10.85, and 20.42 percent respectively. There are 16 different ethnic groups found in 8 woredas. Except the Ari ethnic group which covers 2 of the 8 woredas and a farming system of sedentary farming. The rest of the ethnic groups having a farming system of pastoral and semi-pastoral type.

2.2. Methods of data collection

The survey was conducted in four woredas of south omo zone, namely, Debub Ari , Malee , Hammer and Selamago. These woreda were selected purposively based on their potential and engagement in honey beekeeping and their representativeness to the various agro climatic conditions of the zone. Three to five PA's were selected from each woreda .The total number of PA's included in the study was sixteen. Three up to six farmers /pastoralists were selected from each PA and the total number of sample population was sixty-eight. Data collection methods used for the study include interview by using a semi-structured interview schedule, group discussions with experts from woreda offices of Agriculture and Rural Development , PA level development workers, key informants and farmers and pastoralists were incorporated. Table.1 shows the lists of PAs included in the study and number of respondents selected from each woreda.

Table.1 lists of woreda, kebele and number of respondents.

Name of woreda	Name of kebele	No. of farmers selected
Debub Ari	KURE,BYTSEMAL,GENAMER and METSER	18
Hammer	Eraimbulle ,Besheda and Dembaite	15
Selamago	Arbuja ,Hailwuha ,Gio and Kagda	16
Malee	Beneta, Gongode,Sholate, Koybe and Geragad	19
Total number of respondents		68

2.3 Method of data analysis

Primary data were collected and analyzed using appropriate statistical packages by (SPSS) software version 17 and by simple statistical descriptive analysis.

3.RESULTS AND DISCUSSION

3.1 Production system of the area

In south Omo zone there is a long history of traditional honey beekeeping practice .The study showed that, on average the respondents have 27 years beekeeping experiences, being 5 and 45years the minimum and maximum experiences, respectively. However, the production system has showed little improvement irrespective of their long honey beekeeping experiences .From the total respondents, 94.1% of them were found to use traditional bee hives, while only 5.9 % respondents reported that they are using both transitional and traditional hives.

As the study showed that, 97.87% of the respondents keep (hang) their beehives in forests, 6-10 km away from their home , while the remaining hang their hives near their homestead. Particularly, most respondents from Bytsemal PA declared that they are on the ease of ceasing bee keeping. This is because, they added that, they were hanging their bee hives in forests found in the territories of Mago national Park which borders the PA in west but as they said that, the park forbids everyone to get in to its territories, for the sake of

protecting the park from deforestation.

3.2 Trends of production

Ethiopia is the leading honey and wax producers worldwide for centuries. Ethiopia produce about 98% of it's from traditional hives (CSA, 2007). For many farmers, beekeeping is one of their major activities in addition to livestock keeping and agriculture. In the study area, there is a decreasing trend in number of colonies, production and productivity of honey in the area. The information generated through group discussions held with the respondents, development workers and key informants, showed that the causes for the declining trend of honey production include a gradual decrement of vegetation cover especially honey bee floras, drought (lack of rainfall) and to some extent damages caused by pests and predators.

Moreover, the sample respondents were requested to prioritize the factors in terms of their relative importance to the declining trend of production and productivity of honey in the area. Then, it was found that 83.27, 53.77 and 18.22 % of the respondents ranked lack/decrement of honey bee flora, first, lack of rainfall/drought, second and the effects of pests and predators, third, respectively. These result show that , the first and the third rank of prioritizing the reason of declining production and productivity trend was coincide with the study of (Beyene, et al . , 2014) but exceptional of the second rank.

3.3 Honey bee floras and poisonous plants

The botanical composition of natural vegetation varies depending on the topography, climate and soil type. The potential for different hive products and success in beekeeping development is dependent first and foremost on the type and quantity of flora available (Amssalu B., 1999, 2004, 2007). In the study areas, as most of the respondents said that, the area has good vegetation cover and include diversified tree, bush and grass species which attract honeybee and there are some plant species poisonous to honey bee. Table.2 below shows the lists (local names) of honey bee flora and poisonous plant species identified by the respondents.

Table.3 list of honey bee flora and poisonous plants

Name of woreda	Lists of honey bee flora(local names)	Lists of poisonous plants
Debub ari	Arbi, wanza, dabdan, abala, sengela, goje, lelesilda, gara, atsim, soba, misa, turna	Alshan, arka, bata , tsedaki
Hammer	Kena, mega, zitaw, silvia, gedaqa, godjo, suni ,are ,regena, zergo, Zarguma, sable, Dille	lola
Malee	Kore, hareg, shere, chelko, galy, zergayno, busuno, fare, banjerndo,	Grawa, shari, gali , lag
Selamago	Chubuye, pukoye, tiby, tuday, kergnane, lalay, kaluch, teach, raduch, raach, wusirich, Latitsagarach, barbur, kujiy	Kuloch, ketekulo

3.4 Pests & Predators and their control

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 (Desalegn, 2001). As this study showed that, there are some pests & predators which attack the colonies, decrease its production and productivity. The major honey bee pests and predators found in the area include ants, wax moth, beetles, spiders, lizards, snake and monkey. This result agrees with studies of (Beyene, et al. , 2014 and Kerealem, 2005) . As 38.25% respondents declared that they have never tried to apply any pests and predators control methods. However, 58.68 % of the respondents responded that they have applied some cultural practices to control/prevent the effects of some pests and predators (whether they were successful or not). Only four respondents were found to use chemicals (malathion and DDT) to control ants and spiders. Table.3 shows the lists of pests and predators found in the study area, along with (cultural) preventive practices applied by the respondents.

Table.3 lists of pests and predators and prevention/control methods

Pests and predators	control methods
wax moth (Galleria mellonella), small hive beetles (Aethina tumida) ,ants ,spiders, lizard, snake, monkey, "polynga"(looks like "kulabayso"), " renso" wasp, "kemecha", hunter birds, "ruoon" (look like dog), "mar feji", " kefo gelbach" (Mellivora capensis)	• Smoking (birbra tree) • cleaning • Spraying DDT and malathion • spraying ash • covering bottom of the trunk with fuel soaked garment • fencing around the tree • burning the surrounding • Trap • covering bottom of the tree with smooth metal sheet • cleaning • killing with bullet ,spear

3.5 Period of harvesting and swarming

The result showed that, 32.50% and 52.78% of the respondents' harvested honey 2-3 and 1 time(s) within a year, respectively. The period of harvesting was also found to be associated with the flowering seasons of various tree, bushes and grass species found in the vegetation cover of the area. However, it is obvious that the flowering season depends on the raining seasons of the area. Similarly, the period of swarming is associated with the flowering stages of different plant species and it occurs just sometimes after the flowering season. The study showed that almost all of the respondents have never tried to control swarming. However, some respondents (17.68%), were found to have swarm catching experiences by hanging new (empty) hives treated with some locally available swarm attractant materials. The swarm attractant plants (materials) used in the area include "karko", "jamo", "sharagacho", "darey", "wuluko" and coffee powder.

3.6 Productivity, post-harvest handling and marketing

Lack of appropriate production technologies, weak market and absence of value chain development largely resulted in much lower contribution of the honey sub-sector, much lower than its potential (Wilson, 2006 and Tallonitire, 2006). In the study area, as the result showed that, the average amount of honey harvested per hive in the area to be 6.91kgs, with a standard deviation of 3.64.It was found that, 58.5% of respondents store the product, on average for 2.5years. They justified some reasons for storing the product such as to get better prices, to improve its quality, to collect a relatively higher amount of the product and earn higher income at once.

The materials used to store the product include "kil" (gourd), "masero"(pot), "silcha" and some plastic materials. Respondents reported that, they sold their product (honey) in nearby markets and /or at their home to consumers, middle men, retailers and whole sellers. In addition, it was found that some respondents sold the product to certain 'tej' /traditional drink producers and they consider them as their regular customers /'jalla'.

As it is showed in Table.4 below, the average amount of annual honey sell of the respondents was found to be 35.36 kgs, with a standard deviation of 45.53. In addition, the respondents' average annual income obtained from sale of honey was found to be 780.57 birr, with a standard deviation of 873.61.

Table.1 mean amounts of honey harvested/hive, amount sold and income obtained

Name of woreda	Average amount of Honey harvested/hive(kg)	Mean total amount harvested/year	Average amount of income obtained(birr)
Debub ari	4.6667(1.03280)	18.2857(7.18132)	400.63(209.155)
Hammer	6.0000(2.59370)	18.2727(5.12037)	453.50(162.941)
Malee	8.6111(4.23068)	29.8889(14.83592)	868.83(448.794)
Selamago	6.0000(3.51188)	86.1250(91.34305)	1452.50(1856.662)
Total respondents	6.9070(3.6370)	35.3636(45.5269)	780.57(873.606)

N.B: numbers in ( ) indicate Standard Deviations

4. Conclusions and recommendations

South omo zone has a long history of traditional honey beekeeping practice. In addition the study showed that the area has high potential for honey production, as it is endowed with various agro climatic conditions and diversified tree, bush and grass species which attract honey bees. On the contrary, little intervention was made to improve the production system of the area. Therefore, much has to be done to improve the production system of

the area and thereby enhance the production and productivity of the sector. Generally, it is advisable to establish a model apiary site to serve as a demonstration center for modern beekeeping practice. Farmers and pastoralists need to get trainings about modern and improved beekeeping practices.

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