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Demonstration and Participatory Evaluation of Improved Beehives and Cooperative and Market Linkage Formation in Dawro Zone Southern Ethiopia

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Abstract

The study was conducted in Loma district of Dawro Zone to evaluate the productivity performance of bee hives using locally adapted honeybees spp. A total of ten farmers with rich experiences in beekeeping were purposively selected for this research purpose first. Theoretical and practical training session about honeybee colony management was given for selected farmers, development agents and Woreda experts. The project was provided technical support and input materials such as improved hives, wax printer, wax and improved bee flora. After share of traditional honeybee colony by each member of cooperative groups, colony transferred to modern hives and inspected regularly at study site to follow up the progress of the bee colonies. Finally, ripened honey was harvested and extracted by using honey extractor and stored in sealed containers and put in dry place until marketed. Both qualitative and quantitative data were collected, systematically analyzed and interpreted using descriptive statistics. During the first harvesting season the average honey yield per hive/season from traditional, Kenya Top bar and frame hive was 7.3 kg, 18.1 kg and 22.875, while in the second round it was 5.5 kg, 14.89 kg and 16.52 kg respectively. The average honey yield per hive/year from traditional, Kenya Top bar and frame hive was 12.85 kg, 32.99 kg and 40.095 kg, respectively, which was significantly different ($p<0.05$). The findings of the study showed that the mean honey yield obtained from frame hive was significantly higher than Kenya Top bar hive and traditional hive. Moreover, formation of beekeepers' cooperative and market linkage is found to be very important to experience modern beekeeping system because it increases sharing of equipments and skills between members.

Keywords: Honeybees; Colony management; Participatory evaluation; Traditional hive

Introduction

Beekeeping is long standing practices in the farming communities of Ethiopia. Ethiopia is one of the major countries keeping bees in the continent, with huge production potential that stands the country among the 8th major organic honey producing countries. The ideal climatic condition and diversity of floral resources allow the country to sustain around 10 million honeybee colonies, of which 7 million are kept in local bee hives under farmers management condition and the remaining exist in the forests as wild colonies, which makes the highest bee density country in Africa [1]. Ethiopia is endowed with wide agro-climatic and edaphic variability which resulted in diverse and unique flowering plants. The contributions of beekeeping in poverty reduction, sustainable development and conservation of natural resources is very high and have been recognized and well emphasized by the government of Ethiopia. The national average honey produced in the year 1997-2004 was estimated at 30 thousands kilogram which accounted over 23% of the total African production and about 2% of world honey production [2]. The majority of household keeps honeybees and the honey harvested serve as a source of cash income for a large number of poor and landless households.

Although Ethiopia is recognized as top ten producers of honey globally which is clearly observed in the last few years with significant increment but it's the national output is still below 10% of its production capacity [3]. One of the prominent factors for this low honey production and productivity is a traditional mode of management even though there are three types of honey production systems have been experienced in the country: traditional, intermediate, and frame improved hive beekeeping The country's average crude honey production at farmers' level in traditional hive, Kenya Top bar, and frame hive were (3-5 kg), (10-15 kg), (15-20 kg) respectively as reported by Africa A [4].

Ethiopia in general and southern region in particular is highly potential in beekeeping, and large volume of honey is produced annually because the country is endowed with wide agro-climatic and edaphic variability which resulted in diverse and unique flowering plants [5]. Although the region has higher potential in number of bee colony, flora and favorable climatic condition, productivity is still low due to poor intervention and improvement strategies of honey bee production. Among the major challenges threatening the sub-sector in the study area are traditional way of production system by smallholders, lack of technical support and facilities needed, current climatic change, population increment, lack of disease and pest management, lack of improved bee flora introduction, shorter flowering season of natural forest, post-harvest handling and storage, marketing price and long market chain, limited capacity of small holders to use improved technologies. In the study area modern beekeeping production system is very not experienced well and most of farmers produce only traditionally because of lack of skill and high demand of modern beehive equipment. Rural poor people in many parts of the world often face serious difficulties in accessing markets. The economic environment within which rural poor households operate is characterized by unpredictability, uncertainty and risk; the poor

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are often obliged to sell low and buy high, with little choice regarding where they conduct transactions, with whom, and at what price [6]. In connection with the above idea, honey production of the area is not also market oriented. The lengthy chain of actors that widens the access of producers to bigger and better paying markets and the beekeepers complain the business as not rewarding better price market for the producers and better quality honey for fair price for the consumers and even lacking market for their product, while the consumers see the ever increasing price of honey as unfair [7]. Again the marketing needs fundamental change in its structure and functioning systems to address the accessibility. Similarly also regarding to qualitative aspect, processing of crude honey into table honey and the crude beeswax into pure form is not practiced by the beekeepers of the study area. Therefore, the study was planned to demonstrate, evaluate, and introduce cooperative and market linkage formation, and finally to scale up the best practices to improve productivity of beekeeping and thereby to improve livelihood of small holder farmers.

General objective

To improve farmer's income and livelihood through increasing production and productivity of honey bees.

Specific objectives

- To demonstrate and evaluate different beehives at farm level.
- To establish beekeepers' cooperative and market linkages.

Methodology

Description of the study area

Study was conducted in Loma district of Dawro Zone. Loma Woreda is located at south of 520 km away from Ethiopia Capital City, Addis Ababa and 283 km away from Southern Capital City, Hawassa. Its elevation is 700 m to 2600 m above sea level, latitude of 7°19" N and longitude of 37° 32" E. The annual rainfall of Loma district ranges from 1401 mm to 1800 mm. The mean annual temperature in the study area ranges between 15.1°C-27.5°C in district.

Farmers and experimental sites selection

For this study purpose, beekeeping potential site was purposively selected with the criteria of having large number of participants in beekeeping, beekeepers' experience and interest, potential area for beekeeping, abundance of honey bee colonies in traditional hives, availability of common bee forage, accessibility of the areas to transportation service and socio-economic value of bee products. Accordingly, Elabacho Kebele from Loma district in Dawro Zone was purposely selected and used for this study purpose. Then after, ten beekeeper farmers were selected based on the criteria set (Figure 1).

Farmers research group approach

After site and farmers selected, theoretical and practical training session was given for a total of 10 beekeeper farmers, and district honey experts and development agents at study site since transitional and modern hives were new to beekeepers the district. Training topics focused on bee biology, beekeeping system, routine honey bee colony management and inspection, procedure of bee colony transferring from traditional hives to transitional and modern hives, honey harvesting and post-harvest handling, bee product marketing, importance of transitional and modern hives. The project was provided technical support and input materials such as modern hives, queen excluders, and refined beeswax and bee flora seeds for farmers. This was performed before honey bee colony transferring to transitional and modern bee hives (Figure 2).

Newly introduced honeybee forage seeds (Mellitus spp., Sunflower types, and Vicia Sativa) obtained from seed supplier and Holeta Bee Research Center (HBRC). These forages were planted in front of beehive on the farm land of participating farmers to be used as supplementary feed in order to strengthen honeybees' colonies and increase honey production. Having given technical support or training on modern beekeeping, input materials/beekeeper equipment, and improved bee

Figure 1: The Apiary site in Dawro Zone of Loma Woreda Atso Mauntain.

Figure 2: Processing Materials and Semi- processed Products.

flora seeds, the project has formed beekeepers' cooperative association in the Woreda in order to facilitate honey value chain and market system. The work was started with only ten farmers in the village but currently it increased to twenty and twenty three cooperative members in Atso beekeepers cooperative in Ela-bacho Kebele, Loma Woreda in Dawro Zone.

Method of Data Collection and Analysis

Data collection

Data collection sheets and check lists were developed by the researchers at team level for each study site. Data related to honey yield per hive were collected for two seasons in the year 2015. The amount of honey yield was soon measured and recorded on honey collection sheets.

Statistical analysis of data

The collected data were statistically analyzed using descriptive statistics such as percentages, frequencies, means, minimum, maximum and standard deviations. SPSS version 20 was used to analyze the quantitative data. Any data that could not be captured through quantitative analysis were analyzed qualitatively based up on Key Informant Interview and group discussion with extension workers and beekeepers.

Results and Discussions

Socio-demographic profile

The results in Table 1 showed that out of total participants, 90.0% participants who engaged in the apiculture improvement project were male headed households but only ten percent were female headed households. Most of the participants (70.0%) aged blow forty. This means most of the beekeepers participated were youths. This is important to see whether the beekeeping practice has relation with the productive labor. Young beekeepers continue accumulating experience by seeking technical advice from fellow beekeepers and development agents (DAs) whenever necessary [8]. They gradually move on to become independent beekeepers as soon as they can obtain their own hives [9]. Regarding the educational status of respondents, Education levels of sample households or beekeepers were categorized as those

Participants' profile		Frequency (N)	Percent (%)
Sex	Male	9	90
	Female	1	10
Age Group	20 - 40	7	70
	41 - 64	3	30
	Above 65	0	0
Educational Level	Did not go to school	2	20
	Primary School	2	20
	Junior School	2	20
	High school and above	4	40
Beekeeping Experience	Less than 10 years	4	40
	10-20 years	3	30
	More than 20 years	3	30

Table 1: Profile of participant beekeepers in Loma Woreda of at kebele.

who have not attended formal education (20.0%), and attended primary school (20.0%), junior school (20.0%) and high school and above (40.0%). This indicates that most of households who participated in this project were attended formal education since only 20.0% were illiterate out of all. On other Words, eighty percent of beekeepers who were attended primary school can read and write. The majority of sample beekeepers were categorized under primary level and above. Except four participants, others have long experiences with bees (more than ten years of beekeeping experiences).

Beehive productivity

The average honey yield obtained in kilograms per hive per year from traditional, transitional and frame hive in (12.85), (32.99) and (40.095), respectively. The average honey yield produced from different beehives was varied significantly as the study showed in Table 2. The present research result was above the national average honey yields which were 5 kg, 12-15 kg, and 15-20 kg for traditional, transitional, and frame beehive [10]. Similarly with this result, according to the survey conducted in Gamo Gofa Zone, average honey yield per hive per year from traditional, transitional and modern hive was 5.88 kg, 14.07 kg and 20.64 kg, respectively [11]. In contrast to this, the study in western Ethiopia showed that the number of kilograms taken per hive per harvest ranged from 3 kg up to 15 kg and 10 kg up to 35 kg of crude honey for traditional and transitional beehive respectively, and 6.25 to 50 kg table honey for movable frame hive. In line with result the

Hive Type	Average Yield Per Season (kg)		Average Yield/Year (kg)
	Season 1	Season 2	Total Yield
Modern Hive	22.875[a]	16.52[a]	40.095[a]
Kenya Top Bar	18.1[b]	14.89[b]	32.99[b]
Local Hive	7.3[c]	5.5[c]	12.85[c]
LSD (5%)	3.5	1.3	4.8
CV	24	11.88	18.4

The mean in table having different superscript are show statistically variation at $p<0.05$.

Table 2: Average honey yield production year from different hive types.

average yield of traditional, transitional and frame hive in Bench-Maji Zone is 15kg, 18 kg and 35 kg/hive/year respectively which is above the average national honey production and similar with this study result [8,12].

Depending on season of production and size of beehives, some farmers indicated that a well-managed traditional beehive can produce its full potential. These results are indicators of the existence of room for increasing performance of these beehives through good management practices coupled with favorable beekeeping environments. In the study area frame five and Kenya top bar hive produced more honey than the traditional one. The study result confirmed that the average honey yield in kilograms of Kenya Top Bar beehives (32.99) and modern beehive (40.095) were better than the local one (12.85). When compared with the average national honey production from Dawro Zone Loma Woreda was better because in addition to availability of bee forages through the year and favorable climate condition of the area for bees, the diversity of bee flora is also so important. Participatory beehive evaluation showed that frame beehive gave three to four times many yield compared with the traditional beehives, and twice more compared with Kenya Top Bar hive due to its easiness for handling honey bee colony simply even though it needs some equipment and practical skill. Different bee floras have varied flowering and flowering season one come after the other. Because of this, honey bees did not suffer from the seasonal food shortage especially during dearth periods in the study areas.

6.3 Beekeepers' Cooperative and Honey Market Linkage Formation: Beekeepers' Cooperative was formed in the project beneficiary site. The group who had given packages of beekeeping materials was developed and promoted into beekeepers' cooperative. Cooperative members under Atso beekeepers' cooperative in Ela bacho kebele of Loma Woreda, Dawro Zone are twenty in number. The members having started working together have been produced processed honey. The cooperative also started honey marketing in better way. After harvesting and processing, the cooperative sealed the honey in the plastic jar in the way available to the market. They started selling the products (packaged honey, 'Birz' and processed wax) to local people in the shop which is along the main road of Tarcha to Wolaita Soddo and also to the exporters (NGO). The main costumers for this product were travelers along the main road from Dawro Tarcha to Wolaita Soddo Town. The average price of honey sold was 100 ETB per kg which is better compared with the local market price (55 birr per kg). In addition to this, the Cooperative started buying crude honey from other farmers of the village in cheap price, and resells it back in better price after processing and packaging/sealing. The cooperatives not only producing pure honey but also they started producing pure wax from traditional and Kenya Top bar hives. Atso beekeepers' cooperative produces, process, and finally sells table honey in their shop and others.

The cooperative is as a producer, processer, honey collectors, and retailers. It act as honey collectors because they collect unprocessed honey in cheap price from other beekeepers (who produce honey locally) in the village and sell for exporters. Then they process, and finally package the table honey. The collectors mainly pass the honey to the whole sellers in big cities and towns, though significant amount of honey they collect also goes to local tej brewers, processors and other consumers [13]. As retailer, the cooperative sell their honey and wax products in their shop partly to local consumers/passengers. In addition to selling table honey, side by side, they produce and sell local beer " Birz" along the road-side. Apiculture production through beekeepers' cooperative (improving market structure and functioning systems address accessibility of the better price market for the producers and better quality honey for fair price for the consumers. This also meets the consumers demand because from the consumers' point of view, the shorter the marketing chain, the more likely is the retail price going to be affordable [5,8,14-19].

Conclusion and Recommendation

Most of beekeepers participated in this project were male headed households (95%) of productive age groups who attended primary school and above (85%) with long beekeeping experiences. Step-by-step approach of apiculture development was carried out starting from colony management and honey production to honey marketing with participant beekeepers. The result of demonstration and participatory beehive evaluation study showed that the average honey yield per hive per year of frame hive (40.095 kg), transitional hive (32.99 kg) and traditional hives (12.8 kg).

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