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Introduction and Participatory Evaluation of Improved Beehives in Adadle District of Shabele Zone, Somali Regional State, Ethiopia

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ABSTRACT

The study was conducted in Adadle District of Shebelle Zone, Somali Regional State, with the objective of introducing and evaluating the productivity performance of improved beehives (modern and transitional) in comparison with the traditional hives commonly used by local beekeepers. A total of 25 experienced members of Pastoral and Agro-Pastoral Research Extension Groups (PAPREGs) were purposively selected to participate in this participatory research. Theoretical and practical training sessions on honeybee colony management were provided to both PAPREG members and local development agents. Both qualitative and quantitative data were collected and analyzed using descriptive statistics. During the first harvesting season, the average honey yield per hive was 3.63 kg for traditional hives and 10.5 kg for modern hives. In the second season, yields increased to 4.25 kg and 11.75 kg, respectively. The average annual honey yield was 7.88 kg per traditional hive and 22.25 kg per modern hive, showing a statistically significant difference ($P<0.05$), with improved hives yielding nearly three times more than traditional ones. PAPREG members highlighted high honey yield, ease of colony inspection, and simplified harvesting as the key advantages of improved hives. However, they also noted high initial cost, the need for technical skills, and additional accessories as relative limitations. Despite these challenges, the positive perception of improved technologies among beekeepers presents a valuable opportunity for apiculture development in the region. It is therefore recommended that improved beehive technologies be widely promoted and scaled up in areas where adoption remains low, to enhance honey production and improve livelihoods in pastoral and agro-pastoral communities.

INTRODUCTION

Beekeeping profitability significantly improves when modern beekeeping technologies, including comprehensive management practices, are fully adopted (Berhe *et al.*, 2016). However, in many areas, traditional beekeeping methods continue to dominate, resulting in low honey yields, inferior product quality, and limited market engagement, thus maintaining beekeeping as a subsistence activity (Meaza, 2010). Ethiopia is endowed with a favorable climate and diverse vegetation that provides ample nectar and pollen sources for honeybees, creating a high potential for beekeeping development (Kinati *et al.*, 2013; Gebretsadik, 2016). Despite this, the country's actual production remains substantially below its potential, with annual honey and beeswax outputs far less than the estimated capacity of over 500,000 tons per year (Birhan *et al.*, 2015). This underperformance largely stems from the fact that over 95% of beekeepers in Ethiopia still rely on traditional hive systems, which adversely affect both yield and honey quality (CSA, 2017). Traditional beekeeping systems in Ethiopia face several challenges, including limited management knowledge, insufficient forage availability, and vulnerability to pests and diseases (Kinati *et al.*, 2013; Fikru, 2015; Kalayu *et al.*, 2018). In response, various interventions have been implemented to improve beekeeping technologies and practices, aiming to enhance productivity while supporting sustainable resource use (Adgaba *et al.*, 2014). For instance, the average annual honey yield per traditional hive ranges between 5 and 7 kilograms, which is significantly lower compared to the 20 to 30 kilograms per hive achievable with improved box hives (Sebeho, 2015). Adoption of improved beekeeping methods, including modern hives and colony management techniques, can enable beekeepers to generate surplus honey and improve livelihoods (Teklu, 2017).

In the Somali region, beekeeping remains largely traditional and underdeveloped, with low productivity in both quantity and quality of bee products. To address this, transferring modern beekeeping technologies and enhancing the skills and knowledge of local beekeepers through training and demonstration are crucial steps. Specifically, Adadle district is known to have a high density of honeybee colonies and abundant bee forage resources. However, the majority of local beekeepers rely on traditional hives, and productivity remains suboptimal. Additionally, improved or modern hives have yet to be introduced or widely adopted in the district. This research aims to fill the gap by demonstrating and evaluating the productivity of improved hives compared to traditional ones through a participatory approach in Harus kebele, Adadle district, thereby contributing region-specific evidence to guide apiculture development strategies.

MATERAIL AND METHODS

Trial Location

The project was conducted in Adadle district at Harus kebel which has high production potential of beekeeping

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and after a deeply discussion with local community during the problem identifications beekeeping were prioritized as a first rank as it needs intervention. Adadle is one of the woredas in the Somali Region of Ethiopia which is well known for beekeeping potentiality. Part of the Gode Zone, Adadle is bordered on the west by the Afder Zone, on the north by the Shebelle River which separates it from Gode, on the east by Kelafo, and on the south by Somalia. Temperatures range from 18-22 Co in the coolest months, July and August, to 30-39 Co in the hottest months, March and April. 250-350 mm of rainfall annually.

Establishment of beekeepers (PAPREGs) and Site Selection

The project was conducted in Adadle district at Harus kebel which has high production potential of beekeeping and after a deeply discussion with local community during the problem identifications beekeeping were prioritized as a first rank as it needs intervention. the farmers/ pastoralist were selected with the criteria of having experience, gender and interest, abundance of honey bee colonies in traditional hives, availability of common bee forage, and accessibility of the areas to transportation service and socio-economic value of bee products, then after, 25 beekeepers were established based on the criteria mentioned above and considered as one research group(PAPREG).

Training of beekeeper farmers (PAPREGs)

After the establishment of the beekeeper farmer/ PAPREGs theoretical and practical training session were given for a total of 25 beekeeper farmers and development agents at project site since modern hives are new to beekeepers in the district. Training topics focused on bee biology, beekeeping system, routine honeybee colony management and inspection, procedure of bee colony transferring from traditional hives to modern hives, honey harvesting and post-harvest handling, bee product marketing, importance of modern hives. In this project different proven and recommended beekeeping technologies were designed to be adopted by the beekeepers so as to improve production and productivity of beekeeping and in turn able to bring positive impacts in their livelihood. The inputs delivered to beekeepers which were also a part of the demonstrations were casting mold which used for wax making, queen excluder, smoker and water sprayer, hive chisel, bee brush, honey sieve, modern hives along with hive frames, protective clothes (0verall), etc.

The Role of Key Actors

PAPREG Members (Beneficiaries)

These participants were directly responsible for managing the beekeeping trials and maintaining accurate records. They also played a key role in sharing information and experiences about beekeeping practices with other pastoralist and agro-pastoralist community members.

Extension Workers (Development Agents - DAs)

Extension workers facilitated resource mobilization and acted as a communication bridge between PAPREG members and researchers. They were also actively involved in the data collection process, ensuring smooth coordination on the ground.

Researchers

Researchers provided technical training and guidance on modern beekeeping techniques. They designed and prepared data collection tools for PAPREG members, collected performance data on improved hives, and gathered pastoralists' perceptions of the new technology. Additionally, researchers supported the pastoralists in analyzing trial results and processing the data to validate the findings.

Data Collection and Analysis

During the project study data were collected on honey yield from different hives (modern hives and traditional hives), perceptions attitudes of farmers toward improved beekeeping technologies were gathered and analyzed using descriptive statistics using SPSS version 26.0.

Implementation Process (What Actually Happened)

During the implementation of the project 25 beekeeper farmers were established as one research group. After the establishment of the PAPREGs After the establishment of the beekeeper farmer/ PAPREGs theoretical and practical training session was given for a total of 25 beekeeper farmers and development agents at project site since modern hives are new to beekeepers in the district. In this project different proven and recommended beekeeping technologies were designed to be adopted by the beekeepers so as to improve production and productivity of beekeeping and in turn able to bring positive impacts in their livelihood. At the end of the project implementations the data the on hive productivities and pastoralist perceptions were collected. In addition to this, a field day visit organized by LLRP was carried out with objective Experience sharing with other PAPREGs groups such Biyole kebele of Adadle district and other PAPREGs groups from Qohle district sharing with experience they have got so far and apart from this the PAPREG members of this project were promoted as CIG (common interest group) after their effort and commitment.

RESULTS AND DISCUSSIONS

Socio-demographic Characteristics of the Beekeepers

The profile of the 25 participant beekeepers reveals important demographic and experiential characteristics. The majority of respondents were male (68%), with females accounting for 32%, indicating a male-dominated participation in beekeeping within the study area. In terms of age distribution, most participants (52%) were between 20 and 40 years old, suggesting that beekeeping is

increasingly practiced by younger individuals. Participants aged 41–60 comprised 36%, while those over 60 made up only 8%, reflecting a potential generational shift in interest and involvement in apiculture.

Educationally, a significant portion of the beekeepers (64%) were illiterate, highlighting a potential barrier to adopting modern beekeeping practices and accessing information. However, 36% were literate, which may contribute to better record-keeping, training uptake, and management practices. Regarding beekeeping experience, nearly half (48%) had between 5 and 10 years of experience, indicating a moderate level of familiarity with beekeeping. Meanwhile, 32% had more than 10 years of experience, reflecting a considerable depth of traditional knowledge and skills. Only 20% had less than 5 years of experience, showing that while some newcomers are joining the sector, the majority have been engaged in beekeeping for a substantial period. This overall profile suggests that targeted training programs, especially those tailored to the needs of less-educated but experienced male and young beekeepers, could enhance productivity and sustainability in the sector.

Table 1: Profile of participant beekeepers (N=25)

Variables	Category	Frequency (N)	Percentage (%)
Sex	Female	8	32.0%
	Male	17	68.0%
Age (years)	20–40	13	52.0%
	41–60	9	36.0%
	>60	2	8.0%
Educational level	Illiterate	16	64.0%
	Literate	9	36.0%
Beekeeping Experience	Less than 5 years	5	20.0%
	5–10 years	12	48.0%
	More than 10 years	8	32.0%

Beneficiaries and Field Day of the project

The project benefited directly for 25 PAPREG members from Harus kebele during its implementation. In addition, 11 non-PAPREG members were attached and involved during the course of the project. A field day, organized by the LLRP (Lowland Livelihood Resilience Project), was also conducted. This event facilitated experience sharing among different PAPREG groups from Biyole Kebele of Adadle District and Qohle District, enabling them to exchange knowledge and practices gained so far. As a result of their dedication and efforts, the PAPREG members involved in this project were promoted to Common Interest Group (CIG) status, recognizing their commitment to improving beekeeping practices.

Table 2: Beneficiaries and field day participants

Beneficiaries and Field Day Participants	Male	Female	Total
Direct Beneficiaries (PAPREG members)	17	8	25
Indirect Beneficiaries	5	6	11
Field day participants	45	15	60
Total	67	29	96

Productivity of Beehives

During the first harvesting season the average honey yield per hive/season from traditional and modern hives were 3.63 Kg and 10.5 Kg, while in the second round it was 4.25 kg and 11.75 kg respectively (Table 3). The average honey yield obtained in kilograms per hive per year from traditional and modern beehives were 7.88% and 22.25% respectively. Average honey yield produced from different beehives varied significantly ($p<0.05$) and there is slightly difference among the seasons. The present research result was above the national average honey yields which were 5 kg and 15-20 kg for traditional and modern hives which implies the potentiality of beekeeping production in the study areas.

Table 3: Productivity of modern and traditional beehives

Hive type	Average yield/hive per season			Average yield /year (kg)
	Season 1	Season 2	Overall	Total yield per hive
Traditional	3.63+0.75a	4.25+0.32a	3.9375+0.39	7.88
Modern	10.5+0.65b	11.75+0.66b	11.0625+0.5	22.25

Perceptions and Attitudes of Beneficiaries Toward Technologies

It is very important to identify perceived relative merit of improved beekeeping technology and its relative detriment to determine the perception of beekeepers about improved technology and for appropriate interventions. The majority of the PAPREGs and indirect beneficiaries reported that high yield (52.77%), ease of inspection (25%) and ease of harvesting (22.22%) are the main advantages of improved beekeeping technology. in the other side PAPREGs and indirect beneficiaries indicated high cost (52.77%), the need of high skill (36.11%) and the need for accessories (11%) as the major relative limitation of improved beekeeping technology (Table 3). This indicates that beekeepers had positively perceived improved beekeeping technology which is a good opportunity for beekeeping extension intervention.

Table 4: Perceptions and attitudes of beneficiaries toward technologies

Variables	PAPREG members (25)	Non beneficiaries (11)	Overall (36)
Advantages of the technologies			
High yield	13(52%)	6(54.5%)	19(52.77%)
Easy for inspection	6(24%)	3(27.27%)	9(25%)
Easy for harvesting	6(24%)	2(18.18%)	8(22.22%)
Disadvantages of the technologies			
High cost	14(56%)	5(45.45%)	19(52.77%)
Needs high skill	9(36%)	4(36.36)	13(36.11%)
Need accessory	2(8%)	2(18.18%)	4(11.11%)

Important Lessons Drawn

Introduction, Demonstration and evaluation of improved beekeeping technologies through participatory approach was conducted in Adadle district and involved members were shown positive perception for the acceptance of the technologies as it is alternative option for income generation which have positive impact for their livelihood. Accordingly, from the evaluation made improved beekeeping technologies and other accessory equipment with it is improved management practice intervention found to boost production and productivity of beekeeping sub-sectors in the demonstrated areas.

Future Focus, Emerging Challenges And Opportunities

Therefore, the technologies is feasible and strongly recommended to be popularized and pre-scale up for maximizing honey production and alleviating the existing problems on shortages of improved beekeeping technologies and poor management practice in the areas one . From this, for effective utilization of the technologies, short-term beekeeping training of beekeeping farmers, DAs and expertise is require to come up some of the constraints limiting the beekeeping production such absconding which resulted from extended drought in the project site. A further promotion of the technologies into the area where there is a gap in utilizing the technology and better management is highly recommended.

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