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Research Article

Knowledge, Attitude and Practice of Bee Keeping in Nadhi-Nono District, Illubabor Zone, Oromia Regional State, Ethiopia

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Abstract

Background: This study investigates the knowledge, attitudes, and practices of beekeeping in Nadhi-Nono district, Illubabor Zone, Oromia Regional State, Ethiopia. A cross-sectional study was conducted, involving 200 beekeeper households selected from a total of 800 households engaged in honey production. Primary data were gathered through questionnaires containing both open-ended and closed-ended questions, focusing on factors affecting honey production, as well as the demographic and socioeconomic characteristics of the households. Data were analyzed by SPSS V. 25 utilizing both qualitative and quantitative descriptive statistics. Result: The results indicated that 95% of beekeepers were male, while only 5% were female. Beekeeping in the area follows three main systems: traditional, transitional, and modern frame hive production. Traditional hives produced an average of 12 kg of honey per hive annually, with 60% of beekeepers relying on this method. The primary honey harvesting season occurs from November to December (85% of beekeepers), with a secondary season from February to April (15%). Key challenges affecting honey production included honey bee diseases (40%), pests and predators (25%), forage shortages (15%), water scarcity (10%), colony absconding (7%), and pesticide and herbicide misuse (3%). The study emphasizes the need for targeted training and education on honey storage, hive management, seasonal practices, and colony care, particularly during critical periods like dearth seasons and cold weather. Both public and private service providers are encouraged to support beekeepers in improving productivity and sustainability. Conclusion: The Nadhi-Nono district shows high potential for honey production, predominantly using traditional methods. Knowledge transfer within families sustains traditional practices, while literate beekeepers adopt transitional and modern systems. Marketing remains informal, with prices driven by honey color and harvest timing.

Keywords

Nadhi-Nono, Ethiopia, Oromia, Beekeeping

1. Introduction

Beekeeping, or apiculture, involves the rearing of bees to harvest products such as honey, pollen, propolis, and brood [13, 14, 20]. It is widely recognized as a promising off-farm enterprise that supports smallholder incomes and contributes to national economies. Ethiopia stands out as a major player in African apiculture, holding the largest honeybee popula-

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tion on the continent and ranking tenth globally in honey production [14, 15, 17].

Global honey production faced setbacks in 2011 due to natural disasters like floods, droughts, and irregular rainfall patterns [5]. The United States saw honey yields drop from 160 to 150 million pounds, the lowest in recorded history while China increased its production dramatically from 172 million to 898 million pounds. Africa, home to diverse wild honeybee species remains rich in honey resources, with Ethiopia leading the continent's production due to its varied ecological and climatic conditions [2, 8, 9, 11, 14].

Ethiopia's diverse flora and fauna, particularly its forests and woodlands, offer abundant nectar and pollen sources [1, 3-5]. This biodiversity supports approximately 10 million honeybee colonies, with farmers managing around seven million in hives, while the rest thrive in the wild [7]. Beekeeping has long been an integral part of Ethiopian farming traditions [7]. The country produces around 24,000 tons of crude honey annually, contributing 24% to Africa's honey output and 2% to global production, making Ethiopia the largest producer in Africa and the tenth worldwide (Edessa, 2005).

With over 7,000 flowering plant species, most of which are suitable for honeybees [6]. Ethiopia possesses significant untapped potential in apiculture. Despite this, honey productivity remains low. Domestic consumption of hive products is high, but export levels are comparatively low. Adaptive research efforts over the past decades have yet to yield significant improvements in hive productivity. This may stem from diverse, location-specific challenges faced by beekeepers [2, 3, 8].

Nadhi-Nono district, with its rich vegetation and crop diversity, holds strong beekeeping potential. However, comprehensive research on honey production systems, challenges, and market dynamics in the district remains scarce. Detailed insights into local honey production, marketing systems, and associated constraints are crucial for improving productivity and supporting local beekeepers. This study aims to fill knowledge gap by examining the district's honey production potential, identifying key challenges, and highlighting opportunities to enhance productivity and sustainability.

2. Materials and Methods

2.1. Study Area

The study was carried out in Nadhi-Nono district (formerly known as Nono-Sele), located in the Illubabor zone of Oromia National and Regional State, Southwestern Ethiopia. The district lies approximately 700 km southwest of Addis Ababa, bordered by Gambela region to the southwest, Bure to the north, Halu to the northeast, and the Southwest Ethiopia Region (SWER) to the southeast (Figure 1). According to data from the Nono-Sele Agricultural Office, the district features varied topography with elevations ranging from 1300 to 2500 meters above sea level, positioned between 7 °45′ 0″ N latitude and 35 ° 15′ 0″ E longitude. According to personal communication with Nono-Sele district agricultural office, population data of the district is 39136 of which, 21032 are male and 18104 are female [12].

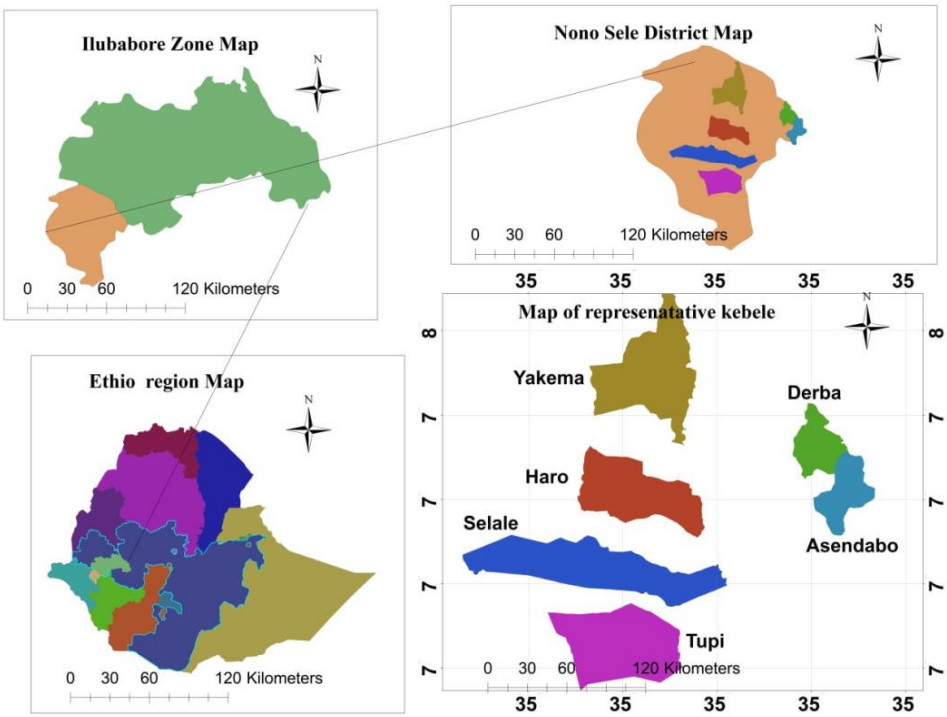

Figure 1. *Map of the Nono Sele district (Nadhi-Nono district) [Source: Generated by Arch GIS 10.4.1].*

2.2. Study Design

A cross-sectional study design was employed to assess the knowledge, attitudes, and practices of beekeeping in Nadhi-Nono district from September to October 2024.

2.3. Study Population

The study population comprised honey-producing households in Nadhi-Nono district and experts from the natural resource and agricultural sectors within the study area.

2.4. Sampling Procedure and Sample Size

Six kebeles such as Haro, Tupi, Yakema, Derba, Asendabo, and Selale were purposively selected. A total of 200 respondents were included to ensure sufficient data collection. Apiaries were considered valid if they contained more than ten operational honeybee colonies. Site and respondent selection criteria included accessibility to roads, agroecological representation, and beekeeper willingness. Accordingly, 200 beekeeper households were selected from the total 800 beekeeping households across the six kebeles.

2.5. Methods of Data Collection

Prior to field data collection, discussions were held with the head of Nadhi-Nono district's livestock resource, development, and health office, along with bee experts, to assist with site and respondent selection. Based on this input, 200 beekeepers were randomly selected. Structured questionnaires, checklists, and visual observations were utilized to gather data from the selected respondents.

2.6. Data Collection Procedure

Data were primarily collected through questionnaires and site visits. The questionnaires included both open-ended and closed-ended questions, designed to assess honey production, influencing factors, and current practices. The questions were formulated to align with the study objectives, covering personal information, educational background, honey production experience, and exposure to modern beekeeping practices.

2.7. Data Analysis

The collected data were analyzed by using SPSS V. 25 performing descriptive statistical methods, integrating both qualitative and quantitative approaches. Results were presented through tables and figures, with frequencies and percentages to illustrate key findings. Qualitative data were analyzed descriptively, while quantitative data were summarized numerically.

3. Result

3.1. Results

Respondents' demographic data, including gender, marital status, age, and education level, are summarized in Table 1. The study revealed that 95% of respondents were male, while only 5% were female, indicating women's underrepresentation in beekeeping. Age distribution showed that 20% of respondents were between 18 to 30 years, 70% were aged 31 to 50, and 10% were over 50 years old. Regarding marital status, 80% were married and 20% were single, demonstrating that beekeeping is practiced across different social groups. Educationally, 57.5% of respondents were illiterate, 35% had completed grades 1-4, 7.5% completed grades 5-8, and none had reached grade 9 or above.

Table 1. *Age, Sex, Marital, and educational status of the respondents.*

Characteristics		Frequency (n = 200)	Percentage (%)
Gender	Male	190	95%
	Female	10	5%
Total		200	100%
Age	18-30	40	20%
	31-50	140	70%
	>50	20	10%
Total		200	100%
Marital status	Married	160	80%
	Single	40	20%

Characteristics		Frequency (n = 200)	Percentage (%)
Total		200	100%
Educational status	Illiterate	115	57.5%
	1-4 grade	70	35%
	5-8 grade	15	7.5%
	>9 grade	-	0%
Total		200	100%

3.2. Honey Production System

Honey production in the study area involves three systems: traditional, transitional, and modern. Traditional hives dominated, accounting for 80% of hives, followed by 14% transitional hives and 6% modern frame hives (Table 2).

Table 2. *Traditional, transitional, and modern honey production system.*

Types of honey production	No. of Bee hives (n = 1014)	Percentage (%)
Traditional	160	80%
Transitional	28	14%
Modern/Frame	12	6%

3.3. Productivity of Beekeeping

Traditional hives produced an average of 12 kg of honey per hive annually, accounting for 60% of production. Transitional hives yielded 18 kg per hive annually (30%), while modern hives produced an average of 22 kg per hive annually (10%) (Table 3).

Table 3. *Mean productivity of honey.*

Types of Hives	Mean Productivity (kg/hive/year	Frequency	Percent (%)
Traditional	12kg	120	60%
Transitional	18kg	60	30%
Frame/Modern	22kg	40	10%

3.4. Current Practices and Placement of Honeybee Colonies

In the study area, the placement of the hives by respondents in the study area" from the total sampled households, 120 (60%) of them place their colonies at the forest tree, then about 60 (30%) place their colonies at backyards and 10% in the all agroecology under the eaves of the house and there is no any hives inside the house in all agroecology. The result shows most of the beekeepers kept their hives at back yard (Table 4).

Table 4. *Placement of the hives by respondents in the study area.*

Variables	Frequency (n = 200)	Percent (%)
Back yard	60	30%
Under the eaves of the house	20	10%
Forest tree	120	60%
Total	200	100%

3.5. Peak Honey Production Periods

Honey is harvested at the end of flowering time. In the study area there are two phase of honey harvesting period. The major and the most known to all beekeepers is February to April 170 (85%) and the minor one is from November to December 30 (15%) (Table 5).

Table 5. *Honey production period in the study area.*

Production Periods	Frequency	Percent (%)
February to April	170	85%
November to December	30	15%
Total	200	100%

3.6. Honey Marketing Systems

In the study area out of the total respondents about 8% of beekeepers used their honey for home consumption, 80% of beekeepers supply and sell their honey for "Tej" house marketing, and 12% to other customers (Table 6).

Table 6. *Honey marketing in the study area.*

Market Participant	Honey producers	
	Frequency	Percent (%)
Home consumption	16	8%
Tej producers	160	80%
Other customers	24	12%
Total	200	100%

3.7. Challenges of Honey Production in the Study Area

The current result shows that (25%) of beekeepers in the study area reported the problem of pest and predators, (40%) of the respondents were reported that honey bee diseases are one of the challenges affects honey production, followed by misuse of pesticides and herbicides (3%), colony absconding (7%), shortage of bee forages (15%), and (10%) of the reported challenge was shortage of water (Table 7). The result of the study on the ". Major challenges with the honey production systems in the study area" The major challenge that affect honey production was honey bee diseases about 80 (40%), then followed by 50 (25%) the problem of pest and predators, the next shortage of bee forages about 30 (15%), shortage of water was about 20 (10%), colony absconding 14 (7%) and the least challenge was misuse of pesticides and herbicides about 6 (3%).

Table 7. *Major challenges with the honey production systems in the study area.*

Parameters	Frequency	Percent (%)
Honeybee pests and predators	50	25%
Misuse of pesticides and herbicides	6	3%
Honey bee diseases	80	40%
Colony absconding	14	7%
Shortage of bee forages	30	15%
Shortage of water	20	10%
Total	200	100%

4. Discussions

The study's findings demonstrated that the majority of respondents were male, while women made up a smaller proportion. However, women's contribution to beekeeping tasks such as cleaning beneath hive shelters and protecting hives from birds and other animals often surpassed that of men. Decision-making, particularly regarding work methods and benefits, was largely controlled by husbands. This imbalance might stem from limited governmental and non-governmental support for female-headed households involved in beekeeping. Therefore, to boost women's participation and motivation, targeted training programs for women are crucial. This finding aligns with the results of [16, 18, 19].

The productivity of the traditional beekeeping system in the area based on beekeeper estimates, revealed that honeybee colonies in traditional hives produce an average of 12 kg of honey per hive annually (60%). Minor variations between agro-ecological zones were attributed to differences in feeding and watering practices during dearth periods. Nevertheless, colony absconding remains a challenge, with colonies abandoning hives within days or becoming inactive. Around 120 (60%) of the beekeepers reported placing their hives on forest trees similarly positioned hives on tree branches, with the remaining ones placing them in backyards. This study aligns with [5, 7, 10, 15].

Honey harvesting occurs in two main phases, typically at the end of the flowering season. The primary and most productive period is from February to April, followed by a smaller harvest from November to December. This pattern reflects the seasonal flowering cycles, leading to a peak honey supply during these times and a decline in the dry season when colonies require supplementary feeding. This result is consistent with findings other research findings conducted elsewhere in the country and in the globe [13,

15-18].

Regarding honey sales, approximately 80% of beekeepers sell their honey to local "Tej" houses, 8% consume it domestically, and 12% supply other customers in kombolcha and birbirsa towns. The honey marketing chain was examined to understand how honey moves from producers to final consumers. In selale Kebele, there are no established district or village-level market centers for honey sales. The key actors in the local honey value chain are smallholder beekeepers, "Tej" producers, and customers, primarily from kombolcha and Birbirsa towns, who often visit beekeepers directly to purchase honey. Honey prices in the area, as reported by sample beekeepers, are primarily determined by color, quality, and source, with prices remaining relatively stable throughout the year. The dominant honey colors observed were red, yellow, and a lighter, whitish hue. Similar studies in different part of the country reported similar report [1, 5-7].

Most beekeepers were able to identify colony problems and the periods when these issues occurred. The primary challenge affecting honey production was honeybee diseases followed by pest and predator issues These finding is consistent with [7, 10, 13, 16].

5. Conclusions

The Nadhi-Nono district shows high potential for honey production, predominantly using traditional methods. Knowledge transfer within families sustains traditional practices, while literate beekeepers adopt transitional and modern systems. Marketing remains informal, with prices driven by honey color and harvest timing. Challenges such as agrochemical use, diseases, and resource shortages persist, despite opportunities like abundant bee flora and growing governmental support. Expanding transitional and modern beekeeping methods, especially in lowland and midland areas, could enhance productivity.

Abbreviations

SPSS	Statistical Package for the Social Sciences
SWER	Southwest Ethiopia Region

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Author Contributions

Abadir Abdu conducted the research, data collection, analysis, and manuscript preparation. Girma Gudesho supervised and guided the study.

Ethics Approval and Consent

The study was approved by Mizan-Tepi University's ethical committee, and informed consent was obtained.

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Data Availability Statement

All data are presented within this manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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