

In partnership with



Unlocking the Potential of Ethiopia's Apiculture Sector: A Diagnostic and Baseline Study

Final Report

Addis Ababa

February 2025

List of Acronyms

ANRS	Amhara National Regional State
BoA	Bureau of Agriculture
CEIC	Center for Excellence International Consult
EAA	Ethiopian Agriculture Authority
EADA	Ethiopian Apiculture Development Association
EAS	Ethiopian Accreditation Service
ECAE	Ethiopian Conformity Assessment Enterprise
EFDA	Ethiopian Food and Drug Authority
EMI	Ethiopian Metrology Institute
FGDs	Focus group discussions
GoE	Government of Ethiopia
FDRE	Federal Democratic Republic of Ethiopia
FGDs	Focus Group Discussions
<i>icipe</i>	International Centre of Insect Physiology and Ecology
IES	Institute of Ethiopian Standards
IIRR	International Institute of Rural Reconstruction
ILRI	International Livestock Research Institute
KIIs	Key Informant Interviews
MaYEA	Mass Youth Employment in Apiculture
MoA	Ministry of Agriculture
MoTRI	Ministry of Trade and Regional Integration
MOYESH	More Young Entrepreneurs in Silk and Honey
NAIP	National Agricultural Investment Plan
PIF	Policy and Investment Framework
SWE	South-West Ethiopia
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TARI	Tigray Agricultural Research Institute
VCA	Value Chain Analysis

Citation:

***icipe* (2025). Unlocking the potential of Ethiopia’s apiculture sector: A diagnostic and baseline study. International Centre of Insect Physiology and Ecology (*icipe*), Addis Ababa, Ethiopia.**

Table of Contents

List of Acronyms	i
List of Tables	iii
List of Figures	iii
Executive summary	iv
1. Introduction	1
1.1. Objectives of this study	2
2. Methodology of the study	2
2.1. Study Design	2
2.2. Desk Review	3
2.3. Stakeholder Mapping and Institutional Capacity Analysis	3
2.4. Data Collection Methods	4
2.5. Study area and period	4
2.6. Sample size and sampling technique	4
2.7. Data Analysis	5
3. Key Challenges of Apiculture Sector: A Systematic Review	6
3.1. Market-related challenges	6
3.2. Quality control and export barriers	7
3.3. Production related challenges	7
3.4. Benchmarking of apiculture sector with other countries	8
4. Key Actors in the Apiculture sector, Interactions and their Capacity	10
4.1. Stakeholder analysis and mapping: Levels of Interest and Influence	10
4.1.1. Stakeholders' Interest and Influence Mapping Matrix	11
4.2. Organizational capacity assessment	13
4.2.1. Institute of Ethiopian Standards	14
4.2.2. Ethiopia Conformity Assessment Enterprise	15
4.2.3. Ministry of Agriculture	16
4.2.4. Holeta Beekeeping Research Center	18
5. The State of the Ethiopian Apiculture Sector: Deep Dive Analysis	19
5.1. Input supply	19
5.2. Honey Production	19
5.3. Honey processing, packaging, handling, maintaining its quality	21
5.4. Honey marketing	23

5.5. Support service	26
5.6. Subsidies and incentives.....	27
5.7. Training and capacity building.....	27
5.8. Value chain analysis and market system mapping.....	27
6. Honey Quality Testing, Certification, and Accreditation.....	29
6.1. Honey Quality Testing.....	29
6.2. Accreditation.....	30
6.3. Testing and certification	30
7. Identify system-level constraints	33
7.1. Policy and Regulatory environment.....	33
7.2. Systemic Constraints.....	36
7.3. Access to Finance.....	40
8. Employment and economic benefits of apiculture	42
8.1. Women in Beekeeping.....	43
8.2. Youth in Beekeeping.....	44
9. Summary and recommendations	46
9.1. Summary.....	46
9.2. Recommendations	47
References	49
Annex	51

List of Tables

Table 1. The survey participants disintegrated by region, study cluster, woreda and sex of respondents	5
Table 2. Enabling environment and youth engagement in the apiculture sector of East African countries bench marking	9
Table 3. Best practice adopted from the adjacent countries.....	10
Table 4. Frequency of honey harvest by region	20
Table 5. Type of hive (%) used by youth beekeepers during 2024	20
Table 6. Priority challenges (%) reported by beekeepers in 2024	21
Table 7. Perceived honey quality (%) by respondents	22
Table 8. Marketplaces (%) for honey or other bee products in different regions by youth.....	24
Table 9. Priority challenges (%) in the apiculture sector.....	36
Table 10. System level constraints in apiculture sector in Ethiopia.....	39
Table 11. Primary source of income (%) from beekeeping.....	44
Table 12. The influence and interest values of government organizations.....	51
Table 13. The Influence and Interest Values of Private organizations	52
Table 14. The influence and interest values of research institutions	52
Table 15. The influence and interest values of cooperative unions	53

List of Figures

Figure 1. Government organizations mapping matrix	12
Figure 2. Private organizations mapping matrix	12
Figure 3. Research Institutions mapping matrix	13
Figure 4. Honey export trend since 2015 (FAOSTAT, 2025).	23
Figure 5. Value chain analysis and key bottlenecks	28

Executive summary

Introduction: *icipe*, ORDA Ethiopia and IIRR jointly implement Mass Youth Employment in Apiculture (MaYEA) Program in partnership with the Mastercard Foundation. The program aims to enable 1 million young women secure dignified and fulfilling jobs by addressing key constraints and unlock the apiculture sector's and allied value chains employment generation potential building on experiences from previous programs such as the More Young Entrepreneurs in Silk and Honey (MOYESH) Program. MaYEA program aims to enhance honey and beeswax production, improve quality standards, promote value addition, and create an enabling environment for youth engagement in the sector. To guide this effort, this study aims to: (i) identify the challenges facing the apiculture sector, (ii) map the key actors in the value chain, and (iii) identify systemic barriers that hinder the sector's potential for growth and employment creation.

The national apiculture sector holds immense potential, both as a contributor to national economic growth and as a provider of sustainable livelihoods, particularly for youth and rural communities. The country's favorable climate and biodiversity, along with its long history of beekeeping, create an ideal environment for honey production. Despite this potential, the sector faces substantial challenges that limit its growth. Key barriers include: (i) heavy reliance on traditional production practices, (ii) limited technology adoption, (iii) poor market structures, (iv) insufficient extension services, and (v) limited institutional coordination. While Ethiopia can produce up to 500,000 tons of honey annually, current production remains far below this potential, with only 53,000 to 58,000 tons produced each year.

This study used a mixed-methods approach to analyze the systemic problems in the apiculture sector, combining qualitative and quantitative data to better understand its dynamics and growth restrictions. Desk reviews, key informant interviews, focus group discussions (FGDs) and youth survey were used to collect data from various actors in the sector. Qualitative techniques were used to understand stakeholders and interaction, while quantitative surveys were used to map operational practices and key sector actors. The study was conducted in Tigray, Amhara, Oromia, South Ethiopia, Southwest Ethiopia, Sidama, Gambella, Benishangul Gumuz, and Central Ethiopia regions.

According to the study, 38.3% of respondents participate in beekeeping, with considerable gender disparity, and 82% continue to use traditional hives, underscoring the obstacles that young people confront. The productivity of regions like Oromia and Southwestern Ethiopia is significantly impacted by adverse weather conditions, limited availability of materials and equipment, and rising financial constraints.

Honey production and harvesting vary across regions, with South Ethiopia reporting the highest annual harvests. Traditional hives produce 5.5 kg of honey per hive per harvest, while modern hives are limited. Bee colony management practices include regular inspections, hive cleaning, and pest control. Regions like Oromia and Benishangul Gumuz face higher pest challenges. However, 61.7% lack access to honey processing equipment. Regions like Oromia, Southwestern Ethiopia, and Sidama face the most challenges, while 80%

have access to processing equipment. Training availability is high, but skill gaps are significant. Honey quality perceptions vary, with Oromia and Sidama reporting higher proportions of high-quality honey.

Youth beekeepers in Amhara and Benishangul Gumuz face significant challenges in market access, with most honey sales limited to local markets. Market access is a bottleneck, with limited market information, poor linkages, and middlemen dominating the market. The apiculture sector is a moderately concentrated, weak oligopoly with price rigidity, collusion, and limited competition. The devaluation of the Ethiopian Birr has raised input costs, resulting in higher local honey prices than international market prices. Ethiopia's honey export market, valued at \$526,000 (37.69 metric ton) in 2022 reduced to \$110,492.56 (9.16 metric ton) in 2023. Factors hindering its international market penetration include inconsistent quality, inadequate packaging, and lack of certification. Improving local value chains, particularly in quality assurance, packaging, and certification processes, is crucial for competitiveness.

Financial challenges of the sector include high interest rates, lack of capital, and insufficient access to loans or grants. The sector's growth is hindered by a lack of tailored financial products and policies that integrate youth into apiculture. Key stakeholders include government organizations, private sector actors, research institutions, and grassroots cooperative unions. Government organizations have regulatory and policy-making roles, while private sector actors have market power and economic clout. Research institutions contribute to knowledge generation and technological advancements.

Youth participation in apiculture as an income-generating activity varies by region, with 68.8% of respondents involved in productive activities. However, barriers such as access to financial resources and infrastructure challenges hinder from full engagement in the sector. FGDs shown hope that youth involvement in beekeeping provides youth with income, enhances household nutrition, and assists in creating becoming an entrepreneur.

The apiculture sector in Ethiopia faces significant challenges, including inadequate infrastructure, insufficient financial resources, and a lack of skilled personnel. The Ministry of Agriculture faces challenges in policy implementation, while the Institute of Ethiopian Standard faces challenges in enforcing quality standards due to limited resources and weak enforcement mechanisms. Research institutions also face challenges, such as limited funding, inadequate infrastructure, and insufficient dissemination of research findings. The Ethiopian Conformity Assessment Enterprise (ECAE) faces challenges in testing services, due to limited staff, financial constraints, and limited stakeholder engagement.

The sector presents a complex value chain with growth potential, but is currently hindered by low productivity, limited access to quality inputs, and poor market integration. Key bottlenecks include dependency on poor quality and limited availability of locally produced inputs, weak distribution networks in rural areas, and lack of standards for overall production limitations. Quality control remains a critical concern, with a lack of accredited testing labs and inconsistent quality standards. Support services are fragmented and inadequate, hindering effective collaboration and resource mobilization.

The honey value chain faces challenges in production, processing, quality assurance, packaging, stakeholder coordination, and extension services. Traditional beekeeping practices, pest outbreaks, inadequate extension services, outdated technology, and lack of traceability systems hinder productivity. Issues of adulteration and low-quality materials also affect the sector's reputation. The full implementation of government policies is constrained by limited resources and the need for stronger regulatory measures.

Ethiopia's honey sector can be revitalized through modern technologies, improved packaging standards, and international market appeal. However, quality standards, traceability systems, and certification facilities are lacking. Promoting Ethiopian honey as an organic product and promoting its unique qualities could enhance its global competitiveness. Government initiatives such as the Ethiopian Digital Agriculture Roadmap (DAR) and the **Yelemat Tirufat** initiative offer support for the apiculture sector through market organization, chemical usage protection, and promotion of product marketing. In addition, the Ethiopia's National Agriculture Investment Plan (NAIP) for EFY 2013-2022 sets honey as one of the key value chains and among twelve strategic commodity-based flagship programs for its potential to improve both food security and income and planned to increase 59 to 152 thousand tons for honey by 2030 with a marketable surplus of 79% and 5% annual increment of improved apiculture honeybee technology¹.

The national quality standards for honey face significant gaps. Honey adulteration, inadequate packaging, and poor traceability systems continue to affect the sector's credibility. Additionally, inconsistent quality due to insufficient training and a lack of standardized practices across regions prevents producers from meeting international requirements. Laboratories and certification bodies in Ethiopia are limited in capacity, forcing producers to rely on international testing facilities, adding to costs and delays.

Despite these challenges, Ethiopia's National Accreditation System (EAS) holds international recognition, which could support efforts to improve the sector's competitiveness globally. However, regional discrepancies in quality standards and a lack of private-sector involvement in accreditation processes hinder sector-wide standardization. In addition, the apiculture sector has utilized less than 10% of its honey and wax potential, and the commercialization of high-value bee products such as pollen, propolis, and bee venom remains largely absent. However, the sector faces intersecting challenges in achieving its full potential. The absence of a comprehensive and effectively implemented policy framework and weak regulatory enforcement undermine the sector's development. The Apiculture Resources Development and Protection Proclamation No. 660/2009 was expected to establish advisory board and empower inspectors to ensure compliance with sustainable practices in regulating pesticide use. Yet, the limited availability of these inspectors in rural areas is limited. The implementation of the regulatory frameworks such as the Food and Medicine Administration Proclamation No. 1112/2019 and Directive 1020/2024 to ensure honey quality and protect against adulteration remains limited.

¹ <https://citizenengagement.nepad.org/pdf/20231005145754.pdf>

Moreover, regulatory bodies such as the Ethiopian Food and Drug Authority (EFDA) lack the necessary resources, technical expertise, and grassroots presence to effectively monitor compliance and enforce quality standards. This gap allows adulteration practices to persist, which not only harms the reputation of Ethiopian honey but also risks a loss of brand and market failure in the international markets. The policy environment is further hindered by a lack of awareness among stakeholders, including producers, cooperatives, and even experts, about quality standards and regulatory provisions. This gap in knowledge exacerbates the challenges faced by the sector and limits its capacity to achieve international market recognition. While KIIs report some progress in drafting a 10-year inclusive apiculture strategy, there is still an urgent need for a clear roadmap to address regional disparities and the enforcement of effective standards.

In conclusion, as illustrated above, the apiculture value chain is fragmented, with limited coordination among actors. Production faces limitations due to low yields, reliance on traditional methods, and the incidence of pests and diseases. Processing is constrained by a lack of modern infrastructure, skilled labor, and standardized practices. Furthermore, market access issues are pervasive, with limited market information, poor branding, and weak market linkages. Quality control remains a critical concern, with a lack of accredited testing labs and inconsistent quality standards.

These challenges are compounded by weak support services, limited financial access, and poor coordination among stakeholders. The productive potential of youth and women remains unexploited including limited access to finance, inadequate training and support services, and lack of access to modern equipment. Many of the challenges were related and unregulated due to the absence of a sectors policy framework. Weak enforcement mechanisms and a lack of clear and consistent standards for production, quality control, and export aggravate the situation.

Furthermore, the absence of clear and consistent standards for production, quality control, and export, coupled with weak enforcement of existing regulations, creates an enabling environment for adulteration and pesticide use remains unregulated. This is exacerbated by a lack of awareness among stakeholders, including producers, consumers, and even some regulatory bodies, regarding the existing legal framework and its implications. The lack of coordination among regulatory agencies, limited access to testing facilities, and the dominance of middlemen in the market further compound these challenges.

To address these challenges and unlock the full potential, a multi-pronged approach is crucial, and it is based on the following key recommendations.

1. Strengthening production through enhancing access to quality inputs, promoting modern beekeeping practices, and improving disease management;
2. Upgrading processing infrastructure, providing training to processors, and developing value-added products;

3. Enhancing market access by strengthening market linkages, empowering cooperatives, improving market information flow, developing robust quality control systems, and addressing market power imbalances;
4. Strengthening support services by improving access to finance, enhancing extension services, and improving coordination among stakeholders;
5. Addressing policy gaps and strengthening the regulatory framework, improving enforcement mechanisms, and developing clear policies for the apiculture sector; and
6. Empowering youth by creating facilitating programs to engage youth in the sector, providing access to finance, training, and mentorship opportunities.

By implementing these recommendations, Ethiopia can create a more enabling environment for the apiculture sector, improve the livelihoods of beekeepers, and unlock the sector's full potential for economic growth and rural development.

1. Introduction

Honey production is an old tradition in Ethiopia since the country has a diversified flora and an ideal climate suitable for honey production (ATA, 2017). Beekeeping is a common activity among smallholder farmers and landless people since it does not require cultivable land, requires little investment, yields immediate financial returns (Dekebo et al., 2019), and can create up to 2 million jobs with proper market-led programs and about 1.9 million farm households are involved in beekeeping (Bihonegn and Begna, 2021).

Approximately 10 million honeybee colonies are there in the country, with roughly 7 million kept in beehives by farmers and the remainder living in the wild in the forests (Sebsib et al, 2018; Siraj and Abdi, 2021). According to (Kuma et al., 2023), more than 96.3% of the management system is traditional. Various studies estimate the country has the potential to produce up to 500,000 tons of honey and 50,000 tons of beeswax annually. However, only 53-58 thousand tons of honey and 5790 tons of beeswax is being produced annually (Mohammed and Hassen, 2021; Bihonegn and Begna, 2021; Gratzner et al., 2021).

Despite the favorable environmental conditions and high production potential, most recent studies agreed on critical bottlenecks affecting honey production and productivity in Ethiopia. For instance, Mohammed and Hassen, (2021) identified insufficient collaboration between government and relevant development partners impeding the country's beekeeping sector from maximizing its potential for honey and beeswax production, foreign exchange, and income generation. Kuma et al. (2023) also found low technological inputs, poor pre-post-harvest management, inadequate extension service, and poor marketing structure affecting the system. Additionally, traditional practices in small scale production resulted in lower honey production in Ethiopia (Miklyaev et al., 2014; Gratzner et al., 2021).

However, various projects have been implemented to improve Ethiopia's apiculture industry, with an emphasis on job creation and livelihood development especially for youths and landless people. For example, SNV Ethiopia implemented Apiculture Scale-up Program for Income and Rural Employment (ASPIRE) project to alleviate rural poverty through the development of a sustainable apiculture industry. ASPIRE focuses on increasing smallholder productivity and quality, facilitating access to finance, and strengthening diverse apiculture associations. The International Center of Insect Physiology and Ecology (*icipe*), in partnership with the Mastercard Foundation and various public and private entities, has implemented the More Young Entrepreneurs in Silk and Honey (MOYESH) Program from 2019 to 2024 and the Young Entrepreneurs in Silk and Honey (YESH) Project from 2016-2021. These two programs have created dignified jobs for young people through integrated beekeeping, establishing thousands of youth-led enterprises that provide direct employment. This initiative has successfully reached over 250,000 youths through capacity building, technology promotion, and financial linkages, creating substantial employment opportunities.

Building on MOYESH, the Mass Youth Employment in Apiculture (MaYEA) Program aims to create over 1 million jobs by adopting a demand-driven approach that addresses systemic issues and engage both new and existing beekeepers. The MaYEA program envisages to promote innovative strategies to enhance market-

driven value addition, improve access to tools and training, and raise the economic performance of the apiculture sector. The program focuses on five key interventions: (i) increasing national honey and beeswax production; (ii) improving honey quality to meet standards; (iii) promoting market-driven value addition; (iv) integrating apiculture with complementary value chains; and (v) enhancing the enabling environment for youth and sector development of which *icipe* leads the implementation of the second and fifth components. Thus, the purpose of this sector wide study is to better understand the Ethiopian apiculture sector, identify its constraints and key challenges, and provide recommendations for the sector transformation.

1.1. Objectives of this study

The overall objective of this sector-wide diagnostic study is to map and assess the capacity of apiculture sector actors in Ethiopia and identify systemic barriers across the honey and beeswax value chains and to highlight areas of intervention to transform the apiculture industry into high employment creating sector.

The following were four specific objectives of the study:

1. Conduct systematic reviews of existing documents and studies and synthesize and take stock of the key problems and challenges to identify critical unaddressed challenges by existing programs and initiatives.
2. Map and update the market system structure and understand its operation and dynamics, key actors, roles, interests, and their interactions in the apiculture value chain system, and assess their capacity vis-à-vis their mandates and suggest capacity building interventions.
3. Deep dive analysis of the state of the apiculture sector all the way from input supply, honey production, processing, quality assurance and packaging, marketing, and policy, using quantitative and qualitative data and identifying critical bottlenecks to transform the apiculture sector.
4. Identify system-level constraints (including the root causes) and understand why the system is not working because of policies, regulations and institutional frameworks, access to finance, marketing and technologies that hinder the transformation and job creation capacity of the sector.

2. Methodology of the study

2.1. Study Design

A comprehensive desk review was initially conducted, followed by in-depth stakeholder interviews and surveys targeting youth, employing both qualitative and quantitative research techniques. The study applied a mixed approach by combining data from qualitative and quantitative sources, ensuring robust and reliable results. Both exploratory and descriptive research designs were utilized to develop a deep understanding of the apiculture sector, identify key challenges and opportunities, and provide a thorough overview of the sector's structure, dynamics, and key actors.

An exploratory approach was employed through qualitative methods to gain foundational insights into the apiculture sector. In-depth interviews with key stakeholders, focus group discussions with beekeepers and youth, and document analysis were used to collect data. These qualitative techniques helped to explore the diverse perspectives within the sector and uncover emerging trends, barriers, and opportunities. They provided a nuanced understanding of the sector's complexities and the experiences of stakeholders.

A descriptive research design was applied to gather quantitative data through surveys targeting beekeepers, processors, and traders. These surveys provided a structured representation of the apiculture sector, mapping out its key players, operational practices, and relationships across the value chain. This approach aimed to create a comprehensive picture of the sector's structure and dynamics, allowing for the generalization of findings.

The study was conducted at the national level, incorporating key institutions and stakeholders in the apiculture sector, including the Ministry of Agriculture and regional agricultural bureaus of Tigray, Amhara, Oromia, Southern Ethiopia, Southwest Ethiopia, Gambella, Benishangul Gumuz, Sidama, and Central Ethiopia. This broad geographical coverage ensured a holistic perspective on the sector, considering variations in practices, challenges, and opportunities across different regions and levels of the value chain.

2.2. Desk Review

For the desk review, 55 documents including studies, reports, strategies, proclamations, and institutional reports were analyzed to assess gaps in the Ethiopian apiculture sector. These documents covered various aspects of the sector, including production, value chain, quality, market systems, and the enabling environment. The review synthesized key problems and challenges to identify critical issues that have been overlooked or inadequately addressed by existing programs and initiatives. The review process was carried out within the timeframe from 2011 to 2024, and sources included 27% review papers, 67% research articles, 5% reports, and 2% online data sources gathered from Google Scholar, JSTOR, Elsevier, Scopus, FAO, GIZ, ESS, MaYEA Program, proceedings of stakeholder meetings, and other relevant databases.

2.3. Stakeholder Mapping and Institutional Capacity Analysis

In addition to the desk review, stakeholder analysis and mapping, as well as an institutional capacity assessment using the Institutional Capacity Assessment Tool (ICAT), were conducted to evaluate the organizational strengths and weaknesses within the apiculture sector. The assessment aimed to identify gaps in institutional capacity and areas for improvement. Furthermore, a Value Chain Analysis (VCA) was conducted to assess the entire value chain, from input supply to marketing. This analysis helped to identify systemic bottlenecks and barriers hindering the sector's growth. A SWOT analysis was also conducted to evaluate the strengths, weaknesses, opportunities, and threats associated with each segment of the value chain. To map and update the market system structure and understand its operation and dynamics, key actors, roles, interests, and interactions in the apiculture value chain system and assess their capacity vis-vis their mandates

and suggest capacity building interventions stakeholder interviews (qualitative research) of 31 key informants were involved from 6 regions or 7 clusters and federal level.

2.4. Data Collection Methods

To identify critical bottlenecks of the sector survey of 768 youth in MaYEA Program intervention areas, 15 key informant interviews (KIIs), and 16 FGDs with youth were conducted from the intervention areas and with federal and regional stakeholders (Table 1). Similarly, to identify system-level constraints including the root causes and understand why the system is not working related to policies, regulations and institutional frameworks, access to finance, marketing and technologies that hinder the transformation and job creation capacity of the sector, we conducted 29 KIIs with stakeholders and 16 FGDs with youths.

2.5. Study area and period

The study covered national-level institutes and stakeholders in the apiculture sector, including the Ministry of Agriculture (Livestock, and Fisheries Development Sector), Ministry of Trade and Regional Integration, Ethiopian Apiculture Development Association, Regional Bureaus of Agriculture; Research institutions: Ethiopian Agricultural Research Institute (EARI), Holeta Bee Research Center; Quality Institutions: Institute of Ethiopian Standards (IES), Ethiopian Conformity Assessment Enterprise (ECAE), Ethiopian Metrology Institute, Ethiopian Agriculture Authority, Ethiopia Accreditation Service; Private sector organizations: Bless Food Laboratory PLC, Forested Foods, Green Face Trading, Apinec Agro Industry, Lal honey, Beza mar, and Habesha Trading PLC; and Cooperative Unions: Limu Enara Farmers' Cooperative Union. Discussions were conducted with selected Regional Bureaus of livestock development in six Ethiopian regions: Tigray, Amhara, Oromia, South Ethiopia, Southwest Ethiopia, and Central Ethiopia, starting from October to November 2024.

2.6. Sample size and sampling technique

The study targeted a population of over 1 million beneficiaries across 7 regions and 11 program clusters. A stratified random sampling approach was adopted to ensure comprehensive programmatic, regional and demographic representation. The sampling process was carried out in multiple stages. We have 11 clusters from 7 regions to select the survey participant youths and conduct FGDs. In the first stage two woredas from each cluster were selected with purpose based on the target of MaYEA. From the entire list of youths targeted in 30 kebeles, two kebeles from each woreda were selected for all except for some woredas. Then on average 23 youths were selected randomly from each kebele list provided. The list of clusters, woreda, kebele, and the number of youths participated in the survey is indicated in the Table 1 below.

To determine the sample size for conducting survey with the youths of different regions the following formula was applied by the study team:

$$n = \frac{Z^2 * p * (q - 1)}{d^2}$$

Where: n = (sample size), $z = 1.96$ (desired confidence level 95% and value obtained from table), $p = 0.5$ (sample proportion of the population interest), $q = 0.5$ $\{(1 - 0.5) \text{ i.e. } 1 - p\}$ weighting variable, and $e = 0.05$ or 5% (Precision rate of acceptable error) to have 768 the final number of survey participant youths female 513 and male 255 (Table 1), depending on the resources, access to survey demanding area due to national security, and the MaYEA program context. The plan of female to male share was 80% initially, we maintained the female to male ratio between 70% to 98% in almost all clusters except two clusters, Akesta and Gonder-Wollo, in Amhara region. The quantitative sample size was allocated proportionally to the 66.8% women representation in the final sample size.

Table 1. The survey participants disintegrated by region, study cluster, woreda and sex of respondents

Region	Cluster	Woredas	Female	Male	Total
Oromia	Bale	Dodola	18	7	25
		Gololcha	44	8	52
Sidama	Sidama	Malga	30	7	37
		Aleta Wondo	27	10	37
Central Ethiopia	Wolayta-Kembata	Damboya	18	4	22
South Ethiopia	Wolayta-Kembata	Sodo Zuria	32	13	45
	Omo-Konso	Hamer	21	5	26
		Kena	44	16	60
	Gamo-Gofa	Kemba	54	1	55
		Malo Gada	22	5	27
Gambella	Southwest-Gambella	Dima	23	6	29
Southwest Ethiopia	Southwest-Gambella	Tello	45	13	58
Amhara	D/Berhan	Kalu	40	13	53
	Gonder-Wollo	Habru	0	55	55
		Lay Gayint	0	4	4
	Akesta	Mekdela	0	62	62
		Borena	8		8
Benishangul Gumuz	Bahirdar (B4DE)	Banja	46	16	62
		Mandura	29	7	36
Tigray	Shire	Tahtay Koraro	12	3	15
Total			513	255	768

For qualitative data, reasonable sample size was drawn for each objective. Individuals, who had in-depth experience in the sector, were purposively selected. In total, 75 key informant interviews (KIIs) from federal and regional stakeholders were conducted. To triangulate the survey result, 16 FGDs were conducted with youth in each cluster.

2.7. Data Analysis

A root cause analysis and identification of systemic bottlenecks was conducted to uncover systemic constraints and address key "why" questions. The study began with a systematic review of existing documents and studies

to synthesize key problems, challenges, and gaps not tackled by current programs. Content analysis was used to identify recurring themes, trends, and interventions, highlighting critical areas for improvement.

The study also mapped and assessed the capacity of actors in the apiculture value chain to understand their roles, interests, and interactions. Using stakeholder mapping tools and Institutional Capacity Assessment Tool, and network analysis, the team mapped stakeholders and capacity gaps. VCA and SWOT analyses were also conducted based on the collected data. Qualitative and quantitative data from FGDs, KIIs, and surveys were analyzed using thematic and descriptive methods to explore systemic bottlenecks across production, marketing, policy, and infrastructure. Finally, system-level constraints related to policies, regulations, institutional frameworks, and access to finance were identified through policy reviews and stakeholder consultations.

3. Key Challenges of Apiculture Sector: A Systematic Review

Traditional beekeeping systems dominate the Ethiopian apiculture sector, resulting in low honey yields and poor quality (Tarekegn, 2022). These systems are constrained by a lack of access to modern beekeeping technologies, making them less efficient and more vulnerable to pests, diseases, and environmental stressors. This often leads to colony absconding, dwindling bee populations, and reduced honey production (Miklyaev et al., 2014). Additionally, deforestation and land-use changes have significantly reduced bee forage availability, further limiting honey production (Papa et al., 2022).

Small-scale beekeepers face critical resource constraints, particularly in accessing modern beekeeping equipment and technologies (Shepherd, 2016). The high cost of modern beehives has been a major barrier to adoption, preventing beekeepers from improving productivity and efficiency (Gratzer et al., 2021). Furthermore, limited research on honeybee characterization and best beekeeping practices has hindered the development of effective apiculture techniques (Gratzer et al., 2021). The widespread and indiscriminate use of pesticides and herbicides also poses a significant challenge, as these chemicals negatively impact honeybee health and reduce productivity (Fikadu, 2019).

The productivity of the apiculture sector is further hampered by insufficient extension services and a lack of technical knowledge among extension agents (Wendimu, 2021). Beekeepers struggle to access timely and adequate advisory services, limiting their ability to adopt improved beekeeping techniques. Weak policies and regulations regarding pesticide use, land access, and honey quality standards further exacerbate the challenges facing beekeepers (Wendimu, 2021). Moreover, limited financial resources and weak market infrastructure create additional barriers, making it difficult for beekeepers to expand their operations and invest in improved production methods (Tulu et al., 2020).

3.1. Market-related challenges

Market inefficiencies significantly hinder the growth of the apiculture sector. Small-scale producers often lack access to stable markets and essential resources, leading to low productivity and inefficient market structures

(Yeserah et al., 2019). High local prices and relatively lower international prices create profitability challenges, making Ethiopian honey less competitive in the global market (Feyisa, 2022). Unfair competition, price manipulation, and limited access to reliable markets further constrain beekeepers' ability to sustain their businesses (Erekalo, 2017). Additionally, poor handling, adulteration, and inadequate storage and transportation infrastructure lead to quality deterioration, reducing the marketability of honey and decreasing profitability (Yeserah et al., 2018).

3.2. Quality control and export barriers

The honey production industry faces quality control issues, with widespread adulteration and poor processing standards affecting honey quality (Admas, 2019). Limited access to export markets due to inconsistent quality and market barriers prevents beekeepers from benefiting from international trade opportunities (Ababor and Tekle, 2018). The Ethiopian honey market is also characterized by oligopolistic structures, where a few dominant firms control a significant share of the market, limiting competition and restricting fair market access for small-scale producers (Weldeyohanis et al., 2016).

A significant bottleneck in the honey value chain is the direct use of crude honey for local beverages such as *tej* (honey wine) and *birz* (mead) instead of further processing for high-value products. This limits the economic contribution of the sector, as only a small fraction of honey is processed into table honey and other value-added products (Bayissa et al., 2024). The lack of processing facilities and investment in product diversification prevents beekeepers from maximizing their income potential and contributing more effectively to the national economy. Low perception and awareness of honey quality were also the driving factors^{2,3}. Limited access to stable and fair markets prevents beekeepers from selling their honey at competitive prices, while widespread quality issues, including adulteration and poor handling practices, further reduce the market value of Ethiopian honey (Andaregie and Astatkie, 2021).

3.3. Production related challenges

The Ethiopian apiculture sector is fundamentally constrained by low productivity and profitability. Diseases and pests continue to devastate bee colonies, reducing honey production and weakening the resilience of the sector (Hristov et al., 2020). Deforestation and land-use changes further compound these challenges by diminishing the availability of bee forage, leading to declines in colony strength and honey yields (Shapiro et al., 2023). Weak policies, inadequate infrastructure, and financial constraints remain significant barriers to the sector's growth, limiting investment opportunities and stalling progress in modernizing the industry (Shanku and Ijara, 2024).

² BfD Journal 99 Access to finance for rural honey trade

³ <https://www.ata.gov.et/wp-content/uploads/2017/08/Honey-and-Wax-Brochure.pdf>

3.4. Benchmarking of apiculture sector with other countries

Benchmarking of Ethiopian apiculture sector with Tanzania, Kenya, and Zambia with a focus on enabling environment and youth engagement was briefly reviewed as a comparative analysis. The apiculture sector in East Africa, particularly in Ethiopia, Tanzania, Kenya, and Zambia, has significant potential for economic growth, rural development, and environmental sustainability (AACCI, 2024). This comparative analysis shows these aspects, highlighting key differences and challenges (Table 2).

The apiculture sectors in Ethiopia, Tanzania, Kenya, and Zambia have significant potential, however, less collaboration among these countries on experience sharing, policy improvements, research, infrastructure development, and youth empowerment (MoA and ILRI, 2013).

Table 2. Enabling environment and youth engagement in the apiculture sector of East African countries bench marking

No.	Indicators	Ethiopia	Tanzania	Kenya	Zambia
1	Government policy and support	The government has recognized apiculture importance, providing subsidies (MoA and ILRI, 2013), training programs [79], and infrastructure development [26]	The government has implemented various initiatives, including the establishment of beekeeping cooperatives and the promotion of beekeeping research with the National Beekeeping Policy (NBP) [86]	The government has been supportive, but challenges persist in terms of policy implementation and enforcement [87]	The government has made efforts to promote apiculture, but more targeted support is needed [88]
2	Research and development	Research institutions and universities are active in apiculture research [2] for example Holeta National Bee Research Center	Growing research community, more investment is needed in beekeeping research [89]	Research efforts concentrated in research centers and universities but limited collaboration with beekeepers [90]	Apiculture research is in its early stage but there is a growing interest [91]
3	Infrastructure and market access	Relatively well-developed infrastructure, facilitating the transportation and marketing of honey and beeswax [16]	Infrastructure challenges, particularly in rural areas hinder apiculture development [92]	Good infrastructure but limited market access to small-scale beekeepers [93]	The lack of adequate infrastructure in rural areas limits the potential of the apiculture sector [94]
4	Youth-focused initiatives	The MAYEA program collaborates <i>icipe</i> with Mastercard to empower Ethiopian youth, foster innovation, and contribute to global recognition of Ethiopian honey [95]	Efforts but more target programs are needed to engage youth in apiculture [96]	Youth engagement is growing but resource and training challenge persists [97]	The Zambian Youth for Conservation, Agriculture, and Livelihood Action (ZYCALA) project aims to create a regenerative future for themselves and their communities [98]
5	Production level in metric tons during 2022 production year	17506.87 with a rich tradition of beekeeping, while from 1993 to 2018 higher production than all three countries [12]	31345.26 [12]	17000 [12]	903.79 [12]
6	Processing and quality	Mostly at a small-scale level while efforts are being made to improve [16]	Honey trademark enhances the global market [99]	Hampered by traditional methods and limited access to modern technology [93]	Improving with increased focus [100]
7	Market access	Ethiopia, Africa's largest honey producer, faces challenges like limited infrastructure, quality control issues, and modern beekeeping techniques, but organizations like UNIDO and Norad are working to improve market access [101].	Tanzania has launched the Tanzania Honey Trademark, aiming to improve the visibility and competitiveness of Tanzanian honey in domestic and international markets [99].	Short of market demand leading to importation of natural honey [93].	Zambia's honey sector is growing despite challenges like limited production capacity and market access, with significant fluctuations in honey prices [91].

Noted: Numbers in [...] indicates the reference number for the stated claims and findings

Based on the best experience taken from adjacent countries (Table 3), the following experiences might be useful and consideration of these strategies may significantly important for Ethiopia in the sector.

Table 3. Best practice adopted from the adjacent countries

Key Indicators	Best Practices from Adjacent Countries
Government Policy and Support	Tanzania: Established beekeeping cooperatives and a National Beekeeping Policy (NBP) to support the sector.
Research and Development	Tanzania: Growing research community with increased investment in beekeeping research.
Youth-Focused Initiatives	Zambia: The ZYCALA project focuses on creating a regenerative future for youth and communities, promoting engagement in apiculture.
Processing and Quality Standards	Tanzania: The honey trademark enhances global market competitiveness, effectively branding Tanzanian honey.

4. Key Actors in the Apiculture sector, Interactions and their Capacity

Collaboration between the public and private sectors can enhance the sustainability and quality of agricultural production (Smyth et al., 2021). Strengthening collaboration between public and private institutions to improve honey quality and safety not only involves joint research and innovation, technology sharing, and traceability systems, but also addressing challenges like contamination, adulteration, and sustainable practices. Some organizations like Amhara BoA, Tigray BoA, Oromia BoA collaborate with stakeholders in the apiculture sector, including government agencies, NGOs, and cooperatives, to enhance the sector development. Key stakeholders are involved in decision-making processes, but there are challenges like lack of awareness and budget constraints.

4.1. Stakeholder analysis and mapping: Levels of Interest and Influence

The stakeholders mapping in this assignment involves characterization of the identified stakeholders on the basis of their levels of interest and influence on the apicultural productivity. First, potential stakeholders relevant for apicultural production were identified by stock-taking from different sources. Following that, data on the identified stakeholders was collected through desk reviews, survey questionnaire and key informant interviews. The situation of each stakeholder was analyzed based on the collected information. Finally, stakeholder mapping has been done using Influence-Interest Mapping matrix. Then, stakeholders who are key and primary and secondary ones for the apicultural sector development have been identified.

Accordingly, the identified and engaged stakeholders are categorized into four based on their organizational nature, interest and influxes values presented and discussed below. The four categories include government organizations, private organizations, research institutions and cooperative unions.

Six organizations involved in apiculture development activities exhibit varying levels of influence and interest. Apinec Agro-Industry demonstrates the highest influence (4.1) and interest (4.5) from maximum of 5, suggesting a leading role in honey production, processing, and export. Cumel PLC and Welela Tsaeda Maar plc, both focused on honey processing and export, also show high influence (4) and interest (4 and 4, respectively), indicating strong engagement and impact. Green Face Trading, involved in beekeeping, honey processing, and export, has moderate influence (3.1) and interest (3.6), while G/kidan Family focused on honey

processing and export, shows relatively moderate influence (3.6) and interest (3.8). Beza Mar Agro Industry PLC also shows high influence (4) and interest (4) in certified honey exports. Overall, the data suggests a generally high level of interest in the sector, with influence varying based on factors such as scale, specialization, and market focus.

Organizations with average or moderate influence but high interest face significant hurdles in expanding operations, accessing markets, and competing effectively due to a limited enabling environment. Specifically, the lack of recognized quality standards creates uncertainty in export markets, hindering their ability to capitalize on international opportunities. Furthermore, the absence of supportive policies and infrastructure restricts their growth potential and limits their contributions to economic growth, job creation, and rural development. Essentially, their high interest and engagement are hampered by a restrictive environment that prevents them from fully realizing their potential.

Tables 12-15 show that the stakeholders have a slightly different level of interest in and influence on apicultural production and marketing. Most of the stakeholders (80%) have above-average scores of influences and interest in apicultural productions and marketing. This shows that most stakeholders have a high interest and high influence in beekeeping, honey production and processing and exporting of the apicultural products. The stakeholders have similar levels of interest and influence on apicultural production and marketing. All the stakeholders (100%) have above-average scores of influence and interest that show that the stakeholders have a high interest and high influence in apicultural production, processing and marketing.

4.1.1. Stakeholders' Interest and Influence Mapping Matrix

The stakeholder matrix that categorizes the stakeholders based on their levels of interest and influence has been used and government organizations mapping matrix is presented in Figure 1. The matrix contains four quadrants. The upper right quadrant contains stakeholders with high interest and high influence. The lower right quadrant contains stakeholders with high interest and low influence. Again, the upper left quadrant contains stakeholders with high influence and low interest, while the one on the lower left quadrant is stakeholders with low interest and low influence.

This matrix and the influence and interest values presented above are used to map the stakeholders. The values have been used to categorize the stakeholders into the four quadrants shown in the mapping metrics. In the mapping matrices presented below, influence rises from 1 to 5 on the vertical axes, and interest grows from 1 to 5 on the horizontal axis. Accordingly, the right top quadrant contains stakeholders with high influence and high interest; the right bottom quadrant holds those with low influence and high interest. Similarly, the left top quadrant has those with high influence and low interest, and the one on the left bottom contains those with low influence and low interest.

As shown in this matrix, all the stakeholders from the government organizations included in this study are found in the upper right quadrant. This shows that all of them have a high influence and high interest in the apicultural production and marketing. They have the capacity to influence (to achieve change) and have an

interest in collaborating with the organization in extension, research and production of the apicultural outputs. These are key stakeholders for activities of the organization (*icipe*).

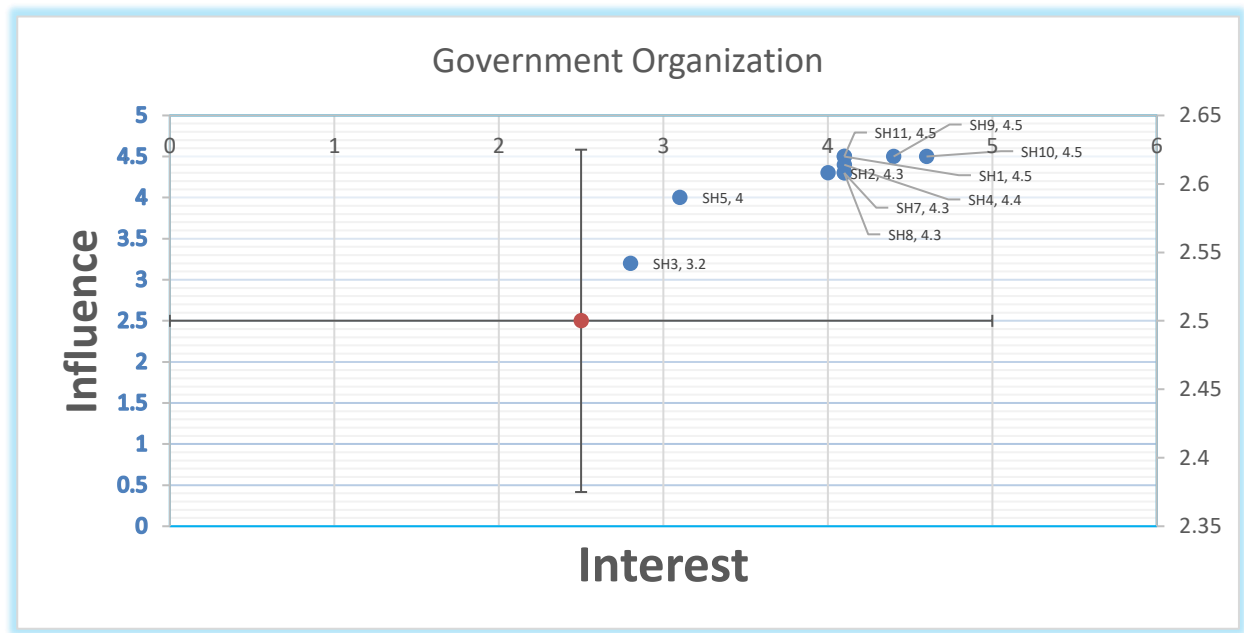


Figure 1. Government organizations mapping matrix

The stakeholder influence matrix presented in Figure 2 shows that all the stakeholders from the private organizations included in this study have a high influence and high interest in apicultural productions and marketing. According to the matrix, all the stakeholders have strong influence and interest in apicultural production and marketing activities including beekeeping, honey processing and exporting of apicultural outputs. Therefore, the capacity of private organizations identified and included in this study may contribute to influence (to achieve change) and have an interest in collaborating with others on issues related to apicultural production and marketing. According to this value, all of them are key stakeholders.

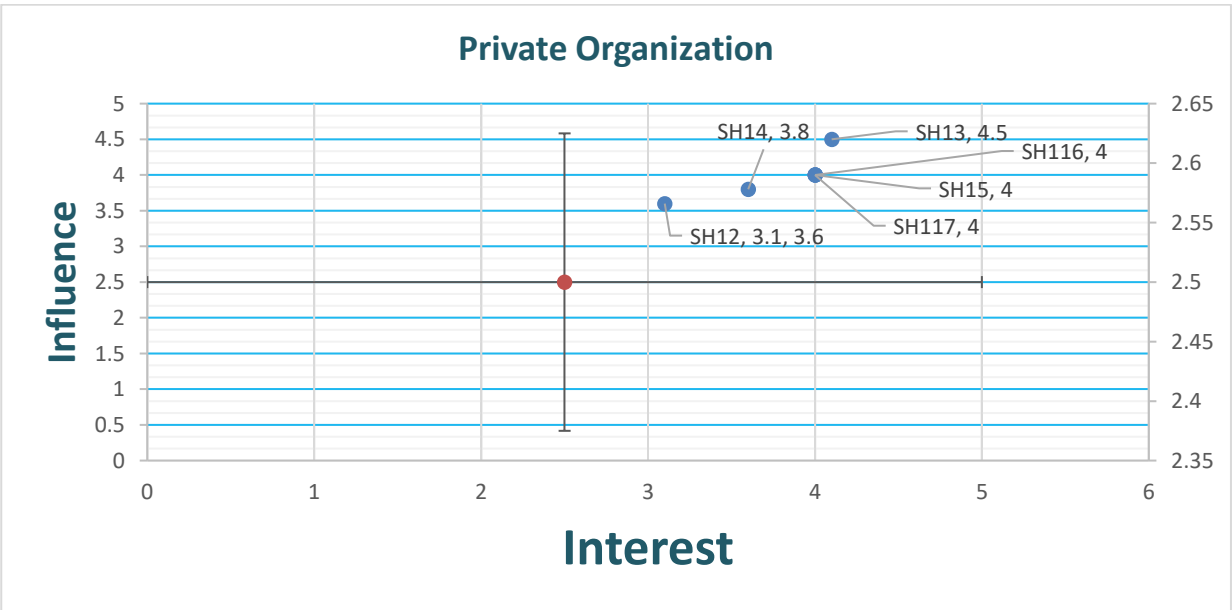


Figure 2. Private organizations mapping matrix

The mapping matrix in Figure 3 for research institutions shows that most of the stakeholders (80%) are in the upper right quadrant and a few of them (20%) are in the bottom of the right quadrant. It shows that the majority of the research institutions are in the upper right quadrant which indicates that they may influence and interest in apicultural production and marketing. Only a few of them have marginal interest and influence. Therefore, the majority of the identified research institutions are key stakeholders.

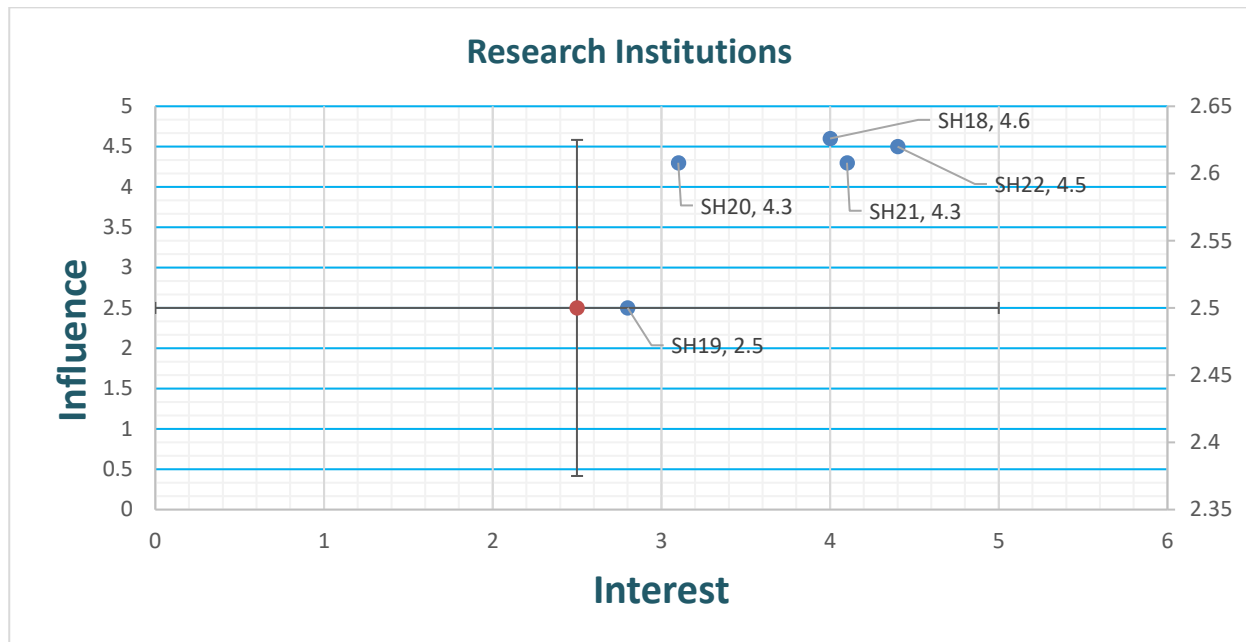


Figure 3. Research Institutions mapping matrix

The mapping matrix for cooperative unions (figure not shown) shows that all of the stakeholders (100%) are in the upper right quadrant which shows that all of them have high influence and high interest in apicultural production and marketing. This result indicates that they are key stakeholders.

All the stakeholders identified in this study are key stakeholders. These stakeholders have a high interest and high influence, therefore, are the key stakeholders in apicultural production and marketing. They are highly interested in beekeeping, honey production, honey processing and exporting. They have been highly involved in beekeeping, honey production, honey processing and exporting. The MaYEA Program should make these organizations an integral part of its interventions going forward.

4.2. Organizational capacity assessment

The assessment of organizational capacity within Ethiopia's apiculture sector reveals significant gaps and challenges that impact the quality of honey production, testing, and certification. Across various regions, including Amhara, South Ethiopia, and Tigray, key issues such as inadequate infrastructure, insufficient financial resources, and a lack of skilled personnel persist. While there is growing awareness among beekeepers, processors, and exporters regarding the importance of honey quality standards, much work remains in terms of capacity building to meet both domestic and international market demands. For instance, the Institutional Capacity Assessment Tool (ICAT) was used to assess the capacity of MoA, ECAE, IES, Holeta Bee Research Center, and Andasa Livestock Research Center capacity in key areas such as governance,

human resources, financial management, infrastructure, stakeholder engagement, and organizational processes.

It measured the skill levels of these staff, identified gaps in technical knowledge of apiculture, and evaluated financial resources available to support beekeepers, including government funding and access to credit, operational capacity and overall enabling environment assessing organizational systems for policy formulation, training, and monitoring, as well as the availability of infrastructure for beekeeping activities. It reviewed the effectiveness of stakeholder engagement with NGOs, cooperatives, and private sector actors, while also considering external factors and the enabling environment for apiculture development.

4.2.1. Institute of Ethiopian Standards

Individual-Level Capacity Gaps: One of the primary capacity gaps at the individual level is the lack of awareness among key stakeholders, including honey producers, cooperatives, exporters, and consumers, regarding honey quality standards and regulatory frameworks. Even within the Institute of Ethiopian Standards (IES), experts have limited technical knowledge of regulatory requirements, reducing their ability to effectively enforce standards. This gap is further exacerbated by insufficient training programs, as there are limited initiatives to educate stakeholders on best practices for honey production, quality control, and compliance. Producers and cooperatives lack access to structured training and awareness materials that could improve their understanding of quality assurance. Additionally, weak dissemination of knowledge prevents stakeholders from benefiting from research findings and best practices in honey production. The absence of strong feedback loops from consumers and producers' further hampers improvements in quality control mechanisms, making it difficult for IES to refine its enforcement and monitoring strategies.

Organizational-Level Capacity Gaps: The IES's mission is to develop, implement, and promote national standards to ensure product quality, safety, and environmental protection, contributing to Ethiopia's economic growth and fair-trade practices. It works to support industries and consumers by fostering conformity with both national and international standards with a vision of becoming a leading institution in standardization, driving sustainable development, enhancing the competitiveness of Ethiopian products, and ensuring public and environmental safety, while facilitating Ethiopia's integration into global trade through adherence to international standards.

A critical challenge is its limited grassroots presence, as IES lacks direct engagement with producers and cooperatives. This reduces its ability to influence local practices and enforce standards effectively. Additionally, inadequate infrastructure remains a major constraint, with a shortage of certified laboratories, inspection systems, and research facilities needed to ensure honey quality. There are also deficiencies in handling equipment, storage systems, and traceability mechanisms, all of which are essential for maintaining quality assurance across the honey value chain. Financial constraints further weaken IES's capacity to perform its mandate. Insufficient funding affects its ability to establish critical infrastructure, conduct regular monitoring, and expand training and outreach programs. The lack of financial resources also impacts research, dissemination efforts, and engagement with stakeholders. Furthermore, weak monitoring and evaluation

(M&E) systems limit the ability of IES to assess honey production and processing activities effectively. The institution struggles with data collection, analysis, and sharing research findings with relevant stakeholders. Another organizational challenge is poor stakeholder engagement, as IES lacks effective communication and outreach programs to educate stakeholders about honey quality standards. Limited collaboration with private and public sector partners has also hindered efforts to build demand for high-quality honey products. Lastly, weak risk management mechanisms expose the honey sector to issues such as adulteration, non-compliance, and market failures. The absence of a clear accountability framework makes it difficult to assign responsibility for overseeing quality assurance across the honey value chain.

Policy and Enabling Environment Level Capacity Gaps: At the policy level, one of the biggest gaps is the lack of a national traceability system, lack of a comprehensive policy and the absence of applicable regulations that can drive effective certification and compliance as well as weak enforcement of existing regulations to regulate honey standards. While legal frameworks such as the EFDA Proclamation No. 1112/2019 and Directive 1020/2024 exist, their implementation remains weak due to institutional integration constraints and resource limitations. Enforcement mechanisms, including penalties for adulteration and non-compliance, are not effectively applied. In addition, there is a lack of a comprehensive policy that explicitly outlines the roles and responsibilities of various institutions involved in honey quality regulation.

The regulatory landscape is further complicated by fragmented efforts among agencies such as EFDA, MoA, and the Ministry of Trade and Regional Integration, which lack clear coordination in implementing quality control measures. There is a lack of clearly defined roles and collaboration among these institutions, leading to inefficiencies in quality control.

Another critical challenge is the lack of research and development (R&D) in honey production and quality assurance. There are significant gaps in research on best practices for honey handling, storage, and transportation. Ethiopia also lacks organic and fair-trade certification mechanisms, limiting its competitiveness in international markets where such certifications are required. Limited infrastructure support at the policy level further restricts the ability to ensure quality standards across production and processing. The absence of government-backed incentives, such as funding for quality assurance laboratories and research institutions, exacerbates this issue. Finally, weak accountability mechanisms mean that no single institution is solely responsible for overseeing the entire honey value chain, leading to poor coordination and ineffective enforcement.

4.2.2. Ethiopia Conformity Assessment Enterprise

Individual Level Capacity Gaps: Ethiopia Conformity Assessment Enterprise (ECAE) has skilled professionals, but there is a shortage of expertise in advanced honey testing methods, such as chromatography equipment for pesticide residue and heavy metal analysis. The lack of continuous staff training further limits the organization's ability to stay current with international quality control standards. Regular and structured training programs are necessary to enhance technical expertise and operational efficiency.

Organizational Level Capacity Gaps: ECAE plays a critical role in ensuring honey quality certification. Its governance and leadership are structured under the Ministry of Trade and Regional Integration (MoTRI), with a mandate outlined in Ethiopian Conformity Assessment Enterprise Re-Establishment Council of Ministers Regulation No. 549/2024. Article 4 emphasizes practical training in laboratory testing and technical skills, while Article 6 mandates the sale of laboratory equipment in collaboration with private institutions. However, responsiveness to market needs is slow, and decision-making processes lack transparency and inclusivity, limiting adaptability to evolving standards.

Operational constraints include outdated equipment, limited testing facilities, and insufficient reagents. The inability to conduct advanced tests locally forces honey producers to rely on costly international laboratories, increasing certification delays. Financial limitations hinder investments in modern testing equipment, certified reference materials, and infrastructure expansion. Additionally, ECAE lacks a strategic sustainability plan to address market fluctuations, operational disruptions, and long-term financial stability. Improved funding mechanisms, such as public-private partnerships and international grants, could enhance financial sustainability. Collaboration with stakeholders, including honey producers and exporters, remains weak, leading to inconsistencies in certification processes. Strengthening partnerships with the private sector and regulatory bodies will improve certification efficiency and align honey standards with international requirements.

Policy Level Capacity Gaps: ECAE operates within a generally effective policy framework but lacks the flexibility to adapt to emerging global standards. Regulatory inconsistencies in honey quality assurance, pesticide control, and export certifications weaken Ethiopia's competitiveness in international markets. Enhancing coordination between regional and national regulatory bodies is crucial for standardizing honey certification processes and improving market access.

4.2.3. Ministry of Agriculture

The Ministry of Agriculture (MoA) in Ethiopia benefits from a clear mandate regarding the development of agricultural resources, including the apiculture sector. It plays a central role in formulating and implementing policies that directly influence beekeeping and honey production. This clear structure allows the MoA to provide guidance to the sector, such as through capacity-building initiatives and facilitating access to financial support. However, the institutional framework, while having a clear set of structures, rules, organizations, and processes to govern apiculture, is limited by the lack of specific strategies tailored to the grassroots level. The MoA has a team of skilled professionals, particularly in the areas of policy formulation and livestock management. The presence of skilled human resources in these areas has allowed the MoA to initiate policies in the broader agriculture sector. As a result, it offers training programs for extension officers and beekeepers, helping to build the necessary skills in the sector but the reach for farmers is limited as most of the trainings remain at an expert level.

Individual Level: There is a shortage of specialized expertise in critical areas of apiculture, such as queen rearing, hive management, and modern beekeeping techniques. While the Ministry of Agriculture (MoA) has

skilled professionals in policy formulation and livestock management, the expertise in advanced apiculture practices is limited. Many extension officers and experts lack technical knowledge in modern hive products diversification, automated hive management systems, and advanced disease control measures. This gap restricts the MoA's ability to support beekeepers in adopting innovative techniques that improve honey quality and productivity. Furthermore, training programs are primarily targeted at expert level and fail to adequately reach farmers and grassroots-level beekeepers, limiting the broader dissemination of knowledge. The absence of well-structured training and extension programs tailored to smallholder beekeepers further weakens the capacity-building efforts in the sector.

Organizational Level: Despite having a clear mandate, the MoA faces multiple organizational constraints that hinder its effectiveness in supporting the apiculture sector. The MoA has access to government funding, but the financial resources allocated for apiculture initiatives are insufficient to meet the sector's growing demands. The limited funding affects the ability to scale up crucial interventions such as the construction of honey processing plants, the provision of modern beekeeping equipment, and the establishment of subsidy programs for small-scale beekeepers. Moreover, access to credit for beekeepers remains a major challenge due to the absence of structured financial mechanisms that cater specifically to the apiculture sector. Many beekeepers lack collateral or formal credit histories, restricting their ability to expand operations and invest in improved production methods. The MoA also lacks a systematic approach to integrating modern technologies into beekeeping, such as automated hive monitoring systems and advanced honey quality testing techniques. The absence of structured policies and investment in technological innovation restricts efforts to modernize the apiculture sector and align with international best practices.

Additionally, while the MoA has established monitoring and evaluation (M&E) mechanisms, these systems remain weak due to fragmented data collection processes, inconsistent reporting structures, and a lack of comprehensive impact assessments. As a result, the MoA struggles to measure the effectiveness of its interventions, making it difficult to adjust programs and policies based on actual field performance.

Policy and Enabling Environment Level: At the policy level, there is a lack of a dedicated and comprehensive national apiculture policy. While MoA has a broader agricultural policy framework, it does not adequately address the specific needs of the apiculture sector. Key gaps include the absence of regulatory frameworks for honey quality standards, traceability systems, and export certification, which limits the competitiveness of Ethiopian honey in international markets. The inconsistent enforcement of policies related to pesticide use and bee health further exacerbates the challenges facing beekeepers, as unregulated pesticide application continues to harm bee populations and reduce productivity. Despite the existence of initiatives such as the '*Ye Lemat Terufat*' program, which envisions the development of vertically integrated financial institutions and honey production hubs, implementation remains weak due to budgetary constraints. The ambitious targets set under this program require significant investments approximately USD 260 million which have not yet been secured, delaying the realization of key interventions such as tax exemptions, subsidies, and loan guarantee agreements for beekeepers. Additionally, policies related to border trade controls and honey export regulations remain underdeveloped, making it difficult for Ethiopian honey producers to expand into

international markets. The lack of infrastructure for quality assurance, including certified laboratories, honey testing facilities, and processing plants, further weakens Ethiopia's ability to meet global quality standards. Climate change, habitat loss, and the absence of strategic policies to mitigate these environmental risks continue to threaten the sustainability of the apiculture sector. The absence of a clear framework for integrating research findings into policy implementation also poses a significant challenge. Despite progress in drafting policies related to apiculture, the MoA has yet to finalize and implement them effectively. Without clear regulatory guidelines, funding mechanisms, and enforcement structures, the sector remains vulnerable to inefficiencies, market failures, and stagnation.

The weak coordination between MoA and relevant institutions, including the Ethiopian Food and Drug Authority (EFDA), cooperative agencies, and private-sector actors, further impedes the establishment of a robust policy environment that supports sustainable apiculture development. Coordination between MoA and other stakeholders—including regional institutions, research organizations, cooperatives, NGOs, and regulatory agencies—is weak. The limited engagement with cooperative agencies and private-sector actors hinders the creation of an integrated and well-supported honey value chain. The lack of synergy between MoA and other actors reduces opportunities for pooling resources, technical assistance, and financial support, ultimately weakening the overall development of the apiculture sector. The MoA also struggles to provide technical support for scaling up beekeeping operations due to poor engagement with beekeepers' cooperatives, reducing the potential for collective action and shared infrastructure investments.

4.2.4. Holeta Beekeeping Research Center

Individual Level Capacity Gaps: The Holeta Beekeeping Research Center has a team of researchers with expertise in apiculture, but there is a shortage of skilled professionals specializing in critical areas such as honeybee disease management, marketing, and hive innovation. Additionally, researchers have limited access to advanced research methodologies and international collaborations, which restrict their ability to stay updated with global developments in apiculture. There is also a lack of skill-based workers or designers familiar with modern hive construction and technology, which hinders innovation in beekeeping equipment. To enhance individual capacity, targeted training programs, participation in global research initiatives, and exchange programs should be introduced to improve technical expertise and research capabilities.

Organizational Level Capacity Gaps: The Holeta Beekeeping Research Center has a strong focus on apiculture research and a well-structured approach to research and training. However, its reach is geographically limited, preventing it from serving the entire country effectively. The organization faces significant challenges in accessing modern research technologies and lacks adequate infrastructure for large-scale honey processing and value addition. Financial constraints also pose a major issue, as the center relies primarily on government funding, with minimal diversification into alternative revenue streams such as private partnerships and consultancy services. Furthermore, knowledge-sharing mechanisms with stakeholders, including beekeepers and exporters, are weak, leading to a gap between research findings and practical application in the field. Strengthening collaboration with research institutions, diversifying funding sources, and improving dissemination strategies will help address these gaps.

Policy Level Capacity Gaps: The Holeta Beekeeping Research Center operates within a structured policy framework that supports research in apiculture. However, there are regulatory inconsistencies in areas such as honey quality assurance, value chain development, and branding Ethiopian honey for international markets. Policies on pollination, bee forage conservation, and climate-resilient apiculture practices are not well integrated, limiting the center's ability to address emerging challenges in the sector. Additionally, there is a lack of incentives for research institutions to collaborate with the private sector, which hinders innovation and the commercialization of research outputs. To improve policy effectiveness, stronger coordination between regulatory bodies, integration of apiculture into national agricultural policies, and the development of incentives for private-sector engagement in research are needed.

5. The State of the Ethiopian Apiculture Sector: Deep Dive Analysis

This section presents the state of the apiculture sector across the value chain, main stakeholders, their roles, constraints and opportunities to improve the honey production and productivity problem in Ethiopia.

5.1. Input supply

Honey production relies on inputs like hives, accessories and packaging materials. Colony producers must have multiplication sites and equipment for beekeepers' safety, backed by competency certificates and valid business licenses. However, most inputs are not following the standards, honey sales are without labeling, and legal metrology is not monitoring or conducting market surveillance inspections to ensure compliance.

In South Ethiopia Habesha Trading and Sodo rural Technology Center, TVET Colleges, private and public organizations are the major input suppliers with huge potential for honey production system, but they are facing the lack of access to production sites/shades, shortage and cost of raw materials, lower credit services, and government support. The survey results also confirm the shortage of finance and equipment to support youth's effort in the apiculture sector. About 19.5% of respondents from seven regions reported equipment support, 7.3% received financial support, while only 3.7% reported assistance in market linkage.

5.2. Honey Production

Beekeepers in remote areas face challenges in accessing markets, purchasing inputs, and receiving training. They use various tools, including colony, protection cloth, smokers, bee veils, knives, and stainless-steel collectors, all of which must be clean and meet specific requirements. Membership sizes and working capital vary based on living conditions, seed money, and local micro financing policies. Share selling also supports cooperatives in purchasing beekeeping inputs. According to the survey results, youth beekeepers in Oromia, Amhara, Tigray, South Ethiopia, and Southwest Ethiopia are actively participating in honey production, overcoming challenges such as loss of honey colonies, limited finance, and resource availability, while also utilizing beekeeping as a significant income source. Moreover, the honey production cycle takes place inside beehives placed in an open field (Catania & Vallone, 2020) and is determined by frequency of honey harvesting

and colony management. According to the current study, 34.9% of respondents in Amhara, 19.4% in Benishangul Gumuz, 2.3% in Oromia, 2.3% in Sidama, 24.8% in South Ethiopia, 4.7% in Southwestern Ethiopia, and 11.6% in Tigray harvest honey three times or more per year. Likewise, 54.5% of respondents in Amhara, 9.1% in Sidama, 9.1% in South Ethiopia, and 27.3% in Southwestern Ethiopia harvest honey twice a year. In addition, 5.6% of respondents in Oromia and 94.4% in South Ethiopia harvest honey once a year (Table 4).

Table 4. Frequency of honey harvest by region

Region	Not yet	Once	Three times or more	Twice	N
Amhara	0.0%	37.8%	5.0%	57.1%	119
Benishangul Gumuz	0.0%	75.8%	0.0%	24.2%	33
Oromia	20.0%	60.0%	0.0%	20.0%	5
Sidama	0.0%	23.1%	7.7%	69.2%	13
South Ethiopia	17.3%	32.7%	1.0%	49.0%	98
Southwestern Ethiopia	0.0%	54.5%	27.3%	18.2%	11
Tigray	0.0%	100.0%	0.0%	0.0%	15
Total	6.1%	43.9%	3.7%	46.3%	294

N = Number of respondents

The average honey yield per hive per harvest varies across various regions. The average yield per traditional beehive is reported to be 5.5 kg in all regions with substantial regional variations. For example, respondents in Tigray region reported average yield of 9 kg hive per harvest per traditional hive followed by South Ethiopia region reported about 6.4 kg per hive per harvest from traditional hive while those in Sidama region reported the lowest yield of about 2.6 kg per hive per harvest. Similarly, for transitional hives the average yield of 9 kg per hive per harvest which is limited to Benishangul Gumuz and South Ethiopia regions and the modern hives in Tigray region gave the highest yield of 12.7 kg per hive per harvest with the average national yield of 11.8 kg per harvest per modern hive. In terms of hives, 82% (241) of respondents use traditional hives, while 21.4% (53) use modern hives and 3.10% use Transitional hives ($P < 0.001$) showing a significant reliance on traditional methods (Table 5).

Table 5. Type of hive (%) used by youth beekeepers during 2024

Hives	Amhara	Benishangul Gumuz	Oromia	Sidama	South Ethiopia	Southwestern Ethiopia	Tigray	Total
Traditional	68.1	100.0	40.0	100.0	98.0	90.9	40.0	82.0
Transitional	0.8	3.0	40.0	0.0	4.1	9.1	0.0	3.1
Frame	39.5	0.0	20.0	0.0	5.1	0.0	66.7	21.4

A KII respondent from the Ministry of Agriculture (MoA) affirmed that, despite the progress in the **”Yelemat Tirufat”** initiative and increased youth involvement, including a higher number of improved hives, the training is limited. *”We provide hives without training due to budget shortages in most regions but the extension system is expected to provide regular training.”*

Among those who received training by regular extension service providers, satisfaction with the quality of extension services is generally low, with 82.2% of respondents across all regions expressing dissatisfaction. This lack of satisfaction is most pronounced in Oromia (98.7%), Southwestern Ethiopia (94.3%), and Sidama (87.8%), where most respondent's report low level of satisfaction with the quality of extension services. Similarly, Amhara (70.9%), South Ethiopia (88.9%) and Benishangul Gumuz (71.4%) also show high levels of dissatisfaction (See annex 10).

The problem of apiculture sector that has been challenging honey production has been prioritized by survey respondents. Hence, priority challenges (Table 6) faced by beekeepers is finance, particularly in Sidama (100%), Oromia (60%), Southern Ethiopia (53), followed by bee pests and diseases in Tigray (60%), Amhara (59%) and Oromia (40) and Benishangul Gumuz (42%).

Table 6. Priority challenges (%) reported by beekeepers in 2024

Region	Bad weather	Finance	Inputs (Hive, extractors, clothes, etc.)	Lack of bee forage plants	Pests and diseases	Other	N
Amhara	4.20	16.8	5.9	5.0	58.8	9.2	119
Benishangul Gumuz	3.03	48.5	3.0	0.0	42.4	3.0	33
Oromia	0.0	60.0	0.0	0.0	40.0	0.0	5
Sidama	0.0	100.0	0.0	0.0	0.0	0.0	13
South Ethiopia	10.2	53.0	8.2	7.1	17.4	4.1	98
Southwestern Ethiopia	18.2	27.3	9.1	9.1	27.3	9.1	11
Tigray	13.3	6.7	0.0	13.3	60.0	6.7	15
Total	6.8	36.7	5.8	5.4	39.1	6.1	294

N = Number of beekeepers

5.3.Honey processing, packaging, handling, maintaining its quality

Youth groups organized in cooperatives engaged in honey production activity. They collect honey and packs to supply to the retailers and the consumers. Respondents asked about support for honey processing facilities from government or NGO programs is limited. According to the survey results, the access to honey processing equipment such as extractors, processors, and bottling machines is limited in the MaYEA intervention areas. In general, 61.7% of respondents across all regions reported no access to such equipment during the baseline survey. The lack of equipment is most pronounced in Oromia Region (93.5%), Southwestern Ethiopia Region (87.4%), and Sidama Region (82.4%), where most respondents report no access to honey processing equipment. Similarly, South Ethiopia (58.3%) and Benishangul Gumuz (66.3%) also show access challenges. In contrast, 80% of respondents in Tigray of respondents' report have access to honey processing equipment and in Amhara region with 34.6% having access and 59.3% lacking equipment.

This was also confirmed by the KII with Sokicha Shoba and Yirga Chefe Youth Cooperatives from South Ethiopia, they are working on honey processing and extracting, packaging and handling. The cooperative now

possess 1.6 million ETB capitals with strong shade provided by the government. They reported that *‘We only now require hands on training for honey processing, packaging and handling, credit access and close follow up. Similarly, youth in Oromia extract honey and pack using local materials, but face equipment shortages and technology limitations. Processors in Amhara and Tigray also generate medium income from production and processing but need to enhance product type and value. As reported by livestock expert from Tigray BoA ‘Due to lack of facility and hands-on training youths store the honey product in dirty stores, bags of sugar and fertilizer, this is highly exposed to adulteration and quality loss’.*

Regarding honey quality testing, respondents were either not tested or very few tested their honey for quality before selling. Similarly, Benishangul Gumuz (21.4%) and South Ethiopia (17.4%) and Amhara (36.3%) report low levels of honey testing (See Annex 11). Organic or geographical indications (GI) for honey certifications are very rare across all regions. Only 3.9% of respondents have certification for their honey. In Benishangul Gumuz has the highest rate at 9.26%, followed by Southwestern Ethiopia (9%), and Amhara (5.5%). Other regions like Oromia, South Ethiopia, Sidama, and Tigray report minimal or no certifications, with some regions like Sidama and Tigray showing no certified honey producers at all.

The perceived quality of honey by respondents indicated that most respondents view their honey quality as medium (Table 7). Of total producers only 18% reported high quality honey while 72% of them reported medium quality honey and only 10% reported low quality honey. Higher share of respondents in Tigray, SWE and Amhara, in that order, reported high quality honey (Table 7).

Table 7. Perceived honey quality (%) by respondents

Region	High	Medium	Low	N
Amhara	20.2	74.0	5.9	119
Benishangul Gumuz	6.1	93.9	0.0	33
Oromia	0.0	100.0	0.0	5
Sidama	0.0	100.0	0.0	13
South Ethiopia	6.1	72.5	21.4	98
South Western Ethiopia	54.6	36.4	9.1	11
Tigray	100.0	0.0	0.0	15
Total	18.0	72.1	9.9	294

N = Number of respondents

A high percentage of respondents in Benishangul Gumuz (93.9%), South Ethiopia (72.4%) and Tigray (66.7%) report skills and knowledge gaps as a challenge and this was considered as a major obstacle. In contrast, regions like Sidama (38.5%) and Southwestern Ethiopia (9.1%) report fewer concerns related to skill and knowledge in maintaining the quality. In addition, in Sidama (92.3%) and South Ethiopia (56.1%) lack of necessary inputs is considered as a serious challenge for maintaining quality. Participants from Amhara (25.2%) and Southwestern Ethiopia (18.2%), experience likewise.

5.4. Honey marketing

Ethiopia has access to promising markets for honey, including Europe (e.g., the UK, Sweden, and France), the Middle East (e.g., Dubai and Saudi Arabia), and Asia (e.g., Japan). The unique quality and flavor profile of Ethiopian honey are highly valued in these regions. However, meeting the stringent requirements of international markets, such as the Codex Alimentarius standards for the European Union, remains a significant challenge. "Investments in modern testing facilities and adherence to international standards will be crucial for securing long-term buyers and expanding exports" (Yeserah et al., 2019).

Despite its potential, Ethiopia's honey export performance remains low as steadily declining export trend (Figure 4). In 2022, Ethiopia exported \$526,000 worth of honey, ranking as the 76th largest honey exporter globally. The primary destinations for Ethiopian honey export included Norway (\$301,000), Sweden (\$104,000), the United Kingdom (\$82,500), the United States (\$21,700), and Japan (\$9,340)" (OCE, 2024). While exports to Norway, the UK, and Sweden have grown significantly, Ethiopia still struggles to establish itself as a major exporter due to inconsistent quality, poor packaging, and a lack of traceability. The apiculture sector also faces disruptions from informal cross-border honey trade, particularly to Kenya, Sudan, and Djibouti, reducing the availability of high-quality honey for formal exports (OCE, 2024). A current report indicates that this value is lower than the previous year to \$110,493 in 2023 (Trendeconomy, 2024; FAOSTAT.2024).

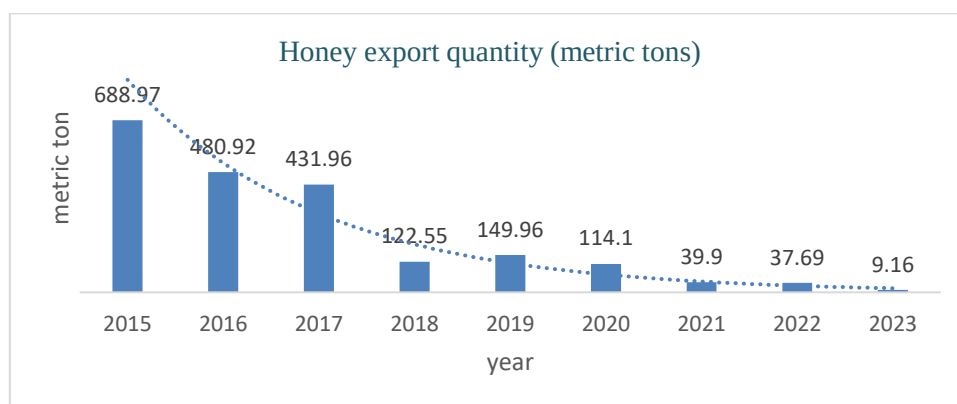


Figure 4. Honey export trend since 2015 (FAOSTAT, 2025).

Accessing international markets remains a significant challenge, particularly due to the high standards required by European and Middle Eastern buyers. "The lack of standardized production tools and practices has significantly reduced the quality of Ethiopian honey, which in turn affects the consistent supply of marketable honey in the export market" (Yeserah, 2022). Laboratory analysis of honey from Ethiopian markets has confirmed widespread adulteration, with high sucrose levels (10.18%) indicating the addition of sugar syrups, which "undermines consumer confidence and limits the ability to meet international standards" (Yeserah, 2022). Additionally, national testing facilities are limited, forcing exporters to rely on costly and time-consuming international quality assessments, further delaying market entry. Without addressing these quality and regulatory issues, Ethiopia risks losing its foothold in high-value export markets.

The absence of reliable market information and infrastructure to connect producers with consumers reduces the transparency and efficiency of the honey market. KIIs also report price manipulation by middlemen, along with a lack of market information and infrastructure, which hinders fair pricing and market access for beekeepers. Beekeepers supply their products to collectors due to the small volume and market distance, maintaining product quality. Collectors mix different products, affecting product character. They supply local brewers, retailers, and industry processors. According to FGDs of Tigray, challenges of the current market for honey and bee products include irregular traders, and lack of working capital and advanced technology equipment. The continuous business development, support for young beekeepers, and technical measurement to improve market linkage and job opportunities are limited. According to KIIs and FGDs from Amhara and South Ethiopia, the main challenges faced by apiculture businesses in accessing domestic and international markets include poor quality, gap in market linkage, and trade barriers due to quality.

Ethiopia's honey market system is characterized by a weak and underdeveloped value chain, dominated by middlemen who control prices and limit farmers' profits. "The sector operates under a moderately concentrated and weak oligopoly market, with a concentration ratio of 47.1%, which results in price rigidity, collusion, and entry barriers" (Yeserah et al., 2019). In regions like Southwest Ethiopia, "poor rural infrastructure, lack of organized marketing, and the absence of price regulation have further reinforced market inefficiencies" (Erekalo, 2017). High local prices, combined with poor handling practices, contribute to quality loss and reduced profitability (Feyisa, 2022). KII from Oromia and Tigray BoA stated that *"the high local price, coupled with low export market prices, has negatively affected the apiculture system in the region."*

The dominance of middlemen in the supply chain has led to unfair pricing for farmers, discouraging investment in modern beekeeping. "Beekeepers primarily sell their honey to collectors due to small-scale production and the long distances to markets," but "collectors often mix honey from different sources, affecting its purity and reducing its market value" (Yeserah, 2022). A national survey found that 99.4% (Table 8) of honey producers sell their products in local markets, while only 1.9% sell at the national level and none directly access international markets. The absence of direct market linkages prevents producers from benefiting from premium prices and discourages quality improvements.

Table 8. Marketplaces (%) for honey or other bee products in different regions by youth

Region	Local markets	Supermarkets	Restaurants and hotels	home/farm gate	Other	N
Amhara	91.6	3.4	6.7	14.3	6.7	119
Benishangul Gumuz	97.0	6.1	0.0	6.1	0.0	33
Oromia	80.0	0.0	0.0	20.0	0.0	5
Sidama	30.8	0.0	0.0	69.2	0.0	13
South Ethiopia	81.6	2.0	18.4	24.5	12.2	98
Southwestern Ethiopia	100.0	0.0	0.0	9.1	0.0	11
Tigray	100.0	0.0	0.0	0.0	0.0	15
Total	86.7	2.7	8.8	18.4	6.8	294

N = 294

The lack of standardized production tools and practices further weakens the market system. Most beekeeping equipment, such as hives and accessories, remains traditional and not easily accessible to many farmers. The absence of a structured marketing system means exporters often struggle with fluctuating prices and frequent quality disputes with buyers. Additionally, packaging and labeling remain significant issues, with most honey sold in low-quality plastic containers that fail to meet international standards" (Yeserah, 2022).

The sector also faces economic challenges, including the impact of currency devaluation. KII from SE BoA said, *"The rising costs of importing modern beekeeping equipment and apiculture accessories have made it difficult for farmers to upgrade their production systems"*. The increased cost of production has also made Ethiopian honey less competitive in the global market. Without investment in improved production tools, quality control, and regulatory enforcement, Ethiopia's honey sector will continue to face market instability.

Ethiopian honey and beeswax products face hurdles like low demand, lack of competition, and limited market access. Future aspirations include expanding hives, diversifying bee products, and establishing linkage with urban markets or export channels. According to FGD with youth beekeepers, future programs should support for adoption of improved hive and processing technology, and engage in marketing activities. As most of the youth are waiting for loans to be disbursed they expressed market linkage, local market development, and export opportunities.

Ethiopian honey production is characterized by a moderately concentrated and weak oligopoly market, with a concentration ratio of 47.1% (Yeserah et al., 2019). This results in price rigidity, collusion, and entry barriers (Shepherd, 2016). The market is also characterized by interdependence, limited competition, and market instability. In Kafa zone Southwest Ethiopia, the market is mostly oligopoly due to poor rural infrastructure, organized marketing, no price regulation, and unlicensed traders (Erekalo, 2017). High local prices and poor handling practices contribute to quality loss and reduced profitability (Feyisa, 2022). KII from South Ethiopia Bureau of Agriculture stated the high local price with low export market price affecting the apiculture system in the region.

The honey sector also faces critical barriers in terms of market access. As most of the KIIs witnessed, one of the primary concerns is the lack of standardized production practices and tools, which undermines the quality of Ethiopian honey and its competitiveness on international markets. Most production tools, such as hives and accessories, remain outdated, and honey adulteration remains a widespread issue, particularly within the domestic market. The absence of legal frameworks to penalize adulterators and enforce quality control only exacerbates this problem. In international markets, the challenge of adhering to stringent quality standards, such as the Codex Alimentarius, further complicates Ethiopia's market access. Exporters face difficulties in obtaining consistent quality assurance due to the limited availability of testing facilities within the country, forcing them to rely on costly and time-consuming international testing options.

Additionally, the market system is suffered from significant fragmentation, with middlemen playing a dominant role in controlling the honey supply chain. This results in unfair prices for farmers, limiting their

ability to profit from honey production. Furthermore, poor packaging and a lack of traceability systems further undermine market confidence, particularly in international markets where consumers demand consistency and transparency. Ethiopia's honey exporters struggle with market access due to inconsistent honey supply, fluctuating prices, and quality disputes with international buyers. The smuggling of honey across borders to neighboring countries such as Kenya, Sudan, Somalia and Djibouti destabilize the market further, reducing the availability of high-quality honey for export. This was reported as one of the bottlenecks for the export market, which requires strict regulations.

The absence of strict enforcement regarding honey adulteration and traceability standards in the domestic and export markets undermines the overall competitiveness and reputation of Ethiopian honey. The KIIs also expressed concern on the impact of Ethiopia's economic change, including currency devaluation, has also compounded these issues. The devaluation of the Ethiopian Birr has had a significant effect on the apiculture sector, especially in terms of import costs. The high cost of modern hives and apiculture accessories, which are often imported, has become even more prohibitive for farmers. The rising cost of inputs, paired with limited access to subsidies in many regions, has made it difficult for many farmers to upgrade their equipment and adopt modern beekeeping practices. The increased cost of production and export challenges ultimately reduce the profitability of the sector and discourage investment in its development.

As most stakeholders shared one of the most pressing challenges facing the country is the lack of comprehensive reforms that address both the production and marketing aspects of the industry. Apart from improving the quality of honey, ensuring it meets international standards is mandatory. Additionally, the sector faces challenges related to market instability, largely exacerbated by the devaluation of the currency. Rising production and local price of honey, combined with market instability, discourage farmers from looking for export niches and in the future limit investing in modern beekeeping practices.

Moreover, the establishment of fair-trade platforms, alongside improvements in packaging and labeling systems, is limited for boosting market confidence and ensuring consistency in product quality. Strengthening the regulatory framework to combat honey adulteration and ensure traceability is also a significant hurdle, as it has been affecting the national competitiveness both domestically and internationally.

5.5. Support service

Key support services identified from the KIIs and FGDs include training and capacity building for beekeepers, access to modern equipment, research and development, quality control and certification, market access and information, financial services, extension services, value addition activities, and policy advocacy. Training improves productivity and quality, while access to modern equipment enhances production efficiency. Research and development help develop new techniques and solutions. Market access and information help beekeepers sell their honey at fair prices. Extension services support beekeepers with technical advice and best practices. Private sectors like Habesha Trading PLC, Rural Technology Institute in Southern Ethiopia,

initiatives in Oromia which distribute subsidized hive report low attention from the stakeholders, shortage of shades for store, lack of credit availability, lack of modern machine for hive making and skill for the farmers.

5.6. Subsidies and incentives

From 768 respondents only 2.2% youths were confirmed to have obtained subsidies incentives from the government for beekeeping activities in the form of training, supplying modern beehives, credit from microfinances, support for crop production, and others. The youths from Oromia and Tigray responded obtaining subsidies and incentives they get from the local government.

5.7. Training and capacity building

According to the current survey, training provided by programs supporting youths engaged in apiculture activities in terms of training and capacity building in different regions found to be 99.9% from the total respondents received training from supporting organizations and programs while 19.5% received material support like modern beehives from organizations and programs working in the area. The magnitude of material/equipment support varies among regions in that high support was reported from South Ethiopia where 80% of the respondents were supported while no youth was supported from Tigray region.

5.8. Value chain analysis and market system mapping

As illustrated in Figure 5, the value chain involves a range of actors, from input suppliers and beekeepers to processors, exporters, and consumers. While the potential for growth is evident, significant challenges hinder the sector's development. Production faces limitations due to low yields because of reliance on traditional methods, and the prevalence of pests and diseases. Processing is constrained by a lack of modern infrastructure, skilled labor, and standardized practices. Furthermore, the sector suffers from market access issues, including limited market information, poor branding, and weak market linkages. Quality control remains a concern, with a lack of accredited testing labs and inconsistent quality standards. These challenges are compounded by weak support services, limited financial access, and poor coordination among stakeholders. Market access appears to be a major constraint, with serious market problems indicated for certain segments. Additionally, there is potential for market development, but this is hindered by quality and linkage-related issues, as shown by the yellow arrow. While some segments may produce quality honey, appropriate market linkage to export markets continue to pose obstacles as even the current domestic price is much higher than the international price.

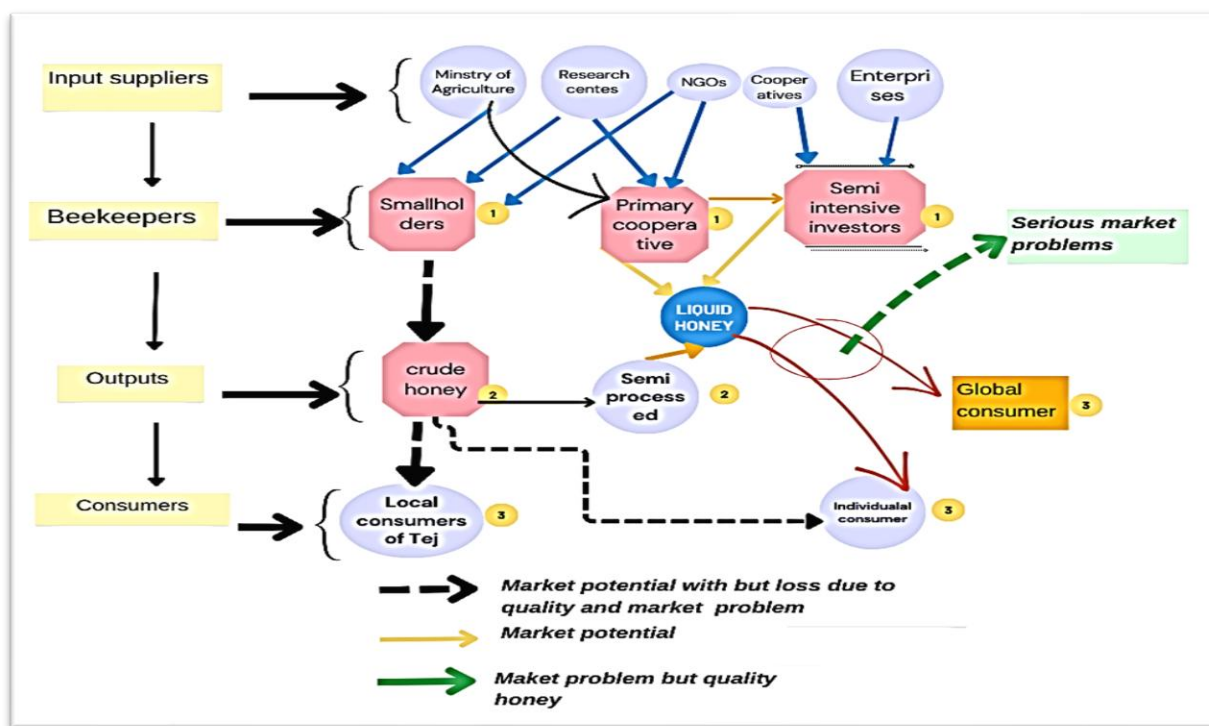


Figure 5. Value chain analysis and key bottlenecks

The SWOT-VCA analysis of Ethiopia's honey value chain highlights key strengths, weaknesses, opportunities, and threats at different stages. Input supply benefits from locally available traditional beekeeping materials but struggles with a heavy reliance on imports and poor-quality control, though local production and subsidies could mitigate these issues. Production has strong potential due to a large rural workforce but faces challenges like traditional practices, pest outbreaks, and limited modern hives, which could be addressed through extension services and pest-resistant hives. Processing is supported by existing cooperatives but lacks modern technologies and value addition, with opportunities in facility investments and capacity building. Quality assurance is undermined by weak regulatory enforcement and limited testing labs, but improvements in traceability and accredited labs could boost product reputation.

Furthermore, marketing and sales suffer from fragmented structures and unfair pricing, though branding Ethiopian honey as organic and leveraging digital platforms could improve competitiveness but the international value is much lower currently according to exporters. The export market further faces supply inconsistencies, weak traceability, and fluctuating prices and lack of specific regulations. Moreover, packaging and handling is also constrained by substandard materials and poor investment, yet promoting local packaging industries and financial support could help, and the support services benefit from NGO and research engagement, but weak extension services and stakeholder coordination hinder progress.

6. Honey Quality Testing, Certification, and Accreditation

6.1. Honey Quality Testing

The national honey quality faces several challenges that undermine its competitiveness in international markets. One major issue is honey adulteration, which significantly reduces market confidence. Many of the experts confirm that adulteration occurs when honey is diluted with sugar or other substances, compromising its authenticity and quality, and is common in the market. This issue is exacerbated by poor packaging systems that fail to meet the required standards, further diminishing the perceived value of Ethiopian honey. In addition to adulteration, robust traceability systems are lacking, making it difficult to ensure that honey products meet the necessary quality standards from production to consumption. This gap in traceability also complicates the enforcement of quality regulations and discourages investment in the sector.

Another critical challenge is the inconsistency in honey quality, which is largely attributed to the varying levels of training among beekeepers, processors, and exporters. Many of these stakeholders lack the knowledge necessary to meet the quality requirements specified in the Ethiopian Standard for Honey (ES 1202:2021). While advanced training has been provided by stakeholders, the overall capacity of honey producers to consistently meet international standards remains inadequate. This is especially problematic when considering the stringent quality requirements in key export markets like Europe, the Middle East, and Asia, where buyers expect high-quality, traceable honey with specific characteristics, such as moisture content, sugar levels, and minimal contaminants.

The limited capacity of testing and certification facilities further hampers the ability to ensure honey quality. Laboratories operated by the Ethiopian Metrology Institute (EMI) and the Ethiopian Conformity Assessment Enterprise (ECAE) lack modern equipment and sufficient capacity to conduct all required tests, particularly for contaminants such as pesticides, heavy metals, and veterinary drug residues. As a result, honey producers are forced to rely on expensive international testing facilities in countries like Germany and South Africa, adding significant costs and delays to the certification process. This not only makes Ethiopian honey less competitive in the global market but also limits its access to high-value markets that demand traceability and consistency in quality.

Furthermore, the national honey industry is hampered by the absence of a comprehensive legal framework that could effectively penalize adulteration and enforce quality standards. Without strong enforcement mechanisms, illegal practices persist, undermining efforts to improve the quality and safety of honey products. This lack of regulation, combined with limited collaboration between public and private institutions, weakens the overall quality infrastructure and makes it difficult to implement and maintain consistent quality assurance measures across the entire honey value chain. These factors collectively contribute to the challenges faced by Ethiopia's honey industry, making it difficult to fully capitalize on the country's rich honey production potential.

6.2. Accreditation

The Ethiopian government has three ministries responsible for regulating food products: the Ministry of Agriculture, the Ministry of Health, and the Ministry of Trade and Regional Integration. These ministries inspect honey production, imports, and processed food items to ensure compliance with requirements. However, no inspection service provider covers the entire honey value chain. Ethiopia's National Accreditation System (EAS) is the primary body responsible for accrediting conformity assessment organizations in the country. This includes entities that handle calibration, testing, certification, and inspection activities, including those involved in honey quality control. EAS is accredited under ISO 17011, which sets the criteria for accrediting conformity assessment bodies. It is also a full member of international organizations such as the International Laboratory Accreditation Cooperation (ILAC) and the African Accreditation Cooperation (AAC), which grants it global authority to accredit testing and certification bodies in Ethiopia. This international recognition strengthens Ethiopia's position in the global market by ensuring that accredited laboratories and institutions adhere to global standards for testing and certification.

Despite these credentials, EAS faces challenges in expanding its accreditation market. One significant hurdle is the relatively small market for calibration and certification in Ethiopia, limiting the scope and growth of accreditation services. While EAS is internationally recognised for food safety and has ISO 22000 certification, it refers to food safety management systems. The lack of private standard developers within the country further limits the growth of accreditation services. The Ethiopian Standard Agency can request the development of standards, but there are no clear procedures for delegating or encouraging private-sector involvement in standard creation or accreditation processes.

In addition to these systemic constraints, regional challenges exist. For example, Oromia has its own honey quality standards, despite efforts from various stakeholders to provide advanced training to improve limited capacity. This discrepancy in standards further complicates the effective application of accreditation processes, as regions may have their criteria that differ from the national or international standards, resulting in inconsistencies in the quality assurance framework. These gaps in accreditation and standard alignment significantly hinder Ethiopia's honey industry from fully accessing global markets and achieving consistent product quality and certification. Furthermore, challenges include a lack of pre-ensuring quality before it enters the market or during harvesting, technology, and capacity gaps.

6.3. Testing and certification

Ethiopia's honey testing and certification framework is primarily managed by the Ethiopian Conformity Assessment Enterprise (ECAE) and the Ethiopian Metrology Institute (EMI), both operating under the Ministry of Trade and Regional Integration (MoTRI). Additionally, other institutions have been developed over time, although some have disappeared from the market after accreditation. These institutions ensure compliance with the Ethiopian Standard for Honey (ES 1202:2021), which aligns with international

benchmarks such as the Codex Alimentarius. This standard defines key parameters for honey quality, including moisture content, reducing sugars, and contaminant limits.

The Ethiopian Standard for Honey (ES 1202:2021), developed by the Institute of Ethiopian Standards (IES), establishes comprehensive guidelines to ensure honey quality and safety. It is part of a broader framework that includes standards for beehives (ES 1204), royal jelly (ISO 150/12824), comb honey (ES 6909), bee propolis (ES 6905), bee pollen (ES 6904), and stingless bee products (ES 6902). These standards align with international benchmarks such as the Codex Standard for Honey (Codex Stan 12), East African Standards (EAS 36), and guidelines from the International Honey Commission (IHC).

According to ES 1202:2021, eight essential tests are required for honey quality certification. However, the ECAE currently offers only five of these tests. The remaining three essential tests that ECAE does not conduct include:

- Diastase Activity – Measures honey's enzymatic quality through an amylase activity assay, with a minimum requirement of 8 or 3, depending on the honey type.
- Fiehe's Test – Ensures that no artificial additives or adulterants are present in the honey, using a colorimetric reaction method.
- Veterinary Drug Residue and Heavy Metals Tests – Detects pesticides, heavy metals, and veterinary drug residues through advanced gas chromatography or liquid chromatography-mass spectrometry techniques.

The inability of ECAE to perform these critical tests limits Ethiopia's ability to meet both national and international standards, particularly for high-value export markets. Consequently, honey exporters must turn to costly and time-consuming testing services in countries like Germany and South Africa, adding significant financial and logistical challenges.

Ethiopia's honey testing and certification infrastructure faces several significant challenges. One of the primary issues is the absence of equipment and limited testing capacity at institutions like ECAE and EMI. The lack of advanced chromatography systems prevents accurate detection of residues and contaminants, making it difficult to comply with international market requirements.

Additionally, there is a shortage of skilled personnel, as many technicians lack training in modern testing methods. Interviews with experts revealed skill gap among laboratory staff, who have not received adequate training to fully utilize advanced testing equipment. The absence of continuous professional development further affects test accuracy and reliability, reducing Ethiopia's competitiveness in the global honey market.

Another challenge is the high cost of consumables and reagents, such as certified reference materials, which are essential for thorough and precise testing. The expense and scarcity of these materials make it difficult for institutions to meet the demand for comprehensive honey testing. This issue is compounded by insufficient

laboratory capacity, particularly for heavy metals, pesticides, and other contaminants. As a result, producers must rely on international testing facilities, adding unnecessary financial and logistical burdens.

Moreover, geographical and infrastructure limitations exacerbate the situation. Testing facilities are primarily located in central regions, making access difficult for honey producers in remote areas. The absence of regional laboratories means that consistent quality standards cannot be easily maintained nationwide.

The quality of Ethiopian honey is another major challenge. Issues such as adulteration, poor packaging, and weak traceability mechanisms undermine market confidence, especially in international markets where adherence to stringent standards like the Codex Alimentarius is required. Weak legal enforcement against honey adulteration further erodes Ethiopia's market competitiveness. The lack of penalties for adulterators makes it difficult to guarantee consistent honey quality and safety.

Although companies exporting to the European Union (EU) had individually implemented traceability systems, there was no unified standard, leading to inconsistencies and difficulties in ensuring accurate traceability across the entire value chain. To address these challenges, recently a pilot project developed a traceability system that harmonizes data collection practices used by exporting companies. The traceability forms and protocols created through this initiative will be piloted within the EU export value chain, with the support of the Ethiopian Apiculture Development Association (EADA) and Ethiopian Agriculture Authority (EAA). Initially, the system will focus on the registration of beekeepers and other economic operators involved in honey exports, ensuring thorough tracking of each critical stage—harvesting, transportation, processing, and sales. This being a good initiative, the system is prepared to be implemented using paper-based forms.

The primary quality infrastructure institutions and service providers for honey in Ethiopia include the Institute of Ethiopian Standards (IES), Ethiopian Metrology Institute (EMI), and Ethiopian Conformity Assessment Enterprise (ECAE). These institutions operate under MoTRI and have received substantial support from both the government and international donors, including new facilities and equipment. However, systemic constraints hinder their effectiveness.

IES and ECAE, both under MoTRI, face a skills gap among their staff, as many employees lack adequate training to operate advanced testing equipment. Additionally, the high cost of importing essential consumables and reagents remains a major constraint. This has forced honey exporters to seek testing services abroad, particularly in Germany and South Africa, citing inefficiencies and high costs associated with Ethiopian institutions.

The EMI also provides honey quality testing services, including physicochemical analyses (e.g., moisture, sugar content, acidity, and microbial analysis). It also offers certifications such as organic and fair trade, accredited by the Ethiopian Accreditation Office. However, gaps in modern technologies, inadequate storage

facilities, and lack of continuous training for technicians and stakeholders persist, reducing the efficiency and accuracy of testing processes.

Additionally, the EMI faces critical challenges due to limited financial resources, which hinder the acquisition of essential equipment and the expansion of laboratory facilities. Outdated equipment further restricts its testing capabilities. Furthermore, a shortage of trained human resources in advanced laboratory techniques, limited professional development initiatives, and a lack of regional laboratories make it difficult to ensure consistent quality standards across the country.

Despite the presence of national honey standards, stakeholder engagement in updating and implementing these standards is limited. Public-private collaboration to enhance honey quality and safety is weak. Key challenges include adulteration, seasonality of requests, inadequate traceability systems, and knowledge gaps among beekeepers, processors, and exporters, all of which hinder compliance with export requirements.

7. Identify system-level constraints

7.1. Policy and Regulatory environment

The apiculture sector in Ethiopia holds significant but untapped potential for income generation and foreign exchange, with less than 10% of the honey and wax potential being utilized, and the commercialization of other high-value bee products such as pollen, propolis, and bee venom being non-existent (MoA and ILRI, 2013). In 2013, the Ethiopian Apiculture Value Chain Strategy, developed by ILRI and the Ministry of Agriculture, aimed to increase honey production from 50,000 tonnes to 200,000 tonnes by 2025. To achieve this, the strategy addressed three key challenges: (i) transitioning from low-productivity technologies to modern beehives to boost productivity, (ii) improving pre-and post-harvest practices to meet international standards, and (iii) strengthening industrial honey processing through market linkages and access to finance. Additionally, it emphasized building capacity through coordinated apiculture extension services, encouraging youth and women participation, and tackling input shortages by establishing start-up funds and enhancing bee forage resources through research and collaboration. These interventions were expected to enable Ethiopia to position itself as a global leader in honey and beeswax production. However, the strategy lacked an implementation framework and did not account for different regional contexts.

In addition, Ethiopia's National Agriculture Investment Plan (NAIP) 2013-2022 EF sets honey as one of the key value chains and among twelve strategic commodity-based flagship programs for its potential to improve both food security and income and planned to increase 59 to 152 thousand tons for honey by 2030 with a marketable surplus of 79% and a 5% annual increment of improved apiculture honeybee technology⁴.

⁴ <https://citizenengagement.nepad.org/pdf/20231005145754.pdf>

Similarly, the *Yelemat Tirufat* initiative of the FDRE government identified apiculture as one of four key commodities requiring policy attention (Dessie et al., 2022).

Despite these supportive frameworks, implementation on the ground remains limited. Institutional support plays a crucial role in influencing farmers' honey marketing decisions. Hussein and Solomon (2019) explain that effective government policies, extension services, and institutional support programs, such as market information dissemination, technical assistance, and subsidies, can significantly enhance farmers' ability to participate in the honey market. The formation of cooperative and farmer associations, for example, enables collective marketing and improved bargaining power. Tadesse and Berhanu (2021) emphasize that supportive policies, such as improving market infrastructure, providing access to credit, and reducing transaction costs, can further encourage market participation by addressing economic and logistical challenges faced by farmers, thus facilitating greater engagement in honey markets.

The Apiculture Resources Development and Protection Proclamation No. 660/2009 focuses on empowering Apiculture Resources Development Inspectors to monitor beekeeping practices, with a particular emphasis on the safe use of pesticides. However, its implementation is hindered by a lack of sufficient inspectors in many regions of Ethiopia, which undermines the enforcement of regulations. The shortage of inspectors leads to unregulated pesticide use, negatively affecting honeybee populations and biodiversity. This gap in oversight contributes to the decline in beekeeping productivity, which in turn impacts food security, poverty alleviation, and ecological sustainability. The proclamation's objectives are thus compromised by inadequate enforcement mechanisms, leaving the apiculture sector vulnerable to harmful pesticide practices.

In contrast, the Ethiopian Pesticide Use and Control Proclamation No. 196/2010 provides a legal framework for pesticide regulation, aiming to protect human health, the environment, and beneficial organisms like honeybees. It includes specific provisions, such as requiring pesticide applicators to notify beekeepers in nearby areas before spraying and prohibiting pesticide application during plant bloom stages. While these provisions are theoretically in place to protect honeybees, enforcement remains an issue. Despite the regulations, the actual implementation is weak, and pesticide misuse continues to occur, impacting honeybee colonies. Both proclamations share the goal of safeguarding honeybees, but both suffer from insufficient enforcement mechanisms, limiting their effectiveness in promoting sustainable apiculture practices.

While the legal framework, including Proclamation No. 1112/2019 and Directive 1020/2024, provides clear administrative and criminal penalties for adulteration and non-compliance, enforcement mechanisms remain weak. Regulatory bodies, such as the Ethiopian Food and Drug Authority (EFDA), face critical limitations in funding, staffing, and technical expertise, particularly at the grassroots level where most honey production occurs. Without sufficient resources to monitor compliance, enforce penalties, or engage directly with producers, these agencies struggle to uphold quality standards. The lack of certified laboratories and inspection infrastructure, especially in rural areas, exacerbates the situation, leaving many cases of adulteration undetected and unaddressed.

Adulteration in honey production remains a significant issue, driven by both economic pressures and weak regulatory enforcement. Producers and middlemen often add substances to increase the bulk or weight of honey, primarily as a cost-saving measure in a competitive market. Middlemen frequently suppress prices, making it difficult for genuine producers to maintain profitability without resorting to adulteration. Although the legal framework explicitly prohibits such practices and prescribes penalties, the lack of effective monitoring systems allows adulterated honey to enter both local and international markets, tarnishing the national honey reputation and diminishing consumer trust.

Institutional constraints further undermine efforts to ensure honey quality. The IES, EFDA, MoA, and Cooperative Agency face overlapping mandates and insufficient coordination, resulting in fragmented and ineffective enforcement efforts. A critical gap exists in the accountability framework, as no single institution is tasked with overseeing the entire honey value chain. This lack of clarity leads to inefficiencies and missed opportunities to enforce standards and improve compliance. Furthermore, the EFDA's limited grassroots presence disconnects it from producers, leaving many without the necessary guidance and support to align with regulatory expectations.

As a key informant from MoA emphasizes a critical gap in Ethiopia's apiculture sector, "The apiculture sector lacks standards, proclamations, and guidelines for honey production, export, quality control, and the overall value chain." Similarly, senior national experts mention concerns about the national honey quality testing and certification system, constrained by a lack of policy and the existing standards lacking applicable regulations and compliance incentives. According to Amhara BoA, government policies support the apiculture sector by organizing enterprises, protecting chemical usage, allowing investors, and promoting product marketing. However, gaps such as lack of implementation of regulations persist. Furthermore, KIIs reiterated that a more enabling policy environment is needed, including stronger rules on agrochemical misuse and pest control. According to IES, the lack of clear roadmaps in apiculture affects selecting endorsements, establishing agreements, implementing quality standards effectively, and addressing regulatory constraints. Experts from MoA acknowledge recent progress in drafting an inclusive strategy for apiculture for the next ten years.

Most recently the issuance of Apiculture Resources Development and Protection Directive No. 1028/2024 pursuant to sub-article 2 of Article 9 of the Apiculture Resources Development and Protection Proclamation No.660/2009 and tax exemption directives for agricultural equipment (457/2013), signal a potential improvement in the enabling environment. The law's section on apiculture protection lists several requirements to be met by people residing in the surroundings of commercial beekeepers' apiaries. It limits the use of pesticides and other chemicals around apiaries, obliging individuals to do so to notify any beekeepers residing within a four-kilometer radius 72 hours before the application of chemicals.

7.2. Systemic Constraints

Smallholder beekeeping practices in Ethiopia continue to rely heavily on traditional beehives. Studies indicate that traditional beekeeping practices may hinder honey production and negatively affect bee health (Tefera & Melaku, 2024). Many beehives are also highly susceptible to pests and diseases, resulting in significant colony losses (Gratzer et al., 2021). High rates of absconding and swarming reduce colony numbers and honey yields, and these are often triggered by overcrowded hive conditions and environmental stressors such as forage scarcity (Hailu et al., 2024). Youth and women play a significant role in beekeeping, but traditionally, their roles are limited to retailing honey and preparing equipment (UNIDO, 2023). The synthesis of both primary and secondary sources shows that low productivity and poor quality in the apiculture sector are rooted in several interconnected challenges. The honey production and productivity across Ethiopia face several system-level constraints, which are rooted in a range of interconnected issues. These include environmental challenges, economic barriers such as high costs for modern beekeeping equipment and limited access to finance, knowledge gaps due to insufficient training and extension services, policy support and institutional weaknesses related to inadequate pesticide regulations, weak enforcement of existing policies, and lack of financial support for beekeepers. According to KIIs these system-level constraints are hindering efforts to improve productivity and the quality of honey across the country.

The current findings also showed that the honey production and productivity were constrained by different problems in all regions of Ethiopia. According to KIIs, several system-level constraints such as deforestation, low forage availability, agrochemical use, high costs of modern equipment, limited access to resources, insufficient training, lack of financial support, pest susceptibility, and limited extension services were reported. Likewise, the survey findings indicate that the most pressing challenge faced by respondents is pests and diseases (39.12%), followed closely by financial constraints (36.73%), highlighting the significant impact of economic limitations and hive health on honey production. Other challenges, such as environmental factors (6.80%), lack of essential inputs like hives and extractors (5.78%), and insufficient bee forage plants (5.44%), were reported to contribute to production difficulties. The Pearson Chi-Square test (Value = 264.852, P-value < 0.001) indicates that these challenges are not randomly distributed but rather systematically affecting honey producers (Table 9).

Table 9. Priority challenges (%) in the apiculture sector

Region	Environment (Weather)	Finance	Inputs (Hive, extractors, clothes, etc...)	Lack of bee forage plants	Pests and diseases	Other	N
Amhara	4.2	16.8	5.9	5.0	58.8	9.2	119
Benishangul Gumuz	3.0	48.5	3.0	0.0	42.4	3.0	33
Oromia	0.0	60.0	0.0	0.0	40.0	0.0	5
Sidama	0.0	100.0	0.0	0.0	0.0	0.0	13
South Ethiopia	10.2	53.1	8.2	7.1	17.4	4.1	98
Southwestern Ethiopia	18.2	27.3	9.1	9.1	27.3	9.1	11
Tigray	13.3	6.7	0.0	13.3	60.0	6.7	15
Total	6.8	36.7	5.8	5.4	39.1	6.1	294

(Pearson Chi-Square (Value=264.852 P-value<0.001). N = Number of respondents)

Environmental constraints are among the most pressing issues (Table 10). Deforestation and land-use changes, driven by the expansion of tea plantations, commercial farms, population growth, and reliance on natural resources, have resulted in significant habitat loss and reduced forage availability for bees. This issue is compounded by climate variability, free grazing, indiscriminate herbicide use, and insufficient attention to forage development or a low level of concern for multipurpose forage production. These factors collectively diminish nectar and pollen sources, further reducing honey production. Additionally, deforestation forces many beekeepers to rely on traditional methods, which in turn perpetuate harmful practices that exacerbate environmental degradation.

Economic barriers also play a critical role in limiting the sector's potential. The high cost of modern beekeeping equipment, driven by the lack of local manufacturers in accessories and quality infrastructure, high import taxes, and limited demand, has made it difficult for beekeepers to adopt improved practices. Additionally, limited access to equipment and resources is caused by poor market linkages, high input prices, low access to finance, limited access to credit, stringent collateral requirements, and the absence of targeted programs, further hinder investments in modern tools and practices. Market constraints, including price manipulation by monopolistic processors and exporters, poor market infrastructure, and a lack of market information, exacerbate these economic challenges. As a result, many beekeepers struggle to achieve profitability, reducing incentives to improve quality or scale of production.

Knowledge and training gaps are equally significant (PACT, 2023). Insufficient practical training and the limited competency of trainers have left many beekeepers without the technical skills needed for improved apiculture practices (Nat & John, 2019). Additionally, as confirmed by KIIs and FGDs of current study, inadequate extension services, characterized by poor monitoring systems, lack of resources, and ineffective dissemination of information, prevents the widespread adoption of improved techniques. These deficiencies result in poor colony management, low yields, and substandard honey quality, further eroding the sector's competitiveness in both local and international markets.

Inadequate policies and institutional weaknesses are a persistent issue, with weak enforcement of pesticide regulations, insufficient focus on apiculture within agricultural policies, and delays in policy implementation. The lack of robust policies, guidelines, and proclamations to regulate pesticide use and ensure safe land access has created unsafe environments for bees, leading to high mortality rates. Additionally, there is limited focus on apiculture within broader agricultural policies, and delays in policy implementation have stifled the sector's growth. The absence of financial support and incentives, such as tax exemptions for apiculture equipment or programs targeting smallholder beekeepers, has further hindered progress. These policy gaps not only perpetuate inefficiencies but also discourage youth engagement, which mostly requires start-up capital critical for innovation and improving the sector's sustainability.

The consequences of these interconnected challenges are severe. Research has shown that local honeybees *Apis mellifera jemenetica* are extremely sensitive to commonly used agricultural pesticides, which may affect the

colony level due to the intensive application of these pesticides in Ethiopia (Abay et al., 2023). The indiscriminate use of agrochemicals has caused significant harm to bee populations. Different studies reported colony loss as a result of unregulated pesticide use. Studies documented a significant decline in honeybee colonies and honey production as well as honeybee colony holdings and hive productivity due to pesticide exposure. Five years ago, farmers owned between 3-5 hives and produced 60-100 kilograms of honey annually, but now, many have lost their colonies entirely (Begna, 2014; Aslake 2022; Tasew et al., 2023).

This issue is compounded by the lack of law enforcement and delays in implementing related proclamation, jeopardizing their health and survival. Despite Pesticide Registration and Control Proclamation No. 674/2010 outlining comprehensive measures for pesticide management, monitoring, its effectiveness has been hampered by the absence of enforcement mechanisms and regulations. It has also mandated the establishment of a Pesticide Advisory Board (PAB), comprising various stakeholders and chaired by the Ministry of Agriculture (MoA) but has not been effective. According to KIIs with research centers and Oromia region experts, areas that use horticultural crops applying agrochemicals have reduced apiculture activity. Further, research was also reported in Amhara region as witnessed by an expert in Amhara region: *“A farmer applied a banned pesticide without taking the necessary precaution on its negative consequences. As a result, a neighboring beekeeper has lost some of his colonies by death. We have taken this issue to the local court and as there is no direct legal framework to handle this, we used other legal verses related to damage imposed on assets to accuse 16 farmers responsible for this. Indeed, we are not sure yet what the final decision would be”*

Poor quality honey and market inefficiencies have diminished the sector’s competitiveness, limiting its potential to access lucrative markets. High production costs and limited profitability have discouraged investments in modern practices, while the lack of youth engagement has stifled innovation and growth in the sector.

These challenges are further reinforced by several feedback loops. For example, deforestation, environmental degradation, and less bee forage availability leads to low productivity in the apiculture sector. High equipment costs and limited access to finance perpetuate low productivity and discourage youth participation. Similarly, the lack of training and technical knowledge leads to poor practices and low yields, which in turn discourage investment in training. Indiscriminate use of agrochemical use, and poor policy enforcement exacerbate bee mortality, reducing productivity and income, while poor market access and quality issues discourage investments and policy reforms.

Table 10. System level constraints in apiculture sector in Ethiopia

Constraints/Challenges	Underlying Causes	Root Causes
Deforestation and land-use changes	Population growth, urbanization, natural resource reliance, tea plantations, mining, drought, civil war	• Lack of land-use planning and enforcement • Poverty driving unsustainable resource extraction • Inadequate alternative livelihood opportunities • Lack of community involvement in resource management
Reduced forage availability	Deforestation, climate change (implied), indiscriminate herbicide use, loss of biodiversity, monoculture farming	• Insufficient awareness of the importance of diverse forage • Lack of incentives for planting bee-friendly plants • Climate change impacts not adequately addressed in agricultural practices
Agrochemical use harming bee populations	Agricultural intensification, irrigation, disease outbreaks, overuse of pesticides/herbicides	• Lack of access to integrated pest management training • Inadequate enforcement of pesticide regulations • Misinformation about pesticide use
High costs of modern equipment and limited access to finance	Lack of local manufacturers, high import taxes, limited access to credit and financial services, inflation	• Limited investment in local manufacturing capacity • High transaction costs for small loans • Lack of collateral for beekeepers • Global economic factors contributing to inflation
Limited access to modern beekeeping equipment/resources	Poor market linkage, poor financing, lack of information flow	• Inefficient supply chains • Lack of information sharing platforms for beekeepers • Limited access to affordable transportation
Insufficient training and resources for young beekeepers	Government policy/dissection, lack of stakeholder support, land access issues, loan access issues	• Lack of prioritization of apiculture in government strategies • Limited coordination among stakeholders • Bureaucratic hurdles for land and loan access
Lack of financial support and incentives	Government policy, absence of specialized financial products for beekeepers	• Lack of understanding of the needs of the beekeeping sector by financial institutions • Perceived high risk of lending to beekeepers • Limited information access traditional loan packages
Limited access to financing tailored for youth	Government policy direction	• Lack of youth-focused financial programs • Lack of financial literacy among youth
Limited extension services and training for beekeepers	Poor infrastructure	• Inadequate investment in rural infrastructure • Limited resources for extension services
Inadequate policies for pesticide use and land access	Less attention to bees/beekeeping	• Lack of research and data on the impact of pesticides on bees • Insufficient advocacy for bee-friendly policies
Price manipulation and limited market access	Fragmented value chain, limited market access	• Lack of organized beekeeper cooperatives • Lack of market information systems and linkage • Limited access to processing and packaging facilities

Constraints/Challenges	Underlying Causes	Root Causes
Quality loss in poor handling and storage	Lack of training/extension, low awareness of quality production	• Inadequate training on post-harvest handling techniques • Lack of incentives for quality production
High production costs	Not using alternative locations, inflation	• Lack of information about alternative production locations • Global economic factors contributing to inflation
Low yields and quality	Less technology, poor management, poor post-harvest handling	• Limited access to improved beekeeping technologies • Lack of training on modern beekeeping practices
Susceptibility to pests and diseases	Lack of nutrition, climate change	• Lack of knowledge about bee nutrition • Climate change impacts on bee health
Lack of a national apiculture policy and honey quality policy and enforcement		• Lack of political will to prioritize honey quality • Limited capacity of regulatory bodies
Institutional arrangement issues (control by Ethiopian Drug and Food Administration)		• Overlapping mandates and unclear responsibilities • Lack of coordination between different government agencies
Poor quality standards and lack of enforcement		• Inadequate resources for quality control and testing • Lack of consumer awareness of honey quality
Pesticide residue affecting export quality and organic certification		• Lack of enforcement of pesticide regulations • Lack of training on integrated pest management practices
High local demand and prices exceeding export prices		• Low production levels unable to meet local demand • Lack of market diversification
Adulteration of honey		• Lack of effective monitoring and enforcement mechanisms • Lack of consumer awareness of honey adulteration

7.3. Access to Finance

Furthermore, with various policies and regulatory efforts by GoE, challenges exist to create an enabling environment nonetheless, financial inclusion, particularly embracing the youth population is not available. The country remains one of the lowest performers in terms of financial inclusion, which is particularly evident in the difficulty that the lowest-income groups, especially youth, face in accessing essential financial services. These services, including credit, savings, and insurance, are crucial for enabling individuals to start or expand businesses, invest in education or health, and meet basic needs. Moreover, the youth, who represent a large segment of the population, remain largely excluded from these financial systems, limiting their ability to engage meaningfully in economic development (Ebakeh, 2023).

Several policy and regulatory documents, such as the *Microfinance Business Proclamation* (revised in 2009 and 2019), the *Movable Property Security Right Proclamation* (2019), the *Youth Revolving Fund* (2019), and the *Financial Inclusion Strategy* (2017), planned to address these issues. However, the effectiveness of these policies has been hampered by significant challenges in implementation. Despite efforts to increase access to microfinance services, these policies still fall short in addressing the needs of youth. The *Youth Revolving Fund*, for example, while established to support youth entrepreneurship, has faced delays and poor awareness, making it difficult for many youths to benefit from the available capital. Similarly, the *Financial Inclusion Strategy* has made little progress in expanding financial services to rural youth due to challenges in infrastructure and financial literacy. For instance, financial inclusion of regional peers for youth is 83% for Kenya⁵ and 77% for Rwanda⁶; compared to ~45% for Ethiopia (NBE, 2023).

The approach embedded in Ethiopia's financial inclusion policies remains heavily government-driven, with limited involvement from the private sector in delivering financial services and business development support to youth. This lack of diversification in financial service provision restricts the potential for innovative financial products and alternative lending mechanisms, such as venture capital, crowd funding, and mobile banking, which could be more inclusive and accessible to youth-led businesses. Moreover, while the *Regulation on Agent and Mobile Banking* (2012) aimed at enhancing financial accessibility through mobile platforms, its reach has been limited, especially in rural and remote areas where digital infrastructure is lacking, and youth is often unfamiliar with digital financial systems.

Furthermore, the *MSE Development Policy and Strategy* (revised in 2012) has been primarily focused on a supply-driven, government-centric approach to microfinance, which does not adequately engage the private sector in delivering financial services. This lack of engagement has led to a scenario where financial services are unable to meet the dynamic needs of young entrepreneurs, especially those with innovative ideas or the need for flexible financing options. While the policy frameworks do acknowledge the importance of promoting microfinance, their implementation is often inefficient due to fragmented efforts across different governmental bodies, lack of effective coordination, and weak monitoring and evaluation systems.

Moreover, while the *Movable Property Security Right Proclamation* (2019) allows for the use of movable property as collateral, many youths remain unaware of this provision, and the application of this regulation has been slow, particularly in rural areas where such resources may be more common. Additionally, the *National Payment System Proclamation* (2011) and the ongoing *National Identification System Project* are aiming to streamline digital transactions and improve access to services. However, these systems are still in their infancy and have not reached a broad level of implementation, particularly among the youth population, who continue to lack proper identification or access to digital financial tools.

⁵ Kenya: FinAccess 2019

⁶ Rwanda: FinScope 2020

While the government has taken several steps toward improving financial inclusion, the challenges of inadequate infrastructure, insufficient private sector participation, fragmented policy efforts, lack of awareness, and slow implementation hinder the effectiveness of these interventions in addressing the financial needs of youth. These barriers continue to limit youth access to the financial services necessary to start businesses, generate income, and contribute to economic development (Mossie, 2022).

According to KIIs financial challenges for small-scale beekeepers include high interest rates, lack of capital, and unsuitable financial products. Improving access could involve government-backed loan schemes and sector-specific financial products. Survey on youth shows that they have no access to affordable loans or credit to purchase beekeeping equipment and inputs. The data shows that 61.7% reported no access to loan which is in 93.5% in Oromia, 87% in Southwest Ethiopia, 82.4% in Sidama, 66.3% in Benishangul Gumuz, 58.3%, in South Ethiopia and 34.6% in Amhara regions while all respondents in Tigray completely reported no access to loan and credit for purchasing beekeeping equipment and inputs.

8. Employment and economic benefits of apiculture

Apiculture has a significant potential for youth employment and rural economy in Ethiopia and creates jobs for nearly 2 million people in Ethiopia (Drost and van Wijk, 2011) and generates a decent income for beekeepers (Abro et al., 2022). Local demand for quality honey is high, and honey and beeswax export markets are rising, showing future potential employment opportunities for young people. Beeswax, like honey, is a multifunctional natural bee product that is used in the production of over 300 different products. Honey and beeswax also play an important role in the cultural and religious life of the country

Apiculture also offers sustainable rural development through pollination services (Fikadu, 2019), ecosystem health and biodiversity conservation, income diversification, reduce dependence on single crop and enhance household resilience (Abro et al., 2022). It also increases the productivity of pollinator-dependent crops and household nutrition through pollination services; and maintains existing natural forests and watershed areas, contributing to ecosystem services including the provision of shelter to pollinators (Gratzier, 2019).

The contribution of biological pollinators to the production of agricultural crops was calculated to be \$815.2 million (Alebachew, 2018) which is about 6.24% of the total value of the agricultural GDP. Beekeeping could increase their income by 51%, while farmers did not participate by 11%, suggesting targeted extension could bridge skills and resource gaps, minimizing income differences between beekeepers and non-beekeepers (Abro et al., 2022).

Although the importance of honeybees in agricultural pollination is undervalued, they play an important role in enhancing the national food supply and the regeneration of plant species. Honeybees are the world's most important pollinators (Gebbru, 2019). Because most Ethiopian beekeepers experience traditional beekeeping with 72% colony increment and pollinated crop area from 1993 to 2018 (Gratzier et al., 2021). The pollination service is estimated to be worth almost 15 times the value of all hive products combined (Tesfay, 2014; Beyene and Verschuur; Teklu, 2017; Fikadu, 2019).

Honeybees have helped to promote agricultural production through pollination of the angiosperms in most Asian countries like China. In addition to boosting agricultural production, it has helped in promoting the livelihoods of the population through honey production that has a lot of proteins which boost nutrition amongst people in the region (Hermas et al., 2021). Bee keeping practiced by most farmers in the world has helped to increase the number of pollinators. This has helped to promote food production hence increasing food security in various areas across the globe (Angelella et al., 2021).

When the normal pollinator falls off, apiculture can donate to the fertilization amenities, guaranteeing the harvest and can also be used to reinforce the livelihoods through commercialization to upsurge financial profits (Devkota et al., 2016). It provides income, as it gives honey, bees wax, propolis, pollen, royal jelly and bee venom. Many farmers depend on this bee cultivation and earn money in rural areas. But this bee cultivation is nonexistent in Ethiopia despite its benefits.

Ethiopia promotes beekeeping in forests and protected areas to promote global plant diversity and environmental health. Beekeeping has no negative impact on the environment and is highly suited to the environment and there is also significant potential to produce mono-floral specialty honey such as coffee honey, acacia honey, cactus fruit honey, and eucalyptus honey⁷.

Agroforestry-apiculture integration systems provide numerous benefits that enhance both agricultural productivity and environmental sustainability. One of the key advantages, highlighted by respondents in agroforestry-apiculture integration systems is their role in mitigating the impacts of climate change.

8.1. Women in Beekeeping

The participation of women in the apiculture sector remains limited, restricting diversity and innovation within the industry (Brar et al., 2023). Women often face cultural and structural barriers that prevent them from fully engaging in beekeeping activities, which impacts the overall growth and inclusivity of the sector. Inadequate training and extension services tailored to women further limit their participation, reducing opportunities for knowledge transfer and skill development (Brar et al., 2023). Until recently, beekeeping and honey production in most regions of Ethiopia were largely male occupations, partly because harvesting honey from traditional hives requires climbing trees, which is not socially acceptable for women. However, the availability of a standard modern hive has helped to overcome this social barrier. Moreover, many women were illiterate, they comprised less than 10 per cent of the membership of cooperatives and often lacked finance, assets and technical training⁸. However, in Amhara and Tigray regions large number of females have been engaged and show to have improved livelihoods.

⁷ <https://www.ata.gov.et/wp-content/uploads/2017/08/Honey-and-Wax-Brochure.pdf>

⁸ WOMEN HONEY PRODUCERS IN ETHIOPIA Non-market interventions and market opportunities

8.2. Youth in Beekeeping

Among the interviewed youths, about 23% of them participate in beekeeping while over 80% of them engaged in crop production. For those who engage in beekeeping, honey is the most often sold product across all areas, accounting for 93.5% of total sales, with the highest sales reported in Southwestern Ethiopia and Tigray (100% each) and the lowest in Oromia (60.0%). Beeswax sales are substantially lower overall (10.9%), with Benishangul Gumuz accounting for the most (39.4%), while Amhara and Tigray had none reported. Colony sales are modest, accounting for only 3.7% total, with Oromia having the biggest amount (40.0%) (Table 11).

Table 11. Primary source of income (%) from beekeeping

Region	Honey sales	Beeswax sales	Colony	Other	N
Amhara	92.4	0.0	0.8	7.6	119
Benishangul Gumuz	97.0	39.4	3.0	0.0	33
Oromia	60.0	20.0	40.0	0.0	5
Sidama	92.3	7.7	0.0	0.0	13
South Ethiopia	93.9	14.3	6.1	6.1	98
Southwestern Ethiopia	100.0	27.3	9.1	0.0	11
Tigray	100.0	0.0	0.0	0.0	15
Total	93.5	10.9	3.7	5.1	294

N = interviewed youths.

Female youth FGDs from Bahidar Cluster shared that they were motivated to pursue apiculture due to their location, which is ideal for beekeeping, as it requires minimal land while yielding high-quality honey. Challenges they faced included a lack of awareness, training, equipment, and finance. However, beekeeping activities have positively impacted their lives and careers, despite their lack of scientific knowledge, which is essential for achieving success in the field.

FGDs with Sidama youth beekeepers revealed that they use honey for household food, medicine, environmental biodiversity, and economic opportunities, despite challenges such as limited knowledge and financial constraints. Youth beekeepers in the South Ethiopia Region, particularly from Melo-Gada, were motivated by the diverse plant flora, extensive experience, and high honey production. However, they face challenges, including a lack of financial resources, equipment, expert support, and training. Beekeeping has had a positive impact on their lives and careers by providing income and enhancing food security. In the Gambella region, beekeeping is driven by the desire to preserve pollination, support local ecosystem health, and provide valuable nutritional food. The challenges faced by beekeepers in this region include limited access to credit, high equipment costs, and climate change. Despite these challenges, beekeeping has positively impacted the environment, economy, and society. It provides income for farmers, boosts crop yields, prevents soil erosion, and preserves biodiversity. Additionally, it plays a crucial role in maintaining pollination and supporting ecosystem health.

Tarekegn et al. (2022) also reported seasonal income, fear of risk, and lack of initial capital hinder youth participation in beekeeping activity in Southern Ethiopia while education level, credit bureaucracy, lack of

initial capital, fear of group, risk, uncertainty, and lack of working place significantly affect youth participation. According to the KIIs the main challenges faced by youth beekeepers include lack of knowledge, financial constraints, lack of training, small land areas, weather conditions, poor infrastructure, transportation challenges, and lack of access to loans or grants. Youth face challenges in accessing resources for beekeeping, including lack of materials, expensive equipment, inadequate space, and limited training, due to distance and guideline restrictions.

Beekeeping activities have significantly impacted life and career by improving household nutrition, generating income, enabling financial independence, improving the economy, enhancing entrepreneurial skills, and enhancing environmental biodiversity. Youth require financial support for materials, land, market connections, improved training, product diversification, and partnership for success in beekeeping.

According to interview with Cooperative Bank, youth involvement in beekeeping is limited due to a lack of supportive policies and access to tailored financing options. There's also a lack of clear policies for integrating youth into the sector, despite its potential as a significant job creation avenue. A lack of appropriate financial package mechanisms that encourage institutions to lend to apiculture entrepreneurs or beekeepers leads to limited access to financing for modernizing production, improving practices, and expanding operations.

The MoA also pointed out that to engage youth beekeepers there is limited knowledge about bees, modern hive concepts, pest and disease protection, effective seasonal management, and colony reproduction. Also noted is the lack of supportive organization to encourage existing entrepreneurs to train in maintaining honey quality, processing, packaging, extraction, diversification, and marketing and sales. Despite the potential for apiculture to create jobs, particularly in rehabilitation of degraded land, youth involvement in the sector remains limited. There are no clear policies or initiatives designed to integrate youth into apiculture, which further exacerbates the sector's stagnation. This lack of engagement with young people means that the sector misses out on the innovation, energy, and manpower that could drive its growth.

9. Summary and recommendations

9.1. Summary

The Ethiopian honey value chain presents significant potential for economic growth, rural livelihoods, and export diversification. However, systemic bottlenecks and structural constraints hinder its full realization. The sector struggles with input supply challenges, including dependency on imports, poor quality control, and high costs of modern hives and biosecurity tools. Production inefficiencies stem from the widespread use of traditional practices, limited technical capacity, and vulnerabilities to pests and diseases, leading to low yields. The processing stage faces a lack of advanced equipment, poor standardization, and inadequate packaging, negatively affecting product quality and competitiveness. Quality assurance mechanisms remain weak due to insufficient accredited laboratories, traceability gaps, and lack of enforcement, which contribute to honey adulteration and reduced market confidence.

The market system is fragmented, dominated by middlemen, and offers unfair pricing to beekeepers, with weak cooperative structures and limited international market awareness. Exporting constraints include inconsistent supply, inadequate quality certification, and regulatory weaknesses, making Ethiopian honey less competitive globally. Poor packaging and handling practices further degrade marketability, and support services, including extension programs, financial access, and stakeholder collaboration, remain underdeveloped.

Key systemic constraints within Ethiopia's apiculture sector include the lack of comprehensive traceability systems, which hinder the ability to monitor and control honey quality from production to consumption. This is compounded by widespread adulteration and insufficient training and technical expertise among beekeepers, processors, and exporters, making it difficult to meet quality standards. Additionally, limited laboratory capacity for testing honey, coupled with reliance on international labs, leads to delays and increased costs, reducing competitiveness. The absence of a comprehensive legal and regulatory framework to enforce quality standards and prevent illegal practices exacerbates the issue. Fragmented accreditation systems and weak regulatory enforcement further complicate quality control. Economic pressures from middlemen create disincentives for producers to invest in quality assurance, perpetuating a cycle of low-quality honey production.

Moreover, there is insufficient support for youth and women in the apiculture sector, and the lack of adequate infrastructure, including certified laboratories and testing facilities, particularly in rural areas, worsens these challenges.

9.2. Recommendations

Quality Improvement

- ✓ Establish a national strategy to standardize training for beekeepers, processors, and exporters, focusing on modern beekeeping practices, sustainable pest control, and international quality standards.
- ✓ Strengthen honey testing laboratories by engaging the private sector and cooperatives, ensuring strict traceability systems from hive to market.
- ✓ Implement a comprehensive legal framework with clear standards for honey production, quality control, and penalties for adulteration, while enhancing the enforcement capacity of regulatory bodies (MoA, EFDA, IES).
- ✓ Strengthen regulations on pesticide use and enhance monitoring systems to improve compliance with quality standards.

Market Development

- ✓ Develop public-private partnerships to boost research, innovation, and policy coordination, improving financial access for small-scale beekeepers through credit facilities and loan programs.
- ✓ Establish regional and national aggregators through cooperatives, connecting producers directly with buyers and ensuring fair pricing for honey producers.
- ✓ Revise export regulations to facilitate international market access, including measures to prevent honey smuggling and enhance market intelligence systems for real-time pricing and demand analysis.
- ✓ Encourage value addition by promoting products like beeswax, propolis, and royal jelly, reducing import dependency on hive accessories and equipment.

Capacity Building

- ✓ Strengthen multi-stakeholder collaboration (government, NGOs, private sector) to drive sustainable development in the honey sector.
- ✓ Introduce financial incentives, training, and access to resources for youth and women in apiculture, ensuring their greater involvement in honey production.
- ✓ Support small-scale processors and cooperatives with financial mechanisms to invest in advanced honey production technologies, improving product quality and market competitiveness.

Policy and Regulatory Framework

- ✓ Establish a national apiculture strategy with clear legal provisions against honey traceability, adulteration, strengthening enforcement through better monitoring and resource allocation.

- ✓ Develop a regulatory framework for middlemen, ensuring fair trade practices and supporting cooperative-based honey collection and sales.
- ✓ Advocate for financial policy packages that encourage local production of beekeeping equipment and accessories, reducing reliance on imports.
- ✓ Create awareness of the new directive on Apiculture Resources Development and Protection Directive No. 1028/2024 and tax exemption directives for agricultural equipment (457/2013)
- ✓ Design youth-focused loans with low interest rates, flexible repayment terms, and alternative collateral options.
- ✓ Support youth beekeeping cooperatives to access group loans and shared resources.
- ✓ Value Chain Financing to provide input financing (e.g., modern hives on credit) and with repayment tied to honey sales

Promote viable businesses

- Encourage proper policy framework by integrating other sectors to encourage product diversification (pollination services, beeswax, propolis, royal jelly). Conduct awareness campaigns and develop policy recommendations on the economic value of crop pollination services.
- Advocate financial mechanisms to enable small-scale processors to produce hive accessories and equipment.

References

- Abro, Z., Solomon, R., Legesse, E. E., Taye, B., Ayalew, W., & Kassie, M. (2022). *The potential economywide job creation and poverty impact of the MOre Young Entrepreneurs in Silk and Honey (MOYESH) Program in Ethiopia: A report submitted to the International Centre of Insect Physiology and Ecology (icipe)* (Vol. 9).
- Adela, S. Y. (2022). *Dignified and Fulfilling Jobs by 2030*. <https://Ethiopianbusinessreview.Net/Dignified-and-Fulfilling-Jobs-by-2030/>.
- ATA. (2017). *Honey and beeswax*. <https://Www.Ata.Gov.et/Wp-Content/Uploads/2017/08/Honey-and-WaxBrochure.Pdf#:~:Text=As%20far%20back%20as%20the%20third%20century%20AD%2C,Candles%20for%20high%20profile%20events%20and%20religious%20ceremonies.https://doi.org/10.1080/0005772x.1926.11096096>
- Bayissa, M., Lauwers, L., Mitiku, F., de Graaf, D. C., & Verbeke, W. (2024). System mapping of the production and value chain to explore beekeeping potential in Southwest Ethiopia. *Insects*, 15(2). <https://doi.org/10.3390/insects15020106>
- Brar, D. S., Pant, K., Krishnan, R., Kaur, S., Rasane, P., Nanda, V., Saxena, S., & Gautam, S. (2023). A comprehensive review on unethical honey: Validation by emerging techniques. *Food Control*, 145, 109482. <https://doi.org/https://doi.org/10.1016/j.foodcont.2022.109482>
- Catania, P., & Vallone, M. (2020). Application of a precision apiculture system to monitor honey daily production. *Sensors (Switzerland)*, 20(7). <https://doi.org/10.3390/s20072012>
- Dekebo, A., Bisrat, D., & Jung, C. (2019). Opportunities and constraints of beekeeping practices in Ethiopia TT -. *Journal of Apiculture*, 34(2), 169–180. <https://doi.org/10.17519/apiculture.2019.06.34.2.169>
- Dessie, T., Zewdie, Y., Yilma, Z., Ayalew, W., And, & Haile, A. (2022). Yelemat Tirufat: An overview of the initiative and lessons of experience from selected livestock development interventions in Ethiopia, Nairobi, Kenya: ILRI. In *A national consultative Workshop on “Are We Ready for Yelemat Tirufat? 24-25 December, 2022, Bahir Dar, Ethiopia*.
- Erekalo, K. T. (2017). Structure and conduct of honey market in Chena District Kaffa Zone, Southern Ethiopia. *World Journal of Agricultural Sciences*, 13(1), 45–52. <https://doi.org/10.5829/idosi.wjas.2017.45.52>
- Fikadu, Z. (2019). The Contribution of managed honey bees to crop pollination, food security, and economic stability: Case of Ethiopia. *The Open Agriculture Journal*, 13, 175–181. <https://doi.org/https://doi.org/10.2174/1874331501913010175>
- Gebremedhn, H., Gebrewahid, Y., Haile, G. G., Hadgu, G., Atsbha, T., Hailu, T. G., & Bezabih, G. (2024). Projecting the impact of climate change on honey bee plant habitat distribution in Northern Ethiopia. *Scientific Reports*, 14(1), 15866. <https://doi.org/10.1038/s41598-024-66949-3>
- Gratzer, K., Wakjira, K., Fiedler, S., & Brodschneider, R. (2021). Challenges and perspectives for beekeeping in Ethiopia. A review. *Agronomy for Sustainable Development*, 41(4), 46. <https://doi.org/10.1007/s13593-021-00702-2>
- Hristov, P., Shumkova, R., Palova, N., & Neov, B. (2020). Factors associated with honey bee colony losses: A mini-review. In *Veterinary Sciences* (Vol. 7, Issue 4). <https://doi.org/10.3390/vetsci7040166>
- Kuma, T., Abebe, G., & Kitila, C. (2023). Assessments on honey bee (*Apis mellifera*) production and its major constraints of Holota Beekeeping Association producers, Ethiopia. *GeoJournal*, 88(3), 2983–2992. <https://doi.org/10.1007/s10708-022-10788-0>
- Miklyaev, M., Jenkins, G. P., & Barichello, R. R. (2014). Honey Production in Ethiopia: a Cost-Benefit Analysis of Modern Versus Traditional Beekeeping Technologies. *Cambridge Resources International Inc, UK*, 43.
- MoARD. (2010). Agricultural Sector Policy and Investment Framework (PIF): MoARD (Ministry of Agriculture and Rural Development). In *Ethiopia’s Agricultural Sector Policy and Investment Framework (PIF) 2010-2020* (Issue September 2010).
- Mohammed, S. S., & Hassen, A. (2021). The current constraints and opportunity of beekeeping in Ethiopia: A review. *Advance in Biological Research*, 2(1), 8–15.

<https://doi.org/10.26855/abr.2021.12.001>

- Nat, S. C., & John, L. D. (2019). Considerations and factors influencing the success of beekeeping programs in developing countries. *Bee World*, 96(3), 75–80. <https://doi.org/10.1080/0005772X.2019.1607805>
- PACT. (2023). *TVET Teachers ' Professional Competency : Challenges and Policy Recommendations*.
- Papa, G., Maier, R., Durazzo, A., Lucarini, M., Karabagias, I. K., Plutino, M., Bianchetto, E., Aromolo, R., Pignatti, G., Ambrogio, A., Pellecchia, M., & Negri, I. (2022). The honey bee *Apis mellifera*: An insect at the interface between human and ecosystem health. *Biology*, 11(2). <https://doi.org/10.3390/biology11020233>
- Shapiro, A., d'Annunzio, R., Desclée, B., Jungers, Q., Kondjo, H. K., Iyanga, J. M., Gangyo, F. I., Nana, T., Obame, C. V., Milandou, C., Rambaud, P., Sonwa, D. J., Mertens, B., Tchana, E., Khasa, D., Bourgoin, C., Ouissika, C. B., & Kipute, D. D. (2023). Small scale agriculture continues to drive deforestation and degradation in fragmented forests in the Congo Basin (2015–2020). *Land Use Policy*, 134, 106922. <https://doi.org/https://doi.org/10.1016/j.landusepol.2023.106922>
- Shepherd, W. G. (2016). Concentration Ratios. In S. Durlauf & L. E. Blume (Eds.), *The New Palgrave Dictionary of Economics* (pp. 1–3). Palgrave Macmillan UK. https://doi.org/10.1057/978-1-349-95121-5_520-1
- Smyth, S. J., Webb, S. R., & Phillips, P. W. B. (2021). The role of public-private partnerships in improving global food security. *Global Food Security*, 31, 100588. <https://doi.org/https://doi.org/10.1016/j.gfs.2021.100588>
- Tarekegn, A. (2022). Traditional Forest Beekeeping and Its Challenge in Benishangul Gumuz Regional State, Ethiopia. *Bee Studies- Apiculture Research Institute*, 14(1), 27–34. <https://doi.org/10.51458/bstd.2022.25>
- Tarekegn, K., Kamaylo, K., Galtsa, D., & Oyka, E. (2022). Youth participation in agricultural enterprises as rural job creation work and its determinants in Southern Ethiopia. *Advances in Agriculture*, 2022(1), 5760331. <https://doi.org/https://doi.org/10.1155/2022/5760331>
- Tulu, D., Aleme, M., Mengistu, G., Bogale, A., Bezabeh, A., & Mendesil, E. (2020). Improved beekeeping technology in Southwestern Ethiopia: Focus on beekeepers' perception, adoption rate, and adoption determinants. *Cogent Food & Agriculture*, 6(1), 1814070. <https://doi.org/10.1080/23311932.2020.1814070>
- UNIDO. (2023). Ethiopia : Strengthening the Quality Compliance Capacity of the Honey Value Chain for Greater. *Project*, 1(May).
- Wakgari, M., & Yigezu, G. (2021). Honeybee keeping constraints and future prospects. *Cogent Food & Agriculture*, 7(1), 1872192. <https://doi.org/10.1080/23311932.2021.1872192>
- Wendimu, G. Y. (2021). The challenges and prospects of Ethiopian agriculture. *Cogent Food & Agriculture*, 7(1), 1923619. <https://doi.org/10.1080/23311932.2021.1923619>
- Yeserah, S., Jenberie, A., & Begna, D. (2019). Honey marketing, structure and conduct of honey market in Gozamen district, East Gojjam Zone, and Amhara Region. *Cogent Food and Agriculture*, 5(1). <https://doi.org/10.1080/23311932.2019.1620153>

Annex

Table 12. The influence and interest values of government organizations

Code	Name of the Organization	Operational Locations/Areas	Major Operational themes	Influence average	Interest
SH1	Bureau of Agriculture	Dilla BoA (South Ethiopia)	Extension, Apiculture production extension expert	<u>4.1</u>	<u>4.5</u>
SH2	South Ethiopia Livestock and Fishery Directorate	Dilla BoA (South Ethiopia)	Breeding and extension	4	<u>4.3</u>
SH3	ANRS Livestock and Fishery Resources Development Office	Amara Region	Extension	2.8	3.2
SH4	ANRS Livestock and Fishery Resources Development Office	Bahir Dar	Extension	4.1	4.4
SH5	ANRS Livestock and Fishery Resources Development Office fishery resources development office	Amara Region	Extension	3.1	4.0
SH7	Tigray Bureau of Agriculture	Mekelle	Production and extension	4.1	4.3
SH 8	TARI (Tigray Agricultural Research Institute	Mekelle	Research	4.1	4.3
SH9	Bonga Research center	Bonga, South West Ethiopia	Research	4.4	4.5
SH10	Ministry of Agriculture	Addis Ababa	Extension. Policy and Strategy	4.6	4.5
SH11	SWE BoA	Bonga, South West Ethiopia	Extension. Policy and Strategy	4.1	4.5

Table 13. The Influence and Interest Values of Private organizations

Code	Name of the Organization	Operational Locations/Areas	Major Operational themes	Influence average	Interest
SH12	Green Face Trading	Addis Ababa	beekeeping and honey processing and export	3.1	3.6
SH13	Apinec Agro-Industry	Addis Ababa	Honey production, processing and export	4.1	4.5
SH14	G/kidan Family	Mekelle/Semien Sub-city	Honey processing and export	3.6	3.8
SH15	Cumel PLC Well honey processing company	Mekelle/Ayder Sub-city	Honey processing and export	4	4.0
SH16	Bee and honey processing Union Cooperative	Agulae	Beekeeping and honey processing	4	4.0
SH17	Welela Tsaeda Maar plc	Agulae	Beekeeping and honey export	4	4.0

Table 14. The influence and interest values of research institutions

Code	Name of the Organization	Operational Locations/Areas	Major Operational themes	Influence average	Interest
SH18	Holeta research center	Holeta	Specialized research center	4	4.6
SH19	Andassa livestock research	Andassa	research	2.8	2.5
SH20	Amhara Regional Agricultural Research Institute, Andasa Livestock Research Center (ALRC)	Bahir Dar, Ethiopia	Research and Extension	3.1	4.3
SH21	Tigray Agricultural Research Institute	Mekelle	Research	4.1	4.3

Table 15. The influence and interest values of cooperative unions

Code	Name of the Organization	Operational Locations/Areas	Major Operational themes (Production, extension, research, advocacy, processing, finance, export)	Influence average	Interest
SH23	Bee and honey processing Union Cooperative	Agulae	Bee and honey processing	4	4.0
SH124	Welela Tsaeda Maar pIC	Agulae	Bee and honey export	4	4.0
SH27	Zembaba beekeepers cooperative union	Bahir Dar	organic honey & honey products	3	4.0
SH28	KATA MUDUGA MULTI PURPOSE FARMERS COOPERATIVE UNION -2623-	Agaro	(eco cert)	2.5	4.0
SH29	LIMU INARA FARMERS MULTIPURPOSE COOPERATIVE UNION	Jimma	Fairtrad coffee	4	4

