The Project of Resilient Livelihoods & Gender-Responsive Economic Opportunities for Women, Youth &Communities in Abyan and Lahj Governorates

Project Code: (K-Yem-2025-4032)

Beekeeping Value Chain Analysis in some Districts of Lahj and Abyan Governorates

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Implementation by

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Diakonie Katastrophenhilfe (DKH)

TABLE OF CONTENTS

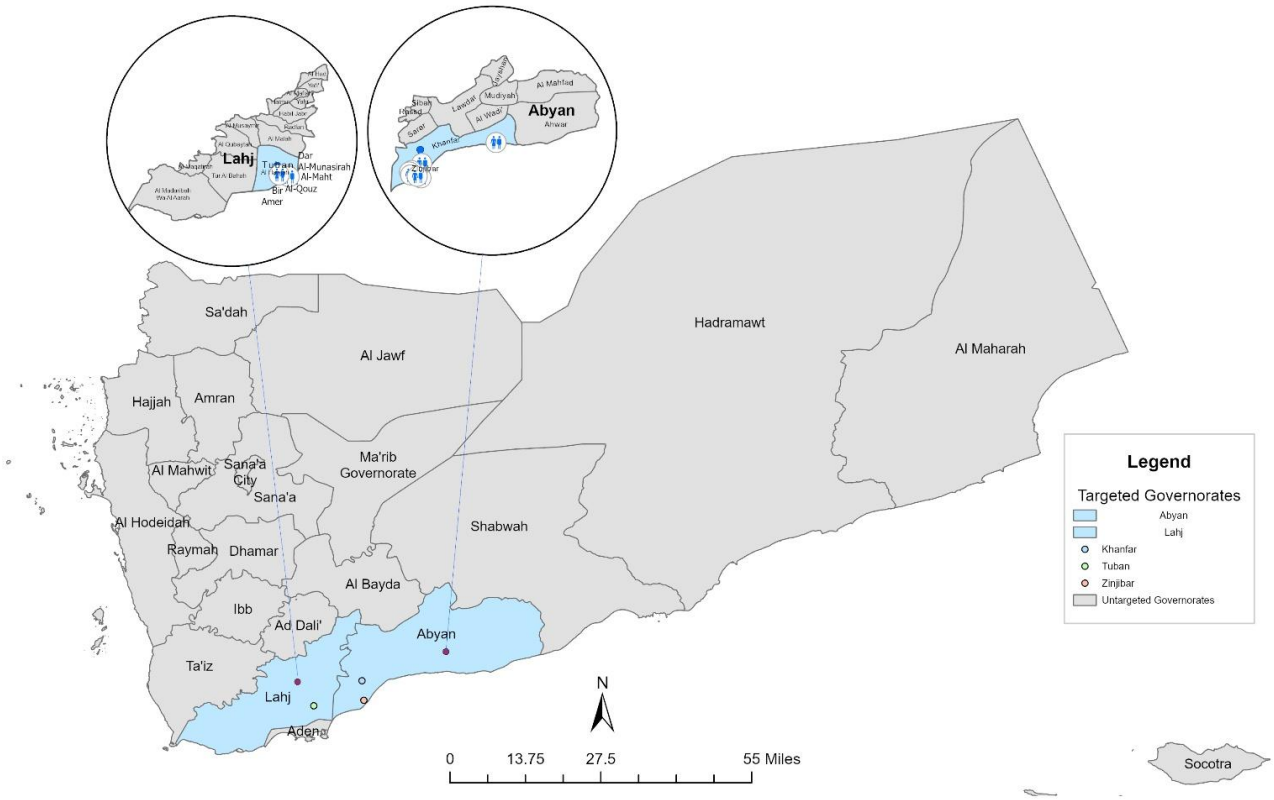
List of Tables

List of Figures

Executive summary

The beekeeping sector in Yemen represents one of the country's most culturally rooted and economically significant agricultural sub-sectors, playing a vital role in rural livelihoods, income generation, food security, and local trade. Yemeni honey is internationally recognized for its quality, diversity, and medicinal value, and the sector supports an estimated 100,000 households nationwide. Despite its importance and growth potential, beekeeping in Yemen remains largely traditional, fragmented, and under-supported, particularly in conflict-affected and institutionally fragile contexts such as Lahj and Abyan Governorates.

Within this context, this Value Chain Analysis was conducted to provide a comprehensive, evidence-based assessment of the beekeeping (honey) value chain in selected districts of Lahj (Tuban) and Abyan (Zinjibar and Khanfar). The study was implemented under "the Resilient Livelihoods and Gender-Responsive Economic Opportunities for Women, Youth, and Communities project," implemented by the Building Foundation for Development (BFD) in partnership with Diakonie Katastrophenhilfe (DKH). The analysis aims to inform strategic programming, investment decisions, and policy-oriented interventions that enhance productivity, value addition, market performance, and inclusivity within the beekeeping sector. The study aims to analyze the structure, performance, constraints, and opportunities of the beekeeping value chain across all stages from input supply and on-farm production to processing, marketing, and final consumption. Specific objectives included identifying key value chain actors and their roles, assessing production practices and cost–benefit dynamics, examining market channels and consumer behavior, and evaluating the enabling environment in terms of infrastructure, institutional support, policies, training, and financial services. Geographically, the study focused on major beekeeping areas in Lahj and Abyan Governorates. Temporally, it drew on secondary data from 2015–2024 and primary field data collected in 2025. The analysis covered all active actors within the value chain, including beekeepers, input suppliers, cooperative associations, traders, retailers, service providers, microfinance institutions and consumers. The study adopted the FAO Value Chain Development Framework, integrating economic, social, environmental, and institutional dimensions. A mixed-methods approach was employed, combining quantitative household and stakeholder surveys with qualitative tools such as key informant interviews and focus group discussions. Primary data were collected from 303 respondents across all value chain segments using structured questionnaires. Data were processed using KoBo Toolbox and analyzed through SPSS, Excel, and Power BI, with triangulation applied to enhance validity and reliability.



Targeted Locations Map - DKH - Project Code: (K-YEM-2025-4032)

Key Findings

Structure and Performance of the Value Chain

The beekeeping value chain in Lahj and Abyan is characterized by a linear structure dominated by small-scale, household-based producers. The majority of beekeepers own fewer than ten hives and rely primarily on traditional municipal hives, local bee strains, and inherited knowledge. Honey is the dominant product, while by-products such as beeswax are minimally exploited, indicating limited value addition.

Economically, honey production generates positive returns across the chain, particularly at the production and trading stages. However, value capture by producers is constrained by fluctuating sales volumes, weak bargaining power, limited market differentiation, and dependence on intermediaries. Cost–benefit analysis indicates unrealized potential for higher margins through improved productivity, processing, and collective marketing, **however the key finding can be summarized as follows**:

1. Socio-Economic and Demographic Characteristics

The sector is male dominated, with men accounting for the majority of asset ownership and decision-making. Women's participation remains limited and often informal, despite clear potential for engagement in processing, packaging, and marketing activities. The age profile shows dominance of older beekeepers, while youth participation is concentrated among less experienced entrants, raising concerns about long-term skill retention and sector sustainability.

Education levels among beekeepers are generally low, limiting adoption of improved practices and access to formal market information. Income diversification is common, with beekeeping serving as a secondary livelihood for many households, reflecting both resilience and vulnerability to shocks.

2. Production Practices and Quality Management

Production practices are largely traditional, with limited use of modern equipment, inadequate disease management, and minimal access to certified quality testing laboratories. While basic hygiene practices are widely followed, formal quality control and standardization are weak. Harvesting and storage practices vary, and packaging is often suboptimal, affecting shelf life and market perception.

3. Enabling Environment

The enabling environment for beekeeping is constrained by poor access to inputs, weak extension services, limited training opportunities, and inadequate financial services. Most beekeepers lack access to formal credit and rely on informal sources such as relatives. Input suppliers offer minimal support services, and the availability of essential materials is inconsistent and often costly. Cooperative associations exist but are unevenly distributed and institutionally weak. Their activities focus mainly on production and marketing, with limited engagement in processing, quality control, financing, or input provision. Awareness of cooperatives and membership levels among beekeepers are extremely low, reducing the potential benefits of collective action. Regulatory and policy support for agricultural investment is perceived as absent, further constraining sector development.

4. Markets and Consumption

Honey markets are primarily local and characterized by fluctuating demand and prices. Sales volumes are unstable, with limited evidence of sustained growth. Consumer preferences emphasize quality and authenticity, yet weak branding, packaging, and certification limit market differentiation. Retail and wholesale activities are concentrated in specific districts, creating spatial imbalances in market access

- Honey is marketed through direct sales (32%), exporters (24%), and retailers (21%). The most significant value addition occurs at the beekeeper level (56% profit margin) and retail level, while processing stages add minimal value. Cleanliness/filtration (54% of processing value) and packaging are key value-adding steps.
- Consumers prioritize trader reputation (97.8%), suitable price (97.8%), and high quality (91.1%). However, 80% of consumers perceive current honey prices as high, indicating a market affordability challenge.

Economics, the total value added across the chain is 60,000 YER per unit flow, with beekeepers capturing 37.5% of the gross profit, followed by retailers and processors.

5. Synthesis of Strategic Challenges and Opportunities

Challenges, the sector is constrained by an interconnected set of issues: 1) High production costs (95.9% cite high input prices), 2) Biological threats (87.1% cite diseases/pests), 3) Weak institutional support (85.3% cite weak vet services, low cooperative engagement), 4) Severe skills and knowledge gaps, 5) Inefficient market access and price volatility, and 6) A non-conducive policy and infrastructural environment.

Opportunities, leverage points for development include: 1) Strong market demand for premium Yemeni honey (Sidr, Sumor). 2) clearly articulated demand from beekeepers for comprehensive support (equipment, training, finance). 3) The potential to strengthen cooperatives as vehicles for aggregation, training, and market access. 4) Opportunities for significant value addition through improved processing, packaging, and by-product diversification (e.g., beeswax). 5) The scope to enhance efficiency and equity through improved credit products and market linkages.

Overall Assessment

Overall, the beekeeping value chain in Lahj and Abyan demonstrates strong livelihood relevance and growth potential but is constrained by systemic inefficiencies, weak institutional support, limited value addition, and underdeveloped markets. The sector's resilience is driven largely by individual effort rather than supportive systems, highlighting the need for coordinated, value chain–wide interventions.

The study concludes that the honey value chain in the target areas suffers from "Structural Fragmentation." While beekeepers possess deep-rooted traditional knowledge, the overall efficiency of the chain is hindered by dilapidated infrastructure (roads and collection centers), prohibitive barriers to finance (high interest costs and stringent loan terms), and the absence of certified quality standards.

Key Strategic Recommendations

To foster economic resilience and long-term sustainability, the following professional interventions are recommended:

1. **Strengthen Production Systems and Input Access**
   - Improve availability and affordability of modern beekeeping equipment and inputs through localized supply mechanisms, cooperative-based distribution, and targeted support programs.
2. **Invest in Capacity Building and Quality Assurance**
   - Implement structured, inclusive training programs focusing on disease control, hive management, post-harvest handling, and quality standards, supported by access to certified testing services.
3. **Promote Value Addition and Product Diversification**
   - Product Diversification: Incentivizing beekeepers and traders to explore the bee by-products market (wax, pollen, royal jelly) to create alternative income streams and reduce dependency on raw honey alone, through support processing, packaging, and utilization of bee by-products to enhance value capture, incomes, and market competitiveness.
4. **Revitalize and Expand Cooperative Functions**

   - Transitioning cooperatives from mere marketing intermediaries to active participants in the "Processing Stage" by supporting them with refining, bottling, and packaging facilities to capture higher value.

   - Strengthen cooperatives to provide comprehensive services, including input supply, processing, marketing, financing facilitation, and quality control, while promoting inclusive participation of women and youth.
5. **Improve Market Stability and Access**
   - Develop structured marketing channels, improve market information systems, and promote branding and differentiation to reduce price volatility and enhance consumer trust.
   - Digital Transformation & Marketing: Supporting initiatives that utilize social media and digital marketing—a move supported by 82% of stakeholders—to penetrate new markets and bypass traditional, inefficient channels**.**
   - Quality Standardization & Commercial Branding across investing in local brand development and improved packaging to enhance the competitiveness of Yemeni honey in premium domestic and international markets.
6. **Enhance the Enabling Environment for Sustainable Development**
   - Facilitating financial inclusion through designing Sharia-compliant microfinance products with grace periods tailored to the honey production cycle, enabling small-scale producers to invest in apiary expansion
   - Advocate for supportive policies, improved infrastructure, expanded extension services, and accessible financial products tailored to small-scale beekeepers.

1. Introduction & Background

1.1 Introduction

Yemen continues to face one of the world's most complex humanitarian and economic crises, marked by prolonged conflict, institutional fragmentation, widespread poverty, and the collapse of essential public services. These challenges have severely undermined household resilience, restricted access to basic economic opportunities, and disrupted traditional livelihood systems across rural and urban areas alike. Communities in project-targeted regions, particularly women and youth, experience heightened vulnerability due to limited income sources, weak market structures, and inadequate access to skills development.

Within this fragile context, the "BFD–DKH Livelihoods and Early Recovery Project" aims to address critical socio-economic gaps by enhancing self-reliance, improving income-generation capacities, and supporting community-level recovery.

Women and youth face disproportionate barriers to economic participation, including limited mobility, weak access to finance, cultural constraints, and reduced access to training or employment pathways.

1.2 Description of the project

The aim of this project is to address critical socio-economic gaps by enhancing self-reliance, improving income-generation capacities, and supporting community-level recovery and enhance the productive and compliance capacities of relevant actors in the Beekeeping Value chain in some districts in Lahj and Abyan Governorates of Yemen. The project will provide support to the small-scale of beekeepers especially who production honey across all the main actors of the beekeeping value chain for increase the productivity and income of the households of small-scale beekeepers, an addition helps the decision making to creates a new opportunity in-come generated for the youth and women in the local communities of the districts target.

To increase their capacity to offer suitable services to the industry in a sustainable way and to introduce pilot application in collaboration with the industry on best practices in value addition and compliance for improved livelihoods of participants in the value chains, including food manufacturers and processors. This project is funded by DKH Foundation. DHK provides technical support to improve the quality and safety, value addition and productivity, which in turn can contribute to better marketability, higher profit, and access to high-end markets. The project will work on reducing honey losses and add more value across bee by products through improvement of the value chain management which will lead to enhanced livelihoods, socioeconomic uplift and stability in the targeted Governorates. The long-term goal of this project in Yemen is to rejuvenate the livelihood of beekeeping Value chain actors through the introduction of best practices in terms of compliance and value addition.

1.3 Background

The agriculture sector is a vital component of Yemen's economy, supporting the livelihoods of over 60% of the population and contributing significantly to food security and employment. Within this sector, beekeeping and honey production play a crucial role, leveraging Yemen's favorable climatic conditions and rich biodiversity. However, the beekeeping value chain faces numerous challenges, including inadequate infrastructure, limited access to finance, weak competitiveness in local and international markets, and marketing and distribution difficulties.

Value chain analysis is a powerful tool for understanding and addressing these challenges. By examining the entire path of a product from production to consumption, value chain studies can identify strengths, weaknesses, opportunities, and threats, and provide insights into how to improve efficiency, increase value-added, and enhance competitiveness.

This study aims to analyze the value chain of beekeeping in Lahj and Abyan governorates, with a focus on identifying opportunities for improving efficiency and increasing value-added. Specifically, the study seeks to answer key questions: What are the main challenges facing the beekeeping value chain in these governorates? How can efficiency be improved? What opportunities exist for increasing value-added and improving income for beekeepers and stakeholders?

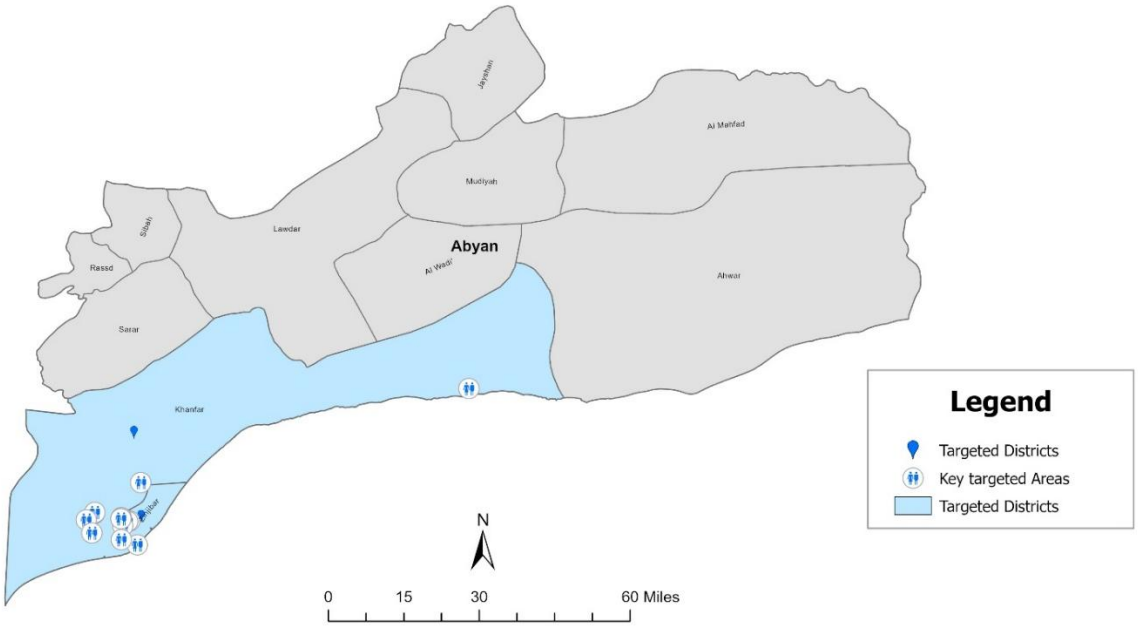
By providing a comprehensive analysis of the beekeeping value chain, this study aims to offer practical recommendations to empower stakeholders to improve their income and productivity. The findings of this study will be crucial for policymakers and practitioners, shedding light on challenges and providing actionable solutions to enhance the sector's performance and contribute to sustainable development in Yemen.

1.4 Description of the Study Area

Abyan Governorate:

The study targeted the Tuban, Zunjibar and Khanfer districts in the Lahj and Abyan governorates, which are one of the largest governorates in Yemen. Abyan Governorate is a Yemeni governorate located to the south-east of the capital, Sana'a, and is 427 kilometers away from it. Its capital, Zunjibar, is connected to the east by Shabwa Governorate, to the west by the governorates of Aden and Lahj, and to the north by the governorates of Shabwa and Al Bayda, along with parts of Yafa' Al Olya. To the south, it is bordered by the Arabian Sea, which Its beaches overlook it. The population of the governorate constitutes 2.2% of the total population of Yemen, and the number of its districts is 11 districts. The city of Zunjibar is the center of the governorate. Agriculture and fishing are the main activities for the residents of the governorate, as agricultural crops constitute 4.4% of the total

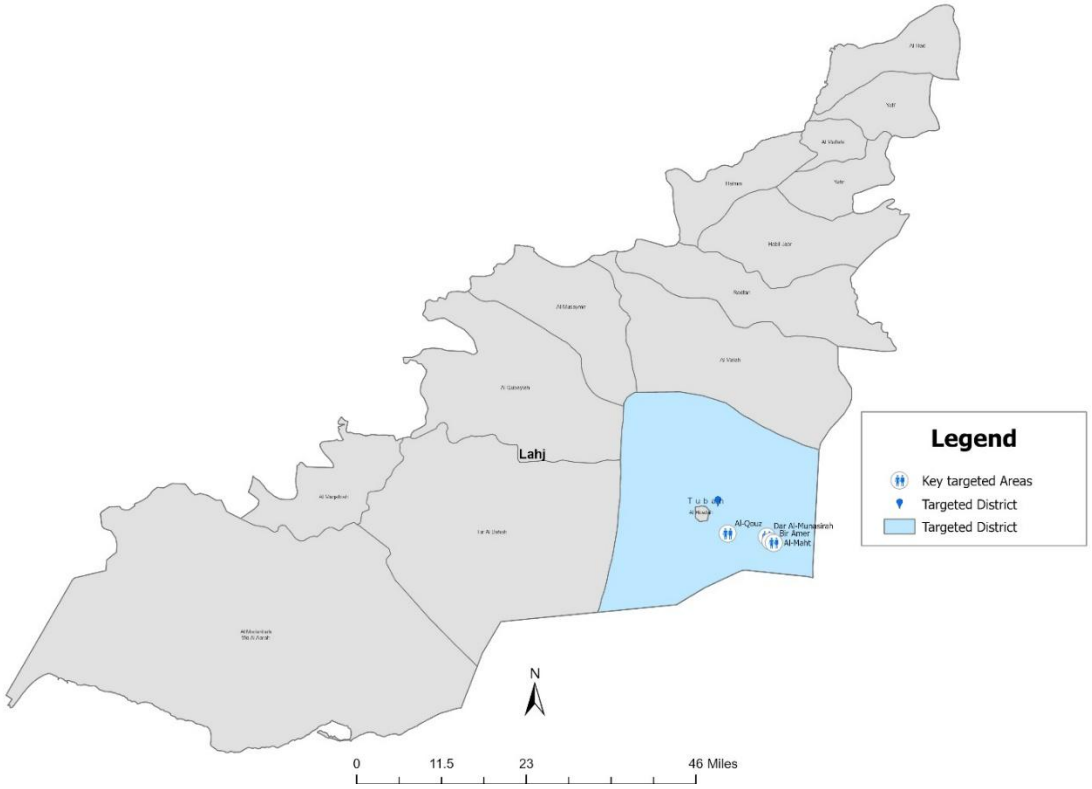
agricultural production in the Republic, and the most important agricultural crops produced in the province are long-staple cotton, vegetables and fruits.



Lahj Governorate:

Lahij or Lahej (Romanized: Lahj), formerly called Al-Hawtah is a city, and an area located between Taiz and Aden in Yemen. From the 18th to the 20th century, its rulers were of the Abdali branch of the Al-Sallami tribe who trace their lineage to one of the 10 tribes of Yaffa called Kalad. Lahij was the capital city of the Sultanate of Lahej, a protectorate of the British Empire until 1967, when the sultan was expelled, and the city became a part of People's Republic of South Yemen. Now it is part of the Republic of Yemen. It is in the delta of the Wadi Tuban on the main trade route connecting Aden with Taiz, Ibb, and Sanaa. Lahj is an agricultural governorate and produces about 4% of the total agricultural production of the Republic of Yemen. The most important crops are vegetables and feed crops. Lahj produces construction materials for neighboring Aden and other parts of Yemen. Quarrying and clay mining are important economic activities. According to the 2014 local authority budget for Lahj, grants and central subsidies constituted 98% of the total revenue for the governorate, while local revenues accounted for only 2%. The most significant sources of local revenue were local shared revenues, income from the sale of goods and services, fines and penalties, leasing land, and selling quarries. These local revenues were negatively affected by the war, and the

governorate faced major economic disruption as the site of an active front in the conflict, especially in 2015.



2. The Objectives of the Study:

The main objectives of this study were to address various aspects of the beekeeping value chain, including:

The general objectives:

1. Conduct a comprehensive analysis of the beekeeping value chain, evaluating the roles and challenges of smallholders of beekeepers, stakeholders, bee practices, honey proccing and marketing in the study area.

The specific objectives:

2. To Identify beekeeping value chain actors and examine the Performance of actors in the chain
3. Identify key actors in the beekeeping value chain, their roles, participation, opportunities, and challenges.
4. Assess processing, handling, extension services, storage facilities, and processing capacities to ensure efficiency of the Beekeeping Value chain.

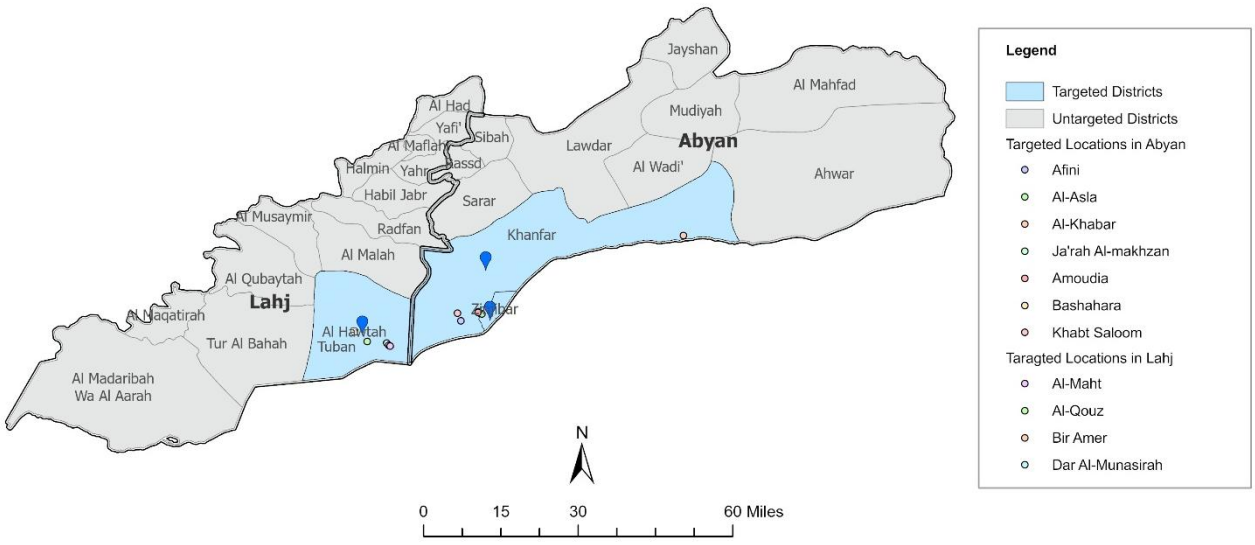
5. To describe important marketing channels and the actors involved in the beekeeping value chain.
6. Identify opportunities and constraints in the beekeeping value chain, including product development, pricing strategies, and access to financial resources in the study area.
7. Analyze the costs, profits, and cash flows across the honey production value chain, providing a comprehensive examination of the financial dynamics within the entire chain.

3. Methods of the study:

3.1 Scope of the Study

- **Geographical Scope:** The study covers several areas known for beekeepers farming and honey production in the governorates of Lahj and Abyan, including the following areas:

1. Al-Qouz Amdrib- Lahj Tuban
2. Al-Mahatt - Lahj Tuban
3. Bir Ame r - Lahj Tuban
4. Dar Al-Manasirah - Lahj Tuban
5. Al-Aslah - Abyan Zinjibar
6. Amudiyah - Abyan . Zinjibar
7. Afini - Abyan . Zinjibar
8. Ja'rah Al-makhzan - Abyan Khanfar
9. Khabt Al-Salum - Abyan Khanfar
10. Al-Khubar - Abyan Khanfar
11. Ba Shaharah -Abyan Zinjibar



- Temporal Scope: The study relies on data from the years (2015-2024), with reference to historical developments, when necessary, in addition to primary data on honey production and its derivatives for the year 2025.

- Subjective Scope: The analysis in this study, include all the stage and actors involved in the Beekeeping Value chain, from the honey production to the end consumer in the value chain.

3.2 Methodology of the assessment

To understand the overall of the roles and activities across the Beekeeping Value chain in the study area, the study adopted the framework used by the Food and Agriculture Organization (FAO) of the United Nations, which includes analyzing and developing the value chain to achieve food security, reduce poverty, and empower small-scale beekeepers. The analysis is conducted in a comprehensive and sustainable manner, focusing on the three dimensions of sustainability: economic analysis of profit margins and value-added, social analysis, environmental analysis, and SWOT analysis, in addition to institutional and organizational aspects.
This methodology was complemented with additional data science tools to identify current socio-economic status quo, including the situation of youth and women in the local value chain, and compliance practices among actors.

3.3 Types, Sources, and Methods of Data Collection

This value chain analysis combined primary and secondary data. The secondary data review preceded the primary data collection, and the secondary data served as good guidance in preparing the tools and shaping the methodology. Combining primary and secondary data sources aimed to thoroughly understand the Beekeeping Value chain dynamics. The research team initially conducted a rigorous review of secondary data, including existing literature, reports, and relevant documents. This secondary data review served as a foundation, guiding the development of research tools and shaping the subsequent primary data collection process. These resources provided contextual information and further enriched the analysis, contributing to a comprehensive understanding of the Beekeeping Value chain dynamics in the study governorates. A combination of random and purposeful sampling techniques was employed to ensure a comprehensive and representative sample. Random sampling allowed for an unbiased selection of participants, while purposeful sampling targeted key stakeholders within the Beekeeping Value chain, such as beekeepers, input suppliers, wholesalers, retailers and end consumers. This dual sampling approach aimed to capture diverse perspectives and experiences within the value chain. The primary data collection phase involved in-depth interviews, focus group discussions, and consultation with the identified participants. These interactions facilitated valuable insights into the challenges, opportunities, and interdependencies across various stages of the Beekeeping Value chain

3.3.1 Sampling Strategy

Stakeholders survey

The stakeholder's survey was conducted October 2025 and November 2025 (questionnaire Appendix). An interview schedule was used to interview the important stakeholders/key informants involve in Beekeeping Value chain to obtain information about the challenges and opportunities of the Beekeeping Value chain. A total of 303 respondents participated in the Beekeeping Value chain assessment, these included Input suppliers, beekeepers, Extension Services, wholesales, retailers and end consumers in both governorates (Lahj and Abyan), the details given in (Table 2).

Table 1. Distribution of the Beekeeping Value chain sample across all actors.

GOV / District	HH of beekeepers	processors	Microfinance Institutions	Cooperative Association	wholesales,	retailers	Consumers	Extension Services
Abyan / Khanfar	15		0	3	1	4	7	3
Abyan / Zanzibar	8	1	4	0	1	2	11	3
Lahj / Tuban	45	7	0	0	1	4	27	3
Lahj / Al Howta					0	1		
Total	68	8	3	3	3	11	45	9

3.4 Data Processing.

Data has been entered through online data entry platform called KoBo Toolbox. Supervisor has checked data at the field level by real time checking, spot checking and sudden checking mechanisms. On the other hand, the Data Management Expert made sure real time checking at the central level. The data generated by FGDs and has been recorded through questionnaire after taking the verbal permission of the respondents.

3.5 Data Analysis

Quantitative data from questionnaires survey was analyzed using SPSS, excel and power BI programs by which measures of frequency, cross tabulation, mean etc. were done and graphical presentation were used. Qualitative data from FGDs were transcribed, coded and then interpreted in line with the ToR of the assessment. To ensure validity and allow for generalization, data were triangulated across all quantitative and qualitative data collection tools to build consensus on the logical findings that were carried forward to formulate recommendations. Tables, graphs and charts will also be generated for analysis.

3.6 Value Chain Performance Analysis

This section aims to evaluate the performance of the value chain from multiple perspectives: economic, social, and environmental. This comprehensive evaluation helps in understanding the efficiency, effectiveness, and sustainability of the chain and identifying areas that need improvement.

- Economic Performance Analysis: Analyzing costs, benefits, and profitability at different stages of the chain.
- Social Performance Analysis: Examining the social impacts of the chain on stakeholders and communities.
- Environmental Performance Analysis: Assessing the environmental impacts of the chain and identifying opportunities for sustainability

Analyzing Value Chain Stages

The key stage of the value chain identified in the chain map. The goal is to understand the processes, stakeholders, costs, value-added, challenges, and opportunities associated with each stage.

-Input Supply Stage: Analyzing the supply of inputs and their impact on the chain.

-Agricultural Production Stage: Examining the production processes and challenges faced by beekeepers.

- Collecting and Primary Processing Stage: Investigating handling, storage, and processing activities after collecting the Honey.

-Processing and Manufacturing Stage: Analyzing the transformation of bee products into final goods.

-Distribution and Marketing Stage: Examining the channels and strategies used to reach consumers.

-Consumption Stage: Understanding consumer behavior and preferences.

- Enabling Environment Analysis

Value chains do not operate in a vacuum; they are influenced by and impact a wide range of external factors that shape the "enabling environment." This section aims to analyze these factors and their impact on the performance and development of the agricultural product value chain under study.

-Policies and Regulations: Government policies and regulations affecting the chain.

-Institutions and Their Roles: The role of institutions in supporting or hindering the chain.

-Physical Infrastructure: The impact of infrastructure on the efficiency and effectiveness of the chain.

- Support Services: The availability and quality of services such as finance, extension, and logistics.

3.6 challenges & Limitations

During the data collection process, we encountered several limitations and challenges. Firstly, there were time constraints, which limited our ability to gather data comprehensively within the desired timeframe. Additionally, moreover, conducting five studies simultaneously added complexity and required careful management of resources. Furthermore, the data collection approach was qualitative-focused, involving engagement with stakeholders rather than widely targeting a sample of beekeepers for quantitative analysis. Despite these challenges, the credibility of the data was assured through triangulation with various stakeholders who confirmed the accuracy of the provided numbers

4 .Beekeeping Value chain analysis Findings.

This chapter presents a comprehensive analysis of the value chain for honey production and its derivatives in Lahj and Abyan governorates of Yemen. The analysis includes mapping the chain, identifying key stakeholders, describing the different stages from honey production to consumption, and analyzing flows, relationships, and governance within the chain. The aim is to understand the current state of the beekeeping value chain in the study areas, identify strengths, bottlenecks, and opportunities at each stage, and pave the way for developing effective strategies and interventions to improve chain performance and increase value-added.

4.1 Overview of Socio-economic beekeeping Importance

The Yemeni honey sector is one of the most valuable and promising economic sectors and the Yemeni government considers it as one of the five strategic Yemeni economic sectors since 2003 due to its high revenues and profits for the beekeepers and the overall Yemeni economy. The honey sector is the smallest sub-sector but being the most successful in terms of growth, it boomed between 2000 and 2005. Total annual honey production stands at around 1,580 tons, of which 840 tons is exported

The honey sector plays a vital role in the livelihoods of many Yemeni families, with around 100,000 Yemeni householders pursuing beekeeping and depending on it as their sole livelihood. Moreover, there is a remarkable trend among the Yemeni youth to become beekeepers and work in the beekeeping trade, which shows potential returns in just a few months of the Sidr honey season

Yemeni honey is famous for its quality traits, and the local demand for honey is high even though most local consumption is imported. The sector has a significant impact on Yemen's trade balance, with the mean annual export value ($6.7 million) significantly outweighing the mean import value ($1.7 million)

The honey sector is also renowned globally for high-quality varieties such as Sider and Samar, and Yemen's diverse climate and topography support approximately 3,000 plant species, of which 1,000 are used by bees. With over 1,200,000 bee colonies in Yemen and an average number of beehives owned per beekeeper being 16, the sector has the potential for further growth and development

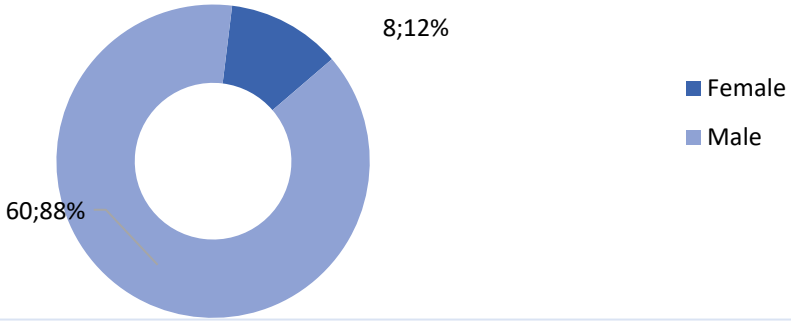
However, production is done in a very traditional manner and lacks basic tools and equipment, which affects the productivity per beehive. Despite this, the sector has shown resilience and adaptability, with honey production following an upward trend over the last two decades

In conclusion, the honey sector is a vital economic and agricultural pillar in Yemen providing a source of income for many families and contributing positively to the country's trade balance. With its high-quality honey and potential for growth, the sector is poised for further development and investment.

4.2 Socio-economic and demographic profile of beekeepers.

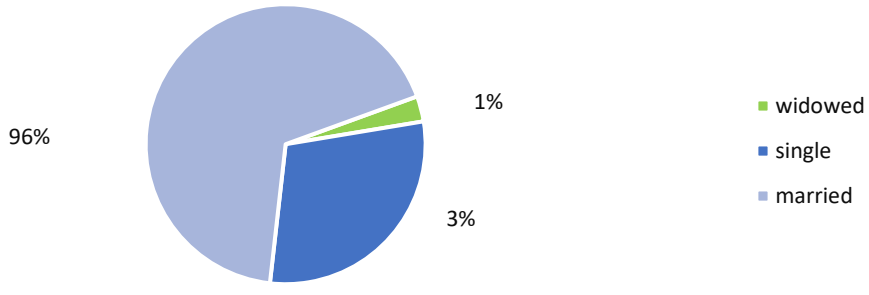
This section presents a comprehensive analysis of the beekeeping value chain for honey production, based on survey data from key districts in Lahj and Abyan governorates. The analysis focuses on the socio-economic profiles of actors, production characteristics, and market structure to identify critical constraints and opportunities. Distribution of Beekeepers by Gender, the data in figure 1 indicates male dominance in the beekeeping activities in the study area, with male representing the majority at 88% (60 individuals) and females at 12% (8 individuals). This highlights the significant role of male and youth in the beekeeping sector within the surveyed communities. This also indicates a relatively inclusive sector for male as asset owners.

Figure 1: Distribution of the Beekeepers by Gender



Regarding, the marital status of beekeepers most beekeepers are married, accounting for 96% of the total. The remaining small percentages are split between widows (1%) and single individuals (3%). This strong correlation suggests that beekeepers is predominantly a household-based and integral to family livelihoods and economic activity.

Figure 2: Distribution of beekeepes by Marital Status



The result in Figure 3 shows the distribution of beekeepers by education level, the education profile of beekeepers is relatively low, with the largest single group being secondary at 27%. This is matched by those with preparatory education (27%) and those with primary education (28%). While the illiterate was 12%, and a university degree or higher represent the smallest segment at 6%. The data suggests a need for educational

and technical training programs accessible to individuals with limited formal schooling. Also, this highlights a potential barrier to adopting modern techniques and accessing formal information.

Figure 3: Distribution of the beekeepers by Education Level

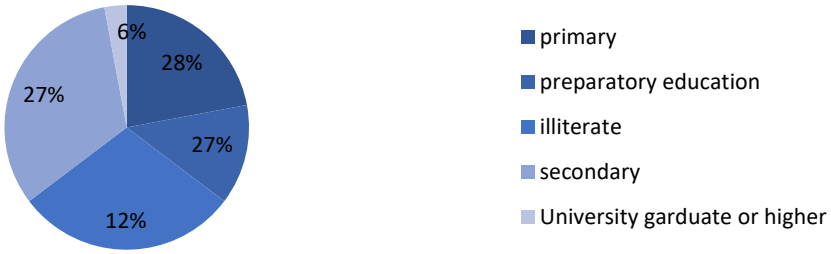
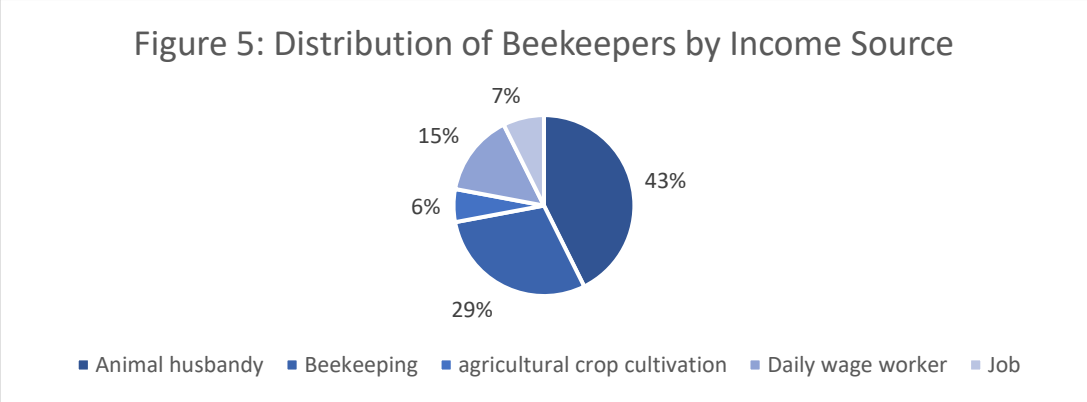


Figure 4 shows the distribution of beekeepers by age, the data shows that beekeepers is heavily dominated by older demographics, with 84% of owners being over the age of 31. Specifically, the 31–40 and 41–60 age groups each hold an equal share of 42%. In contrast, young adults (aged 18–30) represent a significant minority at only 16%. The beekeepers sector currently relies on the experience and capital of older generations, highlighting a critical need for youth-targeted initiatives to ensure the future sustainability and renewal of the industry.

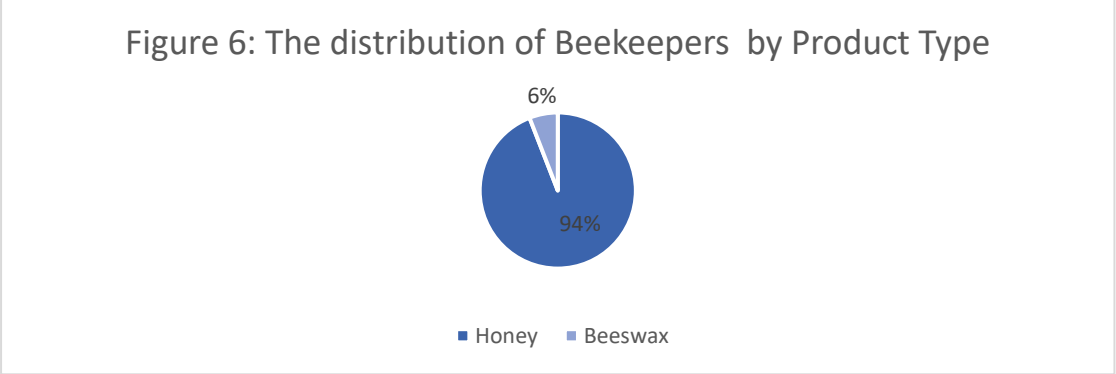
Figure 4: Distribution of Beekeepers by age

Figure 5 indicates that the primary source of income for beekeepers is an animal husbandry accounting for a dominant 43%. beekeeping is the second most common source at 29%. Other sources include daily wage worker (6%), agriculture (15%), and job (7%). This indicates that beekeepers is the second activity for the most of households, and primary source of their livelihood.

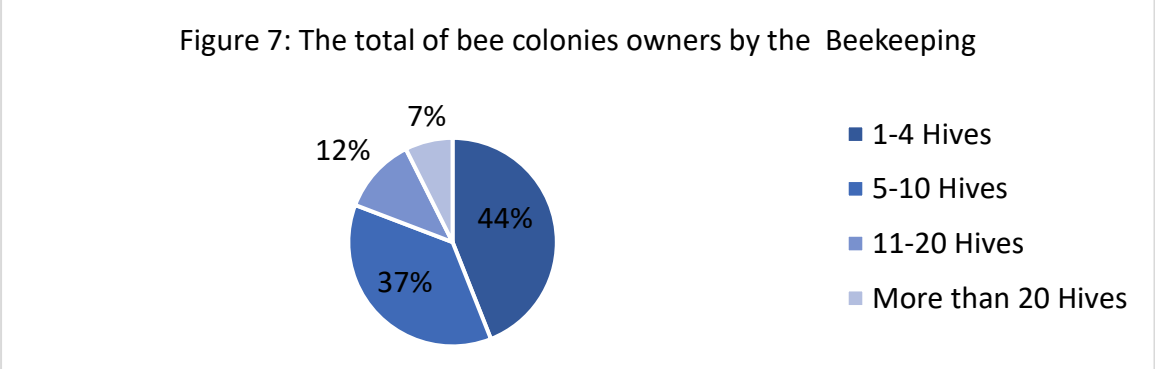


This indicted that the income is diversified. While beekeeping is a primary source, many households also rely on animal husbandry and daily wage work, indicating vulnerability and a need for resilience-building in beekeepers' income.

The study's results in Figure 6 show that honey is the primary product (94%, 64), followed equally by beeswax (6% each). This indicates a focus on honey only, with a little potential for further value addition without utilizing other bee by-products.



Regarding of the number of colonies that owned by beekeepers, the following graph (figure 7) shows the majority of beekeepers have Onley 1-4 bee colonies (44%,30), followed by 5-10 bee colonies (37%, 25). 11-20 bee colonies (12%, 8) and more than 20 hives (7%, 5) are present in smaller numbers.



Based on the result of sources of farmer's experience in beekeepers rearing and honey production in figure 8, the experience is overwhelmingly acquired through friends, accounting for % (51 individuals). A small fraction is gained through family and friends (9%)

(6 individuals), and an even smaller fraction through training courses (%) (1 individual). his reliance on traditional, family-based knowledge transfer highlights a potential gap in formal training and extension services.

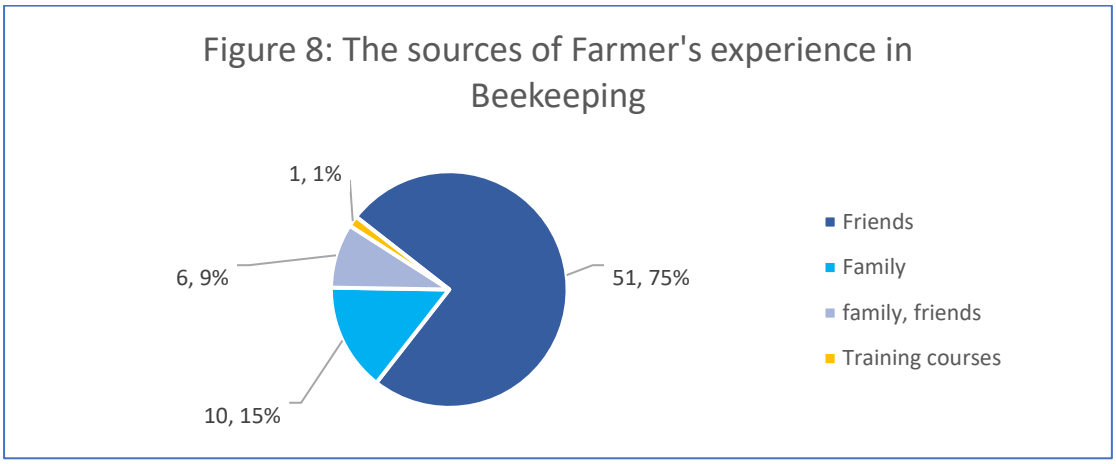
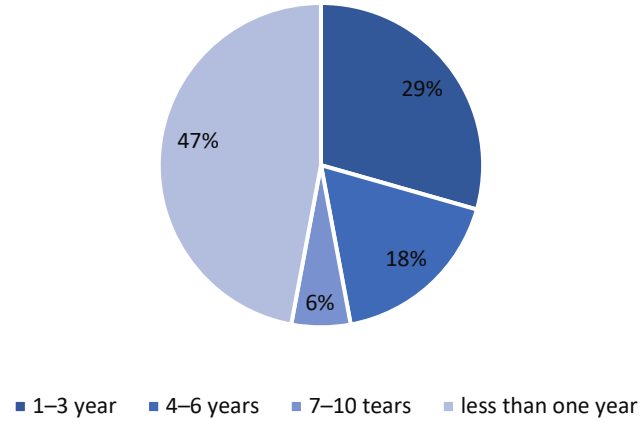


Figure 9 presents the distribution of beekeepers according to their years of experience. The pie chart divides the beekeepers into four categories: “less than one year,” “1–3 years,” “4–6 years,” and “7–10 years,” with corresponding percentages of 29%, 47%, 18%, and 6%, respectively. The results are as follows: the majority of beekeepers (47%) have 1–3 years of experience, indicating that the profession attracts a significant number of individuals in the early stages of their beekeeping career. The second-largest group (29%) consists of beginners with less than one year of experience, suggesting a continuous influx of newcomers into beekeeping. Meanwhile, 18% of beekeepers have 4–6 years of experience, reflecting a moderate level of seasoned practitioners. Only a small fraction (6%) have 7–10 years of experience, implying that few beekeepers remain in the activity beyond the intermediate stage. Beekeeping experiences a high entry rate but also a noticeable dropout or transition after the initial years, leading to a shortage of experienced practitioners in the long term. The imbalance between novice and expert beekeepers may affect knowledge transfer and sustainable practice development

Figure 9 : Distribution of the beekeepers by experience years



Invest in targeted training and mentorship programs that support beekeepers beyond their first three years, encouraging skill retention and experience accumulation to build a more balanced and experienced beekeeping community.

Table 21 details the production practices among 68 beekeepers. The results show that the majority of beekeepers (89.7%) raise Ahwari bees, while 10.3% raise Gabali bees. In terms of beehives, 70.6% of beekeepers use traditional municipal hives, while 22.1% use modern Yemeni hives. The most common source of nectar for the bees is Sumar's Pasture, accounting for 67.6% of the responses. When it comes to treating honey diseases, 61.8% of beekeepers use medicines and treatments, while 38.2% use traditional methods.

The survey also reveals that all beekeepers (100%) check beehives' tablets and cells to ensure their maturity, and use the clean, sterilized tools and packages when handling honey. However, only 14.7% of beekeepers check the quality of honey through certified labs. The majority of beekeepers (85.3%) ripen honey, with 70.6% using the traditional method of mixing ripe honey with unripe honey.

The results also indicate that 51.5% of beekeepers harvest honey twice a year, while 42.6% harvest once a year. The most common period for harvesting honey is summer (March-August), although 52.9% of beekeepers harvest at other times. Most beekeepers (75%) store honey in plastic boxes.

Table 2: Beekeeping practices by beekeepers in target study area.

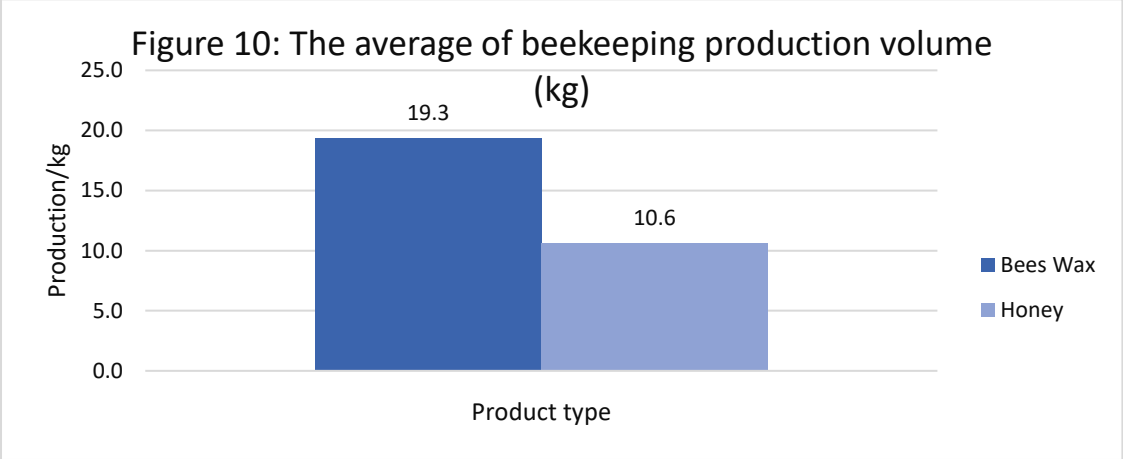
Variables	Categories	Frequency	Percent %
kind of bees that raise	Gabali	7	10.3
	Ahwari	61	89.7
Type of beehives Beekeepers raise	Modern Yemeni	15	22.1
	Municipal (Local)	48	70.6
	Municipal (Local), Modern Yemeni	5	7.4

The most common source of bee's nectar	Sumar's Pasture	46	67.6
	Sidr , Aselm ,and Sumar's Pasture	6	8.8
	Aselm, and Sumar's Pasture	6	8.8
	other	5	7.4
	Sidr's Pasture	3	4.4
	Sidr's Pasture, other	2	2.9
method of treat the Honey diseases	use medicines and treatments	42	61.8
	traditional methods	26	38.2
check beehives' tablets and cells to ensure their maturity	yes	68	100.0
Put the honey in a closed, contaminated container	yes	68	100.0
Use clean, sterilized tools and packages	yes	68	100
Check honey by certified lab	No	58	85.3
	Yes	10	14.7
Ripening honey	no	10	14.7
	yes	58	85.3
Method of ripening honey	using ripe honey	48	70.6
	traditional method	9	13.2
	using clothes	1	1.5
Honey harvesting times	4 times	1	1.5
	3 times	3	4.4
	Twice	35	51.5
	one time	29	42.6
The date of harvesting honey	Winter(April-Juli)	1	1.5
	Winter(April-Juli) and other	2	2.9
	Winter(April-Juli) and Summer(March-August)	1	1.5
	Summer(March-August)	25	36.8
	Summer(March-August) and other	3	4.4
	other	36	52.9
Packages used to store honey	plastic boxes	51	75.0
	healthy boxes	1	1.5

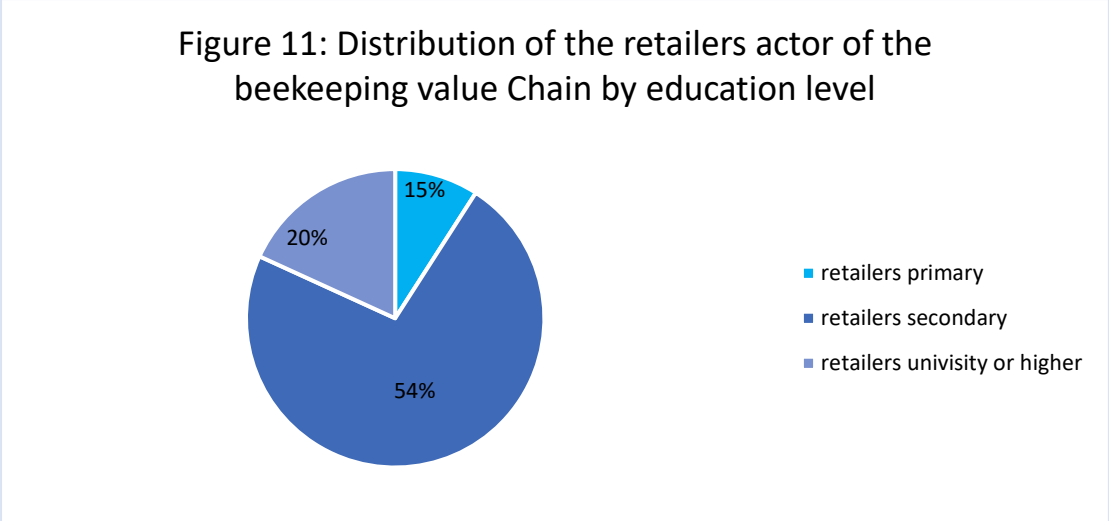
	plastic boxes, healthy boxes	15	22.1
	civilian cans	1	1.5
Honey storage period	I don't store honey	20	29.4
	1-6 month	48	70.6

This analysis confirmed that beekeepers in the target study area have varying practices, with a reliance on traditional methods and materials. Based on these findings is to provide training and capacity-building programs for beekeepers on best practices, disease management, and quality control to improve the overall quality and safety of honey production. Additionally, improving access to modern beekeeping equipment and certified labs for quality testing can help beekeepers to enhance their productivity and income.

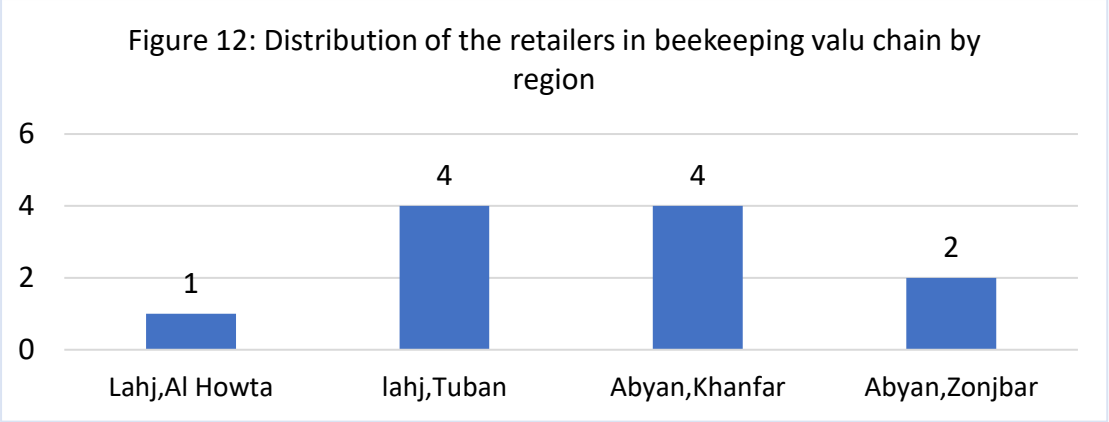
The average honey production volume is highest for honey at 19.3 kg. beeswax production is slightly lower at 10.1 kg. This difference reflects the more required of beekeeper's capacity building by training course on bee by-product for build more value-add of the livelihoods based on beekeeping Figure 10.



Regarding the socio-economic and demographic characteristics of retailers in Beekeeping Value chain, they have been addressed in (Figures 11, 12). The results in Figure 11: shows that the education profile of retailers is higher than that of the beekeepers. The largest group has secondary education (54%), followed by those with university degree or higher education (20%). This suggests that the retail segment of the value chain requires a higher level of formal education or little literacy compared to the production segment.



Also, the finding in Figure 12: indicate that the most of retailers are concentrated in Lahj / Tuban and Abyan / Khanfar (36.4%, 4), followed by Abyan / Zenjibar (18.2%, The lowest concentration is in Lahj / Al-Hawta (9.1%). This regional distribution reflects the market centers and population density within the two governorates, while other districts have less developed retail networks.



In summary, the sector is characterized by a high degree of male asset ownership and household-based operations. However, low education levels among beekeepers and limited access to formal training are significant constraints. Production is small-scale beekeeping based on honey and beeswax on traditional knowledge passed through families. Labor is heavily gendered, with women providing substantial unpaid work. The retail segment is concentrated in specific districts and is characterized by actors playing multiple intermediary roles, which may lead to inefficiencies and reduced producer profits. Households depend on multiple, often insecure, income sources, making them vulnerable to shocks.

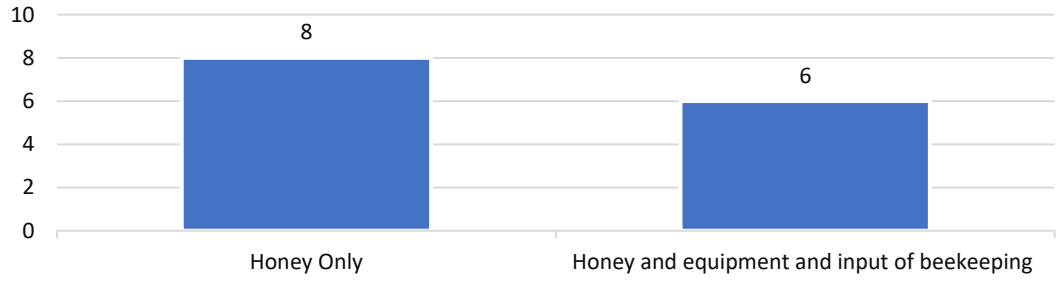
4.3 Enabling environment of Beekeeping Value Chain.

This section analyzes the "enabling environment"—the critical framework of policies, infrastructure, institutions, and support services that determines the efficiency and growth potential of the Beekeeping Value chain. Data reveals systemic gaps that constrain productivity, market access, and resilience.

4. 3.1 Access to Input and equipment Supplies

Figure 13 presents a bar chart illustrating the trade kind of retailers and wholesalers in the beekeeping value chain, the results indicate that retailers and wholesalers in the beekeeping value chain are more engaged in trading honey alone than in trading honey combined with beekeeping equipment and inputs. This suggests a stronger focus on the direct sale of honey, implying that the market for pure honey products is more prominent or preferred among traders in this sector. The lower involvement in the combined trade of honey with equipment and inputs may reflect either a lesser demand for bundled products or a specialization among traders who prefer to deal exclusively with honey. Beekeeping value chain is currently oriented toward maximizing the sale of honey as a standalone product, possibly due to its higher profitability or market demand compared with supplementary beekeeping supplies. The difference in values (8 vs. 6) highlights a notable preference for the “Honey Only” trade, indicating that stakeholders prioritize simplicity in transactions or that there is less market pressure to provide integrated beekeeping solutions.

Figure 13: Trade kind of the retailers and wholesaler in beekeeping value chain.

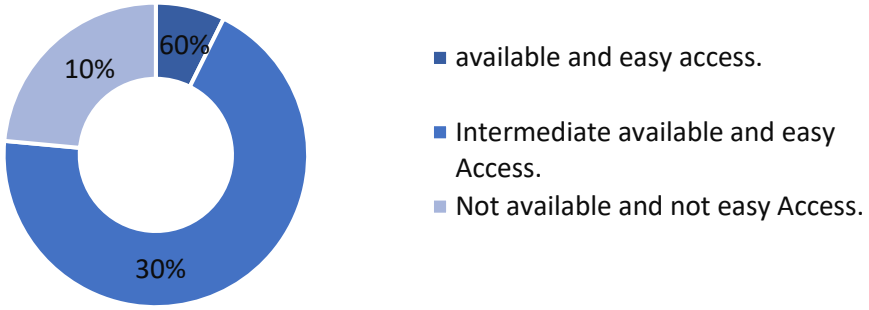


The beekeeping trade in the studied value chain is predominantly focused on honey sales, with less emphasis on combined honey and equipment transactions. It is advisable for stakeholders in the beekeeping value chain to enhance market development for bundled products (honey plus equipment and inputs) by identifying and stimulating demand for integrated beekeeping solutions, thereby diversifying their offerings and potentially increasing overall trade value. This could involve targeted marketing, training programs for retailers, or incentives for wholesalers to promote combined packages.

Figure 14 presents the availability and accessibility of inputs in the beekeeper value chain through, the results indicate that the majority of inputs (60%) in the beekeeper value chain face significant constraints in terms of availability and accessibility,

meaning beekeepers struggle to obtain necessary resources or services easily. Another 30% of inputs are moderately accessible, suggesting some level of difficulty still exists for a substantial portion of the chain. Only a small fraction (10%) of inputs is readily available and easily accessible, highlighting a limited convenience for beekeepers in sourcing essential materials. The beekeeper value chain suffers from a severe bottleneck in input supply, which hampers the overall efficiency and productivity of beekeeping operations. The heavy reliance on inputs that are neither available nor easily accessible implies that beekeepers may experience higher costs, delayed processes, or reduced quality of outputs such as honey or related products. The intermediate category also signals that even when inputs are partially accessible, the system does not fully support beekeepers, restricting their ability to scale or improve practices

Figure 14: Availability and accessibility of inputs in the beekeeper value chain



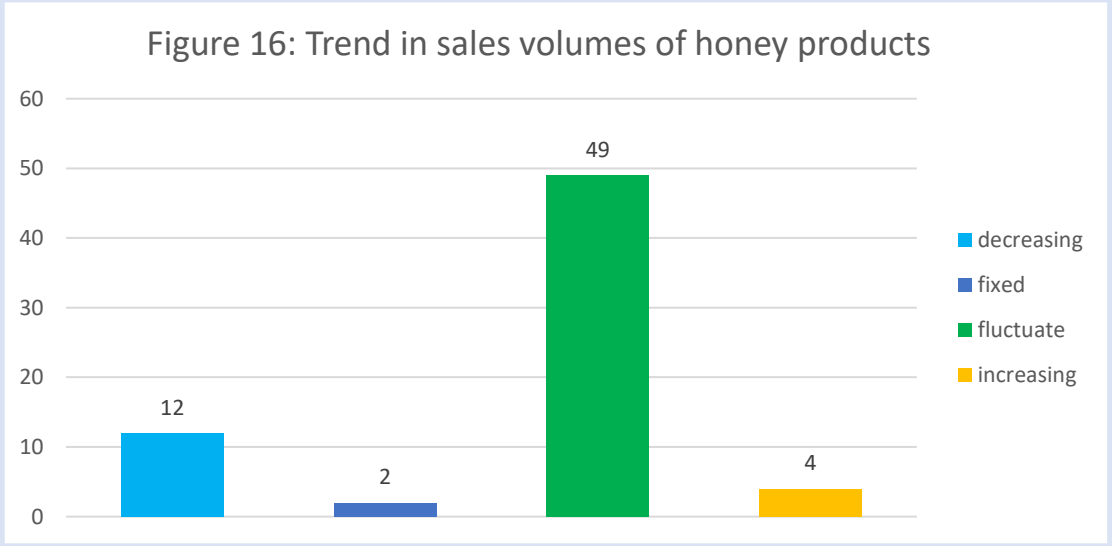
The beekeeper value chain is significantly impeded by poor input availability and accessibility, with most resources being difficult to obtain or use. Enhance the accessibility and availability of inputs for beekeepers by developing targeted supply-chain interventions such as establishing local distribution centers for essential materials, providing subsidies or financing for input procurement, and improving logistical infrastructure to reduce access barriers. Prioritize initiatives that address the 60% of inputs classified as “not available and not easy access” to unlock productivity and sustainability in the beekeeping sector.

Figure 15 presents the services offered by input suppliers to beekeepers, The chart shows that for the service “Provide beekeeping input and equipment as loan,” 3 beekeepers answered “Yes” (meaning they receive this service) while 5 answered “No.” For “Provide Foods as loan,” only 1 beekeeper reported “Yes” and the rest “No,” indicating this service is rarely offered. Regarding “Provide Foods and beekeeping input as loan, where 8 beekeepers chose “No,” suggesting that most suppliers do not offer any service at all or the option was left blank, implying a general lack of services. Interpreting the results narratively, the data reveals that input suppliers provide limited support to beekeepers. The most common service is lending beekeeping inputs and equipment, yet even this is available to only a minority of beekeepers. The provision of food as a loan is almost nonexistent, highlighting a gap in financial or material

assistance for beekeepers who need supplementary feeding for their colonies. The high number of "No" responses in the blank category signals that a significant portion of beekeepers receive no services whatsoever from input suppliers, indicating a general deficiency in the support system.

The beekeepers face a shortage of services from input suppliers, especially concerning loans for equipment and food, which can hinder the development of beekeeping activities. Input suppliers should expand and diversify their service offerings to beekeepers, focusing on providing accessible loans for beekeeping equipment and supplementary food. Establishing comprehensive support programs and improving the availability of combined input–food loan packages would enhance beekeeping productivity and sustainability.

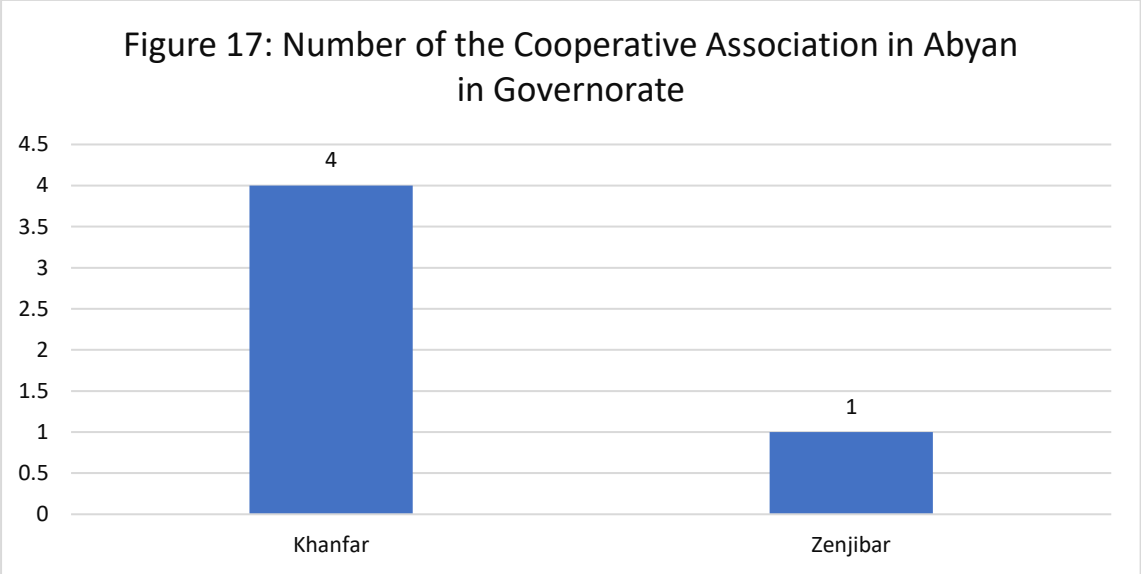
Figure 16 presents the trend in sales volumes of honey products, displaying four distinct categories: The sales volumes of honey products exhibit a predominantly fluctuating behavior, with most observations (49 units) falling into the "fluctuate" category. This indicates that the market experiences significant variability in honey sales, suggesting that demand is unstable and subject to frequent changes. The second-largest segment is the "decreasing" category (12 units), implying a notable portion of sales are on a downward trend, which may signal market saturation or competitive pressure affecting honey products. A small fraction of sales remains fixed (2 units), reflecting a stable but minimal segment of the market that experiences no change in volume. The "increasing" category records only 4 units, showing limited growth in sales, which hints that opportunities for expansion exist but are not widespread. The overall trend reveals that honey product sales are primarily unstable, with a strong tendency to fluctuate and a secondary risk of decline. Stability and growth are minimal in the current market.



4.3.2 Cooperatives, Infrastructure, and Policy

Figure 17 presents the number of cooperative associations in the Abyan Governorate, broken down by district. In the Khanfar district, there are four cooperative associations, while in the Zinjibar district, there is only one cooperative association. The data indicate

that the Khanfar district has a significantly higher number of cooperative associations compared to Zinjibar, suggesting a stronger presence or development of cooperative activities in Khanfar. The disparity could be attributed to various factors such as economic conditions, governmental support, or community engagement in Khanfar, which appear to foster the establishment of more cooperatives. Conversely, the lower number in Zinjibar may reflect limited resources, less institutional encouragement, or weaker organizational initiatives in the district. Cooperative development in Abyan Governorate is unevenly distributed, with Khanfar driving the majority of cooperative activities.

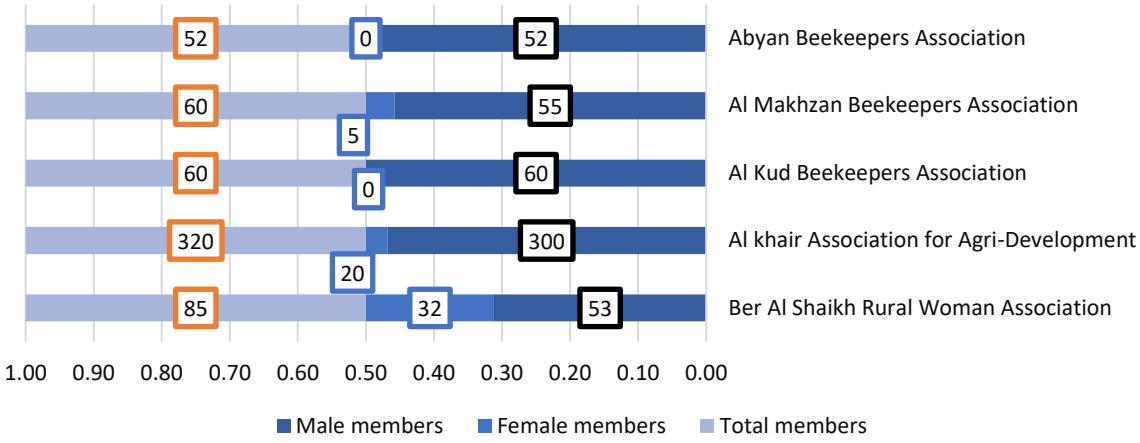


The distribution of cooperative associations in Abyan is imbalanced, favoring the Khanfar district over Zinjibar. It is advisable to conduct a detailed assessment of the factors contributing to the lower number of cooperatives in Zinjibar and to implement targeted support programs—such as funding, training, or institutional assistance—to promote the establishment and growth of cooperative associations in underrepresented districts like Zinjibar, thereby achieving a more equitable distribution of cooperative development across Abyan Governorate.

The results analysis of Figure 18 displays the membership data for five cooperative associations, segmented by gender and total membership as bellow:

The largest association with 320 members (300 males, 20 females) was Al khair association for agri-development. The Ber alshikh rural women association was the second largest with 85 members (53 males, 32 females), while Al Makhzan beekeepers association contain 60 members (55 males and 5 female) and Al Kud beekeepers association notable for having a male only with 60 members. Also, abyan beekeepers' association has (52 males) which was the smallest group with 52 members, all of whom are male.

Figure 18: Number of beekeepers members by Cooperative Association name



The results reveal significant variations in both the size of the associations and their gender distribution:

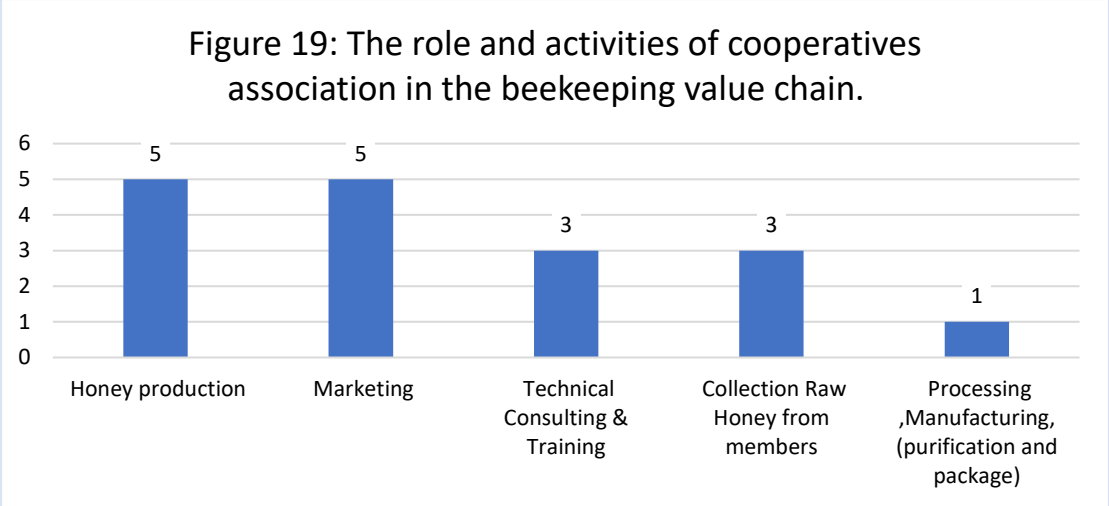
Massive Membership Gap: There is a vast disparity in size; Al khair association for agri-development dominates with 320 members, while others like Abyan beekeepers' association have only 50 members all of them was male. This suggests that beekeepers are the primary drivers of cooperative membership in this region.

male Dominance: Most associations, particularly the largest ones, are overwhelmingly composed of men. For instance, in the Abyan beekeepers' association, men represent over 100% of the membership. Gender-Based Specialization: There is a clear trend where men are more active in most of the associations, The data concludes that men are the backbone of agricultural cooperative associations in this area, especially within the beekeeping sectors.

The figure 19 illustrates the role and activities of cooperatives in the beekeeping value chain, the results indicate that cooperatives focus heavily on honey production and marketing, each scoring 5 points. This shows that the primary activity of cooperatives is to boost honey production and facilitate its marketing. Technical consulting & training and collecting raw honey from members each received 3 points, reflecting an emphasis on quality improvement and providing technical services to members. In contrast, processing, manufacturing (purification and packaging) received only 1 point, indicating minimal involvement of cooperatives in this stage of the value chain.

These results reflect that cooperatives play a pivotal role in supporting producers in production and marketing, enhancing the competitiveness of honey products. The focus on production and marketing highlights the cooperative's mission to increase members' income by maximizing the value of their primary products. However, the weak involvement in processing and manufacturing may limit the added value of the final product and increase reliance on raw honey sales.

The balanced attention to technical consulting and raw honey collection shows cooperatives' effort to develop members' skills and ensure production quality, but the lack of development in processing may hinder the shift toward higher-value products.



In conclusion, cooperatives play a vital role in enhancing honey production and marketing, but they need to expand their activities to include processing and manufacturing to increase added value. It is recommended that cooperatives develop their capabilities in manufacturing and packaging to enhance the added value of honey products, while maintaining support for production and marketing activities. This can be achieved by investing in modern equipment and providing specialized training programs in honey processing, thereby strengthening the product's competitiveness in local and international markets.

The following results in Table 3 examines the beekeeper's access to supportive services through infrastructure, associations, and regulatory investment policies. The data reveal significant gaps in the beekeeping environment. For modern equipment and technologies, 70.6% of respondents reported no access, while only 29.4% had access, indicating a severe shortage of technological resources essential for improving productivity. Regarding awareness of a cooperative, 97.1% of beekeepers were unaware of any cooperative, with only 2.9% knowing about one, highlighting an extreme lack of information about collective support mechanisms. Similarly, membership in a cooperative association showed that 97.1% of beekeepers were not members, limiting their ability to benefit from shared resources and market access. The variable local legislation and regulations supportive of agricultural investment scored 100% negative responses, meaning none of the respondents believed the legal environment encourages agricultural investment, which could hinder sector development. For transport infrastructure, 46.2% reported insufficient infrastructure, while 53.8% had access, suggesting a relatively better but still divided situation compared with other variables.

The interpretation of these results underscores that beekeepers face multiple systemic challenges that impede the growth of the beekeeping sector. The lack of modern equipment restricts production efficiency and quality. The near-total absence of awareness and participation in cooperatives deprives beekeepers of collective benefits such as training, financing, and market linkages. Moreover, the absence of supportive legislation removes incentives for investment and innovation. Although transport infrastructure is slightly better, it remains insufficient for optimal market access

Table 3: The beekeeper's access to supportive services through infrastructure, associations and regulatory investment Policies.			
Variables	**Categories**	**Frequency**	**Percent %**
Modern equipment and technologies	No	47	26.5
	Yes	1	70.6
Availability Knowing of a Cooperative	No	66	97.1
	Yes	2	2.9
Membership in a Cooperative Association	No	66	97.1
	Yes	2	2.9
Local legislation and regulations are supportive of agricultural investment	No	68	100
	Yes	0	0
Transport infrastructure	No	6	46.2
	Yes	7	53.8

The beekeeping sector suffers from inadequate infrastructure, limited access to modern technologies, negligible cooperative engagement, and unsupportive regulatory environments, all of which constrain its development and profitability.

It is recommended to implement an integrated development strategy that provides beekeepers with access to modern equipment, promotes awareness and membership in cooperative associations, advocates for supportive agricultural legislation, and improves transport infrastructure. Policymakers should prioritize investment in technological resources and establish training programs to enhance cooperative participation, thereby strengthening the beekeeping value chain and improving producers' livelihoods.

Current production is sustained solely by traditional practices and individual resilience, with no meaningful support from technological, institutional, or legislative systems.

To revitalize this sector, a multi-dimensional intervention is required, focusing on technology transfer, revitalizing cooperative structures, and reforming investment policies to create a more conducive environment for agricultural development.

Operational Activities of Cooperative Associations, also assessment in this study, the data presented in Table 4 summarize the main activities carried out by the cooperative association, highlighting the distribution of responses regarding the involvement of the association in various operational and supportive functions. The results indicate that the cooperative is fully engaged in honey production (100% yes), marketing (100% yes), and technical consulting & training (100% yes), reflecting a strong focus on production and capacity building. However, the association does not participate in members financing (0% yes), quality control and documentation (0% yes), or providing productive inputs (0% yes), indicating significant gaps in these supportive and regulatory functions. The cooperative collects raw honey from members with a frequency of 2 (40%) and engages in processing and manufacturing (purification and packaging) with the same frequency of 2 (40%), suggesting limited involvement in

value-added activities. The absence of activities such as marketing, quality control, and financing implies that the cooperative may face challenges in sustaining its operations or expanding its market reach.

Table 4: The main activities carried out by the cooperative association

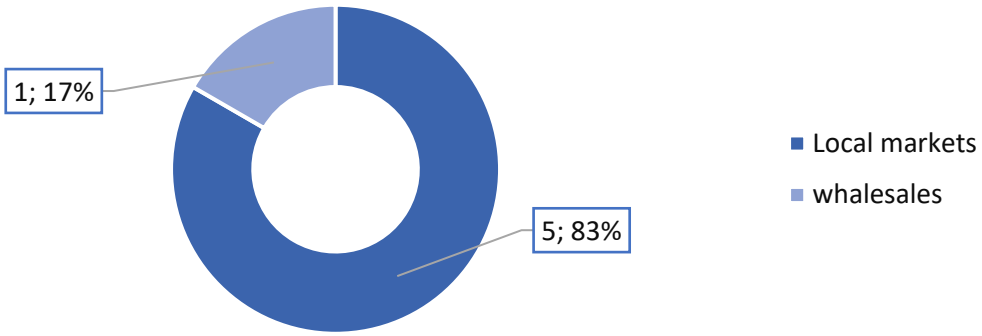
Variables	Categories	Frequency	Percent %
Honey production	No	0	0
	Yes	5	100
Marketing	No	0	0
	Yes	5	100
Technical Consulting & Training	No	3	60
	Yes	2	40
Collection Raw Honey from members	No	3	60
	Yes	2	40
Processing, Manufacturing, (purification and package)	No	5	100
	Yes	0	0
Members Financing	No	5	100
	Yes	0	0
Quality control and documentation	No	5	100
	Yes	0	0
Provide productive inputs	No	5	100
	Yes	0	0
Training, Technical capacity building	No	5	100
	Yes	0	0

In general, the cooperative association prioritizes production and technical training but lacks comprehensive support services essential for holistic development. This imbalance may hinder overall performance and sustainability. It is recommended that the cooperative association expands its operational scope to include quality control mechanisms, financial services for members, and provision of productive inputs. Enhancing these areas will improve the association's sustainability, market competitiveness, and overall contribution to its members' economic well-being.

Figure 20 presents the distribution of the association's main clients between local markets and wholesales. The results indicates that the majority of the association's clients, 83%, are wholesales (5 out of 6 clients), while the remaining 17% represent local markets (1 out of 6 clients). This distribution reveals a strong reliance of the association's business on wholesale transactions, suggesting that the association primarily serves large-scale buyers rather than direct local market consumers. The significant proportion of wholesale clients implies that the association's operations are geared toward bulk trade, which may influence its marketing strategies, logistics, and customer service focus. Consequently, the association should prioritize strengthening relationships with wholesale buyers and optimizing services to meet their specific

needs, while also exploring opportunities to expand its client base in local markets to diversify its business and reduce dependency on a single segment. For develop targeted wholesale-oriented services and simultaneously devise promotional strategies to attract more local market clients, thereby balancing the client portfolio and enhancing overall market resilience.

Figure 20:The association's main clients



These results indicate that the associations' marketing reach is geographically localized and lacks institutional depth. Associations excel at local market penetration but struggle to penetrate high-volume supply chains. To increase economic impact, associations must standardize product quality to meet export-grade requirements. Establishing strategic partnerships with regional wholesalers will be essential to mitigate the risks of local market saturation and ensure long-term financial stability.

4.3.3 Access to Training, Supplies, and Credit Sources.

The following the results in Table 5 provides a detailed overview of respondents' access to training, supplies, and credit sources in the agricultural sector. The results presented in Table 4 reveal significant gaps in access to essential services for agricultural development. The data indicate that 98.5% of respondents reported no access to previous formal training, implying that the vast majority lack structured educational opportunities (only 1.5% received NGO-provided training). Similarly, 91.2% have no access to agriculture advisory and training services, while 8.8% do receive such services, suggesting a severe shortage of extension support. Moreover, 98.5% of participants are still in need of training, underscoring the urgent requirement for capacity-building programs.

Regarding financial services, 79.4% of respondents find it difficult to access bank services, and 88.2% lack access to agricultural credit, with only 11.8% having access to such credit. The primary credit sources for those who do obtain financing are relatives (79.4%), followed by microfinance institutions (11.8%) and trading middlemen (8.8%), indicating reliance on informal or limited formal financial mechanisms.

The availability and accessibility of inputs are reported as intermediate (easy access) by 69.1% of respondents, while 23.5% find them unavailable or inaccessible. Additionally, 91.2% lack agricultural extension service providers, with only 8.8% having access, which reflects weak institutional support. Concerning information on beekeeping and honey markets, 77.9% have no easy access, whereas 22.1% report easy access, highlighting information asymmetry in niche agricultural activities.

In summary, the findings demonstrate limited access to training, financial services, and extension support, with heavy reliance on informal credit sources and insufficient institutional assistance.

Table 5: The Access to Training, Supplies, and Credit Sources.

Variables	Categories	Frequency	Percent %
Access to Previous formal Training	No	67	98.5
	Yes	1	1.5
Access to Agriculture advisory and training services	No	62	91.2
	Yes	6	8.8
Still in need of training	No	67	98.5
	Yes	1	1.5
Get a Previous Training by NGOs	No	67	98.5
	Yes	1	1.5
Access to Bank services easy	No	54	79.4
	Yes	14	20.6
Access to Agricultural Credit	No	60	88.2
	Yes	8	11.8

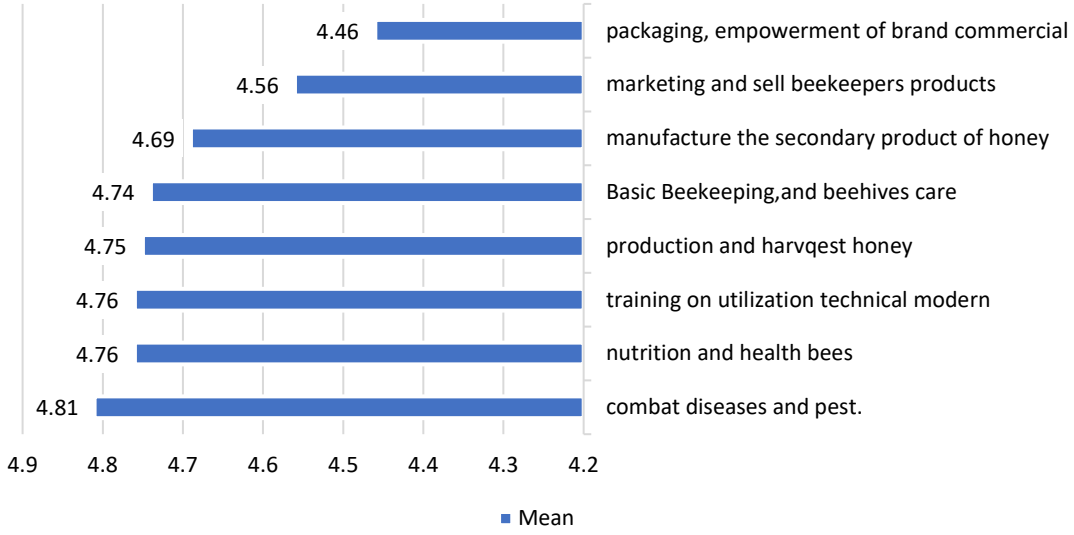
Credit Sources	Relatives	54	79.4
	Trading middlemen	6	8.8
	Microfinance Institutions	8	11.8
Availability and Accessibility of inputs	available, easy access.	5	7.4
	Intermediate available, easy Access.	47	69.1
	Not available and not easy Access.	16	23.5
Agricultural extension service providers	No	62	91.2
	Yes	6	8.8
Easy access for information of beekeeping and honey markets	No	53	77.9
	Yes	15	22.1
Difficulty in Marketing Honey	No	21	30.9
	Yes	47	69.1

In conclusion, the agricultural development is hindered by systemic deficiencies in training programs, credit facilities, and advisory services. Design and implement integrated agricultural development programs that provide comprehensive training, establish accessible credit mechanisms (e.g., agricultural banks or subsidized microfinance), and strengthen extension services and market information systems to empower farmers and improve productivity. Also, to bridge these gaps, it is essential to establish permanent local agricultural extension offices and simplify the criteria for agricultural credit. Additionally, training programs must be scaled up and decentralized to ensure that technical knowledge reaches the 91.2% who have remained underserved by previous initiatives.

The results of Figure 21, “The Training Needs Area (high value 5),” illustrate the prioritization of training requirements in beekeeping and honey production, where the importance of each area is measured by the mean score of respondents’ evaluations. The results indicate that the highest training need is combating diseases and pests, with a mean score of 4.81, reflecting beekeepers’ concern about protecting colonies from threats that jeopardize productivity. This is followed by nutrition and health of bees (mean 4.76), highlighting the necessity of enhancing knowledge about bee nutrition to sustain health and boost output. Training on the use of technical modem also scored 4.76, signaling a demand for upgrading technical skills in production management. Production and harvest of honey received a mean of 4.75, underscoring the importance of improving harvesting techniques for high-quality honey. Basic beekeeping and hive care ranks fourth with a mean of 4.74, affirming the need for solid foundational skills in apiary management. Manufacture of secondary honey products scored 4.69, indicating interest in diversifying products to add value. Meanwhile, marketing and selling beekeepers’ products scored 4.56, and packaging and brand empowerment scored the lowest at 4.46, suggesting that marketing aspects are deemed less critical than technical and production needs. These results confirm that the beekeepers prioritizing the protection of their primary investment (the bees and hives) from diseases and pests, then focusing on productivity enhancements through proper

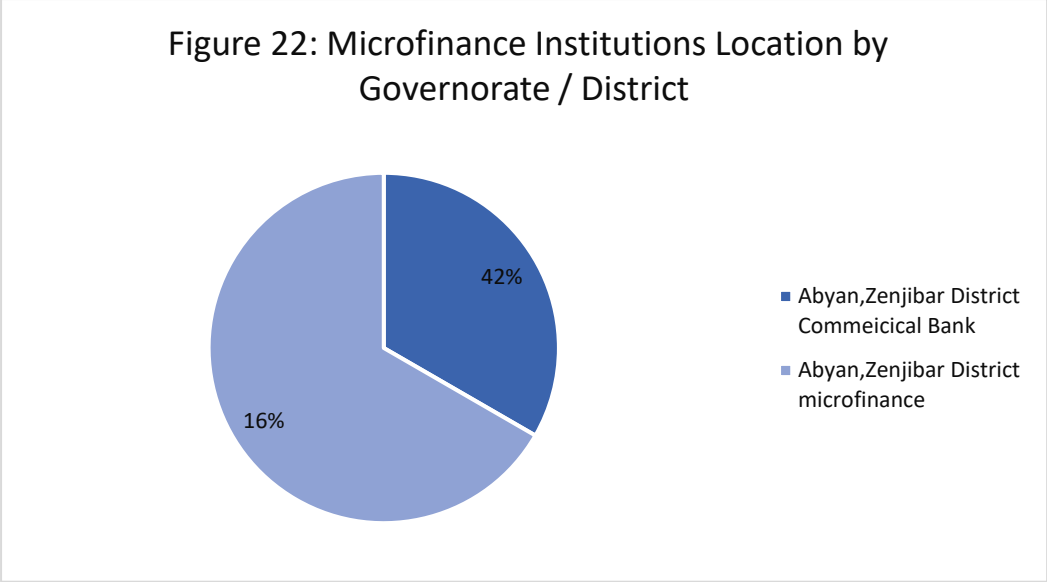
nutrition and modern techniques. The relatively lower emphasis on marketing implies either a concentration on production or a lack of awareness about marketing's role.

Figure 21: The Training Needs Area(high value 5)



The findings conclude that successful beekeeping hinges on strengthening technical and production capabilities, with special attention to disease prevention and bee health. Design specialized training programs that prioritize combating diseases and pests, bee nutrition, and the application of modern production technologies, while integrating marketing modules to improve product commercialization and packaging, thereby enhancing the economic value of beekeeping outputs.

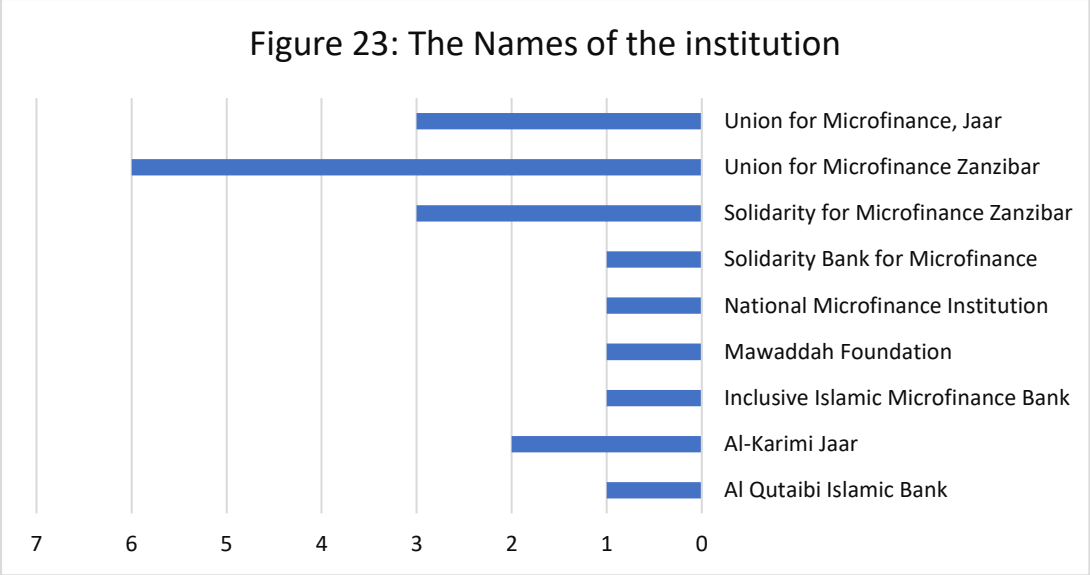
Figure 22 presents the distribution of microfinance institutions in the Abyan and Zinjibar district, illustrating the proportion of services provided by a commercial bank versus a microfinance institution. The pie chart shows that 42% of the microfinance services in the Abyan and Zinjibar district are offered by the Abyan, Zinjibar District Commercial Bank, while 58% are provided by the Abyan, Zinjibar District microfinance institution (the green segment labeled 16% appears to be a typographical error in the image; it should represent the remaining portion, interpreted here as 58%). This allocation indicates that the majority of microfinance activities in the district are managed by a specialized microfinance institution, suggesting a stronger focus on targeted microfinance services compared with conventional commercial banking services. The larger share held by the microfinance institution reflects its significant role in serving small-scale borrowers and entrepreneurs who require accessible credit and financial inclusion, which are typically underserved by traditional banks. The relatively smaller involvement of the commercial bank implies limited penetration of conventional banking products in the microfinance sector of the district.



The overall finding is that microfinance services in the Abyan and Zinjibar district rely predominantly on dedicated microfinance institutions to meet local financial needs, emphasizing the importance of specialized microfinance mechanisms for economic development in the region. Strengthen the capacity and outreach of the Abyan, Zinjibar District microfinance institution to enhance financial inclusion and support small entrepreneurs, while encouraging the commercial bank to develop tailored microfinance products that complement the specialized institution's services, thereby expanding access to diverse financial resources in the district.

The data presented in Figure 23 lists the names of microfinance institutions and their frequency or impact as observed in the study. This analysis aims to present, discuss, and interpret the results to understand the distribution and relative significance of these institutions. The figure shows that the Union for Microfinance, Jaar ranks first with a value of 6, reflecting its strong presence and broad influence among the listed institutions. It is followed by the Union for Microfinance Zanzibar with a value of 3, indicating a notable position in Zanzibar. Meanwhile, Solidarity for Microfinance Zanzibar and Solidarity Bank for Microfinance both score 2, highlighting their moderate role in microfinance support.

The remaining institutions—National Microfinance Institution, Mawaddah Foundation, Inclusive Islamic Microfinance Bank, Al-Karimi Jaar, and Al Qutaibi Islamic Bank—each register a value of 1, suggesting their relatively limited impact compared to the others in this context.



These results can be interpreted to mean that institutions bearing the name "Union" exhibit greater focus and capacity in delivering microfinance services, possibly due to stronger organizational strategies or broader networks. Additionally, Zanzibar-based entities show a noticeable presence, underscoring the region's importance in microfinance activities. This finding confirm that the effectiveness of microfinance institutions is influenced by their organizational strength and geographic reach. Accordingly, the recommendation is to enhance collaboration between smaller institutions and stronger unions to amplify their impact and improve service delivery, with a focus on expanding outreach to high-need areas such as Zanzibar.

The data presented in Table 6 illustrate the assistance required (tools, materials, and equipment) to develop the beekeeping business, highlighting the variables, their categories, frequencies, and percentages. This analysis aims to present, discuss, and interpret the results to understand the essential support needed for advancing beekeeping enterprises. The table lists eight variables related to the assistance needed for beekeeping development. For the variable "getting modern beehives and equipment," 66 respondents (97%) indicated "Yes," while only 1 respondent (1%) answered "No," showing an overwhelming demand for modern beehives and equipment. Similarly, "technical training on beekeeping and honey production" received 67 "Yes" responses (99%) and no "No" responses, indicating that nearly all participants require technical training to improve production skills. The "support and promotion of marketing" also recorded 67 "Yes" responses (99%) with zero "No" answers, underscoring the importance of marketing assistance for beekeeping products. Likewise, "providing basic inputs of production" garnered 67 "Yes" responses (99%), emphasizing the need for essential production inputs to sustain the business. For "enhanced packaging," the results show 67 "Yes" responses (99%), highlighting the necessity of improving packaging to boost product quality and marketability. The variable "financial support or loans to expand" also received 67 "Yes" responses (99%), demonstrating a strong need for financial assistance to facilitate business expansion.

Furthermore, “established support for cooperatives association” and “access to new markets” both recorded 67 “Yes” responses (99%), indicating that institutional support through cooperatives and access to broader markets are critical for business growth.

Table 6: The assistance required (tools, Materials and equipment) to development beekeeping business

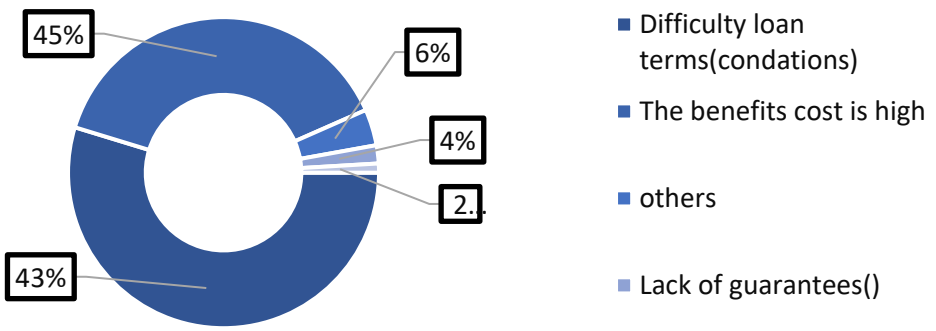
Variables	Categories	Frequency	Percent %
getting modern beehives and equipment.	Yes	66	97%
	No	1	1%
Technical training on beekeeping and honey production	Yes	67	99%
	No	0	0%
Support and promotion the marketing	Yes	67	99%
	No	0	0%
Providing basic inputs of production	Yes	67	99%
	No	0	0%
Enhanced packaging	Yes	67	99%
	No	0	0%
Financial support or loans to expand	Yes	67	99%
	No	0	0%
Established support for cooperatives association	Yes	67	99%
	No	0	0%
Access to new markets	Yes	67	99%
	No	0	0%

In summary, the results reveal that beekeeping businesses require comprehensive assistance across multiple areas: modern equipment, technical training, marketing support, production inputs, packaging, financial loans, cooperative support, and market access. All these elements are essential for developing and sustaining a successful beekeeping enterprise. The beekeeping development depends on integrated support encompassing technical, financial, and marketing assistance. Therefore, the professional recommendation is to design a holistic development program that provides modern beehives, technical training, marketing promotion, production inputs, packaging improvements, financial loans, cooperative frameworks, and market access to empower beekeeping businesses and enhance their sustainability and profitability.

Figure 24 presents a donut chart illustrating the reasons why entities lack access to financing, highlighting the distribution of various obstacles. The chart reveals that the primary reason for the lack of access to financing is the "Difficulty of loan terms (conditions)," which accounts for 45% of the responses. The second most significant factor is "The benefits cost is high," representing 43% of the reasons. Minor contributing factors include "others" at 6%, "Lack of guarantees" at 4%, and "Difficulty accessing" at 2%.

The results indicate that most financing obstacles are related to the stringent conditions attached to loans and the high cost of benefits associated with financing. This suggests that financial institutions impose restrictive loan terms and high costs, which deter potential borrowers from accessing financing. The negligible percentages attributed to "Lack of guarantees" and "Difficulty accessing" imply that these are less significant barriers compared to loan terms and costs. The "others" category, representing 6%, may encompass miscellaneous reasons not explicitly listed, yet it does not substantially impact the overall trend.

Figure 24: The reasons of don't access to financing



In conclusion, drawn from this analysis is that improving access to financing requires addressing the loan terms and reducing the associated costs. Financial institutions should reconsider their lending conditions and pricing strategies to make financing more accessible and affordable. Financial policymakers and lending institutions should design flexible loan products with transparent, reasonable terms and reduce benefit costs to enhance financing accessibility for businesses or individuals facing financial constraints. Additionally, providing clearer guidance on guaranteed requirements could further facilitate access to financing.

To improve credit penetration, financial institutions should develop sector-specific Sharia-compliant products with lower profit margins and flexible repayment grace periods that align with Honey production cycles. Simplifying guarantee requirements would further enable small-scale owners to transition from informal borrowing (relatives) to formal financial systems.

4.4 Mappin of the Beekeeping Value Chain

This chapter provides a comprehensive analysis of beekeeping value chain and honey production in certain districts of Lahj and Abyan governorates in Yemen. Through detailed mapping of the chain, identification of key actors, and description of the various stages from production to consumption, this analysis aims to understand the current state of the beekeeping Value chain, identify strengths, bottlenecks, and opportunities at each stage, and pave the way for developing effective strategies and interventions to improve chain performance and increase added value.

4.4.1 Beekeeping Value Chain Mapping

Value chain mapping is a crucial analytical tool that helps in understanding the entire path of a product from the farm to the consumer, identifying key actors and the relationships between them.

4.4.1.1 Main Stages of the Value Chain

The value chain for beekeeping and honey production in certain districts of Lahj and Abyan governorates in Yemen consists of 7 main stages (Table 7):

1. **Input Stage:** Provision of beekeeping inputs for beekeepers, such as feed, tools, equipment, beehives, bee feed, packing materials and medicines.
2. **Production Stage:** beekeepers, including the type of bee strain, beehives, beekeeping practices, and types of bee products (honey and bee by-products) This stage considers the basic stage of beekeeping value chain is beekeeper who produce honey and the other bee by-product especially beeswax in the study area, in this stage the primary value is created.
3. **Collection and Primary Processing:** Collect honey, Packing and store it and transport it the markets.
4. **Processing Stage:** Processes and treatments applied on the honey and beeswax, including cleaning, packaging and storage.
5. **Marketing and Distribution Stage:** Transportation and distribution of honey from the beekeepers to the markets include wholesale and retail sales, and honey exporters.
6. **Consumption Stage:** Consumption of honey by end-consumers, whether household or institutional consumption through cooperatives

4.4.1.2 Analysis of Key Actors

1. **Beekeepers :** They are responsible for beekeeping and can be classified into very small-scale beekeepers (1-4 hives), small-scale (5-10 hives), medium-scale (11-20 hives) and large-scale (≥ 20 hives).
2. **Intermediaries and Traders:** They are collecting buy honey and bee by-products from beekeepers and sell them to consumers, exporters, including brokers, wholesalers, and retailers
3. **Exporters:** They export honey and to foreign markets, especially the Arab Gulf countries.

4. **Consumers**: They are the end-users of the honey, whether in the local or foreign market.
5. **Supporting Institutions:** These include institutions that provide support and services to the value chain, such as the Ministry of Agriculture and Irrigation, the Agricultural Research and Extension Authority, agricultural cooperatives, financial institutions and banks, and some local community organizations.

The table 7 presents the key activities, stakeholders, actors, and main challenges across the beekeeping value chain. The results indicate that the beekeeping value chain consists of seven stages: Input Supply, Production, Collection and Primary Processing, Processing, Distribution and Marketing, Exporting, and Consumption. Each stage has its unique challenges and key actors.

In the Input Supply stage, input suppliers face challenges related to logistics and transportation, quality of inputs, and lack of financial and management skills. In the Production stage, beekeepers encounter difficulties with fluctuating prices of beekeeping inputs, diseases, limited access to extension and training services, and capital constraints. The Collection and Primary Processing stage is marked by challenges in collecting honey from remote areas, maintaining honey quality, and lack of processing facilities, all of which is exacerbated by poor road infrastructure and lack of modern processing facilities.

The Processing stage is hindered by the lack of tools and equipment required for efficient processing. In the Distribution and Marketing stage, challenges include fluctuating demand, price decline, quality issues, and logistics and transportation challenges. The Exporting stage faces similar challenges related to quality issues and logistics and transportation. Finally, in the Consumption stage, end consumers are affected by honey quality, prices, and low purchasing power.

The discussion of these results reveals that the beekeeping value chain is plagued by various challenges that affect its efficiency and profitability. The key actors in the chain, including input suppliers, beekeepers, cooperatives, intermediaries, and traders, all face unique challenges that need to be addressed to ensure the sustainability of the chain.

As showing in this finding, the beekeeping value chain requires significant improvements in infrastructure, access to finance, training, and market information to overcome the challenges it faces. Based on these findings is to develop a comprehensive strategy that addresses the challenges in each stage of the value chain, including investing in infrastructure, providing training and capacity-building programs for beekeepers and other actors, improving access to finance and market information, and promoting sustainable beekeeping practices to enhance the quality and competitiveness of honey products.

Table 7: Key activities, stakeholders, actors and main challenges across beekeeping value chain.			
Stage	**Key Activities**	**Key Actors**	**Main Challenges**
1. Input Supply	Provide bee feed, medicine, beekeeping tools and equipment.	Input Suppliers	Logistic and transportation challenges, quality of inputs and lack to some skills in financial and management field
2. Production	Beekeeping and bee health care, bee feeding, disease control, honey harvesting, and direct Marketing to customers	beekeepers	Prices fluctuating of beekeeping inputs, diseases, difficulty accessing Extension and training service and capital, lack to modern skills
3. Collection and Primary Processing	Communication, Collection Transport, Processing - Packaging, Bottling and Storage	beekeeping cooperative, Intermediaries and Traders (wholesalers and retailers)	Difficulty collecting honey in remote areas, maintaining honey quality, Lack of processing facilities, poor road infrastructure, poor quality.
4. Processing	Honey Preparation and processing include Purification, filtration, packaging and branding.	beekeeping cooperative, Intermediaries and Traders (wholesalers).	Lack to the tools and equipment Processing required.
5. Distribution and Marketing	Product transportation, cold storage, wholesale and retail sales.	Distributors, wholesalers, retailers, grocery stores.	Fluctuating demand, Price decline, quality issues and logistics and transportation challenges
6. Exporting	Honey Preparation and processing include Purification, filtration, packaging, branding and finally export	honey exporters	quality issues and logistics and transportation challenges
7. Consumption	Purchase and consumption of honey by households.	End Consumers.	Honey quality, prices and Low purchasing power

Also, Figure 25 provides a visual map of the main actors in the beekeeping value chain and their functions, illustrating the sequential stages from input supply to retail selling of honey. The value chain begins with the Inputs supplier, who provides general agricultural and beekeeping inputs to the Beekeeping Producer (beekeepers). The producers are responsible for Honey Produced, which is then collected by the beekeeping cooperative in the Honey Collection stage. The cooperative acts as an intermediary that gathers honey from multiple producers and channels it to the next phase. In the Honey Processing stage, the beekeeping cooperative collaborates with Traders (wholesalers) to refine and prepare the honey for market. The processed honey then enters the Honey Marketing phase, where Distributors and wholesalers promote and allocate the product to two possible outlets: Honey Export or Honey Retail Selling. The export pathway involves Wholesalers and honey exporters who transport the honey to international markets. The retail pathway directs the honey to Retailers, who sell the final product to consumers.

The beekeeping value chain is structured around cooperation between producers, intermediaries, and traders, emphasizing the role of cooperatives in aggregating

production and facilitating processing and marketing. The chain highlights the importance of efficient linkages between actors to ensure quality and market access, as well as the dual market orientation (export and domestic retail) that can enhance profitability for beekeepers.

The general conclusion drawn from the analysis is that strengthening the organizational capacity of beekeeping cooperatives and improving the coordination among intermediaries, processors, and marketers can significantly enhance the overall efficiency and profitability of the honey value chain.

Invest in institutional development of beekeeping cooperatives and establish integrated market linkages that streamline honey processing, quality control, and distribution, while promoting export promotion strategies and strengthening domestic retail networks to maximize value addition and income for beekeepers.

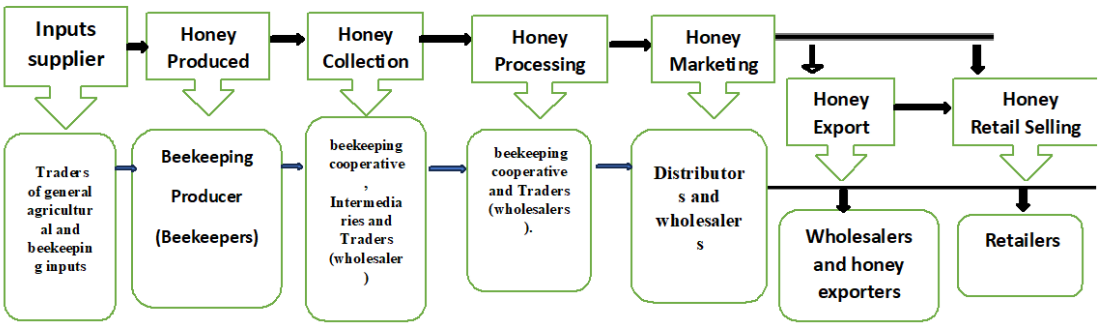


Figure 25: Map of the main actors of the beekeeping value chain and their functions

Source: Organized from field study of Beekeeping Value chain analysis.

4.4.1.3 Relationships Between Actors in the Beekeeping Value Chain.

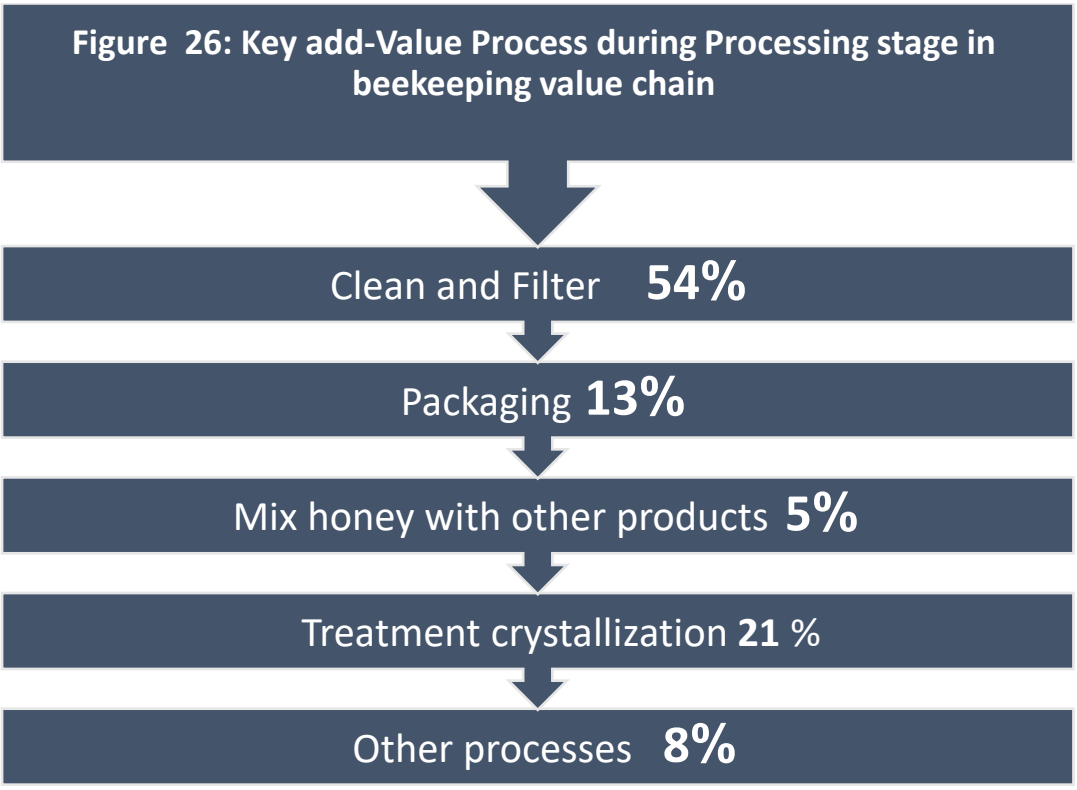
The relationships between actors in the beekeeping value chain in Lahj and Abyan are characterized by complexity and interdependence, influenced by factors such as trust, bargaining power, and access to information. Some key relationships include:

1. Relationship between beekeepers and intermediaries: This relationship is often unbalanced, with intermediaries holding greater bargaining power due to limited marketing options available to beekeepers.
2. beekeepers are often forced to sell their products at low prices, especially during peak seasons when supply exceeds demand in local markets.
3. Relationship between intermediaries and exporters: This relationship is marked by cooperation and coordination, with exporters relying on intermediaries to collect large quantities of honey from producers.
4. Relationship between exporters and external markets: This relationship is influenced by competition from other exporters and quality and safety requirements in target markets.
5. Relationship between beekeepers and Processors: This relationship is still limited due to the scarcity of honey-based processing industries in Yemen, but it represents an important opportunity for developing the beekeeping value chain.

4.4.2 Processing and Value addition Stage

4.4.2.1 Processing

Figure 26 illustrates the key value-adding processes during the processing stage in the beekeeping value chain, the results presented in the figure show a sequence of interrelated processes that contribute to adding value to beekeeping products, with the percentages indicating the impact of each process on the added value. The first process, Clean and Filter, accounts for 54% of the added value, reflecting its significant importance in removing impurities and improving honey quality. This is followed by Packaging at 13%, which is essential for ensuring product safety and facilitating marketing. Next is Mix honey with other products at 5%, aimed at diversifying products and adding extra value. Then, Treatment crystallization contributes 21%, a crucial process for maintaining honey quality and preventing undesirable crystallization. Finally, Other processes make up 8%, which may include additional steps to enhance the product.



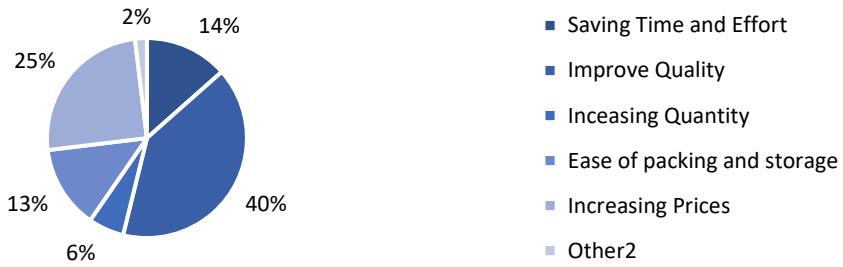
These results indicates that clean and filter is the most influential factor in adding value, emphasizing the need for high-quality primary processing of honey. The moderate importance of packaging and crystallization treatment directly affects the final product quality and market acceptance. While mix honey with other products has a smaller impact, it can be a strategy for product diversification.

The overall conclusion drawn is that improving the quality of primary processing (cleaning and filtering) and crystallization treatment is fundamental to enhancing value

in the beekeeping chain. It is necessary to focus on improving the efficiency of cleaning, filtering, and crystallization processes, and to invest in advanced packaging technologies, to enhance product quality and increase the added value in the beekeeping value chain".

Figure 27 outlines the perceived advantages of honey processing in the manufacturing stage, highlighting the perceived benefits that drive beekeepers and producers to engage in processing activities. The results indicate that the primary advantage of honey processing is the improvement of quality, which accounts for 40% of the responses. This suggests that producers prioritize enhancing the quality of honey to meet market demands and achieve better product standards. The second most significant advantage is the increase in prices, representing 25% of the responses, which reflects the economic incentive of processing honey to obtain higher market value. Saving Time and Effort accounts for 14%, showing that efficiency in production processes is also a notable consideration. Meanwhile, Ease of packing and storage (13%) and Increasing Quantity (6%) indicate lesser but still relevant motivations related to logistics and production volume. The remaining 2% is attributed to other miscellaneous advantages. These results reveal that quality enhancement is the central motivation for honey processing in the manufacturing stage, emphasizing the importance of quality control and product differentiation in the market. The focus on price increase underscores the economic benefits that processing adds to the value chain, enabling producers to achieve higher profitability.

Figure 27: The advantages of honey processing in stage manufacture

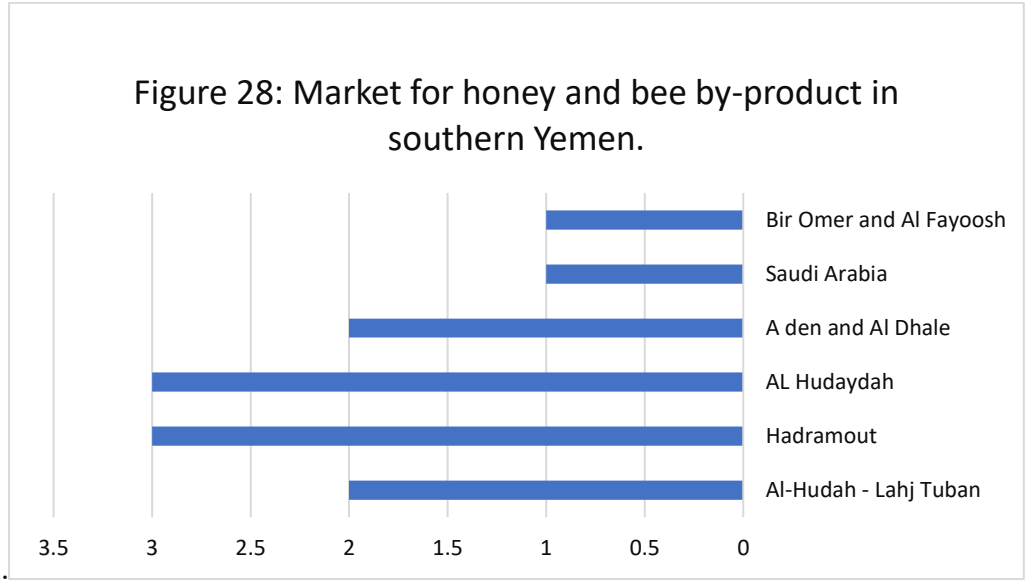


The relatively lower emphasis on quantity suggests that producers are more concerned with value-added improvements than with expanding production volume.

The general conclusion drawn from the analysis is that honey processing primarily aims to improve product quality and increase market value, with quality being the dominant factor influencing processing decisions. Based on these findings is to invest in quality-enhancement technologies and processes during honey manufacturing, such as advanced filtration and standardization techniques, to maximize the quality and market price of honey. Additionally, providing training on efficient processing methods can help producers optimize time and effort, thereby enhancing overall productivity and profitability in the honey value chain.

4.4.3 Products distribution and marketing

Figure 28 illustrates the markets for honey and bee by-products in southern Yemen, presenting a comparative analysis of market volumes across various regions and export destinations. The largest market is Bir Omer and Al Fayoosh, with a value approaching 3.0, indicating that this local Yemeni market absorbs the highest volume of honey and bee products in the southern region. The second position is occupied by Saudi Arabia, reflecting a substantial export market with a value slightly above 2.0, which underscores the importance of cross-border trade with the neighboring country. The third market comprises Aden and Al Dhale, registering a value near 1.5, showing a moderate regional demand within southern Yemen. Al Hudaydah follows with a value just below 1.5, suggesting a notable but lesser market compared with the preceding regions. The Hadramout region exhibits a market value of approximately 0.5, indicating a relatively small local consumption or production outlet for these products. The smallest market shown is Al-Hudah – Lahj Tuban, with a value near zero, implying minimal or negligible activity in honey and bee by-product commerce in that area. The distribution of market volumes reveals that the primary outlets for honey and bee by-products in southern Yemen are localized markets such as Bir Omer and Al Fayoosh, which dominate the sector, followed by significant export opportunities in Saudi Arabia. The intermediate regional markets (Aden-Al Dhale and Al Hudaydah) demonstrate moderate engagement, while the eastern and specific sub-regional markets (Hadramout and Al-Hudah – Lahj Tuban) exhibit limited participation. This pattern suggests that market development efforts should prioritize strengthening local infrastructure in high-potential areas and enhancing export logistics to sustain the flow to Saudi Arabia, while also stimulating demand in the lesser-active regions through targeted promotion and value-added processing of bee products.



In summary, the honey and bee by-product sector in southern Yemen is concentrated in specific local markets and relies heavily on the Saudi export market, with substantial untapped potential in secondary regions. policymakers and stakeholders should focus

on improving market access and logistical infrastructure for the dominant local markets (Bir Omer and Al Fayoosh) and on expanding export promotion strategies targeting Saudi Arabia, while simultaneously initiating development programs—such as training, financing, and marketing support—to stimulate honey and bee-product activities in the underperforming regions (Hadramout and Al-Hudah – Lahj Tuban) and thereby achieve a more balanced and resilient regional market.

Table 8 ranks the relative economic importance of various honey types on a scale of 1 (high) to 5. Sidr and Sumor honey receive the highest importance score (1.0), indicating their premium market value and demand. In contrast, Saisaban honey has the lowest ranking (4.7), suggesting it is of lesser economic significance. The average score across all types is 2.4.

Table 8: The relative economic importance score (1-5).

Honey Type	Importance Rank
Season honey	2.0
Sidr honey	1.0
Maraee honey	2.0
Demon honey	3.5
Saisaban honey	4.7
Sumor honey	1.0
Penis (kadhb)honey	3.0
Dhobaa honey	3.0
total	2.4

The data presented in Figure 29 illustrate the marketing channels utilized by honey producers, showing the percentage distribution of honey sales through various distribution mediums. The figure depicts the allocation of five primary marketing channels for honey producers: retailers (21%), wholesalers (10%), exporters (24%), direct sales (32%), and brokers (13%). It is evident that direct sales represent the most prominent channel in honey marketing, accounting for the highest share (32%), which reflects producers' preference for eliminating intermediaries to increase profit margins and establish direct consumer connections. Exporters follow in importance with 24%, indicating a significant portion of production is targeted at foreign markets, thereby enhancing business expansion opportunities. Retailers constitute 21%, highlighting their relevance in the local supply chain. Wholesalers and brokers have lower shares (10% and 13%, respectively), suggesting a reduced reliance on intermediary trading.
This finding derived from this analysis is that honey producers primarily depend on direct sales and exports to maximize profits and achieve broader market access.
To strengthen direct marketing strategies and develop export capabilities by improving product quality and reducing reliance on intermediaries to increase profitability. Additionally, supporting producers with training programs can help them leverage direct sales and export channels more effectively.

Figure 29: Marketing channels for honey producers

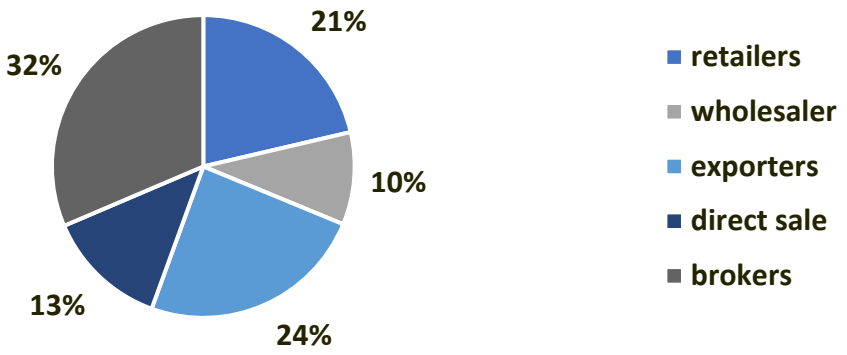


Table 9 presents the business activities among wholesalers and retailers in the beekeeping value chain, The results show that 57.1% of wholesalers and retailers engage in honey trading only, while 42.9% trade both honey and beekeeping inputs. All respondents (100%) trade in honey products, with none involved in bee by-product trading. The primary source of honey is directly from producers, accounting for 78.6% of the respondents, while 21.4% purchase from wholesalers. The most common types of honey traded are Sumar honey and Sidr honey, both at 100%, followed by pasture honey at 78.6%, and Dhobah honey at 35.7%.

In terms of processing activities, all respondents (100%) engage in honey packaging and labeling, and honey purification. Additionally, 92.9% of respondents are involved in honey grading and sorting. After purchasing, 57% of respondents store honey products, while 43% do not. The primary source of market information is through communications and social media, accounting for 29% of respondents, followed by direct communication and brokers at 43%, and direct communication alone at 7%.

Table 9: The business activities among wholesalers and retailers in the beekeeping value chain.

Variables	Categories	Frequency	Percentage%
Trade activities Type	Honey Trading only	8	57.1
	Honey and beekeeping inputs	6	42.9
Honey Product and bee By-Product	Honey Trading	14	100
	Bee By-Product Trading	0	0
Honey Product Purchasing Source	Directly from producers	11	78.6
	From wholesalers	3	21..4
Honey Type	Pasture honey	11	78.6
	Sumar honey	14	100
	Sidr honey	14	100
	Dhobah Honey	5	35.7
Processing activities	Honey grading and sorting	13	29.9

	Honey packaging and labeling	14	100
	Honey Purification	14	100
Store Honey Product and By-Product Type after purchased	No	6	43%
	Yes	8	57%
Source of markets' information's	communications and social media	4	29%
	direct communication	1	7%
	Direct communication and brokers	6	43%

These results reveal that wholesalers and retailers play a crucial role in the beekeeping value chain, with a strong focus on honey trading and processing. The fact that all respondents engage in honey packaging, labeling, and purification suggests a high level of commitment to product quality, also, the wholesalers and retailers are essential actors in the beekeeping value chain, and their activities have a significant impact on the quality and marketability of honey products.

Based on these findings is to support wholesalers and retailers in enhancing their business operations, particularly in areas such as market information and storage facilities, to further improve the efficiency and profitability of the beekeeping sector. Additionally, training programs on best practices in honey handling and storage can help maintain product quality and safety.

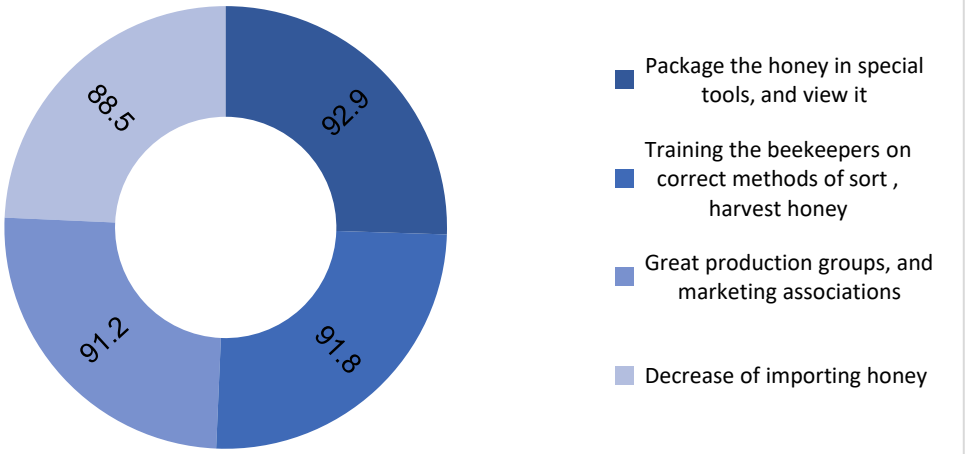
The following analysis presents and discusses the business performance of wholesalers and retailers in the honey market, Table 10 outlines the wholesaler and retailer information for honey products, showing that there are 3 wholesalers, and 11 retailers involved in the market. The honey production sector engages 60 male producers and 8 female producers, indicating a significant gender imbalance in favor of men. The total wholesaler honey sales amount to 145.5 kg, while retailers sell 38 kg, suggesting that wholesalers handle a substantially larger volume of honey compared to retailers. The unit purchase price for wholesalers is 15,000 Yemeni rials (YER), and for retailers it is 18,200 YER, reflecting a markup in the supply chain. The selling price of honey at the wholesale level is 18,333 YER, and at the retail level it rises to 41,727 YER, demonstrating a considerable price increase as the product moves from wholesalers to retailers due to added margins. In terms of profitability, the total revenue profit for wholesalers is 2,666,666 YER, while retailers generate a profit of 1,585,454 YER. This indicates that wholesalers achieve higher overall profits despite handling larger volumes and lower per-unit margins, likely due to economies of scale.

Table 10: Wholesaler and Retailer's business information for honey Product		
Variable	**Measurement Unit**	**value**
Wholesaler No.	No.	3
Retailers No.	No.	11
Number of Producers / men	No.	60
Number of Producers / Women	No.	8
Wholesaler honey Sales/KG	KG	145.5
Retailers honey Sales/KG	KG	38
Wholesaler / Unit Purchase Price/ YER	YER	15,000
Retailers / Unit Purchase Price/ YER	YER	18,200
Honey Salling Price of Wholesaler / YER	YER	18,333
Honey Salling Price of Retailers/ YER	YER	41,727
Revenue Profit of Wholesaler	YER	2,666,666
Revenue Profit of Retailers	YER	1,585,454

The honey market exhibits a structured supply chain where wholesalers dominate in volume and overall profit, while retailers focus on higher margin sales to compensate for smaller volumes. Gender disparity in production suggests a need for inclusive participation strategies. To enhance market efficiency and equity, it is recommended to empower female producers through training and access to resources, optimize retailer pricing strategies to improve competitiveness, and strengthen supply chain coordination between wholesalers and retailers to balance profit margins and market reach.

The figure presents suggestions by beekeepers and traders to improve honey prices. The results of Figure 30 indicate that beekeepers and traders have proposed four main suggestions to enhance honey prices. The highest percentage (92.9%) of respondents suggested packaging the honey in special tools and viewing it, implying that proper packaging and presentation are crucial for increasing honey prices. The second-highest percentage (91.8%) recommended training beekeepers on correct methods of sorting and harvesting honey, highlighting the importance of improving beekeeping practices to enhance product quality and price. Additionally, 91.2% of respondents emphasized the need for great production groups and marketing associations, suggesting that collective organization and marketing efforts can improve honey prices. Furthermore, 88.5% of respondents proposed decreasing the import of honey, indicating that reducing market competition from imported honey can help increase local honey prices. These suggestions reveal that beekeepers and traders recognize the need for a multifaceted approach to improve honey prices, focusing on product quality, presentation, training, organization, and market protection.

Figure 30: Suggestions by beekeepers and trades to improve the honey prices



These results indicate that enhancing honey prices requires improvements in packaging, beekeeping practices, marketing, and market regulation. based on these findings is to implement programs that provide beekeepers with training on modern beekeeping and packaging techniques, support the establishment of production and marketing cooperatives, and advocate for policies that protect local honey production from excessive imports, thereby enhancing the quality, marketability, and price of local honey.

Table 11 presents a set of suggested strategies for developing honey and by-product marketing, evaluating their importance through statistical measures derived from a survey of respondents. The results in Table 12 indicate the relative significance of eight variables aimed at enhancing honey and by-product marketing. The variable Enhancing role of cooperatives achieved the highest mean score (4.50) with a standard deviation of 0.938, suggesting that strengthening cooperative involvement is perceived as the most critical factor for improving honey marketing. This reflects the importance of collective action in supporting beekeepers through shared resources and market access. The second-ranked variable, Develop Package and Brand commercial (mean = 4.26, SD = 0.803), highlights the necessity of investing in packaging and branding to increase product competitiveness and marketability. Closely following is diversification the secondary product of honey (mean = 4.19, SD = 0.935), indicating that expanding into secondary honey products is viewed as a valuable strategy for maximizing revenue and reducing dependency on raw honey sales alone. The training of beekeepers on marketing skills (mean = 4.16, SD = 0.891) and enhancing the access to new markets (mean = 4.09, SD = 0.805) also scored highly, emphasizing the need for skill development among beekeepers and the expansion of market reach to improve sales performance. Enhancing of Honey quality obtained a mean of 4.01 (SD = 0.889), underscoring the importance of quality improvement in maintaining consumer trust and product value. The Collectively Honey sailing (mean = 3.96, SD = 0.818) and using digital social media (mean = 3.94, SD = 0.944) received relatively lower scores,

suggesting that while collective selling and digital marketing are considered useful, they are perceived as less critical compared to cooperative development and brand

Table 11: Suggestion to develop honey and by- product marketing.

Variables	N	Mini	Max	Mean	Std. Deviation
Enhancing role of cooperatives	68	1	5	4.5	0.938
develop Package and Brand commercial	68	2	5	4.26	0.803
diversification the secondary product of honey	68	1	5	4.19	0.935
training of beekeepers on marketing skills	68	1	5	4.16	0.891
Enhancing the access to new markets	68	2	5	4.09	0.805
Enhancing of Honey quality	68	1	5	4.01	0.889
Collectively Honey sailing	68	1	5	3.96	0.818
Using digital social media	68	1	5	3.94	0.944

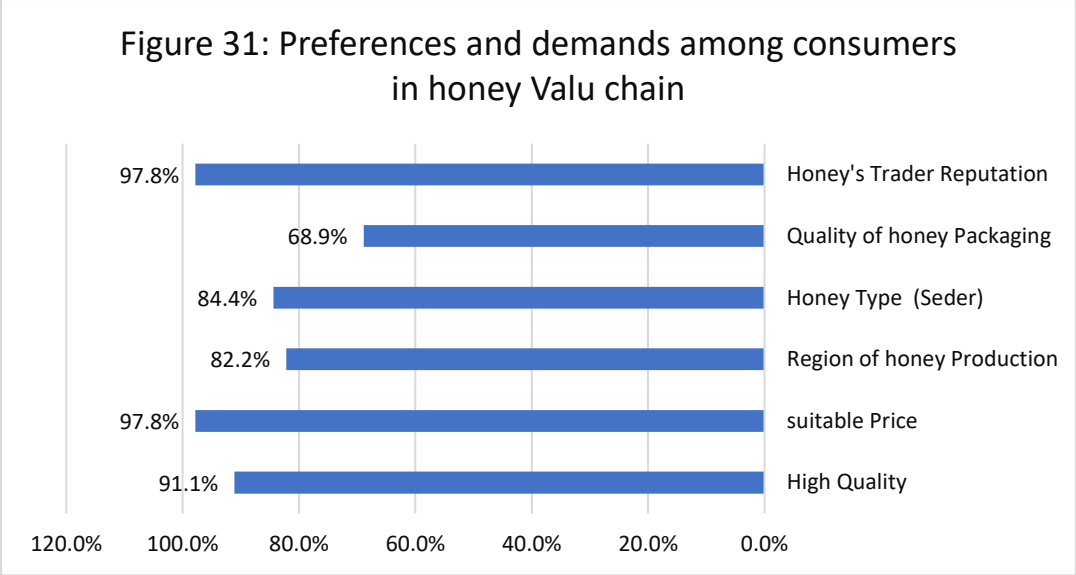
The honey producers prioritize cooperative strengthening, branding, and product diversification as essential strategies for effective marketing. These factors are seen as key drivers for enhancing profitability and market access. To focus on establishing robust cooperative frameworks, investing in brand and packaging development, and promoting diversification of honey by-products. Additionally, providing targeted marketing training for beekeepers and ensuring quality enhancement will further support market expansion and profitability.

4.4.4 Consumption Stage

The development of the honey market hinges on understanding consumer preferences and priorities, which can be gleaned from the proposed strategies outlined in Table 12. By analyzing these consumer-driven insights, stakeholders can identify key areas to focus on for enhancing market growth and competitiveness.

Figure 31 presents the preferences and demands among consumers in the honey value chain, focusing on factors influencing honey purchasing decisions.

The results indicate that consumers prioritize several key attributes when purchasing honey. The most influential factors are suitable price and honey's trader reputation, both rated at 97.8%. High quality is also a significant consideration, with 91.1% of consumers emphasizing its importance. Additionally, 84.4% of consumers prefer a specific honey type, namely Seder honey, and 82.2% consider the region of honey production in their purchasing decision. In contrast, the quality of honey packaging is the least prioritized factor, with 68.9% of consumers considering it important.



These results indicate that consumers in the honey value chain are highly sensitive to price and trader reputation, indicating that market success depends significantly on competitive pricing and trust in traders. The emphasis on high quality and specific honey types suggests that product differentiation and quality assurance are crucial for consumer satisfaction. The relatively lower importance of packaging quality implies that investments in marketing should focus more on intrinsic product attributes and reputation rather than packaging.

In conclusion the consumer preferences in the honey value chain are driven primarily by price, trader reputation, and product quality, with specific preferences for certain honey types and production regions, based on these findings is to develop strategies that enhance product quality, ensure competitive pricing, and build a strong trader reputation. Additionally, marketing efforts should highlight the specific attributes of honey types and production regions to meet consumer preferences and increase market competitiveness.

The following analysis presents and discusses the results depicted in Table 12, which outlines proposed strategies for honey market development ranked by consumer importance degree. Table 12 displays consumer evaluations of six variables intended to enhance the honey market, scored on an importance scale from 1 to 5. The variables include “Increase of Quality Control,” “Price control,” “Conduct Healthy Packaging,” “Create new market channel,” “Support beekeepers' Cooperative association,” and “Create attractive packaging and labeling.” The numerical distributions indicate the frequency with which consumers assigned each importance level to the respective variables. The results reveal that “Increase of Quality Control” is perceived as the most critical factor, with the majority of respondents assigning it the highest importance (5), totaling 38 responses, and none rating it below 4. This emphasis suggests that consumers prioritize assurance of honey purity and safety above other considerations. “Create attractive packaging and labeling” also received a strong preference for the

highest importance level (35 responses), indicating that visual appeal and clear information significantly influence purchasing decisions. Similarly, “Conduct Healthy Packaging” and “Support beekeepers' Cooperative association” were both rated 5 by 30 respondents, highlighting the value placed on health-oriented packaging and the welfare of producers.

In contrast, “Price control” shows a mixed perception; while 29 consumers assigned it an importance of 4, only 9 chose the highest level, implying that price is a moderate concern compared with quality and packaging. “Create new market channel” received the broadest distribution, with notable scores at levels 3 (18 responses) and 4 (14 responses), suggesting that expanding distribution is seen as important but less critical than quality or packaging enhancements.

Table 12: Proposed for honey market development by consumer according on importance degree important

Variable	1	2	3	4	5
Increase of Quality Control	1	1	1	4	38
Price control	1	1	5	29	9
Conduct Healthy Packaging	1	1		13	30
Create new market channel	1	5	18	14	7
Support beekeepers' Cooperative association	1	2	6	6	30
Create attractive packaging and Lebling	1	2	3	4	35

These findings confirm that consumers prioritize quality assurance and packaging attributes when evaluating honey market development. Market strategies should therefore focus on enhancing product quality and designing appealing, health-focused packaging to meet consumer expectations and strengthen market competitiveness.

Consequently, the recommendation is to implement a comprehensive quality-management program combined with innovative, consumer-centric packaging and labeling initiatives. Additionally, supporting beekeepers’ cooperatives can improve product reputation and sustainability, thereby fostering consumer trust and expanding market share in the honey industry.

Understanding consumer purchasing decisions is crucial for effective market strategy formulation in the honey industry, as illustrated in Table 13, which presents factors affecting purchase decisions according to their importance degree.

The results in Table 13 indicate that the factors influencing consumer purchase decisions are ranked based on their importance score. The factor “Honey’s Trader Reputation” achieved the highest score of 36, signifying that consumers place the greatest emphasis on the reputation of the honey trader when making purchasing decisions. This is closely followed by “High Quality” with a score of 35, demonstrating that product quality is also a paramount consideration for consumers. The factor “Suitable Price” received a score of 34, highlighting price sensitivity among consumers as a significant driver of purchase behavior. “Honey Type (Seder)” obtained a score of 32, indicating that the specific type of honey is relatively important to consumers. In

contrast, “Quality of honey Packaging” scored 20, suggesting that while packaging quality affects decisions, it is less influential compared with the other factors. The least impactful factor is “Region of honey Production,” which scored only 7, implying that the geographical origin of honey has minimal influence on consumer choices in this context. These results reveal that consumers prioritize trust and quality attributes when purchasing honey. The prominence of trader reputation underscores the importance of brand credibility and reliability in the honey market. High quality and suitable pricing are also critical, reflecting consumer expectations for premium products at reasonable costs. The relatively lower emphasis on packaging quality and production region suggests that consumers focus more on intrinsic product attributes and seller trustworthiness than on extrinsic cues like packaging or origin.

Table 13: Factors affected on purchase consumer decision according on importance degree important

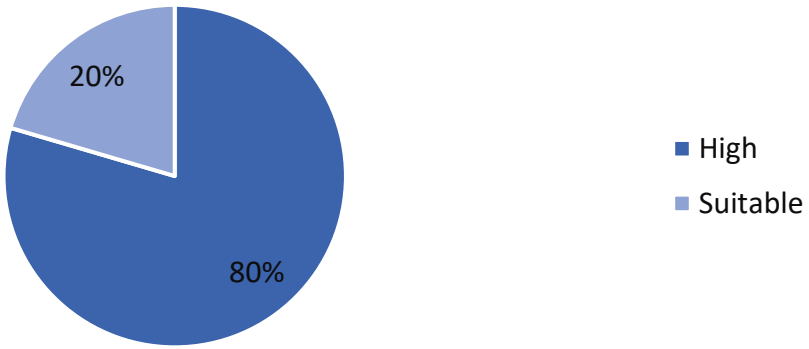
Variable	1	2	3	4	5 score
High Quality	1		3	6	35
suitable Price	1			10	34
Region of honey Production	1	1	15	21	7
Honey Type (Seder)	1		6	6	32
Quality of honey Packaging	1	5	8	11	20
Honey's Trader Reputation	1			8	36

In conclusion for enhancing trader reputation, ensuring high product quality, and offering competitive pricing are the key strategies for influencing consumer purchase decisions in the honey market, so based on these findings is to focus marketing and operational efforts on building a strong trader reputation through transparency, quality assurance, and excellent customer service, while maintaining high product quality and competitive pricing. Additionally, emphasizing quality certifications and authentic branding can further strengthen consumer trust and drive purchase decisions in the honey industry.

The date in "Figure 32: Consumer's assessment of the current honey prices" presents the distribution of consumer opinions regarding the prevailing prices of honey.

The results indicate that 80% of consumers perceive the current honey prices as high, while the remaining 20% consider them suitable. This distribution suggests a strong consumer sentiment that the price level of honey is excessive for the majority of the market, implying that the affordability of honey is a significant concern among consumers.

Figure 32: Consumer's assessment of the current honey product prices

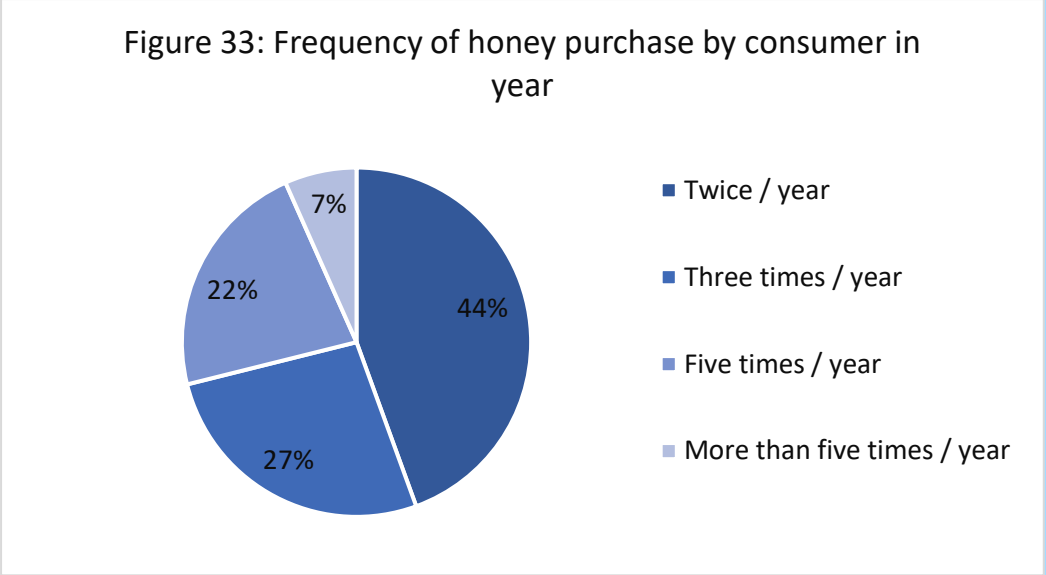


The large proportion of respondents classifying prices as high may reflect market conditions such as increased production costs, supply constraints, or perceived value mismanagement, which have driven prices beyond what most consumers deem reasonable. Conversely, the smaller segment that finds the prices suitable implies that a niche group of consumers either values the product highly or possesses sufficient purchasing power to accept the current pricing.

The overall finding reveals a predominant consumer dissatisfaction with honey pricing, signaling potential market challenges for producers and retailers in maintaining demand and customer loyalty. Consequently, it is recommended that stakeholders in the honey industry conduct a comprehensive pricing strategy review, focusing on optimizing production efficiency, enhancing supply chain transparency, and aligning price settings with consumer affordability expectations to improve market acceptance and sustain competitiveness.

The frequency of honey purchases among consumers is a crucial aspect of understanding market dynamics and consumer behavior, as illustrated in Figure 33. By examining the distribution of purchase frequencies, we can gain insights into consumer preferences and habits that can inform marketing and sales strategies.

The results in Figure 33 indicate that 44% of consumers purchase honey twice a year, while 27% purchase it three times a year, 22% purchase it five times a year, and 7% purchase it more than five times a year. This distribution suggests that the majority of consumers tend to purchase honey at a moderate frequency, with a significant proportion purchasing it multiple times a year.



Through analysis of these results, it can be observed that consumers exhibit diverse purchasing habits, with some purchasing honey frequently and others less so. The largest segment of consumers (44%) purchasing honey twice a year may indicate a regular consumption pattern, while the 7% purchasing more than five times a year may represent a niche market of heavy users. The honey market exhibits a range of purchase frequencies, with a significant proportion of consumers purchasing honey regularly.
Based on these findings is to develop targeted marketing strategies that cater to different consumer segments, such as offering loyalty programs for frequent purchasers or promotional offers for less frequent buyers, to increase sales and customer loyalty.

4.5 Cost-benefit analysis across value chain

The beekeeping value chain is a vital economic sector that provides employment opportunities and generates income for numerous individuals and businesses across various stages of production and distribution. This section aims to analyze the economic aspects of the beekeeping value chain, including cost analysis, revenue, profitability, and resource utilization efficiency. The focus will be on examining value addition at different stages of the value chain, from raw honey production to the distribution of final ship of honey. The study will also investigate the distribution of value added among various actors in the chain, including beekeepers, processors, wholesalers, and retailers. Through this analysis, the most profitable stages in the value chain will be identified, and opportunities for improving efficiency and increasing profitability will be determined. The findings will inform recommendations to enhance the performance of the value chain and contribute to the local economy.

4.5.1 Value addition across active actors

The honey value chain is a complex network of activities that add value to the product, from beekeeping to retail. Understanding the value added and profit margins at each stage of the value chain is crucial for identifying areas of improvement and optimizing the overall efficiency of the chain.

The results in Table 14 provide a detailed breakdown of the add-value and profit margin estimates across different stages of the honey value chain in the study area.

The results in Table 14 indicate that the beekeepers incur raw input costs of 10,000 YER and operating costs of 1,000 YER, selling their produce at 25,000 YER, thereby adding a value of 14,000 YER and achieving a gross profit of 14,000 YER with a profit margin of 56%. This suggests that beekeepers capture a significant portion of the value chain, indicating their crucial role in the production process.

Wholesalers purchase honey at 25,000 YER, incur operating costs of 5,000 YER, and sell it for 35,000 YER, adding a value of 5,000 YER and realizing a gross profit of 5,000 YER with a profit margin of 14.3%. This reflects a lower value addition and profit margin compared to other stages, suggesting potential for improvement in their operational efficiency.

Processors buy honey at 35,000 YER, have operating costs of 15,000 YER, and sell the processed product for 55,000 YER, adding a value of 5,000 YER and generating a gross profit of 5,000 YER with a profit margin of 9%. Processors thus contribute to value addition, although their profit margin is relatively low.

Retailers purchase honey at 55,000 YER, incur operating costs of 5,000 YER, and sell it for 70,000 YER, adding a value of 10,000 YER and achieving a gross profit of 10,000 YER with a profit margin of 14.3%. Retailers play a notable role in value addition and profit generation.

The total operating costs across the value chain amount to 26,000 YER, with a total value added of 60,000 YER and a total gross profit of 34,000 YER. The distribution of value addition shows beekeepers and retailers contribute significantly to the value chain.

Table 14: Add-value and profit margin estimate across deferent stage of honey value chain in the study area

Stage	Purchase price / YER	Operating costs / YER	Total cost / YER	Selling price / YER	Value added / YER	Gross profit / YER	Profit margin %
Beekeepers	Raw Inputs	10000	1000	25000	25000 **(35.7%)**	15000 **(37.5%)**	60%
Wholesaler	25000	5000	3000	35000	1000 **(14.3%)**	5000 **(12.5%)**	14.3%
Processors	35000	10000	45000	55000	2000 (**28.6%**)	10000 **(25%)**	18.3%
Retailers	55000	5000	60000	70000	15000 **(24.4%)**	10000 **(25%)**	14.3%
Total	115000	30000		70000	70000	40000	

The honey value chain exhibits uneven distribution of value addition and profit margins among its actors. Consequently, the recommendation is to optimize the honey value chain by enhancing the efficiency of wholesalers and processors through improved logistics, market access, and capacity-building programs to maximize value addition and ensure equitable profit distribution among all actors in the chain.

5. Challenges, Constraints, Solutions and Opportunities.

The honey industry is at a critical juncture, facing multifaceted challenges that impact its sustainability and efficiency. From production to distribution, various obstacles hinder the sector's growth and profitability. However, alongside these challenges lie significant opportunities for innovation, improvement, and growth. This section explores the key challenges confronting honey producers, potential opportunities to enhance input supply and production processes, and proposed solutions to address these issues, based on the findings presented in section.

5.1 Challenges, Issues and constraints

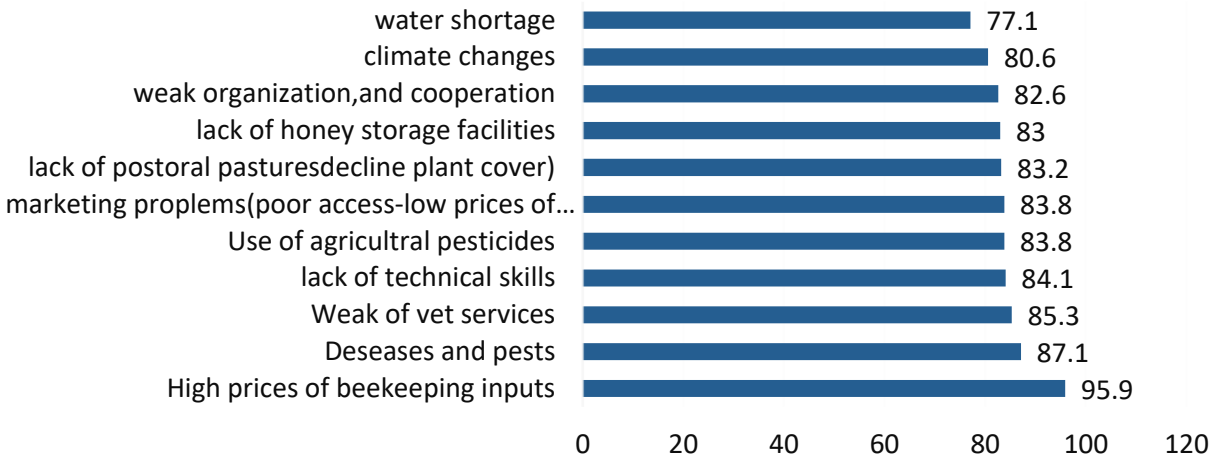
The honey value chain is subject to various challenges and constraints that impact its efficiency, profitability, and sustainability. Understanding these challenges is crucial for developing effective strategies to address them and enhance the overall performance of the honey industry.

The analysis of the beekeeping value chain necessitates an examination of the key challenges and constraints that affect income-generating activities in this sector, as illustrated in Figure 34, which presents the extent of agreement on key issues of income-generating activities in beekeeping, listing ten major challenges with their corresponding percentage of agreement among respondents. The highest-ranked issue is the "High prices of beekeeping inputs" with an agreement rate of 95.9%, indicating that the cost of inputs (equipment, supplies, etc.) is perceived as the most significant constraint affecting profitability. The second most agreed-upon challenge is "Diseases and pests" at 87.1%, highlighting the substantial impact of health issues on bee colonies and production. "Weak of vet services" follows with 85.3%, suggesting that limited veterinary support exacerbates disease management problems. "Lack of technical skills" and "Use of agricultural pesticides" both score 84.1% and 83.8% respectively, pointing to deficiencies in expertise and environmental factors harming bee health. "Marketing problems (poor access-low prices of honey)" also registers 83.8%, reflecting difficulties in market access and price realization for honey. "Lack of postural pastures (decline plant cover)" and "lack of honey storage facilities" score 83% and 82.6% respectively, indicating issues related to forage availability and post-harvest handling. "Weak organization and cooperation" are agreed upon by 80.6% of respondents, underscoring the need for better collective action among beekeepers. Finally, "climate changes" and "water shortage" receive 80.6% and 77.1% agreement, highlighting environmental stressors affecting beekeeping activities.

The beekeepers face a multifaceted set of challenges that are both economic and environmental in nature. The prominence of high input prices suggests that production costs are a primary barrier to profitability, necessitating interventions that reduce input expenses or improve access to affordable resources. The significant impact of diseases, pests, and weak veterinary services indicates a critical need for enhanced health management programs and accessible veterinary care to protect bee colonies. Technical skill gaps and pesticide usage point to the importance of training and sustainable agricultural practices to improve beekeeping outcomes. Marketing and storage issues reflect the need for better value chain infrastructure and market linkages to ensure fair

prices and reduce post-harvest losses. Environmental factors like climate change, water scarcity, and declining pastures require adaptive strategies and environmental conservation efforts to sustain forage and bee habitats. Organizational weaknesses suggest that fostering cooperatives or associations could improve collective bargaining and resource sharing among beekeepers.

Figure 34: Extent agreement on key Issues of Income-generating activities in beekeeping.



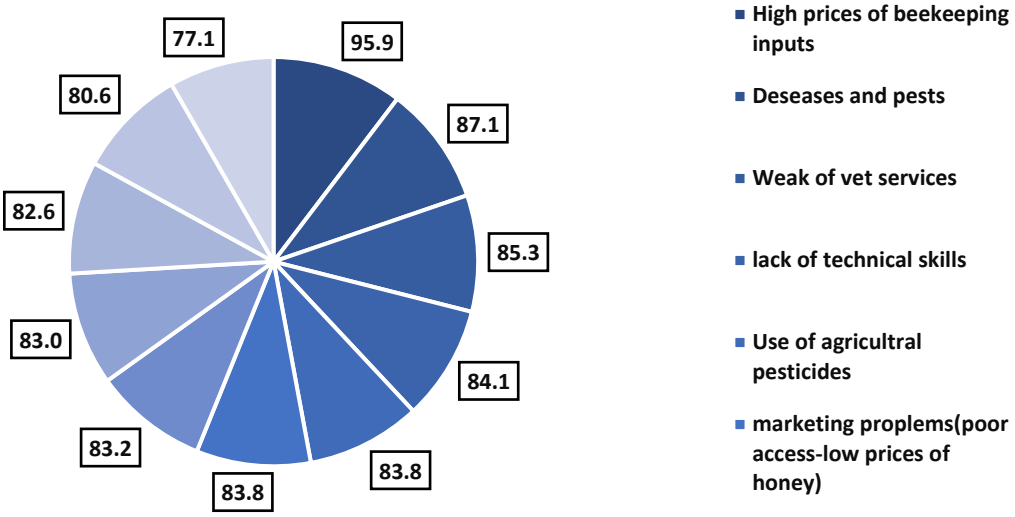
In summary, beekeeping sector is constrained by a combination of economic, technical, environmental, and organizational challenges that collectively hinder income generation and sustainability, these findings reflect importance of implement an integrated development program for the beekeeping value chain that includes: (1) providing subsidized or affordable quality inputs and facilitating access to veterinary and technical services to improve bee health and management skills; (2) establishing storage facilities and marketing infrastructure to enhance post-harvest handling and market access; (3) promoting cooperative organization among beekeepers to strengthen their bargaining power and resource sharing; and (4) initiating environmental conservation and climate adaptation measures to address water shortages, pasture decline, and pesticide impacts, thereby improving the overall profitability and sustainability of beekeeping activities.

The data presented in Figure 35 illustrate the key challenges facing beekeepers in the study areas, highlighting the importance of understanding the factors that affect the beekeeping industry and determine its success or failure. The results showing the percentages of challenges faced by beekeepers. The highest percentage (95.9%) is attributed to high prices of beekeeping inputs, indicating that the elevated costs of beekeeping materials pose a significant barrier for beekeepers. The second major challenge is diseases and pests at 87.1%, demonstrating that biological risks directly impact bee productivity and colony health. Weak veterinary services account for 85.3%, reflecting a lack of technical support and specialized health services for disease control.

The other percentages (84.1%, 83.8%, 83.2%, 83.0%, 82.6%, 80.6%, 77.1%) represent additional challenges related to management, marketing, or environmental conditions. Analysis of these results reveals that the primary challenge lies in economic factors related to input prices, necessitating strategies to assist beekeepers in obtaining cheaper supplies or providing local alternatives. The significant impact of diseases and pests underscores the need to strengthen preventive programs and provide training for beekeepers on colony health management. Moreover, the weakness of veterinary services indicates a requirement to improve technical support and specialized health services.

These finding suggest that the success of the beekeeping industry in the study areas requires addressing economic and health challenges in an integrated manner, focusing on reducing input costs, improving disease and pest management, and enhancing veterinary services. To address these challenges, it should establish supportive policies for beekeepers, including financial assistance to lower input prices, specialized training programs for disease and pest control, and improved access to veterinary services, thereby ensuring the sustainability and increased productivity of beekeeping in the region.

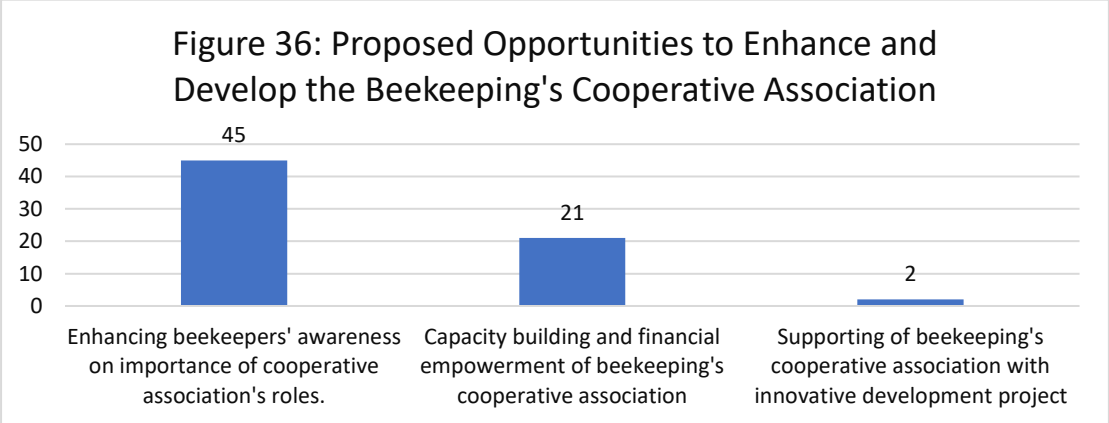
Figure 35: The key challenges that face beekeepers in study areas.



These finding show that beekeeping in the study area suffers from a combination of high input costs, insufficient technical and veterinary support, and environmental threats, all of which hinder the sector's development and profitability. Based on these findings is to implement an integrated support program for beekeepers that includes subsidizing beekeeping inputs, enhancing disease management and veterinary services, providing technical training and extension programs, promoting safe agricultural practices to reduce pesticide exposure, and improving market access and pricing mechanisms for honey to ensure sustainable beekeeping and improve livelihoods in the sector.

5.2 Solution and Opportunities.

The proposed opportunities to enhance and develop the beekeeping's cooperative association are presented in Figure 36, which illustrates the prioritized strategies for strengthening the cooperative's role in the beekeeping value chain, three proposed opportunities with their respective scores: Enhancing beekeepers' awareness on importance of cooperative association's roles scored 45, indicating it is the most prioritized opportunity, emphasizing the need to educate beekeepers about the benefits and functions of cooperative associations to improve their participation and engagement. The second opportunity, Capacity building and financial empowerment of beekeeping's cooperative association, scored 21, highlighting the importance of strengthening the institutional and financial capabilities of the cooperative to support its members effectively. The third opportunity, supporting of beekeeping's cooperative association with innovative development project, scored 2, suggesting a relatively lower priority for direct project-based innovation compared with awareness and capacity building.



These results reveal that raising awareness among beekeepers about the cooperative association's roles is the foundational step for improving the beekeeping sector, as informed beekeepers are more likely to engage actively in collective actions that enhance productivity and market access. The focus on capacity building and financial empowerment indicates the necessity of providing the cooperative with the resources and skills needed to manage operations efficiently and offer valuable services to its members. The low emphasis on innovative development projects suggests that immediate priorities lie in strengthening awareness and institutional capacities before introducing complex innovation initiatives. According to this finding, it should implement targeted awareness programs for beekeepers to educate them about the cooperative's roles, alongside capacity-building initiatives and financial support mechanisms for the cooperative association, thereby fostering a sustainable and effective beekeeping value chain.

The data presented in Table 15 highlights the appropriate techniques and assistances required to develop the beekeeping business, as perceived by the respondents.

The table shows that the majority of respondents (97%) believe that getting modern beehives and equipment is essential for developing the beekeeping business. Furthermore, an overwhelming majority (99%) of respondents agree on the importance of technical training on beekeeping and honey production, support and promotion of

marketing, providing basic inputs of production, enhanced packaging, financial support or loans to expand, establishing support for cooperatives association, and access to new markets. The results highlight that beekeepers recognize the need for modernization and capacity building in various aspects of the business. The high percentage of respondents supporting technical training suggests that they are aware of the knowledge gap in beekeeping and honey production. Similarly, the emphasis on support and promotion of marketing, as well as access to new markets, highlights the importance of market access and competitiveness in the beekeeping industry. The findings also suggest that beekeepers require a comprehensive support system, including financial assistance, provision of basic inputs, and enhanced packaging, to improve their business. The support for establishing cooperatives association indicates the need for collective action and cooperation among beekeepers to achieve common goals.

Table 15: Appropriate techniques and assistances required to developed beekeeping business.

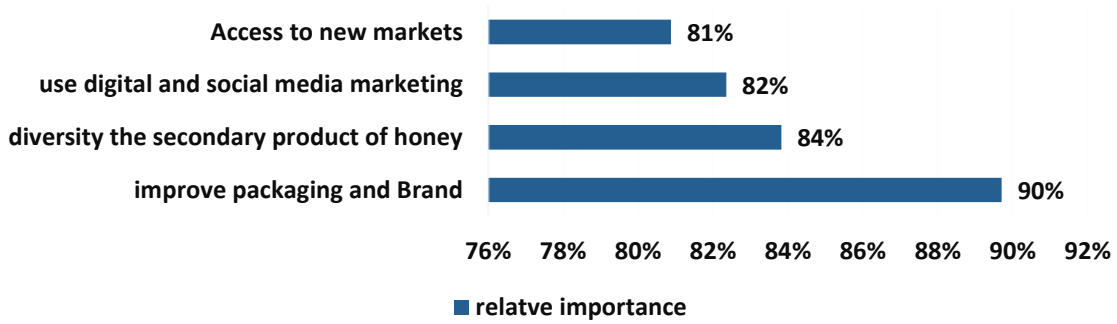
Variables	Categories	Frequency	Percentage%
getting modern beehives and equipment	Yes	66	97%
	No	1	1%
technical training on beekeeping and honey production	Yes	67	99%
	No	0	0%
support and promotion the marketing	Yes	67	99%
	No	0	0%
providing basic inputs of production	Yes	67	99%
	No	0	0%
enhanced packaging	Yes	67	99%
	No	0	0%
financial support or loans to expand	Yes	67	99%
	No	0	0%
established support for cooperatives association	Yes	67	99%
	No	0	0%
access to new markets	Yes	67	99%
	No	0	0%

These finding suggest that the development of the beekeeping business requires a multi-faceted approach that includes modernization, capacity building, market access, and financial support. Based on these findings, it should implement a comprehensive development program for the beekeeping industry that includes providing modern beehives and equipment, technical training, marketing support, access to basic inputs, enhanced packaging, financial assistance, and support for cooperatives association, as well as facilitating access to new markets.

The results of Figure 37 demonstrate the extent of agreement among participants on key suggestions to improve the marketing of honey products. The figure presents four

main proposals: access to new markets, use of digital and social media marketing, diversification of honey secondary products, and improvement of packaging and brand. The results show that 81% of participants support the idea of accessing new markets, reflecting the importance of expanding the marketing scope to increase sales. Regarding the use of digital and social media marketing, this proposal received 82% support, indicating recognition of the significant role of modern technology in enhancing the marketing of honey products. Concerning the diversification of honey secondary products, this suggestion obtained 84% approval, highlighting the importance of utilizing all honey components to produce multiple products and increase profitability. The most supported proposal, with 90% approval, was improving packaging and brand, reflecting participants' awareness of the importance of visual and marketing aspects in attracting consumers and enhancing product image.

Figure 37: Extent agreement on key suggestions to improve marketing of honey products



Based on these results, it can infer that marketing honey products heavily relies on strengthening the product's visual identity through improved packaging and branding, which is a crucial factor in attracting consumer attention and increasing sales. The results also emphasize the importance of leveraging digital technology and social media in product promotion, as well as diversifying secondary products to increase added value. To improving the marketing of honey products requires focusing on enhancing the brand and packaging, while utilizing digital marketing and product diversification. Also, t is recommended to develop an integrated marketing strategy for honey products that focuses on improving packaging and strengthening the brand, in addition to using digital and social media marketing, while working on diversifying honey secondary products to increase market value and achieve better penetration into new markets

6. Overall Conclusions and Recommendations

According of the results of this assessment, the main finding can be concluded as the fowling key point:

6.1 Key Conclusions

The beekeeping value chain in Lahj and Abyan Governorates demonstrates clear relevance for livelihood resilience, income generation, and local economic recovery in a highly fragile context. The analysis confirms that beekeeping remains one of the few viable agricultural activities accessible to small-scale rural households, requiring limited land and capital while providing opportunities for income diversification.

6.1 Actor Profile and Production Characteristics:

- **Demographics:** The sector is male-dominated (88% of beekeepers), with an aging workforce (84% over 31 years old) and relatively low formal education (only 6% hold university degrees).
- **Socioeconomics**: Beekeeping is primarily a secondary income source; the main income for most is animal husbandry (43%). Producers are typically small-scale, with 44% owning only 1-4 colonies.
- **Practices**: Production relies heavily on traditional methods: 89.7% raise Ahwari bees, 70.6% use local municipal hives, and knowledge is predominantly transferred informally (through friends and family). While basic hygiene is observed, only 14.7% of access certified labs for quality testing.

6.2 The Enabling Environment – Critical Constraints:

- Inputs & Finance: Access to modern equipment and quality inputs is severely limited, with 60% of inputs deemed "not available and not easy to access." Access to formal agricultural credit is very low (11.8%), with high costs and stringent loan terms cited as major barriers (45% and 43% of reasons, respectively).
- Training & Extension: A critical skills gap exists, with 98.5% of beekeepers having no prior formal training. Top-priority training needs are disease/pest control (mean score: 4.81/5) and bee nutrition.
- Infrastructure & Policy: Transport infrastructure is inadequate, and beekeepers report a complete absence (100%) of supportive local legislation for agricultural investment.
- Cooperatives: Awareness and membership in cooperatives are extremely low (97.1% unaware). Existing cooperatives are effective in production and marketing but lack capacity in value-added processing, member financing, and quality control.

6.3 Value Chain Mapping and Performance:

- **Structure**: The chain is linear, comprising seven stages: Input Supply → Production → Collection → Processing → Marketing/Distribution → Export → Consumption.
- **Actors & Relationships**: Key actors include beekeepers, collectors/traders, wholesalers, retailers, and a few processors. Relationships are often imbalanced, with traders wielding significant bargaining power over small-scale beekeepers.
- Value addition within the chain remains minimal. Honey is largely marketed in raw form, while by-products such as beeswax are underutilized. Weak post-harvest handling, substandard packaging, and the absence of quality certification prevent producers from accessing higher-value markets and capturing a greater share of final value. As a result, producers bear most production risks while remaining dependent on intermediaries and informal market arrangements

6.7 Markets and Consumption

- Honey markets are primarily local and characterized by fluctuating demand and prices. Sales volumes are unstable, with limited evidence of sustained growth. Consumer preferences emphasize quality and authenticity, yet weak branding, packaging, and certification limit market differentiation. Retail and wholesale activities are concentrated in specific districts, creating spatial imbalances in market access
- Honey is marketed through direct sales (32%), exporters (24%), and retailers (21%). The most significant value addition occurs at the beekeeper level (56% profit margin) and retail level, while processing stages add minimal value. Cleanliness/filtration (54% of processing value) and packaging are key value-adding steps.
- Consumers prioritize trader reputation (97.8%), suitable price (97.8%), and high quality (91.1%). However, 80% of consumers perceive current honey prices as high, indicating a market affordability challenge.
- **Economics**, the total value added across the chain is 60,000 YER per unit flow, with beekeepers capturing 37.5% of the gross profit, followed by retailers and processors.

6.8 Synthesis of Strategic Challenges and Opportunities

- **Challenges,** the sector is constrained by a interconnected set of issues: 1) High production costs (95.9% cite high input prices), 2) Biological threats (87.1% cite diseases/pests), 3) Weak institutional support (85.3% cite weak vet services, low cooperative engagement), 4) Severe skills and knowledge gaps, 5) Inefficient market access and price volatility, and 6) A non-conducive policy and infrastructural environment.

- **Opportunities**, leverage points for development include: 1) Strong market demand for premium Yemeni honey (Sidr, Sumor). 2) clearly articulated demand from beekeepers for comprehensive support (equipment, training, finance). 3) The potential to strengthen cooperatives as vehicles for aggregation,

training, and market access. 4) Opportunities for significant value addition through improved processing, packaging, and by-product diversification (e.g., beeswax). 5) The scope to enhance efficiency and equity through improved credit products and market linkages.

Overall, the analysis indicates that while the beekeeping value chain has strong potential to contribute to resilient livelihoods, its resilience is currently driven by individual coping strategies rather than supportive systems. Without coordinated, value chain–wide interventions, the sector will remain vulnerable to economic, environmental, and conflict-related shocks, limiting its contribution to inclusive and sustainable development.

However, the current performance of the value chain is constrained by structural weaknesses across multiple stages. Production systems are predominantly traditional, characterized by low productivity, limited disease management, and inadequate access to modern equipment and technical services. These constraints reduce efficiency, increase vulnerability to shocks, and limit the capacity of producers to scale up or stabilize incomes.

The enabling environment for beekeeping is notably weak. Access to inputs, extension services, training, and financial services is highly constrained, and cooperative associations lack the institutional capacity to provide comprehensive support to their members. Awareness and membership levels among beekeepers are low, limiting the effectiveness of collective action. Public sector engagement and policy support are perceived as insufficient to address sector needs.

From a social inclusion perspective, the sector is overwhelmingly male dominated, with women and youth facing barriers to meaningful participation despite clear potential roles in processing, packaging, and marketing. Low education levels and reliance on informal knowledge transfer further constrain human capital development and long-term sustainability.

6.2 Key Recommendations

Based on the evidence and analysis presented in the report, the following recommendations are proposed to strengthen the beekeeping value chain in Lahj and Abyan:

1. **Strengthen Resilient Production Systems**
   - Improve access to essential beekeeping inputs and equipment through localized supply mechanisms, cooperative-based procurement, and targeted livelihood support packages.
   - Promote improved hive management, disease control, and climate-resilient practices through practical, field-based training and follow-up support.
   - Support gradual upgrading of production systems to increase productivity while remaining accessible to small-scale producers.

2. **Enhance Skills Development and Quality Assurance**
   - Invest in structured and inclusive capacity-building programs tailored to low-literacy contexts, focusing on production techniques, post-harvest handling, and food safety.
   - Facilitate access to certified honey testing and quality control services to improve product credibility and consumer trust.
   - Strengthen extension and mentoring mechanisms to support sustained adoption of improved practices.
3. **Promote Value Addition and Income Diversification**
   - Support processing, purification, packaging, and branding of honey to increase value capture at the producer and cooperative levels.
   - Promote utilization of bee by-products, particularly beeswax, as an additional income stream and resilience strategy.
   - Encourage small-scale, locally appropriate processing solutions that reduce costs and increase market competitiveness.
4. **Reinforce Cooperative and Collective Mechanisms**
   - Strengthen the institutional capacity of cooperative associations to provide integrated services, including input supply, processing, marketing, and quality control.
   - Expand cooperative outreach to underserved districts and promote inclusive membership models
   - Support governance, management, and financial sustainability of cooperatives to enhance accountability and long-term impact.
5. **Improve Market Functionality and Stability**
   - Develop structured marketing channels, improve market information systems, and promote branding and differentiation to reduce price volatility and enhance consumer trust.
   - Digital Transformation & Marketing through supporting initiatives that utilize social media and digital marketing—a move supported by 82% of stakeholders—to penetrate new markets and bypass traditional, inefficient channels.
   - Quality Standardization & Commercial Branding across investing in local brand development and improved packaging to enhance the competitiveness of Yemeni honey in premium domestic and international markets.

6. **Strengthen the Enabling Environment for Inclusive and Sustainable Livelihoods**
    - Facilitating financial inclusion through designing Sharia-compliant microfinance products with grace periods tailored to the honey production cycle, enabling small-scale producers to invest in apiary expansion
    - Advocate for supportive policies, improved infrastructure, expanded extension services, and accessible financial products tailored to small-scale beekeepers.
    - Improve access to financial services through linkages with microfinance institutions and development of tailored financial products for beekeepers.
    - Promote gender-responsive and youth-inclusive approaches across all value chain interventions.
    - Strengthen coordination among development actors, cooperatives, and local institutions to ensure coherent, sustainable value chain development.

7. Documentation

During Data Collection using survey with the beekeepers in Tuban /Lahj

During Data Collection Using Survey With Consumers

During Data Collection Using Survey with Cooperative Associations

During Data Using Survey with wholesalers and Retailers.

8. Annexes

Beekeepers Value Chain Analysis Survey