QUALITATIVE GENDER ANALYSIS COUNTRY REPORT, ZAMBIA:
Building Equitable Climate Resilient African Bean and Insect Sectors

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ZARI Zambia Agriculture Research Institute
Affaires mondiales Canada
Global Affairs Canada

CITATIONS

Mwiinga Mulube, Arnold Banda, Moses Chanda, Fredrick Ouya, Lutomia Cosmas, Dessalehn Ketama and Eileen Nchanji (2025). *Qualitative Gender Analysis Country Report, Zambia. Building Equitable Climate Resilient African Bean and Insect Sectors.* Alliance of Bioversity International and CIAT.

ACKNOWLEDGEMENTS

This work was carried out with a grant/financial support from the Government of Canada, provided through Global Affairs Canada (GAC). Tool development and data collection were jointly done by the Pan African Bean Research Organization colleagues under the Alliance of Bioversity International, the International Centre of Insect Physiology and Ecology and the Zambia Agriculture Research Institute. We thank farmers and entrepreneurs of the bean, insect for food and feed and fruit value chain who took the time to talk to us as we collected data on the gaps and opportunities we can build on in this project.

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ABBREVIATIONS

BRAINS	Building Equitable Climate Resilient Africa Bean & Insect Sectors
CSA	Climate-smart agriculture
CSAP	Climate-Smart Agriculture Project
COMACO	Community Markets for Conservation
FGD	Focus Group Discussion
FISP	Beyond the Farm Input Subsidy Programme
GAC	Global Affairs Canada
HIV	Human Immunodeficiency Virus
KII	Key Informant Interviews
NGO	Non-Governmental Organization
PABRA	Pan African Bean Research Alliance
PLWD	People living with disability
SIFAZ	The Sustainable Intensification of Smallholder Farming Systems
SNV	Netherlands Development Organisation
SSA	Sub-Saharan Africa
VMGs	Vulnerable and marginalised groups
8NDP	Eighth National Development Plan

EXECUTIVE SUMMARY

This report presents findings from a qualitative gender analysis conducted under the Building Equitable Climate Resilient African Bean and Insect Sectors (BRAINS) project in Zambia. The study was implemented in seven districts across six provinces—Eastern, Central, Lusaka, Northern, Muchinga, and Luapula to establish a baseline understanding of climate resilience, gender dynamics, and farmers' socio-economic opportunities within three value chains of fruit trees, common beans, and bees/insects for feed and food.

The study adopted a qualitative design involving 47 Focus Group Discussions (FGDs) of men-only, women-only, and mixed groups; 60 Key Informant Interviews (KIIs); and in-depth interviews with farmers, entrepreneurs, persons living with disabilities, and other marginalised groups. The data was analysed thematically to explore gender roles, decision-making patterns, livelihood diversification, waste management, and access to finance and collective networks.

Results show differences in gender roles across the common bean, insect, and fruit tree value chains in the different provinces. For instance, in the bean value chain, men, women, and youths participate in most activities, with women more involved in planting, winnowing, sorting, and selling while men transport the beans to the market. Women mostly sold beans at the farm gate, while men sold in higher-value markets. In fruit tree production, land preparation and planting were mainly done by men. Both men and women did the weeding and mulching. However, men do most of the harvesting and hand over the fruits to women to sort and proceed to sell. Transportation and marketing were done by men and women, depending on the volumes harvested. Insect harvesting was seasonal and done mainly by women. Overall, men made most decisions, except for divorced women and women-headed households.

Climate variability poses substantial challenges for all farmers and entrepreneurs across different value chains. Droughts, heavy rains, and pest infestations significantly reduced yields and caused income losses. Despite these challenges, farmers in Zambia are increasingly adopting various climate-resilient practices, such as intercropping, early planting, crop rotation, planting early-maturing varieties, and agroforestry, to manage the effects of climate change, including delayed rainfall, droughts, pest outbreaks, and soil degradation, which have significantly reduced yields and incomes. Waste management practices varied from composting and animal feeding to burning of residues, with limited awareness of sustainable methods. Financial services such as credit remained largely inaccessible due to high interest rates and rigid repayment terms. At the same time, social networks and farmers' cooperatives played a key role in disseminating agricultural knowledge and supporting adaptation.

The study concludes that gender and social inequalities continue to influence decision-making, access to resources, and resilience to climate change. Women, youth, and people living with disabilities face deepened barriers to climate-smart technologies, financial services, and market participation. The report recommends targeted capacity-building on gender-responsive climate-smart practices for the three value chains, facilitation of inclusive financial mechanisms, and strengthening of social networks to enhance equitable resilience and sustainable livelihoods.

1. INTRODUCTION

1.1. Background of the Project

Agriculture remains the foundation of Zambia's economy, supporting over 70 percent of the population and contributing significantly to employment, food security, and rural livelihoods (World Food Programme, 2023). However, the sector's dependence on rain-fed production systems makes it highly vulnerable to climate variability and change, which has intensified over recent decades. Droughts, erratic rainfall, and floods have become more frequent and severe, undermining crop yields, incomes, and food availability (CIAT & World Bank, 2017).

Zambia's agriculture is dominated by smallholder farmers who rely mostly on subsistence production. Climate-related shocks such as floods, droughts, increased pest incidence, and storms compound the challenges posed by shrinking household landholdings and low productivity (Mataa et al., 2021; Mukeshimana et al., 2014; Nelson et al., 2014). These challenges threaten farmers' livelihoods and have particularly severe effects on women, youth, and other marginalised and vulnerable groups who entirely depend on natural resources for their survival and sustenance (Eastin, 2018). Agriculture remains the foundation of Zambia's economy, supporting over 70 percent of the population and contributing significantly to employment, food security, and rural livelihoods (World Food Programme, 2023). However, the sector's dependence on rain-fed production systems makes it highly vulnerable to climate variability and change, which has intensified over recent decades. Droughts, erratic rainfall, and floods have become more frequent and severe, undermining crop yields, incomes, and food availability (CIAT & World Bank, 2017).

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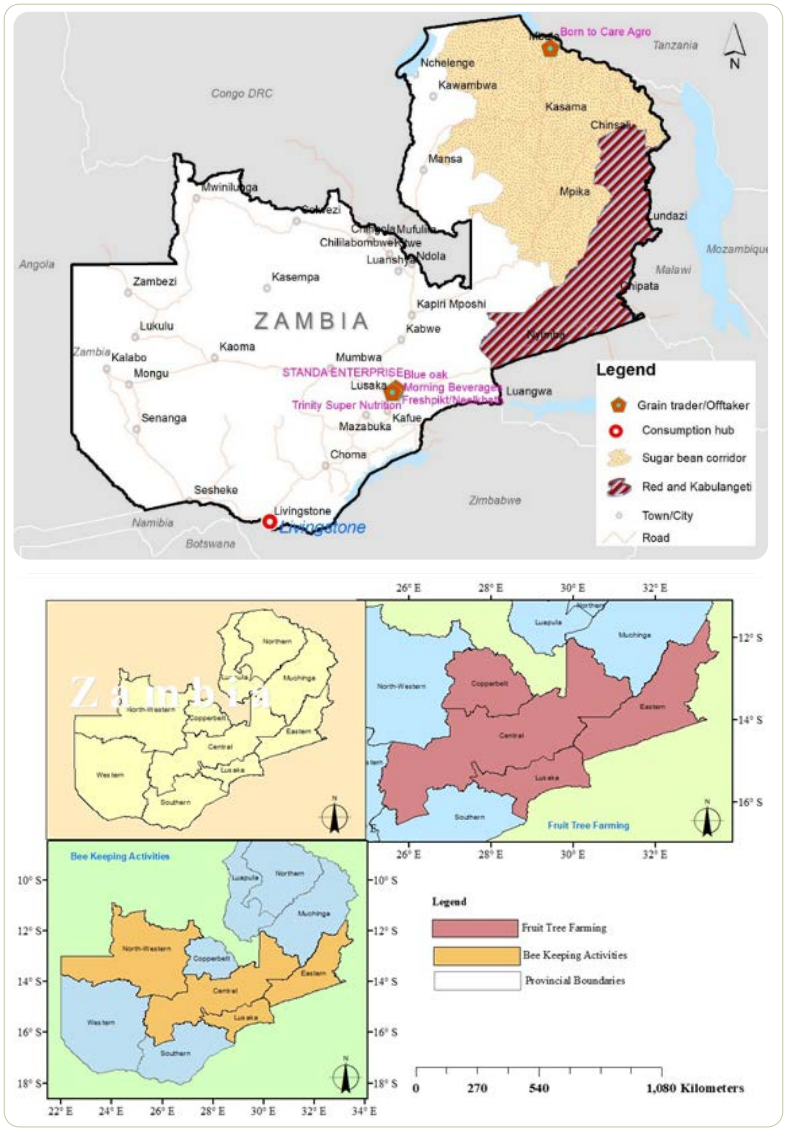

Figure 1: Common beans, insect, and fruit tree corridors in Zambia

and marginalised groups (VMGs) are often omitted from climate and agricultural initiatives due to physical barriers, lack of adaptive technologies, and limited policy enforcement (Abebe, 2014).

The Building Equitable Climate Resilient African Bean and Insect Sectors (BRAINS) project responds to these vulnerabilities by promoting gender-responsive, climate-smart agriculture (CSA) interventions across the common bean, fruit tree, and bee/insect value chains for feed and food. The project aligns with Zambia's National Agriculture Policy (2012–2030) and Zambia's Eighth National Development Plan (8NDP), which recognise agriculture as the main pillar for economic transformation, job creation, and climate resilience (Afreximbank, 2023).

This qualitative gender report presents a baseline for understanding prevailing gendered roles, livelihood strategies, decision-making dynamics, waste management practices, and access to financial and social networks. The findings will inform BRAINS project interventions and policy recommendations that will ensure advanced gender equality, improved productivity, and enhanced resilience to weather and climate change in Zambia. Finally, this report contributes to national and regional efforts to achieve sustainable, inclusive agricultural growth and food and nutrition security in sub-Saharan Africa. The BRAINS project intends to enhance climate resilience, leadership and agency among women and youth participants in the beans, insects for food and feed and fruit tree value chain. Build capacity building designed around the social norms and constraints critical to climate-smart agriculture adoption to enhance the participation of women and youths in the common beans, insect, and fruit tree corridors (as shown in Figure 1)

1.2. Aim of the Study

To understand the status of agricultural practices, climate resilience, and gender dynamics within the common bean, fruit tree, and insect value chains, setting a foundation for measurable impact assessment. Insights from the gender analysis will be integrated into interventions at both programmatic and policy levels, as we highlight prevailing trends in Zambia, understand the status of agricultural practices, climate resilience, and gender dynamics within the beans, insects for food and feed, and fruit tree value chains.

Research Questions

- To understand how differently men, women, youth and marginalised groups in the bean, insect for food and feed and fruit tree are affected by climate challenges and ensure climate resilience.
- Identify barriers to and opportunities for increasing women's and youth leadership, decision-making, and empowerment within the common bean, fruit tree, and insect value chains.
- Identify gaps and opportunities in climate-smart agriculture, including climate-smart practices, waste management, financial access, and networks in the bean, insect, feed, and fruit tree value chains.
- Identify barriers to and opportunities for increasing women and youth entrepreneurship within the common bean, fruit tree, and insect value chains.

1.3. COUNTRY CONEXT – ZAMBIA

Background

Zambia is a landlocked country in southern-central Africa. It covers an area of 752,618 square kilometres, making it the 17th largest country on the continent. Zambia shares borders with the Democratic Republic of Congo to the north, Tanzania to the north-east, Malawi to the east, Mozambique to the southeast, Zimbabwe and Botswana to the south, Namibia to the south-west, and Angola to the west. With an estimated population of about 20 million inhabitants in 2023, Zambia is Africa's 22nd most populous country and the 63rd most populous country in the world (Afreximbank, 2023). Zambia has 73 ethnic groups.

In 2022, Zambia's output stood at US$29.78 billion, making it the 19th-largest economy in Africa and the 104th-largest in the world (Afreximbank, 2023). Although the service and industry sectors are the major drivers of the Zambian economy, agriculture is a critical sector that provides jobs, growth, and livelihoods. Agriculture is a

source of food, employment, and income for more than 70 percent of the population (World Food Programme, 2023). The authorities have set out several agricultural policies and goals to enhance the sector's potential in reducing poverty. The Eighth National Development Plan (8NDP) identifies the agriculture sector as a key national strategic area critical in ensuring economic transformation and job creation, premised on value addition in the agriculture sector and other relevant sectors. Specifically, the 2012 – 2030 National Agriculture Policy (NAP) goals include increasing the annual rate of growth of real crop GDP, increasing the value and growth rate of crop exports, reducing poverty, and ensuring food security among small-scale farmers (Afreximbank, 2023).

Zambia has set ambitious climate mitigation and adaptation goals, to reduce GHG emissions by 25 percent to as much as 47 percent, depending on international support and financing levels. Under its Strategy Framework, the government of Zambia promotes the implementation of climate-smart agriculture (CSA) practices to sustainably increase productivity, enhance resilience, and reduce or eliminate GHG emissions. Climate change and policy implementation challenges are significant constraints to production and productivity in the agriculture sector.

The largest proportion of farmers affected by climate change are small-scale farmers who mainly depend on rainfall for cultivation. The threat has become even more pronounced over the years as the frequency and magnitude of droughts and floods have increased (World Bank, 2017). As an improvement to the Beyond the Farm Input Subsidy Programme (FISP), the Climate-Smart Agriculture Project (CSAP) seeks to incorporate irrigation infrastructure and extension services to minimise the impact of climate change on the agriculture sector. Furthermore, policymakers continue implementing other adaptation and mitigation measures, such as climate-smart agriculture (CSA) practices.

With the climate changing (unpredictable rainfall patterns, droughts, cyclones, etc), crop productivity has fallen across the country. The production of beans, usually under rainfed conditions, is particularly vulnerable to insufficient or unpredictable rainfall and intermittent and/or terminal droughts that limit its yield (Mataa and Lunga, 2021). This vulnerability is expected to worsen, as 60 percent of common bean production occurs in drought-prone areas and increasing competition with major crops continues to push common beans into marginal lands, thereby increasing the risk of drought stress (Mukeshimana et al., 2014). The impact of climate change on common bean production is a pressing issue that requires immediate attention.

Common Beans (Phaseolus vulgaris L.), the second most important source of dietary protein, carbohydrates, dietary fibre, and minerals (particularly iron and zinc) and calories in Zambia, are under threat from biotic and abiotic factors, including pests and diseases exacerbated by the changing climate. Despite these challenges, the majority of bean production is done by small-scale farmers, predominantly women, who sell about 65% of the beans harvested at the farm gate. This is a significant contribution to the local economy, as most households have no market access in the villages where they live. Their resilience and determination in the face of climate change is truly inspiring.

Overall, women play a significant role in the family's unpaid labour, particularly in land preparation, weeding, and harvesting. Men's unpaid labour contribution mainly goes to land preparation. Men constitute a greater percentage of hired labour. Men make most decisions on land preparation, input use, crop management, and harvest use. In most households (about 60%), men control income from bean sales (Hamazakaza et al., 2014). This gender dynamic in common bean production is an important consideration in the context of rural development and food security. Gender research and development work on the common value chain focuses on adopting and diffusing improved bean varieties, climate-smart practices, and enhanced access to the common bean market.

The bean corridor approach, a strategy spearheaded by the Pan African Bean Research Alliance (PABRA), has not only significantly expedited the commercialisation of common beans in Zambia (Anyango, 2023) but also holds the key to a more sustainable and profitable future for the industry. This approach enhances the efficiency of the common bean commodity flow from the production hub to the consumption point by establishing robust marketing and distribution networks across the country. The corridor approach has also fostered a reliable network of value chain actors, including breeders, researchers, input suppliers, seed companies, farmers,

agro-processors, and off-takers (Mulube et al., 2023). It has created business and employment opportunities by promoting close collaboration between farmers and off-takers, such as Good Nature Agro, Blue Oak Agro, and Born to Care Agro. The value chain actors have platforms that enable them to share marketing information, including highly demanded varieties and emerging market issues.

This ensures that farmers produce the right varieties and quantities to meet market demand. The farmer-off-taker partnership ensures that farmers have access to certified seeds and a market for their produce. Moreover, the partnership enhances the quality and quantity of common beans purchased by off-takers, thereby boosting their market share. The land under bean production has increased significantly over the past 15 years. Also, the productivity of common beans in the country has been rising in the same period, doubling from 350kg/ha to 650kg/ha (Anyango, 2023). The bean corridor approach is a shining example of the potential of common bean production and commercialisation, urging other regions to consider adopting it.

There is an increasing need for protein-rich food, and edible insects are an alternative (Tiencheu and Womeni, 2017). Insects also offer an environmentally friendly alternative to resource-intensive livestock. Insect farming for feed and food is rapidly expanding in Zambia. Insects such as black soldier fly are used as organic waste and edible caterpillars (*Gonimbrasia belina* and *Gynanisa maja*), grasshoppers (*Ruspolia differens*) and winged termites (*Macrotermes falciger*) are consumed by people of all ages and income levels, contributing to improved food security, creating jobs, and improved livelihoods while reducing waste and protecting the environment (Tanga and Kababu, 2023).

While many people rely on the wild for insects, which are often seasonal, multiple options are now available to produce them at home for income. The literature provides limited information on gender disparities in access to and use of insects for food and feed in Zambia under a changing climate. Women are more involved in insect harvesting and preparation than men; while feeding a growing population is crucial, we don't want to overburden already taxed farmers, especially women, with high labour requirements that result in low edible insect yields (Stull, 2018). Despite limited research on using insects as fertilisers, the International Centre of Insect Physiology and Ecology has developed a range of frass fertiliser products to suit different crop production requirements (Beesigamukama et al., 2022).

Fruit trees (exotic and indigenous) are important for food security in rural and urban households in Zambia and provide additional income through year-round sales. Exotic fruit trees such as mangoes and avocados are permanent features in homesteads, grown to secure land, provide food, and earn revenue. Therefore, trade in fruits and fruit trees creates significant employment for many Zambians; however, they are scarce due to deforestation, fires, demand for wood fuel, and agricultural expansion (Gichungi et al., 2023). Currently, there is significant waste due to a lack of storage technology, which provides an opportunity to add value to juices, jams, and other drink types.

The productivity gap is attributed to pests, particularly the oriental fruit flies, *Bactrocera dorsalis* (Hendel). Farmers use chemical insecticides (causing environmental pollution) to control it, but it is neither sustainable nor effective. The International Centre of Insect Physiology and Ecology and its partners have developed, disseminated, and validated integrated pest management for managing these mango-infesting fruit flies. Men are willing to pay higher prices than women, suggesting that women are more price-sensitive (Gichungi et al., 2023).

2. METHODOLOGY

2.1. Study areas

The study was conducted across seven districts in six provinces of Zambia: Lundazi in Eastern Province, Chilanga and Lusaka in Lusaka Province, Serenje in Central Province, Mpika in Muchinga Province, Lunte in Northern Province, and, lastly, Chipili in Luapula Province as shown in Figure 2. These regions were purposively selected based on production and proximity to the capital city, Lusaka, which serves as the primary market for these

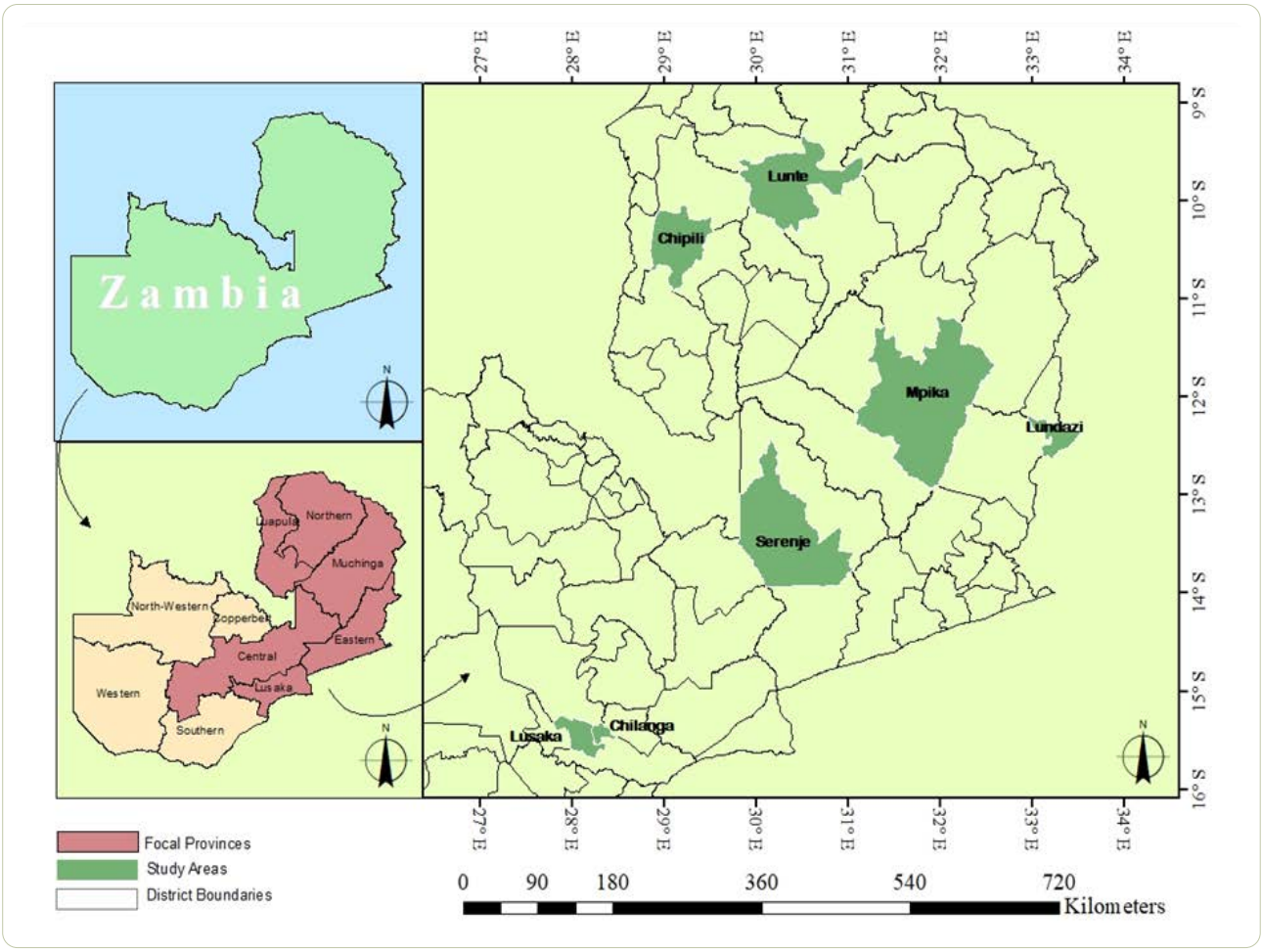

Figure 2: Map showing the different study sites in Zambia

three value chain products (common bean, fruit tree, and insect/bee), as well as the presence of entrepreneurs and cooperatives for these products. Agricultural production in Zambia is spread throughout the country, with different crops growing in various regions. The heterogeneity in farming production can be explained by Zambia comprising three distinct agroecological zones, each with unique climatic characteristics and soil properties.

There are three agroecological zones in Zambia's agricultural production, each characterised by distinct climatic conditions and soil properties that influence agricultural production systems. Zone I (southern and western regions) is experiencing low and unpredictable rainfall, which is less than 800 mm annually, as well as frequent droughts. Zone II (central, eastern, and Lusaka regions) is the most productive region in Zambia and supports both commercial (large-scale farmers) and smallholder farmers. Zone III (northern and Luapula regions) receives a high volume of rainfall (over 1,200 mm annually) but is characterised by highly leached, acidic soils (Simute et al., 1998). These agroecological variations justify the project's focus on context-specific climate-smart agriculture interventions tailored to local environmental realities (Teschemacher et al., 2023).

2.2. Data Collection

The study used gender- and age-disaggregated methods to collect qualitative data, including focus group discussions (FGDs) with bean, fruit tree, and insect farmers; key informant interviews (KIIs) with entrepreneurs; and key informant interviews with persons living with disabilities (PLWD), as shown in Figure 3 below.

Using gender and age disaggregation for FGDs, the study had four groups of interest: men under 35 years (youth), men over 35 years, women under 35 years (youth), and women over 35 years. These methods complemented

Figure 3: Key informant interviews and focus group discussions in the field

and triangulated each other, providing thick descriptions. The methods unpacked the status, challenges and opportunities for beans, insects for food and feed and fruit tree farmers and entrepreneurs in the study locations. The FGDs focused on gender roles and decision-making in beans, insects for feed and food, and fruit tree production; community perceptions of climate change; community waste management practices; community access to financial services; and social networks and their roles in climate resilience. The FGD themes were the same across all groups included in the study.

We carried out two KII sessions. The first KIIs targeted entrepreneurs across diverse value chains. They gathered data on participants' experiences running their businesses, including business structures, resources, and networks that help entrepreneurs build and succeed in their businesses in the study locations. The second KII focused on opportunities and challenges faced by persons with a disability or vulnerable groups (that is, people with vulnerable and marginalised status, including widows, people living with disabilities, widowers, people living with HIV, squatters, and internally displaced persons) in accessing, using and adapting diverse climate-smart technologies. It also examined policy implications and potential community support. In this manner, the study generated varied realities and perspectives on the study themes, which have substantively yielded different meaningful patterns and contextual interpretations in data analysis.

2.3. Sampling Frame

The sampling frame included farmers in 7 districts of Zambia: Lundazi District in Eastern Province, Chilanga District in Lusaka Province, Lusaka District, Serenje District in Central Province, Mpika District in Muchinga Province, Lunte District in Northern Province, and Chipili District in Luapula Province. These Districts were purposively selected

based on several factors: (1) the areas are prominent in bean production, fruit trees and insect farming; (2) they have several entrepreneurs in bean processing and value addition, fruit trees and insect farming; (3) proximity to the primary market in Lusaka.

To reduce the cost of conducting the study, 2 Agricultural camps were further selected from each district; Mapala and Vuu agricultural camps were selected in Lundazi district; Mwembeshi and Nyemba agricultural camps in Chilanga district, Mufubushi and Chilonga camps in Mpika district, Chitoshi and Shibwalya Kapila agricultural camps in Lunte district, Lupososhi and Kashimba agricultural camps in Chipili district, and Nchimishi and Teta agricultural camp in Serenje District.

From the Northern- Luapula region (Lunte and Chipili), the study had 16 FGDs and 16 KII (8 entrepreneurs and 8 PLWDs), the Muchinga Central region (Mpika and Serenje) had 15 FGDs and 16 KII (8 entrepreneurs and 8 PLWDs), the Eastern region (Lundazi) had 8 FGDs and 8 KII (4 entrepreneurs and 4 PLWDs), and the Lusaka region (Chilanga) had 8 FGDs and 8 KII (4 entrepreneurs and 4 PLWDs). In addition, the study had 12 KII entrepreneurs in the Lusaka district.

2.4. Data Analysis

The study applied content, thematic, and discourse analysis to examine agricultural practices, climate resilience strategies, and gender dynamics within the common bean, fruit tree, and insect value chains. These qualitative methods facilitated the systematic identification of patterns, meanings, and narratives that inform the project's baseline performance. A summative approach to qualitative content analysis was used, beginning with the identification and quantification of specific words and concepts to explore their contextual significance. As documented by Kondracki and Wellman (2002), the summative approach extends beyond simple word counts to include latent content analysis, which focuses on interpreting underlying meanings within the text. Following Shava et al. (2021), this procedure entailed a manual and computer-assisted iterative search for the occurrence and interpretation of key terms to extract deeper insights from the data. Discourse analysis was used to understand and compare how different categories of groups, disaggregated by sex and age, are affected by climate change, their access to finance and support services, their involvement in decision-making, and their gender roles. Discourse analysis is helpful for analysing qualitative data if the study is interested in comparing results across gender, social groups, and community settings. Discourse analysis aims to expose or deconstruct the social practices that constitute 'social structure' and what we might call social life. It is a sort of forensic activity. Discourse analysis has three domains: the study of social interaction, minds, selves and sense-making, and culture and social relations (Jaworski & Coupland, 2006).

Thematic analysis is also an important technique for analysing qualitative data employed in this study. Thematic analysis is a method of analysing qualitative data. It is usually applied to texts, such as interviewee transcripts. The researcher closely examines the data to identify common themes, topics, ideas, and patterns of meaning that recur. There are various approaches to conducting thematic analysis. Still, the most common form follows a six-step process: familiarisation, coding, generating themes, reviewing themes, defining and naming themes, and writing up (Braun and Clarke, 2023).

3. RESULTS AND DISCUSSION

This section presents the qualitative findings from focus group discussions (FGDs), key informant interviews (KIIs), and in-depth interviews conducted across the seven districts of six provinces in Zambia. The results are discussed under the following major focus areas: gendered roles and decision-making; climate change and livelihoods; on-farm waste management; financial support services; social networks and collective action; economic opportunities and challenges; and business ownership and motivation

3.1. Gendered roles and decision-making in production

Results show that men and women (both young and old) have distinct roles and responsibilities in agricultural production, specifically in the beans, fruits, and insects value chains for food and feed in the six provinces of Zambia. In bean production, land preparation was mainly done by household members, including men, women, and youths, as shown in Table 1. Bean planting was done primarily by women (reported by 40 of the 46 FGDs). Men primarily did spraying; however, some women also sprayed their crops, explained a participant in the FGDs, **"We carry sprayers on our backs as long as someone who knows the instructions and dilutions of the pesticides is around to advise"**. The study found that weeding, harvesting and threshing were reported to be done by men, women and youths. Women mostly did winnowing and sorting; an FGD participant said that **"women ensure good sorting is done, separating rotten beans from good beans; men don't have the time and patience for that work"**. Selling was done mostly by women. However, men mostly carried beans to the market or loaded them into a hired vehicle for transport. Men mainly acquired inputs.

Table 1: role of men and women in bean production

WOMEN'S ROLE IN BEAN PRODUCTION	MEN'S ROLE IN BEAN PRODUCTION
Planting, winnowing, sorting and selling	Spraying pests and transporting beans to the market

However, the study found that women who are widowed, separated or single are the ones who mostly carry out the activities involved in bean production. In the FGD for adult women, it was discovered that older men get sick often, leaving the wife to play the roles in production. The participant narrated,

> **Before my husband got sick with low blood pressure, we used to work together. But now, he can't work as it can worsen his condition, so I make all the decisions because he can't go to the field. Sometimes men give instructions and drink beer instead of helping. So, I do the planting, weeding, and even sell the beans.**
> – FGD, Adult Woman, Mpika District in Muchinga Province

The study found that men made most of the decisions; however, women who were single, widowed, or divorced made decisions as household heads. Women married to irresponsible men (men who drink a lot of beer) make decisions about production activities. These findings were consistent across all regions.

In the central province, the study found that men mainly did land preparation and planting for fruit farming. Both men and women did the weeding and mulching. Both men and women harvest fruits. However, men do most of the harvesting and hand over the fruits to women to sort and proceed to sell. Transportation and marketing are done by men and women, depending on the volumes harvested. For small quantities, women usually take it to the local market to sell, whereas, for large quantities, it's the men who take it to the market (local or town) because such amounts require a lot of physical strength to carry on a bicycle. Even when men sell, they give the money to women to keep; **"we give the revenue to women to keep as treasurers"** (FGD Participants). Men and women are involved in acquiring specific inputs, such as manure, whereas only men are involved in pest management inputs and practices. No programs specifically focused on women/men/ or the youths in fruit enterprises. No value addition through processing is done to the fruits; they are sold as they are.

For the marginalised groups of people living with different disabilities, gender roles vary depending on the position of the disabled person in a household (spouse, dependent, household head, etc.), the extent of their disability and their ability to participate in various production activities. For those who are married, most decisions are made by husbands, who are household heads with strong influence and support from their non-disabled spouses. In cases where the disability is severely debilitating, the non-disabled spouse makes the most significant decisions regarding agricultural production and the household's general well-being.

3.2. Climate Change and Livelihoods

The FGDs showed that farmers across agroecological zones had witnessed climate change, which had significantly impacted their bean production and other crops. The climate changes included unanticipated rainfall onset and offset, prolonged droughts, increased temperatures, and crop pests. In the past, farmers would have rain from November to April, with the onset of rain expected to be around the 24th of October. On 24th October 1964, Zambia gained independence from British rule. On this day, it rained in most parts of the country. It has been raining around this date in the past; therefore, most farmers mark this date as the onset of rain. In an FGD, a participant narrated that so many things had changed, **"In the past, we used to prepare our crop fields in August, September, and by 24th October rains would start, we would sometimes do potholing and plant in November, but nowadays rains would start in December, and by January you start experiencing droughts"**. There's also an early offset of rains; rains would stop in March instead of April. Sometimes, farmers plant early but later face drought, which affects crop production and yield. At times, they would wait for rain to stabilise but then plant later, affecting crop yield. A participant from the FGD said, **"Sometimes you can plant early but face drought, and your crops starve, and surprisingly, the farmer who plants later after the drought produces better yields than the one who planted early".**

In the Lusaka district, a participant from the female FGD explained that she waited until January to plant beans, but there were none, so the household ended up cooking and eating the bean seeds due to the lack of rainfall. This study reported the adverse impact of climate change, specifically dry spells and drought, mainly affecting Lusaka and the eastern provinces. The Northern, Luapula, parts of Muchinga and Central provinces reported fewer dry spells and drought events than other parts of the country. In the 2023/2024 farming season, the northern province and parts of Muchinga and Luapula Provinces experienced negligible dry spells and no drought. However, most of the country was severely affected by drought; many farmers' crops dried up due to prolonged drought and intense sunlight.

Farmers also reported an increase in pests affecting bean production. In the Chilanga district (in the Lusaka province), a farmer narrated from one of the FGDs that, **"We had so many pests, just after the beans germinated, pests started eating them."** Common pests reported to affect common beans included bean leaf beetles, bean stem maggots, and aphids. Climate change is adversely affecting the livelihoods of smallholder farmers. Most of the smallholder farmers are not producing enough beans or food for household consumption and sale for income generation to support livelihood. In the Lusaka Province, smallholder farmers in the Chilanga district reported a complete crop failure (all the crops dried up). Farmers reported that the problems of poor crop harvest or not harvesting anything due to climate change affect everyone at home: men, women, youths and children. In the central province however, smallholder farmers in fruit farming observed changes in weather patterns, such as droughts, late onset of rains, and uneven rainfall distribution over the season. Farmers also explained that persistent droughts caused low fruit sizes (yields) due to reduced water supply. In some cases, flowers and young trees dried up.

People living with disabilities (PLWDs) had some knowledge about the various forms and effects of climate change on their livelihoods. They indicated that the impact of climate change is more severe on PLWDs, the older population and children in general. These categories of vulnerable people were reported to have reduced physical and economic capacity to participate in productive activities that affect household livelihoods, due to compromised health. As a result, they were severely affected by the impacts of climate change, including food shortages caused by droughts or floods. They were also more negatively affected by general household food insecurity as compared to the able-bodied members of the community due to comparative limitations on coping mechanisms. Across all three value chains, PLWDs were the most negatively affected and disadvantaged by climate change.

3.3. Climate Resilience Practices

Over the years, farmers have been trained in conservation agriculture. Conservation agriculture practices are entirely part of the climate-resilient practices. The Ministry of Agriculture, Crusa International, Conservation Farming Unit, World Vision, and Zambia Marumori are among the organisations that have trained farmers on

climate-resilient practices. Farmers reported being taught potholing (planting basins), early planting, crop rotation, intercropping, planting early-maturing varieties, ripping, and incorporating agroforestry into crop production (e.g., planting Faidherbia Albida alongside crops) as ways of combating climate change. A focus group discussion participant narrated:

> **Potholes/basins in the field can retain soil moisture for 2 to 3 weeks after rainfall, helping protect crops from drying. Intercropping beans with other crops (e.g., Maize) helps control weeds by suppressing weed growth, protects the soil from direct sunlight, and ultimately helps the soil hold moisture for a long period of time.**
> – FGD farmer, Lundazi District in Eastern Province

However, most farmers in Lusaka and the Eastern provinces reported practising ripping and planting early-maturing varieties. Most farmers in Lundazi district (Eastern Province) reported practising potholing, ripping, and incorporating agroforestry in crop production. Farmers have also been trained to use irrigation as a strategy to improve crop yields and mitigate the effects of climate change. However, very few farmers have access to irrigation water or can afford to install irrigation systems for crop production. It was observed that not all farmers were using the climate-resilient practices they had been trained on. This was due to the labour-intensive nature of some practices and farmers' neglect of them, especially when they received sufficient rainfall and produced crops well. Many farmers were following early planting. However, it was difficult for farmers who relied on government inputs under the Fertiliser Input Support Program (FISP) to plant early; most of the time, the inputs arrived late, by which time other farmers had already grown. In another FGD, a farmer explained that **"Early planting helped to mitigate the effect of climate change on crop production, but seed from FISP to cooperatives came very late, sometime in January, which, when planted, can't produce yield like those who planted early".**

3.4. Waste Management Practices

From the FGDs, farmers have adopted several waste management practices, including making compost using bean waste (residues), leaving the waste in the fields as manure, feeding the bean waste to animals, and baking soda from burnt bean waste, which is used for cooking okra and African Polony. The waste from beans is used to feed cattle or pigs, and what remains is spread on rip lines or basins as manure. In an FGD from Lundazi district, a participant explained they were taught to make good compost, **"the compost manure is prepared by adding bean residues plus cattle manure plus pounded charcoal plus sawdust plus milk plus sugar solution plus yeast plus water, then covered with a plastic".** To check if the compost is ready, farmers check the heap's temperature with their hands; if it's cold, it's ready for use.

Participants explained that they reduce the amount of inorganic fertiliser they use in the field when compost is used. Though this method produces high-quality compost, most farmers may not be able to afford the associated costs. Therefore, most farmers leave the waste in the field to decompose as manure. Farmers in Lundazi also indicated that they don't burn the bean waste in the fields. Interestingly, farmers in the Chilanga district mentioned using bean roots for making traditional drinks (Munkoyo), **"we use the bean roots to make traditional drink (Munkoyo), we pound the bean roots and put them in the traditional drink to help in fermentation".**

Farmers also explained how different periods of the agricultural season influence the effectiveness of waste management. An FGD participant explained that producing compost manure during the rainy season is challenging because precipitation infiltrates beneath the plastic, compromising its quality, and that collecting manure from the kraal is hindered by mud during this period. When it comes to managing bean waste, the study found that most waste management practices, such as composting and spreading the waste in fields, are carried out by everyone. Women made soda and used the bean roots for fermentation.

Despite these waste management practices, some farmers reported throwing the waste away, while others burned it in the fields. A farmer explained that **"every farmer has a way of handling the waste. Some farmers throw away the bean waste, but I pluck out the beans and leave the bean plants in the field as manure."**

In fruit farming, waste management practices included using organic composting and mulching.

People living with disabilities also practised some form of waste management, despite the labour constraints they faced when implementing these practices. The most common waste management practices employed by PLWDs included leaving crop residues in the field to decompose, feeding them to livestock, and sometimes just throwing them into the rubbish pit. If lots of labour is required to manage the waste in question, burning it in situ is also an option. However, most smallholder farmers lack information on proper waste management practices and the associated benefits.

3.5. Social networks and collective action

The advancement towards gender equality and community empowerment is evident through collaborative efforts and organised initiatives reported in the different provinces. Farmer cooperatives spearheaded by the Ministry of Agriculture were the most widely used platform for collective action. This was a platform through which farmers were organised to receive or share information on agricultural practices. In addition, farmer groups were organised to receive or share information from various private sector organisations under various agricultural projects. In some cases, organisations asked farmers to form specific groups through which they shared information, in addition to those formed under the Ministry of Agriculture.

The Sustainable Intensification of Smallholder Farming Systems (SIFAZ), the Ukama Ustawi CGIAR initiative, and the Netherlands Development Organisation (SNV) provide knowledge on climate-resilient practices, waste management, and information on agricultural production in Eastern Province. They have established on-farm trials to carry out adaptive research and enhance farmer participation in promoting diverse climate-smart technologies. It was found that men, women, and youths were all actively involved in social networks, while farmers who were not in networks rarely used climate-resilient practices and had lower crop production than those in networks.

The study found no collective action to combat climate change's impacts on bean insect farming. Though farmers were trained in climate-resilient practices, it was up to them to decide whether or not to implement them. In communities, some farmers applied what they were taught, such as potholing, ripping, and intercropping, while others used conventional farming methods, such as making ridges, ploughing, monocropping, etc. However, farmers not in social networks were reported not to be applying climate-resilient practices.

The in-depth interviews with PLWDs revealed that they were often not included in social networks, such as agricultural cooperatives, to facilitate the receipt of extension services and subsidised inputs, among others. Most of them had never participated in any form of collective action in the community, as they were left out due to the distances involved and mobility challenges, among other challenges. Most PLWDs belonged only to social cash transfer groups, through which they received bi-monthly transfer payments of about 32 US dollars as government support, and an annual food security pack comprising two bags of fertiliser, 5 Kg of maize, and common bean seed.

Only one individual in the northern region confirmed that he belonged to a regular agricultural cooperative and to other community groups, and that he had adequate access to information, training, and other services under him as the village headman. Still, he indicated that other ordinary PLWDs were usually left out.

3.6. Financial Opportunities or Challenges

One of the challenges facing farmers is poor access to finance to support their businesses. The study found that most farmers had no access to financial services, such as loans for climate-resilient investments or financial education. Farmers also reported no access to insurance services to support production or adapt to climate change.

Despite that, some farmers in Eastern Province reported that during the 2022/23 farming season, they had access to bean seed loans from Good Nature Agro. Farmers repaid the loan with interest after selling the produce to the same company (Good Nature Agro) and then to the market. Farmers also indicated a problem with the seed loan: **"The first problem most farmers faced was that the company brought seed late, and secondly, the change in rainfall pattern affected the productivity of the crop" (FGD participant)**. Framers further stated that there was no negotiation when recovering the seed loan. The company recovered everything, regardless of the quantity a farmer produced. **"It was more like just growing for the Agro dealer without any benefit for the farmer" (FGD participants)**.

Financial lending companies were present in Eastern and Lusaka provinces. However, farmers were reluctant to take out loans for some reason. Interest rates were very high, and farmers had to be in a group of ten members to access the loan; if one or two members defaulted, then the others were supposed to be defaulter colleagues. Farmers were also required to repay the loans every month; however, at the time of the study, they had yet to produce and sell their crops to repay the loans.

> **We are not getting loans. Agora Microfinance Zambia Limited and Mastercard Foundation financial institutions came offering loans, but we farmers are scared because of the high interest rates and repayments every month; before you can even harvest and sell the crop, you are required to be paying back every month, and also, if you put that money into farming. You don't harvest anything or enough to repay the loan, the financial institution may not understand, their interest is to recover the loans regardless of the farmer's harvest situation.**
> – FGD participants narrated

> **If one fails to repay, they will come and remove the iron sheets from the house and take them**
> – Another FGD Participant

The other financial service found in communities was village banking; however, the loans obtained were small for production, and the amount of loans depended on how much a farmer had saved.

> **With village banking, you can't get a loan and use it in farming because you are required to pay every month before you can even harvest and sell the crop, and also the amount of loan you can get depends on your savings; one can only borrow three times their total savings.**
> – FGD participant

The in-depth interviews with PLWDs showed that they had no access to financial opportunities except for the Social Cash Transfer Fund, which provides about 32 US dollars to PLWDs bi-monthly. They did not have definite financial opportunities to access credit facilities, such as loans, except for a very few individuals who belonged to a community savings group (Silk) for women.

3.7. Income Generation

From the FGDs, the primary source of income for most farmers was crop production, which was the opportunity farmers saw in bean farming. An FGD participant explained, "Common beans brought some income at home

when they made sales, and the income from beans was used to buy some of the things needed at home". For beans as a source of income, farmers added that "beans were fast money", indicating that beans take a very short period to produce, harvest and sell. In addition, farmers noted that bean prices were higher than those of many other crops. Beans were also used as relish in households, as they were a source of protein for children and adults. A participant said, "Health practitioners advise feeding beans to children to improve their nutrition status, and if the farmer had beans, it was easy to follow the advice". Another income-generating activity was gardening for a few farmers with access to irrigation water.

For most PLWDs, the primary source of income was the government's social cash transfer. Due to financial and mobility constraints imposed by their physical status, they have few opportunities to generate revenue through farming.

3.8. Opportunities for Growing Businesses

The key informant respondents comprised small and medium-scale entrepreneurs across the three value chains: common beans, fruit trees and insects for food. The owners of these businesses were mostly men who also managed them. This pattern was particularly pronounced in regions outside the Lusaka (capital city) district, where women at the forefront of running successful businesses were perceived as engaging in clandestine activities that compromised their moral standing in society. One male bean entrepreneur from the northern region said,

> **"In our community, it is uncommon for a woman to do this business. The community thinks that women are not well-suited to this business because it involves a lot of movement, depriving them of the time needed to manage home affairs. Furthermore, the community believes that a woman is best suited for kitchen chores and fieldwork on the farm. The community has a wrong perception of women in this business; they usually think that those women in business are morally corrupt, and they are considered prostitutes.**
> – FGD Farmer, Lusaka District in Lusaka Province

This view was also echoed by other respondents in the same region, unlike in Lusaka, a cosmopolitan region where respondents appreciated the entrepreneurial capabilities of both men and women. "Men and women can run any business they wish as long as they have start-up capital," says one entrepreneur.

The Key informant entrepreneurs along the bean value chain revealed how their businesses evolved, with a general growth pattern for the majority. The businesses experienced growth in sales, volumes, and revenue. This growth was attributed to the high demand for beans, as the commodity was widely consumed in the country. The market for beans stretches from the farm gate through major towns to the border markets near the Democratic Republic of Congo. This unsatisfied market demand presents greater opportunities for business expansion. This demand-pull is expected to spur bean production at the farm level, thereby increasing incomes and promoting improved livelihoods among value-chain players.

Most entrepreneurs in the bean value chain buy grain in bulk from producers at the farm gate and resell it in town and border markets. At the same time, a few have integrated vertically by engaging in primary bean production and purchasing from other farmers/producers. They have been trading in common beans for 3 years now. One entrepreneur stated, "Initially, we used to produce our own beans and sell to the markets, then we started buying additional grain from other local farmers and taking it to the urban market on the Copperbelt and later started taking it to Kasumbalesa (Zambian border with Congo DRC). Our initial revenue used to be about K28,000, but later grew to an average exceeding K50,000.00 after we began buying from other farmers." Another farmer from the eastern province attested that "The business of selling bean gain is very profitable, and I would advise people to venture in. Lundazi beans are the most marketable beans in this area, and I would advise farmers to produce

more Lundazi beans".

Only one SME (Trinity Super Nutrition) engaged in value addition by pre-cooking the beans before taking them to market for sale. The rest of the entrepreneurs dealt with either raw grain or seed. Entrepreneurs involved in the bean trade were found in all the regions covered by the study, clearly indicating the distribution of the bean market.

On the other hand, entrepreneurs for fruit trees were mainly in the Central-Muchinga region. The main fruits produced and traded included Avocados, Citrus (oranges and lemons), and Mangos. Having realised the economic value of fruits on the market and the consequent increasing demand, farmers in the region have integrated fruit farming into their farm enterprises as a form of diversification. In the past, fruit production was not meant for business but mainly for home consumption. As one key informant puts it, "The business has evolved. Before now, fruit farming was done without any intention for selling, but now it is a viable economic activity".

A female key informant who experienced increased sales states, "Sales have increased compared to 5 years ago due to the mindset change of local people. In the past, people used to think that fruits were not supposed to be sold and were given freely, but now people have realised that they can make money by selling fruits". There has been an overt increase in citrus fruit production in the region, driven by local demand from the community and urban markets, including roadside trading, thereby presenting greater opportunities for expanding production and trade. The key informants had orchards ranging from 3 to 20 years of production, with a steady increase in orchard size. Both men and women farmers are engaged in fruit production and trade. "Community members generally believe that it is okay for women to run businesses to contribute to the well-being of their families. Businesses such as owning a retail shop, trading in agricultural commodities and general foodstuffs, clothing, etc., are considered appropriate for women.

In the Central Lusaka region, one fruit entrepreneur produces seedlings of various fruits and sells an average of about 2000 seedlings annually. His target market includes people from different places, mainly Lusaka and Kabwe. In describing his market opportunities, he stated that,

> **You should carve out your niche; maybe look at the area where you are and see what could be marketable, yes. You know, like in an area where we are here, I think if you go flat out with ornamentals, you may not make it because, you know, because most of the people are farmers. They want a livelihood from their farming activities, so they would like to plant something that, in the end, gives them some income. If you are near town, you know that many people want to beautify their places, and you know, in that situation, ornaments could sell. So, the idea is to carve out your niche and grow quality plants; quality will speak for itself. Once your plants are of high quality, people will come to buy them. Then you could also do some wholesaling, you know. In Lusaka, there are a lot of chaps who are vending plants. Those guys usually come to buy from people like us in bulk, and once you develop a constant network with them. You have quality plants, and you find that they keep coming, even at our nursery. We have had a situation where they come, buy in bulk, then go and sell. Overall, you should be passionate about what you are doing. The market for seedlings, however, is mainly seasonal.**
> – KII in Central Lusaka region, Lusaka Province

Key informants on insects for food were all honey producers and traders, mainly found in the Eastern and Central provinces, with very few in Lusaka. Most of them were motivated by the support received from Community Markets for Conservation (COMACO) through training, provision of traditional beehives as shown in Figure 4 and market linkages. According to key informant entrepreneurs, beekeeping is profitable, and honey production has increased over time. "Bee farming is a good business because it has low input requirements and is a reliable source of household income."

Honey prices have risen equally across local markets and supermarkets, prompting producers to supply more to wholesalers and retailers. One producer says, "I have been in this business for 3 years. The business has changed because the number of beehives has increased from 1 to 12. What led to the increase of beehives was that I observed that the money I obtained could help out at home with school fees, buying food and a bicycle for transportation, among other obligations". Most of the honey producers were men, while only two of them were women

Figure 4: Traditional beehives

3.9. Challenges of Growing Business

The challenges of growing SMEs among entrepreneurs in the bean, fruit, and insect food value chains are diverse and specific to value chains. The general challenges include inadequate working capital, high cost of transport for produce, inadequate access to financial support, and unstable market prices. The challenges associated with the bean value chain include low production among farmers in the recent seasons due to climate variability, which has led to low bean supply on the market and negatively affecting business growth. Due to commodity scarcity, the order price at the farm gate keeps going high while the prices at the urban markets keep fluctuating. Regarding transportation to the main market, one entrepreneur says, "Top on the list of challenges is finding reliable and affordable transportation. In some periods, it's very difficult to find transport going directly to Kasumbalesa (border market); if you happen to chance, it is usually very expensive".

The highlighted challenges for fruit producers and entrepreneurs include inadequate knowledge of fruit farming, lack of quality fruit seedlings, and diseases and pests. Others were the high cost of inputs for raising seedlings, lack of knowledge on value addition, and the presence of middlemen in urban markets who demand high commission rates. One key informant says that "fruit farmers in this area have never been exposed to any training. Hence, we lack knowledge on fruit farming and processing into sellable juice, for example, so if we have such training, we can be better off than we are."

Honey producers' main challenges include inadequate sources of beehives (only one supplier), inadequate access to protective clothing, a small market niche, and inadequate financial support. "The quality of beehives supplied is generally poor because COMACO contracts local carpenters to make beehives, most of whom don't do a good job", said most producers. Maintenance of beehives is also a challenge, especially for the women, due to their often-remote location in the forests where hives sometimes suffer from bushfires. Sometimes, the prices COMACO offers to the honey suppliers are comparatively lower than the market price at which the organization sells in supermarkets. Other beekeepers did not face significant challenges but are eagerly looking forward to new innovative opportunities.

4. CONCLUSION AND RECOMMENDATIONS

4.1. Conclusions

This qualitative baseline study for the Building Equitable Climate Resilient African Bean and Insect Sectors (BRAINS) project in Zambia provides critical insights into how gender, climate change, and agricultural livelihoods intersect across the bean, fruit tree, and beneficial insect/bee value chains. The findings reveal that both women, men, and youth mutually contribute to agricultural production, processing, transportation, and marketing, but gender disparities persist. Women still dominate labour-intensive tasks such as planting, weeding, and small-

scale marketing, while men largely control decision-making processes, productive assets, and income from the sale of agricultural produce. Vulnerable and marginalised groups, particularly PLWDs, remain excluded from value chain activities due to stigma, mobility challenges, and weak institutional support. Climate-induced stresses such as droughts, delayed rainfall, and pest outbreaks further intensify farmers' vulnerabilities. Although local adaptation practices such as intercropping, composting, and early planting are increasingly adopted, their uptake is hindered by high input costs, insufficient extension services, and limited access to information.

Access to inclusive finance also remains a significant challenge. Most smallholder farmers depend on informal savings groups, as formal credit institutions like banks remain inaccessible due to collateral requirements, high interest rates, and rigid repayment terms impeding investment in improved agricultural technologies and value addition. Social networks and cooperatives play crucial roles in farmers' knowledge exchange, input access, and collective marketing, yet participation remains unequal. Overall, entrenched gender norms, structural inequalities, and institutional gaps continue to limit equitable participation and adaptive capacity within the value chains. Addressing these barriers calls for deliberate gender-transformative actions that enhance women's and youth's agency, promote inclusion of PLWDs, and strengthen access to climate information, finance, and innovation for sustainable and resilient agricultural systems.

4.2. Recommendations

The following recommendations are proposed to enhance gender-responsive climate-smart agriculture (CSA) and equitable value chain development in Zambia.

- Mainstream gender and social inclusion in agricultural policy: Strengthen integration of gender and disability inclusion in national and subnational agricultural policies, ensuring that all climate-smart interventions under the BRAINS project align with Zambia's National Agriculture Policy (2012–2030) and the Eighth National Development Plan (8NDP).
- Enhance extension and advisory services: Expand decentralised, gender-sensitive extension systems that include female extension officers and sign language-trained facilitators to reach women, youth, and PLWDs effectively.
- Support an enabling environment for value addition: Provide incentives for investment in small-scale processing, packaging, and storage facilities to reduce post-harvest losses, particularly in the fruit and bee value chains.
- Strengthen gender-responsive capacity building: Implement training programs that equip women, youth, and PLWDs with skills in climate-smart technologies, waste management, entrepreneurship, and value addition.
- Facilitate access to inclusive financial services: Collaborate with microfinance institutions and cooperatives to design flexible, low-interest, collateral-free loan products tailored to smallholder farmers, especially women and youth.
- Enhance inclusion of PLWD: Ensure physical accessibility of project facilities, provide adaptive farming tools, and establish mentorship programs pairing PLWD farmers with experienced producers or entrepreneurs.
- Undertake gender-disaggregated impact assessments: Continuously monitor and evaluate the BRAINS interventions to assess their differentiated impacts on men, women, youth, and PLWDs across value chains.
- Promote multi-stakeholder collaboration: Strengthen partnerships among ZARI, PABRA, local governments, and private sector actors to foster knowledge exchange and co-investment in inclusive climate-resilient agriculture.

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