

Edible Insects: A Climate-Resilient and Inclusive Livelihood Strategy for Zimbabwe

Susan Martha Dambudzo Bvochora²²

Abstract

Innovative farming methods are critical in a world under siege of increasing climate change induced food insecurity. This study explores the transformative opportunity that edible insects commercial farming propounds towards climate change livelihood adaptation in Zimbabwe. The study focuses on marginalised groups - women and the youth - examining how gendered challenges create barriers to decision-making, accessing resources and full participation and growth in the edible insect value chain in the country. 20 participants engaged in the edible insects' sector were engaged through semi-structured qualitative individual interviews, three focus group discussions and field observations. The data were then analysed to identify patterns leading to the formulation of key themes. The findings suggest that commercialising the production of edible insects increases food security, advances women and youths' business agency within the agrobusiness sector, increases income, all while promoting environmental sustainability. However, despite the critical role that women play in the edible insects' value chain - from insect gathering, preparation and retailing, they face a multitude of challenges and barriers in accessing business resources, markets and in decision-making power. Likewise, the youth though drawn to the edible insects' sector due to its attractive income potential and low entry barriers, face challenges in the form of lack of business, technical and structural support. The commercial production of edible insects provides an attainable means towards climate change resilience and inclusive development in Zimbabwe. However, in order to realise this pathway's full potential, targeted support for the youth and gender-transformative support for women in the edible insects' value chain are necessary from both the private and public sectors. Thus, through the engagement of the business' ecosystem towards overcoming these barriers and challenges, edible insects' production can contribute to sustainability and equity in Zimbabwe.

Keywords: Climate Change, Food Security, Edible Insects, Sustainable Livelihoods, Gender, Youth, Zimbabwe.

²² Faculty of Graduate Studies, Research and Innovation; Catholic University of Zimbabwe
Email: sbvochora@cu.z.ac.zw; sbvochora@gmail.com

1.0 Introduction

The effects of climate change, poor political decisions and declining agricultural production have birthed a state of economic uncertainty and rising food insecurity in Zimbabwe (Moyo, 2024). Magwegwe et al., further explains how extreme weather patterns experienced in the country over the past two decades, characterised by erratic rainfall patterns interspaced with prolonged droughts, have had an adverse effect on maize and other staple crops in Zimbabwe. Their study, focused on quantifying the effects of climate change in a rural Zimbabwean district, found that rural livelihoods dependent on rain-fed subsistence farming, are the most affected with 38% of families experiencing annual food shortages (Magwegwe et al., 2024). Further to this, the country's growing economic instability marked by rising inflation, is increasingly making it difficult for Zimbabwean families to secure affordable nutrition (Moyo, 2024). In such a situation, Weru (2022) proposes that there is an urgent need for alternative, climate-resilient food sources that are both nutritionally rich and economically viable.

Scholars agree that in Africa, edible insects have long played an important role in traditional diets (Hlongwane & Munyai, 2021; Ogwu & Izah, 2025; Matiza Ruzengwe et al., 2022). It is particularly true in rural areas, where mopane worms (*madora/amacimbi*), flying termites (*ishwa*), soldier termites (*majuru*), and stinkbugs (*harurwa*), serve as an accessible and nutrient-dense protein sources (Hlongwane et al., 2020). In addition to their high vitamin and micronutrient content, edible insects are an essential and accessible source of protein. Unlike traditional sources of animal protein, they require minimal land, feed, water and management (Weru et al., 2021; Ogwu & Izah, 2025). Thus, in an age of rising food production costs, edible insect production is an attractive alternative food option (Moruzzo et al., 2021; Ogwu & Izah, 2025). However, despite their potential role towards sustainable food security, edible insects are currently underutilised in modern agricultural and commercial systems, primarily due to informal market structures, limited investment, and policy gaps (R. Caparros Megido et al., 2024).

While edible insects have been part of Zimbabwean diets for centuries, as in the rest of Africa, their full potential as a sustainable food source remains untapped in policy and commercial systems (Ogwu & Izah, 2025). Wijerathna-Yapa and Pathirana (2022) caution that existing food production systems are highly exposed to climate shocks

and economic fluctuations due to their focus on current staple crops and conventional livestock requiring high inputs, feed and water. Musundire et al. (2021) concur and propose the commercialisation of edible insects as an adaptive alternative. However, as the researchers readily acknowledge, edible insect production faces systemic neglect in terms of investment, policy integration, and value-chain development (Musundire et al., 2021; Ogwu & Izah, 2025). This marginalisation results in edible-insect farmers and retailers having little structured support to scale up operations, improve market accessibility, or integrate insect-based products into mainstream food supply-chains. Thus, the convergence of economic and climate pressures demands new, low-cost yet nutrient-dense food systems.

Women's contributions to insect farming and trade often go unrecognised and undervalued. This fact highlights a critical gap in gender-inclusive agro-policy research. The youth too, are less engaged in insect farming, primarily due to perceptions of the sector as informal, outdated, thereby more difficult to realise profits (Dokubo et al., 2023). Without targeted support to improve market conditions, access to credit, and regulatory frameworks, edible insect farming will continue to be restricted to informal economies, preventing it from reaching its full potential as a viable and sustainable agribusiness (Ameixa et al., 2020; Tanga et al., 2021).

In addition, edible-insects farming and commercialisation in Zimbabwe is understudied. The majority of literature focuses on the nutritional profiles of edible insects and the cultural practices associated with them. However, scholars agree that there is little emphasis on policy frameworks, gendered barriers, or commercial scaling in the production of edible-insects in the country (Chikonyani, 2022; Manditsera, 2019; Mutai, 2024).

It is with this in mind that this study poses and is guided by the overarching research question: *“Under current cultural and policy conditions, how can the farming of edible-insects be developed into a climate-resilient, gender-inclusive and economically viable livelihood strategy in Zimbabwe?”*

To address this question, this study explores the potential of edible insect farming as a climate-resilient and inclusive livelihood strategy in the country. Specifically, this study aims to fill the identified gaps by systematically examining the socioeconomic, gendered, and policy dimensions of edible insect farming in Zimbabwe.

1.1 Significance

The importance of this study lies in its potential contributions to academic research and practical policy implementation. By recognising these traditional, indigenous protein sources as alternative sustainable food systems and climate adaptation strategies, this study provides a detailed analysis of the economic feasibility, social acceptance, and gendered dimensions of edible insect farming, and filling a critical gap in existing literature (Kelemu et al., 2015; Moyo, 2024; Dagevos, 2021). From a policy perspective, this research provides recommendations for government agencies, development organisations, and private sector stakeholders towards the development of inclusive policies that support small-scale edible insect farmers and traders. The paper contributes to the discourse on promoting the creation of regulatory frameworks that ensure food security, standardising the edible insects' market, in addition to promoting consumer awareness and facilitating access to finance and training for women and youth entrepreneurs in this sector. Thus, this study aims to contribute to developing a more resilient, gender-inclusive, and sustainable agricultural system in Zimbabwe, ensuring long-term food security and economic empowerment.

2.0 Literature Review

2.1 Theoretical Framework

This study is anchored by three key theoretical frameworks that provide a lens for analysing edible insect farming as a climate-resilient and inclusive livelihood strategy in Zimbabwe. These are the Sustainable Livelihoods Approach (SLA) developed by Chambers and Conway (1992), the Gender and Development (GAD) perspective, developed by feminist scholars in the 1980s (Rathgeber, 1990), and Ajzen's (1991) Theory of Planned Behaviour (TPB).

2.1.1 Sustainable Livelihoods Approach (SLA)

As Morse and McNamara (2013) attest and Ragie (2016) confirms, the Sustainable Livelihoods Approach (SLA) is a widely used framework in development studies that examines how households and communities build resilience and access resources to maintain and improve their livelihoods. SLA emphasises five capital assets: human, social, natural, physical, and financial capital, that determine a household's ability to withstand shocks and sustain economic well-being (Jele, 2012; Morse, 2025).

Ogwu and Izah (2025) and Morse (2025) agree that SLA is particularly relevant in edible insect farming, as it highlights how low-cost, high-protein insect farming can enhance food security, generate income, and reduce environmental pressure on conventional agriculture. A comparison of Mrabet's (2023) analysis of cattle and poultry farming requirements, and Fernández's (2025) report on the substantially lower production requirements for edible insects, indicates that edible insects are a more sustainable alternative for rural households facing climate-related agricultural challenges. On the other hand, other scholars argue that institutional barriers, limited financial support, and weak value chains constrain the scalability of edible insect farming (Ameixa et al., 2020; Mrabet, 2023). Thus, the viability of commercially producing edible insects requires both public and private interventions to improve access to market infrastructure, credit, and technical knowledge (Chidozie Ogwu, 2025).

2.1.2 Gender and Development (GAD) Perspective

According to Miller and Razavi (1995), and Onyike et al. (2025), the Gender and Development (GAD) perspective is critical to understanding the unequal access to resources, economic opportunities, and decision-making power in insect farming. The perspective foregrounds gender inequality concerning women in Zimbabwe, who though contributing significantly to agriculture, remain marginalised in land ownership, financial access, and market participation (Musundire et al., 2021).

Chikonyani's (2022) study offers insight into the dilemma by showing how despite Zimbabwean women's involvement in harvesting, processing, and selling edible insects, they continuously lack formal recognition in the industry, thereby creating an environment of diminishing empowerment as the women's lower bargaining power corresponds to their limited business profitability (Chikonyani, 2022). GAD provides a lens to examine how institutional and policy interventions can address these disparities by enhancing women's access to training, credit, and cooperative networks in the edible insect sector (Hlongwane et al., 2021).

2.1.3 Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) helps to explain consumer acceptance and behavioural intentions regarding edible insect consumption (Bae & Choi, 2021; Lucchese-Cheung et al., 2020; Thu et al., 2023). TPB suggests a three-factor influence behaviour:

Table 1: Theory of Planned Behaviour (TPB)

No.	Factor	Description	Relevance to Edible Insects in Zimbabwe
1	Attitudes	Perceptions of whether consuming insects is beneficial or undesirable.	Cultural stigma often associates insect consumption with poverty, limiting market expansion.
2	Subjective Norms	Social pressures influencing dietary choices.	The influence of societal beliefs and traditional dietary habits affects consumer acceptance.
3	Perceived Behavioural Control	Individuals' confidence in adopting insect-based diets.	Education, marketing, and policy interventions can enhance consumer confidence and demand.

In Zimbabwe, cultural stigma often associates insect consumption with poverty, limiting market expansion (Ameixa et al., 2020; Tanga et al., 2021). TPB enables an examination of how social, educational, marketing, and policy interventions can influence public perceptions and enhance consumer demand for edible insect products (Thu et al., 2023).

2.2 The Role of Edible Insects in Food Security in Zimbabwe

As previously established by scholars including Kinyuru et al. (2015), edible insects have always been a fundamental component of human menus. In traditional Zimbabwean diets, they play an important role in providing a rich source of protein, essential micronutrients, and seasonal food options. According to Hlongwane et al. (2020), popular delicacies such as mopane worms (*Gonimbrasia belina*), crickets (*Acheta domesticus*), and stinkbugs (*Encosternum delegorguei Spinola*) are higher in protein than livestock, thus, making them valuable in addressing nutritional deficiencies and food insecurity. Kazembe et al. (2024) note how stinkbugs - *harurwa* - widely consumed across Southern Africa, are especially prized for their unique

flavour, high protein content, and micronutrient density. A seasonal delicacy traditionally harvested and consumed in Masvingo and Matabeleland, the stinkbug (*harurwa*) remains an important high-value food source in local communities. In addition, the mopane worms (*madora/amacimbi*), are particularly popular among communities with limited access to livestock (Selaledi et al., 2021). A ready source of dietary omega-3 fatty acids, iron and zinc, edible insects are thus the backbone of indigenous cuisine, providing a safety-net during seasons of food shortage (Zielińska et al., 2025; Hlongwane et al., 2021).

While rural communities continue to incorporate edible insects into their daily diets, urban markets have yet to fully embrace them beyond traditional consumption practices. As urbanisation and shifting dietary habits reshape food preferences, the underlying reasons for low urban consumption are yet to be sufficiently explored in the Zimbabwean context (Manditsera et al., 2018). Matandirotya et al. (2022) and Wade and Hoelle (2020) agree that further research into the commercialisation of edible insects is necessary to understand how they could be integrated into modern food systems while preserving cultural relevance.

Rooted in indigenous knowledge systems embedded in recipes and preparation methods often handed down from mother to daughter, edible insects are harvested, processed, and consumed to maximise their nutritional and economic value (R. Caparros Megido et al., 2024). The table below presents the traditional collection, preservation, and consumption methods of the most commonly consumed edible insects across Zimbabwe's provinces.

Table 2. Indigenous harvesting and preparation methods of commonly consumed insects in Zimbabwe.

Insect Order	English Name	Local Name (Shona / Ndebele)	Provinces Found	Consumption Stage	Seasonality	Collection Methods	Collectors	Processing for Preservation	Cooking Methods
Lepidoptera	Mopane Worm	<i>Madora</i> (Shona) / <i>Amacimbi</i> (Ndebele)	Matabeleland South & North, Midlands, Masvingo	Larval stage	Rainy season (December to April)	Handpicked from Mopane trees	Predominately Women & Youth	Degutted, boiled in salted water, sun-dried or smoked	Rehydrated for stews, fried, or roasted
Isoptera	Flying Termites	<i>Ishwa</i> (Shona & Ndebele)	Mashonaland East & West, Midlands, Manicaland	Winged adult stage	Early rainy season (after the first rains)	Attracted to light; collected by hand or traps	Families Especially Youth	Lightly fried to remove moisture; can be sun-dried	Roasted or fried as a crunchy snack
Hemiptera	Edible Stinkbugs	<i>Harurwa</i> (Shona) / <i>Umtshipela</i> (Ndebele)	Masvingo, Matabeleland South	Adult stage	Late dry season (August to October)	Shaken from trees into nets or containers	Predominantly Men	Boiled to remove secretions; sun-dried	Boiled or fried; used as seasoning or snack
Orthoptera	Locusts and	<i>Mhashu</i> (Shona)		Nymph and	Throughout	Caught by	Youth	Wings and legs	Fried, roasted,

	Grasshoppers	<i>/ Inkankane</i> (Ndebele)	Mashonaland Central, Manicaland, Matabeleland North	adult stages	the year, peaks during crop seasons	hand, nets, or traps		removed; sundried or smoked	often seasoned with salt or chilli
Orthoptera	Cricket s	<i>Makurwe</i> (Shona) <i>Inyekuvhu</i> (Ndebele)	Midlands, Mashonaland West	Adult stage	Rainy season (November to February)	Collected by hand at night or early morning	Youth & children	Cleaned ; sometimes sundried for storage	; added to soups

2.3 Viability and Market Potential

Because they are low in production costs but high in demand, edible insect farming is considered economically viable. This is particularly true in areas where seasonal shortages drive up retail prices (Aigbedion-Atalor et al., 2024). This demand is confirmed by the higher price per kilogram of mopane worms as compared to the prices of beef or chicken (Babarinde et al., 2021; Chagwena et al., 2019; Siddiqui et al., 2023).

Despite this, edible insects' commercialisation remains informal and poorly structured, limiting scalability. Additional barriers to edible insects' production becoming a fully integrated agribusiness sector include supply chain constraints, lack of standardisation, and policy uncertainties (Ameixa et al., 2020). Moreover, studies in market expansion suggest that investment in processing technologies, branding, and packaging could enhance consumer trust and facilitate broader market penetration (Munson, 2021).

2.4 Environmental Sustainability and Climate Resilience

With a smaller environmental footprint due to their significantly lower emissions of greenhouse gases compared to traditional livestock such as cattle, pigs or poultry, edible insects also require far less water and feed (Szulc, 2023; Siddiqui et al., 2023). Magara et al. (2021) suggest that cattle production requires as much as six times more feed than cricket production, for instance, to produce an equivalent amount of protein.

However, caution must be taken when commercialising edible insects' production. While the wild harvesting of insects has long been a sustainable practice, large-scale farming poses potential ecological concerns, such as disrupting local insect populations and biodiversity (Hlongwane et al., 2021). More research is needed to develop best practices for insect farming that balance sustainability with production efficiency (Moruzzo et al., 2021).

2.5 Gender and Youth Inclusion in Insect Farming

Despite the acknowledged role of women and youth in the edible insects' business sector (Dokubo et al., 2023; Platta et al., 2024; Szulc, 2023), few studies have explored the undergirding systemic barriers limiting their full participation in and growth within this agribusiness sector. Women entrepreneurs in the edible insects' value chain are

casualties of discriminatory financial exclusion, as agricultural loans are typically structured for male crop and livestock farmers rather than women, let alone women in alternative protein production (Mrabet, 2023). Similarly, youth engagement remains low due to a lack of training, startup capital, and business development support (Aigbedion-Atalor et al., 2024). Addressing these gaps could inform gender-responsive agricultural policies promoting inclusive edible insect farming business models (Ameixa et al., 2020; Tanga et al., 2021).

By focusing on the economic feasibility of commercial edible insect farming from the viewpoint of the actors within its value chain, this study explores the intersection of gender, youth participation, and policy constraints in scaling up insect farming. In addition, this paper addresses administrators through policy recommendations to strengthen food safety regulations, financial access, and integration of the commercial value chain for edible insects. This research addresses these critical areas and contributes to agricultural innovation, sustainable food systems, and inclusive economic development in Zimbabwe.

The study focuses on Zimbabwe, where edible insects hold cultural significance, yet remain economically underdeveloped and where gender-inclusive market participation is underexplored. The research therefore, prioritises studies on the economic and nutritional viability of edible insects, policy analyses on market regulation and financial barriers, as well as social inclusion in gender and youth participation in the country. This narrow approach ensures that findings are directly relevant to Zimbabwe's food security and agricultural policy landscape.

By comprehensively analysing opportunities and challenges, this study offers evidence-based policy recommendations to support the sustainable development of edible insect farming in the country.

3.0 Methodology

3.1 Research Design

Adopting a phenomenological qualitative design, this study examined the personal experiences and perspectives of people making a living in Zimbabwe's edible-insect value chain. Following Pilarska (2021), this approach is especially effective in understanding how participants in a research study interpret their roles, navigate

challenges, and seize opportunities within a particular setting. Considering the scarcity of existing research on edible-insect farming in Zimbabwe, qualitative methods offer nuanced insights that quantitative approaches might miss (Morse & McNamara, 2013).

Using phenomenology allowed the researcher to deeply delve into and understand how people view edible-insect farming as a livelihood (Kazembe et al., 2024). It was particularly effective in uncovering the motivations, barriers, and future hopes of women and youth involved in this industry. The study also integrated aspects of ethnography by directly interacting with and observing insect traders, farmers, chefs, and agricultural extension workers in their work settings. To further strengthen validity, the researcher cross-referenced findings from participants coming from diverse geographic areas, and socioeconomic backgrounds.

3.2 Participants

This study included the following respondents: small-scale edible insect farmers, traders, consumers, a chef, and agricultural extension officers, all from multiple regions in Zimbabwe. Especially chosen for being involved in the edible insects' value chain, the respondents are actively involved in edible insect farming, market activities, or extension services. The research thus ensured diversity of insights into market trends, sustainability challenges, and policy-related obstacles.

3.3 Sampling Strategy

Following Chikonyani (2022), this study followed a purposive sampling strategy and so ensured the participation of key informants with experience and expertise in the edible insects' value chain. By such a selection, the method ensured that only participants most suitable in meeting the research topic were selected. In addition, snowball sampling was also employed and this enabled the study to delve more deeply into the edible insects' sector as participants voluntarily referred other individuals within the sector. In the end, this combination of the methods not only ensured diversity in representation, but also saw that both rural and urban voices were heard.

3.4 Data Collection Methods

Data were collected through semi-structured interviews, focus group discussions, and a case study to capture diverse views and specific contexts related to edible insect farming. Semi-structured interviews involved 20 participants, including farmers,

traders, a professional female chef, four consumers, and an agricultural extension officer. These interviews allowed follow-up questions while maintaining key themes covering economic benefits and barriers, cultural attitudes toward edible insects, market entry challenges, agricultural extension services, and culinary innovations involving insects. Including four consumers provided insights into their acceptance, preferences, and concerns about insect-based food products.

Additionally, the interviews with the agricultural extension officers offered valuable information about government support, availability of technical training, and potential policy initiatives to help young edible-insect farmers.

Three focus group discussions were held, consisting of groups of three, five, and six participants drawn from women traders, young entrepreneurs, and small-scale farmers.

These discussions facilitated group dialogue and experience sharing, especially on women's roles in insect farming and trading, shifting dietary and farming practices among different generations, and challenges related to accessing finance and market regulations. Participants shared their personal views on the cultural and economic importance of edible insect farming in Zimbabwe, helping to understand barriers and opportunities for market access and commercialisation.

A case study focused on a professional chef exploring innovative ways to market edible insects through new culinary approaches. The chef, a successful entrepreneur in the country, developed recipes such as gourmet dishes and cakes made with stinkbugs (*harurwa*), cricket flour bread, insect protein bars, and dishes containing mopane worms (*madora/amacimbi*). The case study examined the feasibility of integrating insects into everyday meals, consumer acceptance issues, food safety regulations, marketing and product development strategies, and the need for investment in production and distribution. Findings from this study offer insights into marketing insect-based foods in urban areas, combining traditional eating habits with modern culinary innovation to cater for the more sophisticated urban palettes.

Site visits were conducted at a traditional harvesting location to examine environmental sustainability practices, and at Mbare Musika, Harare's main urban market, to document business transactions, pricing, and interactions between consumers and edible insect traders.

An additional visit took place at the chef's food preparation facility, helping evaluate the market expansion potential within Zimbabwe's food industry and changing consumer acceptance of insect-based foods. Site visit data provided deeper context for interviews and focus group discussions, enabling thorough analysis of economic and cultural aspects of edible insect farming in Zimbabwe.

3.5 Data Analysis

Data analysis was conducted using thematic analysis as described by Braun and Clarke (2006) and Dawadi (2020). This included familiarising with the data, generating codes, creating themes, and refining identified themes. From this exercise, themes such as economic viability, gender roles, and policy constraints emerged from both inductive and deductive coding. NVivo 12 Pro software (QSR International, 2019) was used to systematically store and organise the data.

Trustworthiness of the findings followed Lincoln and Guba's (1994) guidelines, focusing on credibility, transferability, dependability, and confirmability. Triangulation, member-checking, and peer debriefing enhanced credibility. Detailed (thick) descriptions and participant selection from diverse groups supported transferability of the findings to other contexts. Audit trails and inter-coder reliability ensured dependability, and reflexivity through research journaling reinforced confirmability.

Participants provided informed consent, with guarantees of confidentiality and the right to withdraw. Data security was maintained through pseudonyms and restricted access. Ethical guidelines ensured minimal disruption to traders and farmers during fieldwork.

4.0 Results

This section presents the study's findings, organised around central themes emerging from thematic analysis of the 20 interviews, three focus group discussions and site observations. The participants' voices are synthesised here to reflect the diversity of experiences within the edible insect value chain in Zimbabwe. Findings are interpreted through the Sustainable Livelihoods Approach (SLA), the Gender and Development (GAD) framework, and the Theory of Planned Behaviour (TPB), as applicable.

4.1 Economic Viability and Market Demand

4.1.1 Income Generation Potential

Of the 20 participants, eighteen reported the farming of edible insects as offering significant potential for higher income than from livestock or conventional crops. Participants indicated that the sale of mopane worms (*madora/amacimbi*) and flying termites (*ishwa*) were particularly lucrative during seasonal scarcity. Participant 01 (a female trader at Mbare Musika, Harare) explained:

“Right now, [January] a cup of madora is \$2, but by October it’s \$5... It’s more expensive than beef or chicken because it’s seasonal.”

Figure 1: Sacks of dried mopane worms (*madora/amacimbi*) with a 5kg tin and cup used for at Mbare Musika market, Harare.



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Participant 02 echoed this observation, noting that edible insects were “more profitable than beans,” particularly when sold to urban and diaspora clients. Youth respondent Participant 03 stated:

“If I had \$500, I could order 10 buckets. Right now, I lose customers because I can’t meet bulk demand.”

Both agricultural extension officers (Participants 19 and 20) affirmed the sector's potential for income generation, particularly for small-scale rural producers. One observed:

“Insects grow fast, require less space and feed, and can provide a lifeline in arid zones where livestock can't thrive.”

These findings align with the SLA, which highlights livelihood strategies that maximise local resource use while minimising vulnerability to climate or economic shocks.

4.1.2 Urban and Diaspora Demand

Nine participants described increasing demand from both urban elites and Zimbabwean diaspora. Participant 01 stated:

“I have clients from the UK and South Africa—they buy in bulk. These insects remind them of home.”

Participant 02 noted that children and young adults in Harare now enjoy edible insects as snacks, suggesting a generational shift. This diversity in consumer interest challenges the assumption that insect consumption is confined to rural populations.

4.2 Gendered Participation and Market Access

4.2.1 Women's Dominance in Retail, Barriers in Bulk Trade

Thirteen participants (11 women and 2 male participants) identified women as central to edible insect retail and informal distribution. Participant 05, a vendor with 24 years of experience, stated:

“I do everything—from sourcing to selling. But I still can't grow. I just survive.”

Participant 06 lamented the lack of financial inclusion:

“Banks want pay slips and company papers—we don't have those.”

GAD's emphasis on systemic inequalities restraining women's agency economically is highlighted in these identified gendered barriers to capital, infrastructure and scale. Even though women are the backbone of the edible insects' trade in the country, they are excluded from both the control of the supply chain and access to formal credit.

Extension officer Participant 19 confirmed this gender imbalance:

“Women dominate the trade but have no voice in decision-making or policy advocacy.”

4.2.2 Youth and Gender Intersection

The GAD framework also explains how young women face dual exclusion: both by age and gender. The chef (Participant 18) explained:

“It’s mostly women and girls who gather and prepare insects in the rural areas. But they don’t see themselves as business owners because there’s no support to formalise what they do.”

Men, on the other hand, appeared less aware of these barriers. One male trader dismissed such gender concerns:

“If you have skills, gender isn’t an issue. It’s just business.”

This comment illustrates the gender blindness that GAD critiques, where structural inequalities are rendered invisible by dominant market norms.

4.3 Youth Engagement and Perceived Informality

Six youth participants (under 35) expressed mixed views concerning edible insect entrepreneurship. Four viewed it as innovative but lacked the financial and institutional support to commercialise it. Participant 03 said:

“I know there’s money in it, but starting is hard. No loans, no training, no business guidance.”

According to TPB, this reflects low “perceived behavioural control,” where youth recognise opportunity but lack confidence in overcoming institutional and financial constraints. Extension officer Participant 20 stated:

“Youth want modern, tech-driven ventures. Insects seem informal and unscalable unless we rebrand them.”

Participant 18 (chef) noted the role of subjective norms in shaping youth engagement:

“They avoid insect work because of stigma; it’s seen as poor people’s food.”

TPB provides a useful lens for understanding how perceived control, attitudes, and social norms converge to limit youth uptake in the sector.

4.4 Climate Change and Seasonal Constraints

All 20 participants expressed concern about the declining availability of edible insects due to erratic rainfall and environmental degradation. Participant 04 stated:

“We used to expect ishwa after the first rains. Now, the rains don’t come, and harvests are poor.”

Participant 01 added:

“No trees, no madora. Deforestation is killing our trade.”

These climate change induced disruptions threaten long-term sustainability, reinforcing the SLA’s emphasis on environmental capital as a foundation for livelihood resilience. Both extension officers stressed the need to shift from seasonal harvesting to structured farming. One said:

“Without breeding programmes and controlled farming, edible insects will remain unreliable.”

4.5 Consumer Perceptions and Cultural Stigma

4.5.1 High Demand and Traditional Value

Seventeen participants reported growing demand across all socioeconomic groups. Participant 02 noted:

“Even the rich buy from us—they just don’t talk about it. It reminds them of their childhood.”

Participant 05 explained that clients see insects as “healthy and healing” food.

Figure 2: A winnowing basket with flying termites (*ishwa*) is strategically displayed in front of traditional grains at Mbare Musika market, Harare



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4.5.2 Stigma in Urban Contexts

However, TPB's construct of 'subjective norms' emerged clearly: urban stigma persists. The chef explained:

"Insects are seen as food for the poor. In low-density suburbs, people would rather eat imported meat."

This stigma creates tension between cultural heritage and modern identity. TPB helps us understand how these perceptions can limit consumer uptake despite nutritional and environmental benefits.

4.6 Infrastructure, Capital Constraints, and Policy Gaps

4.6.1 Inadequate Storage and Security

Twelve participants cited storage and infrastructure as limiting factors. Participant 01 noted:

"We leave our produce with guards. Sometimes it gets stolen. We need proper vending stalls."

Participant 05 discussed fumigation methods:

“With fumigated rooms, I can keep madora for two years. But I can’t always afford to rent them.”

4.6.2 Lack of Capital and Institutional Support

Women and youth were especially affected by lack of collateral, documentation, and business registration. Participant 06 stated:

“We’ve never even approached a bank. We know we don’t qualify.”

Both extension officers and some youth farmers confirmed the absence of formal policies, financial instruments, or food safety standards to support edible insect production and commercialisation. Participant 08, a youth harvesting *harurwa* explained:

“Right now, anyone can sell insects with no standards. There’s no guidance for processing or packaging. This holds us back.”

This absence of regulatory frameworks aligns with the GAD perspective, where informal economies (particularly those led by women) are often excluded from policy discourse and support.

These findings indicate the transformative potential of edible insects farming as a viable livelihood option in Zimbabwe. The participants’ reflections and experiences foreground such challenges as informality in business and the dilemmas of accessing markets as well as cultural and current stigmatisation in the sector. Such dynamics differ across men’s and women’s gender, age, and role on the value chain, calling for gender-and-age-specific interventions (as summarised in Table 3). These considerations shall serve as the basis for a more in-depth theoretical discourse in the next section.

Table 3: A Summary of Participants Themes and Contributions.

Theme	Participants (n=20)	Representative Roles	Key Insights
Income Generation	18	Traders, farmers, chef, extension officers	High margins during seasonal scarcity; greater profitability than meat or beans; challenged by inconsistent supply

Gendered Market Barriers	13 (mostly women)	Female traders, chef, extension officers	Women dominate retail but lack access to finance, cooperatives, and scaling opportunities
Youth Engagement & Stigma	6	Youth traders, chef, extension officer	Youth interested but constrained by stigma, lack of training, and perceptions of informality (TPB: low perceived control and negative norms)
Climate & Seasonality	20	All respondents	Rainfall variability and deforestation reduce insect availability; support needed for controlled farming
Consumer Demand vs Stigma	17	Traders, chef, diaspora clients	Traditional value remains strong, but stigma persists in urban/elite spaces; rebranding needed for mainstream adoption
Infrastructure & Capital Gaps	12	Traders, extension officers, chef	Inadequate storage, insecure vending areas, and lack of tailored loans; traders lack documentation for formal financing
Policy & Regulation Void	7 explicitly, 5 indirectly	Chef, extension officers, youth entrepreneurs	Absence of standards and safety regulations hinders formalisation; edible insects remain excluded from national agro-policy frameworks

5.0 Discussion

5.1 Integrated Framework for Climate-Resilient and Inclusive Edible Insect Farming in Zimbabwe

This study contributes to emerging scholarship that positions edible insect farming as a viable livelihood strategy in the face of worsening food insecurity, unemployment, and climate change. Building on previous research (Kelemu et al., 2015; van Huis, 2015), it confirms that Zimbabwe's edible insect sector holds untapped potential across economic, environmental, and nutritional domains. In addition, the findings expand upon earlier studies by foregrounding the gendered and generational dynamics that shape access to market opportunities, financing, and policy influence.

Edible insect farming in Zimbabwe presents a transformative opportunity for addressing food security, economic empowerment, and climate resilience. This study

points towards there being a strong market demand for edible insects, particularly mopane worms (*madora/amacimbi*), flying termites (*ishwa*), and crickets (*majuru*). Traders have highlighted that profits from selling these insects are higher compared to those from traditional agricultural products such as beans or other sources of protein such as dried kapenta (*Limnothrissa miodon*). Nevertheless, despite this clear economic potential, the edible insects sector remains informal, hindered by seasonal insect availability, limited financial support, and a lack of clear policies for market integration. These barriers prevent edible insect farming from evolving into an organised industry capable of growth and serving both rural and urban markets, thus missing the opportunity to significantly contribute to strengthening national food security.

The study's findings align with the Sustainable Livelihoods Approach (Chambers & Conway, 1992), thereby suggesting that edible insects present vital economic opportunities, requiring minimal initial investment and helping to diversify income sources for actors in the value chain. The study confirms Musundire's (2014) assertion that there is high profitability during challenging periods. Further to this, this study also corroborates that women heavily depend on the insect trade to sustain household incomes during crises. Moreover, the fact that 18 out of 20 participants saw insects as more profitable than traditional crops strongly supports formalising this sector into a viable business.

Women play key roles along the edible insect value chain, especially in harvesting, processing, and trading. Despite holding these roles, they face challenges such as limited access to credit, a lack of technical training, and the absence of structured markets. These barriers prevent women from scaling their enterprises effectively. This gendered exclusion confirms the earlier work by Ayieko et al. (2010), who highlighted the challenges of the informal nature of women's participation in insect harvesting in Kenya. However, unlike previous studies, this research explicitly connects these barriers to institutional blind spots in Zimbabwe's financial and agricultural policy systems, which fail to recognise women-led informal enterprises in this sector. Viewed through the GAD lens, this lack of structural support perpetuates women's marginalisation in value-added agricultural sectors.

Similarly, youth participation remains low, primarily due to the perception that insect farming is informal, seasonal and lacks consistent profitability. However, young entrepreneurs who have entered the sector recognise its potential, particularly in modern processing, branding, and agribusiness development. Expanding their engagement will require targeted interventions in training, financial support, and business development to position edible insect farming as a viable career path.

This perception gap aligns with the Theory of Planned Behaviour (Ajzen, 1991), particularly the constructs of “subjective norms” and “perceived behavioural control.” Unlike previous studies that broadly cite youth disinterest in agriculture (Geza et al., 2021; M Nthoesane & Teele, 2024; Baidoo & Maame Kyerewaa Brobbey, 2023), this study shows that youth are not inherently disinterested in insect farming, they are discouraged by its informality, low visibility in entrepreneurship support programmes, and peer perceptions that associate it with poverty. The chef’s observation that youth avoid the trade due to stigma supports this interpretation.

Edible insect farming offers significant environmental advantages in addition to economic benefits. Unlike traditional livestock production, insects require minimal land, water, and feed, making them an efficient, climate-resilient food sources. These findings corroborate van Huis et al. (2015) and Matandirotya et al. (2022), who identify edible insects production as low-carbon alternatives to livestock. However, this study expands upon these environmental arguments by linking them to the lived experiences of participants. All 20 interviewees attributed declining insect harvests to climate shocks and deforestation, a point rarely emphasised in commercialisation debates. This finding reinforces the SLA’s emphasis on natural capital and validates calls for semi-intensive farming as a sustainable response to climate volatility. However, cultural perceptions present a significant challenge. While rural communities continue to incorporate insects into their traditional diets, urban consumers often associate insect consumption with poverty and outdated customs. This inclination by urban consumers confirms earlier findings by Kinyuru et al. (2015). However, this study goes further by revealing a dual perception: insects are both stigmatised and nostalgically valued among urban consumers and diaspora clients. Such ambivalence suggests that urban market resistance is not absolute and may be shifted through branding and cultural repositioning, as supported by TPB’s focus on attitudinal change.

This study therefore, suggests that culinary innovation and branding can help reposition edible insects as premium, sustainable food products. The case study of the professional chef illustrates how modernising insect-based cuisine and integrating it into gourmet markets can increase consumer acceptance, expand commercial potential and introduce edible insects to new markets.

Despite these opportunities, the absence of food safety regulations, clear processing guidelines, and financial incentives remains a significant barrier to commercialisation. Without formal government recognition and structured market support, edible insect farming risks remaining an informal, small-scale activity with limited growth potential. While previous literature has called for regulatory frameworks (Kumar & Ogwu, 2025; Lähteenmäki-Uutela et al., 2021), this study adds granularity by documenting how traders' daily realities, such as lack of hygienic vending space or packaging standards, contribute to marginalisation. Participants' calls for processing regulation and secure vending infrastructure illustrate the practical bottlenecks that policy inaction perpetuates. Addressing these regulatory and financial gaps is essential for transitioning insect farming from a subsistence practice to a fully integrated agribusiness sector.

5.2 Barriers and Opportunities in the Edible Insect Sector

This study confirms the role of edible insects in providing nutritious, seasonally available food, especially in rural communities. In addition, edible insects promote diversity in diet as well as economic stability in the value chain actors' households. Despite its encompassing significant potential as a livelihood strategy, the sector remains informal. Unlike previous research by Simatele and Kabange (2022), which viewed informality as a form of external financial marginalisation, this study identifies it as a failure of formal policy structures contributing to the exclusion of actors within the edible insects' value chain in Zimbabwe from accessing the resources and institutional frameworks they need to thrive in their industry.

The exclusion of edible insect farming from agricultural financing, food safety regulations, and market development highlights the absence of a clear government vision, not merely a lack of market development. Women traders lament the lack of financial support and organised structures, which they identify as a barrier to their

accessing higher-value markets. Similarly, limited financing, training opportunities, and structured industry frameworks prevent youth from fully participating in the sector.

Consumer attitudes continue to influence market dynamics, with urban residents hesitant to consume insects due to an acquired cultural stigma as a result of colonisation and a lack of awareness of edible insects' nutritional benefits. However, emerging trends in health consciousness, local sourcing, and dietary shifts indicate that this stigma is gradually decreasing. This paradox of persistent cultural stigma alongside growing demand, builds upon Verbeke's (2015) observations, suggesting that emotional and cultural perceptions can shift when aligned with sustainability, health benefits, or local identity.

The increasing recognition of traditional foods and their health benefits, including edible insects, presents opportunities for urban market expansion. Culinary innovation has become a powerful tool in reshaping consumer perceptions. Effective marketing, product development, and contemporary preparation techniques can further enhance acceptance and demand. Nonetheless, large-scale commercialisation remains challenging without formal food safety regulations, clear production standards, and financial incentives. Official government recognition and support for structured markets are crucial in transitioning insect farming from informal practices into a formal, thriving industry.

5.3 The Sustainable Edible Insect Farming Framework

For Zimbabwe to fully harness the potential of edible insect farming, a comprehensive, multi-sectoral approach is required. This approach integrating insights from the Sustainable Livelihoods Approach (SLA), Gender and Development (GAD) theory, and the Theory of Planned Behaviour (TPB), should combine climate resilience, social inclusion, government support, and consumer education, transforming edible insect farming into a structured and profitable industry.

Central to this strategy is promoting controlled insect farming, shifting from traditional harvesting toward more efficient and sustainable methods of production. Integrating edible insect farming into circular agriculture would serve to enhance industry resilience by using organic waste to produce low-carbon food sources. Investing in climate-smart harvesting, processing, and preservation methods reduces post-harvest losses and improves product quality.

An industry model that fully integrates women is essential for equitable participation. Expanding women's access to financial resources through microfinance, savings groups, and government-backed credit schemes would enable them to scale up their businesses. Forming cooperatives and business training programmes would help women access formal markets and increase productivity. Enhancing women's leadership along the edible insect value chain, ensuring their involvement in decision-making and policy processes, would address barriers they currently face.

Youth participation is another crucial component. Establishing youth-targeted incubation hubs offering mentorship, business training, and seed funding supports young entrepreneurs interested in insect farming. Creating a National Youth Edible Insect Association could facilitate networking, advocacy, and knowledge exchange. Moreover, leveraging digital platforms for e-commerce, social media marketing, and brand development can open new market opportunities for insect-based products.

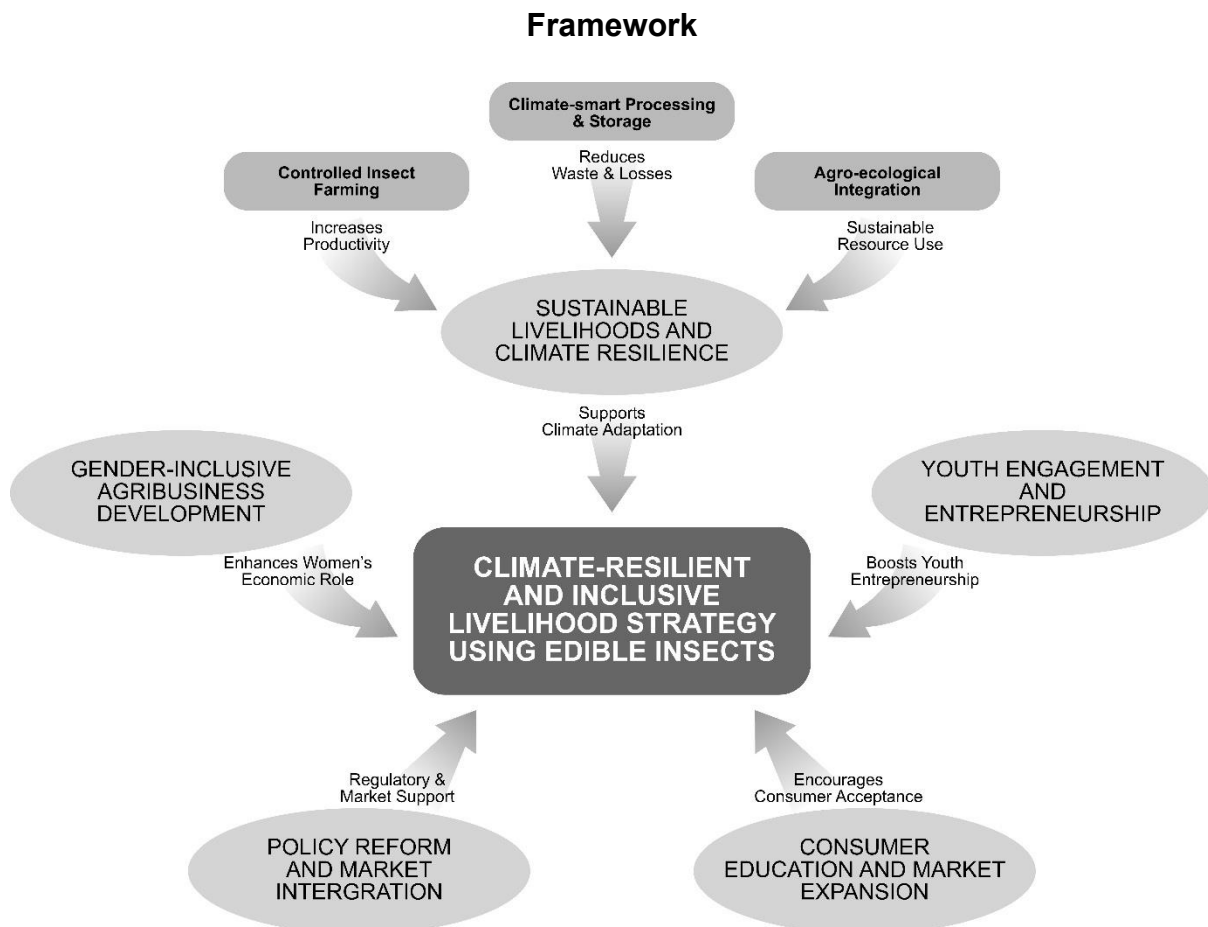
Policy reform and structured market integration are key to the industry's long-term sustainability. Developing clear food safety standards and production regulations helps protect consumers and builds market trust. Recognition of edible insect farming within government agricultural policies, along with financial incentives, will encourage investment. Private sector partnerships are also vital, driving commercialisation efforts through investment in edible-insect food processing and supply chain improvements.

Consumer education forms another cornerstone of this strategy. Culinary innovation should be actively employed to shift consumer perceptions positively. Introducing gourmet insect-based dishes, high-protein snacks, and value-added products can appeal to urban consumers. Nationwide public awareness campaigns will reduce stigma, educating consumers on the health benefits, cultural value, and environmental sustainability of edible insects. There is also potential for market expansion among Zimbabweans living abroad, who have indicated an interest in packaged edible insects to reconnect with their cultural heritage.

This study proposes the **Sustainable Livelihoods & Climate Resilience Edible Insects Framework** (see Figure 4) illustrating how edible insect farming can become a climate-resilient and inclusive livelihood strategy in Zimbabwe. The framework integrates controlled insect farming, climate-smart processing and storage, and agro-ecological practices to promote sustainable livelihoods and climate adaptation in the

country. Central to this strategy are gender-inclusive agribusiness development, youth engagement and entrepreneurship, supportive policy reforms, and comprehensive consumer education. By addressing each of these critical dimensions simultaneously, Zimbabwe can transition edible insect farming from informal survival activities into a structured, economically viable, and socially inclusive industry.

Figure 4: Sustainable Livelihoods & Climate Resilience Edible Insects



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5.4 Implications for Policy, Practice, and Future Research

The findings of this study emphasise the urgent need for regulatory frameworks that formalise edible insect farming, establish food safety guidelines, and integrate the sector into national food security strategies. Policymakers must prioritise the development of financing mechanisms and training programmes for women and youth entrepreneurs to ensure equitable access to market opportunities. The private sector can be crucial in commercialising edible insect-based foods by investing in product development, branding, and distribution channels.

6.0 Future Research

Future research should focus on scaling up edible insect farming through controlled breeding techniques, mechanised processing, and structured supply chains. Shifting

from traditional wild harvesting to semi-intensive and intensive farming systems could enhance production efficiency and ensure a stable, year-round supply of edible insects. Investigating how structured farming improves supply chain consistency and quality control would provide critical insights into making insect farming a commercially viable agribusiness. Furthermore, assessing the environmental impact of scaling up production would be necessary to ensure that sustainability remains a core component of edible insect farming.

Understanding consumer perceptions, particularly in urban areas, is crucial for expanding the market for insect-based foods. Research should explore how cultural attitudes, dietary preferences, and purchasing behaviours influence the acceptance of edible insects. A deeper analysis of consumer willingness to pay for processed or value-added insect products could guide branding, marketing, and distribution strategies. Additionally, studies on the effectiveness of culinary innovation and food product diversification in increasing consumer appeal could provide essential insights for industry players looking to reposition edible insects as premium, nutritious, and sustainable food options.

At the policy level, future research should investigate the best approaches for integrating edible insect farming into Zimbabwe's national food security strategies and agricultural sustainability frameworks. Studies could examine how policy reforms, food safety regulations, and government incentives could support the sector's transition from an informal trade to a structured, regulated industry. Research should also assess the potential for public-private partnerships in promoting insect farming and the role of development organisations in providing technical training, financial support, and infrastructure investment. Addressing these research gaps would provide a solid foundation for developing evidence-based policies and business strategies, positioning Zimbabwe as a leader in alternative protein production and climate-resilient agriculture.

7.0 Conclusion: A Call to Action

Edible insect farming offers a promising, climate-resilient, and inclusive pathway to tackle Zimbabwe's food security and livelihood challenges. This research highlights that insects like mopane worms (*madora/amacimbi*) and termites (*ishwa*) are not only nutritious and environmentally sustainable but can also generate substantial profits,

especially for informal traders, women, and youth. Yet, as findings show, this potential remains limited by the informality of the sector, climate-related uncertainties, lack of funding, and persistent cultural stigma around insect consumption.

To transform insect farming from a crisis-response strategy into a structured agribusiness industry, intervention is required at multiple levels as proposed in the Sustainable Livelihoods & Climate Resilience Edible Insects Framework. Policy reform is urgently needed to ensure integration into agricultural financing, establishment of clear food safety regulations, and product quality standards. Such policy changes will not only position insect farming within official agricultural programmes but also attract investment and business innovation.

Women, central to harvesting, processing, and trading, must receive financial and institutional support to scale their businesses, formalise their operations, and enter higher-value markets. Addressing gender disparities in access to credit, training, and cooperative groups strengthens women's economic participation and boosts overall industry growth.

These measures align with the Gender and Development (GAD) approach, highlighting that structural constraints, rather than women's individual capabilities, limit their advancement in agribusiness. Ensuring women's leadership roles, financial access, and inclusion in formal cooperatives is critical for achieving equitable industry development.

Similarly, youth engagement must be actively encouraged through structured training programmes, financial incentives, and entrepreneurship initiatives in insect farming, processing, and product innovation. Drawing on the Theory of Planned Behaviour (TPB), this study indicates young people's perceptions of stigma and informality reduce their willingness to engage, despite the economic opportunities. Public awareness campaigns, youth-oriented training centres, and digital platforms could significantly change these perceptions and stimulate youth-driven innovation in the sector.

Consumer education and culinary innovation will play crucial roles in reshaping perceptions and expanding market reach. Overcoming stigma and positioning insects as desirable, healthy, and sustainable requires targeted marketing, brand-building, and diverse product offerings.

This study suggests rising sustainability awareness and growing health consciousness, particularly among urban residents and Zimbabweans abroad, present new market opportunities. Food innovators and chefs will be essential in reshaping consumer acceptance through novel food products and high-end culinary experiences.

Integrating insect-based products into mainstream food industries, supported by clear food safety regulations and quality standards, will further legitimize the industry. For Zimbabwe to fully exploit this opportunity, a collaborative, evidence-based approach involving policymakers, researchers, entrepreneurs, agricultural workers, and communities is essential.

Such an approach, built on the Sustainable Livelihoods Approach (SLA), will position insect farming as both a climate-resilient food source and an inclusive economic development tool. By enacting cohesive policies, investing in inclusive infrastructure, and consistently educating the public, Zimbabwe can become a leader in promoting alternative protein sources, ensuring food security, climate resilience, and economic equality for all.

References

- Aigbedion-Atalor, P. O., van Huis, A., & Fogliano, V. (2024). Regenerative edible insects for food and feed in Nigeria: Status and prospects. *Journal of Insect Science*, 25(1), 45-62.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.
- Ameixa, O. M., Duarte, P. M., & Rodrigues, D. P. (2020). Insects, food security, and sustainable aquaculture. In *Zero hunger* (pp. 425-435). Cham: Springer International Publishing.
- Ayieko, M., Oriaro, V. and Nyambuga, I.A. (2010). Processed products of termites and lake flies: improving entomophagy for food security within the lake victoria region. *African Journal of Food, Agriculture, Nutrition and Development*, 10(2). doi:<https://doi.org/10.4314/ajfand.v10i2.53352>.
- Babarinde, S. A., Mvumi, B. M., Babarinde, G. O., Manditsera, F. A., Akande, T. O., & Adepoju, A. A. (2021). Insects in food and feed systems in sub-Saharan Africa: the untapped potentials. *International Journal of Tropical Insect Science*, 41, 1923-1951.
- Bae, Y. and Choi, J. (2021). Consumer acceptance of edible insect foods: an application of the extended theory of planned behavior. *Nutrition Research and Practice*, 15(1), p.122. doi:<https://doi.org/10.4162/nrp.2021.15.1.122>.
- Baidoo, J. and Maame Kyerewaa Brobbey (2023). 'Review on engaging the youth in agribusiness'. *Cogent Social Sciences*, 9(1). doi:<https://doi.org/10.1080/23311886.2023.2193480>.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
- Chagwena, D. T., Matanhire, G. T., Jombo, T. Z., & Maponga, C. C. (2019). Protein quality of commonly consumed edible insects in Zimbabwe. *African Journal of Food, Agriculture, Nutrition and Development*, 19(3), 14674-14689.
- Chambers, R., & Conway, G. (1992). Sustainable rural livelihoods: practical concepts for the 21st century.

- Chidozie Ogwu, M. (2025). Market Trends and Business Opportunities in Edible Insects. In *Edible Insects: Nutritional Benefits, Culinary Innovations and Sustainability* (pp. 189-214). Cham: Springer Nature Switzerland.
- Chikonyani, J. (2022). The effects of a land reform programme on smallholder farmers' livelihoods and availability of edible insects for food and nutrition security.
- Dagevos, H. (2021). A literature review of consumer research on edible insects: recent evidence and new vistas from 2019 studies. *Journal of Insects as Food and Feed*, 7(3), 249-260.
- Dawadi, S. (2020). Thematic analysis approach: A step-by-step guide for ELT research practitioners. *Journal of NELTA*, 25(1-2), 62-71.
- Dokubo, E. M., Sennuga, S. O., Omolayo, A. F., & Bankole, O. L. (2023). Effect of rural-urban migration among the youths and its impacts on agricultural development in Kuje area council, Abuja, Nigeria. *Science and Technology*, 4(2), 12-27.
- Fernández, A. J. (2025). Turismo agroecológico: Un enfoque transdisciplinario para el desarrollo sostenible en zonas rurales. SATHIRI. <https://doi.org/10.32645/13906925.1335>
- Geza, W., Ngidi, M., Ojo, T., Adetoro, A.A., Slotow, R. and Mabhaudhi, T. (2021). Youth Participation in Agriculture: A Scoping Review. *Sustainability*, 13(16), p.9120. doi:<https://doi.org/10.3390/su13169120>.
- Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research*, 2(163-194), 105.
- Hlongwane, Z. T., & Munyai, T. C. (2021). Diversity of edible insects and their related indigenous knowledge: evidence from KwaZulu-Natal and Limpopo provinces, South Africa. *Doctor of Philosophy Thesis, University of KwaZulu-Natal. Pietermaritzburg, South Africa*.
- Hlongwane, Z. T., Slotow, R., & Munyai, T. C. (2020). Nutritional composition of edible insects consumed in southern Africa: A comparative analysis. *Frontiers in Nutrition*, 7, 102.
- Jele, Z. (2012). *The contribution of small-scale timber farming in enhancing sustainable livelihood at Sokhulu*. University of South Africa (South Africa).

- Kazembe, C., Madzikatire, E., & Nyarota, M. (2024). Stakeholders' perceived experiences with indigenous edible insects in Zimbabwe. *Journal of Culinary Science & Technology*, 22(1), 1-15.
- Kelemu, S., Niassy, S., Torto, B., Fiaboe, K., Affognon, H., Tonnang, H., ... & Ekesi, S. (2015). African edible insects for food and feed: inventory, diversity, commonalities and contribution to food security. *Journal of Insects as food and feed*, 1(2), 103-120.
- Kinyuru, J.N., Mogendi, J.B., Riwa, C.A. and Ndung'u, N.W. (2015). Edible insects—a novel source of essential nutrients for human diet: Learning from traditional knowledge. *Animal Frontiers*, [online] 5(2), pp.14–19. doi:<https://doi.org/10.2527/af.2015-0014>.
- Kumar, P. and Ogwu, M.C. (2025). Regulatory Frameworks and Challenges for Edible Insects: Pathways to Mainstream Adoption. pp.165–188. doi:https://doi.org/10.1007/978-3-031-90087-7_8.
- Lähteenmäki-Uutela, A., Marimuthu, S.B. and Meijer, N. (2021). Regulations on insects as food and feed: a global comparison. *Journal of Insects as Food and Feed*, 7(5), pp.1–8. doi:<https://doi.org/10.3920/jiff2020.0066>.
- Lucchese-Cheung, T., Aguiar, L.K.D., Da Silva, R.F.F. and Pereira, M.W. (2020). Determinants of the Intention to Consume Edible Insects in Brazil. *Journal of Food Products Marketing*, 26(4), pp.297–316. doi:<https://doi.org/10.1080/10454446.2020.1766626>.
- M Nthoesane and Teele, T. (2024). The Role of African Youth Attitude in Agriculture: A Comprehensive Overview. *Suid-Afrikaanse tydskrif vir landbouvoorligting/South African journal of agricultural extension*, [online] 52(5). doi:<https://doi.org/10.17159/2413-3221/2024/v52n5a14266>.
- Magara, H.J., Niassy, S., Ayieko, M.A., Mukundamago, M., Egonyu, J.P., Tanga, C.M., Kimathi, E.K., Ongere, J.O., Fiaboe, K.K., Hugel, S. & Orinda, M.A. (2021). Edible crickets (Orthoptera) around the world: distribution, nutritional value, and other benefits—a review. *Frontiers in nutrition*, 7, 537915.

- Magwegwe, E., Zivengwa, T., & Zenda, M. (2024). Adaptation and coping strategies of women to reduce food insecurity in an era of climate change: A case of Chireya District, Zimbabwe. *Climate*, 12(8), 126.
- Manditsera, F. A., Lakemond, C. M., Fogliano, V., Zvidzai, C. J., & Luning, P. A. (2018). Consumption patterns of edible insects in rural and urban areas of Zimbabwe: taste, nutritional value and availability are key elements for keeping the insect eating habit. *Food security*, 10(3), 561-570.
- Manditsera, F.A., 2019. *Wild harvested edible insects: Potential for nutrition security* (Doctoral dissertation, Wageningen University and Research).
- Matandirotya, N. R., Filho, W. L., Mahed, G., Maseko, B., & Murandu, C. V. (2022). Edible insects consumption in Africa towards environmental health and sustainable food systems: a bibliometric study. *International Journal of Environmental Research and Public Health*, 19(22), 14823.
- Matandirotya, N.R., Filho, W.L., Mahed, G., Maseko, B. and Murandu, C.V. (2022). Edible Insects Consumption in Africa towards Environmental Health and Sustainable Food Systems: A Bibliometric Study. *International Journal of Environmental Research and Public Health*, [online] 19(22), p.14823. doi:<https://doi.org/10.3390/ijerph192214823>.
- Matiza Ruzengwe, F., Nyarugwe, S. P., Manditsera, F. A., Mubaiwa, J., Cottin, S., Matsungu, T. M., ... & Macheka, L. (2022). Contribution of edible insects to improved food and nutrition security: A review. *International Journal of Food Science & Technology*, 57(10), 6257-6269.
- Miller, C., & Razavi, S. (1995). From WID to GAD: Conceptual shifts in the women and development discourse (No. 1). UNRISD Occasional Paper.
- Morse, S. (2025). Having Faith in the Sustainable Livelihood Approach: A Review. *Sustainability*, 17(2), 539.
- Morse, S., & McNamara, N. (2013). *Sustainable livelihood approach: A critique of theory and practice*. Springer Science & Business Media.
- Moruzzo, R., Mancini, S., & Guidi, A. (2021). Edible insects and sustainable development goals. *Insects*, 12(6), 557.

- Moyo, P. (2024). The political economy of Zimbabwe's food crisis, 2019–2020. *Journal of Asian and African Studies*, 59(2), 640-655.
- Mrabet, R. (2023). Sustainable agriculture for food and nutritional security. In *Sustainable agriculture and the environment* (pp. 25-90). Academic Press.
- Munson, R. (2021). *Tech to table: 25 Innovators reimagining food*. Island Press.
- Musundire, R. (2014). Bio-active compounds composition in edible stinkbugs consumed in South-Eastern districts of Zimbabwe.
- Musundire, R., Ngonyama, D., Chemura, A., Ngadze, R.T., Jackson, J., Matanda, M.J., Tarakini, T., Langton, M. and Chiwona-Karlton, L. (2021). Stewardship of Wild and Farmed Edible Insects as Food and Feed in Sub-Saharan Africa: A Perspective. *Frontiers in Veterinary Science*, 8. doi:<https://doi.org/10.3389/fvets.2021.601386>.
- Mutai, L.K., 2024. *Utilisation of biomass waste as feed for edible insects and how it can be used to close the food economy cycle and contribute to food security in Sub Sahara Africa* (Doctoral dissertation, Hochschule Rhein-Waal).
- Ogwu, M. C., & Izah, S. C. (2025). Edible Insects: Nutritional Benefits, Culinary Innovations and Sustainability.
- Onyike, J., Okafor, M., Onyenechere, E., Azuwike, O., Okeahialam, S., & Emetumah, F. C. (2025, April). Built Environment and Sustainable Development Faculty of Environmental Sciences, Imo State University, Owerri Conference Proceedings Series. In Faculty of Environmental Sciences International Conference (FESICON 2024).
- Pilarska, J., 2021. Phenomenological Qualitative Research Design. *Research paradigm considerations for emerging scholars*, p.33.
- Platta, A., Mikulec, A., Radzyńska, M., Suwała, G., Zborowski, M., Ruszkowska, M., Nowicki, M. & Kowalczewski, P.Ł., 2024. Edible Insects as a Potential Product for Achieving Global Food Security. Part 1. *Zywnosc*, 31(3). (2024). Edible Insects as a Potential Product for Achieving Global Food Security. Part 1. *Zywnosc*, 31(3).
- QSR International. (2019). NVivo (Version 12) [Computer software]. Retrieved from <https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home>

- R. Caparros Megido, Francis, F., E. Haubruge, P. Le Gall, Tomberlin, J.K., Miranda, C.D., Jordan, H.R., Picard, C.J., Pino, M.J.M., J. Ramos-Elordy, Katz, E., K.B. Barragán-Fonseca, E.M. Costa-Neto, R. Ponce-Reyes, G. Wijffels, Ghosh, S., Jung, C., Han, Y.S., Conti, B. and A. Vilcinskas (2024). A worldwide overview of the status and prospects of edible insect production. *Entomologia Generalis*. doi:<https://doi.org/10.1127/entomologia/2023/2279>.
- Ragie, F. H. (2016). *Relationships Between Household Resource Dependence, Socio-economic Factors, and Livelihood Strategies: A Case Study from Bushbuckridge, South Africa* (Doctoral dissertation, University of the Witwatersrand, Faculty of Science, School of Animal, Plant and Environmental Sciences).
- Rathgeber, E. M. (1990). WID, WAD, GAD: Trends in research and practice. *The journal of developing areas*, 24(4), 489-502.
- Selaledi, L., Hassan, Z., Manyelo, T. G., & Mabelebele, M. (2021). Insects' production, consumption, policy, and sustainability: what have we learned from the indigenous knowledge systems? *Insects*, 12(5), 432.
- Siddiqui, S.A., Aidoo, O.F., Ghisletta, M., Osei-Owusu, J., Saraswati, Y.R., Bhardwaj, K., Khalid, W., Fernando, I., Golik, A.B., Nagdalian, A.A. & Lorenzo, J.M. (2023). African edible insects as human food—a comprehensive review. *Journal of Insects as Food and Feed*, 10(1), 51-78.
- Simatele, M. and Kabange, M. (2022). Financial Inclusion and Intersectionality: A Case of Business Funding in the South African Informal Sector. *Journal of Risk and Financial Management*, 15(9), p.380. doi:<https://doi.org/10.3390/jrfm15090380>.
- Szulc, K. (2023). Edible insects: A study of the availability of insect-based food in Poland. *Sustainability*, 15(20), 14964.
- Tanga, C.M., Egonyu, J.P., Beesigamukama, D., Niassy, S., Emily, K., Magara, H.J., Omuse, E.R., Subramanian, S. and Ekesi, S. (2021). Edible insect farming as an emerging and profitable enterprise in East Africa. *Current Opinion in Insect Science*, 48, pp.64–71. doi:<https://doi.org/10.1016/j.cois.2021.09.007>.

- Thu, T., J. Dürr, Klink-Lehmann, J. and Borgemeister, C. (2023). Predicting consumers' intention towards entomophagy using an extended theory of planned behavior: evidence from Myanmar. *International Journal of Tropical Insect Science*, 43(4), pp.1189–1206. doi:<https://doi.org/10.1007/s42690-023-01016-4>.
- van Huis, A. (2015). Edible insects contributing to food security? *Agriculture and Food Security*, 4, 20.
- Wade, M. and Hoelle, J. (2020). A review of edible insect industrialization: Scales of production and implications for sustainability. *Environmental Research Letters*, 15(12). doi:<https://doi.org/10.1088/1748-9326/aba1c1>.
- Weru, J., Chege, P., & Kinyuru, J. (2021). Nutritional potential of edible insects: a systematic review of published data. *International Journal of Tropical Insect Science*, 41, 2015-2037.
- Weru, N. U. J. (2022). *Edible insects as a substitute for conventional meat in human diet: An application of nutritional profiling models* (Doctoral dissertation, JKUAT-COANRE).
- Wijerathna-Yapa, A., & Pathirana, R. (2022). Sustainable agro-food systems for addressing climate change and food security. *Agriculture*, 12(10), 1554.
- Zielińska, E., Baraniak, B., Karaś, M., Rybczyńska, K., & Jakubczyk, A. (2015). Selected species of edible insects as a source of nutrient composition. *Food Research International*, 77, 460-466.