INFLUENCE OF GENDER ON THE UTILIZATION OF EDIBLE INSECTS FOR FOOD AND NUTRITIONAL SECURITY

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DECLARATION

This thesis is my original work and has not been presented for a degree or diploma award in any other university or institution.

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ABSTRACT

In Western Kenya, insects have historically been consumed more as a delicacy than a primary nutritional source. With the growing popularity of entomophagy as an alternative protein and the challenges posed by climate change and declining food production, there is a renewed interest in edible insects as a sustainable and efficient protein solution. Notably, there are prevailing gendered views on insect consumption in these communities. For instance, while women and children have embraced this delicacy, many adult males have reservations. This study delved into gender dynamics around the consumption and production of edible insects, focusing on Bungoma County—a region with a longstanding tradition of insect consumption. Given the scarcity of literature on this subject, the research aimed to deepen the understanding of how gender roles, knowledge levels, and decision-making power influence the use of insects for nutrition and food security. The main research objective was to study the influence of gender in using edible insects for food and nutritional security. A mixed-method research design that combined quantitative and qualitative methods was used to examine the cultural and gender-related factors affecting edible insect use in Bungoma County, providing robust insights for policy interventions to improve food and nutrition security in the region. Data was collected from 384 Bungoma farming households, constituting 78% of the County's farming demographic. The data was collected using questionnaires, interviews, and purposive sampling techniques. Descriptive analysis, the Chi-square test of associations, and the Kruskal-Wallis H test were used in the study, whose findings were presented in tables and figures. Key findings revealed that while gender itself had no significant influence on the utilization of edible insects for food and nutrition security, gender influenced decision-making played a crucial role in their utilization. Gender influenced knowledge was also found to significantly influence the utilization of edible insects for food and nutrition security. The study’s findings underscore the need for community awareness programs to alter perceptions of insects as complements to diets. From the results, it is recommendable that the remaining counties ensure accessible nutritional information and prioritization of gender-inclusive approaches in promoting entomophagy, even though only Bungoma County was studied in this research.

Keywords: Entomophagy, Edible Insects, Food Security, Gender, Gender Roles, Utilization, Decision-Making

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ACRONYMS AND ABBREVIATIONS

ERC:	Energy Regulatory Commission
JOOUST:	Jaramogi Oginga Odinga University of Science and Technology
KII:	Key Informant Interviews
KNBS:	Kenya National Bureau of Statistics
MoALFC:	Ministry of Agriculture, Livestock, Fisheries, and Cooperatives
NACOSTI:	National Commission for Science, Technology, and Innovation
TPB:	Theory of Planned Behaviour

CHAPTER ONE: INTRODUCTION

1.1. Background Information

Edible insects have formed part of the food humans consume for thousands of years, and they remain an important source of protein and other nutrients in many cultures worldwide (Liceaga, 2022). Edible insects are highly nutritious, contain high-quality protein, vitamins, and minerals, and can be harvested sustainably with minimal environmental impact compared to other animal protein sources (Baiano, 2020). They have also been recognized as a potential solution to global food insecurity, as they are a highly efficient and low-cost source of protein that could be produced on a small scale using low-tech methods (Adegboye *et al.*, 2021). In recent years, interest in edible insects has grown due to their potential to provide a sustainable and nutritious food source for human consumption (Baiano, 2020). However, despite their potential, consuming edible insects remains a relatively niche practice in many parts of the world. In some cultures, there may be negative attitudes toward consuming insects as food and limited knowledge about the nutritional benefits of edible insects (Adegboye *et al.*, 2021). In addition, little has been done to understand the role of gender in the production and consumption of edible insects. Therefore, further research is needed to understand how gender dynamics impact the edible insect value chain for food and nutrition security.

Gender refers to the socially constructed roles, behaviors, activities, and attributes that a given society considers appropriate for men, women, and other gender identities (World Health Organization, 2021). In the context of this study, gender dynamics are crucial as they shape decision-making processes, access to resources, and participation in the production and consumption of edible insects. Understanding gender roles is essential for assessing how men and women contribute differently to food security. Gender Roles involve the expectations placed on individuals based on their gender, influencing how they engage in household and community activities (UN Women, 2020). In Bungoma County, traditional gender roles may affect who is responsible for collecting, preparing, and consuming edible insects, which directly impacts food security outcomes. Food Security is defined as the state in which all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs for an active and healthy life (FAO, 2020). This study examines how gender

influences access to and utilization of edible insects as a source of food security in Bungoma County. Entomophagy refers to the practice of eating insects, which is prevalent in many cultures as a traditional food source. The practice has gained attention as a sustainable alternative to conventional protein sources (Raheem et al., 2019). This study explores how gender influences the acceptance and integration of entomophagy into local diets.

According to Tripathi *et al.* (2019), the world's population is predicted to reach 9.7 billion, leading to a rise in food consumption by 2050. Yet, achieving this demand would be difficult due to the need for sustainable and equitable food production. Several regions of the world, especially developing nations with inadequate access to food, continue to struggle with food insecurity and malnutrition (Duro *et al.*, 2020). As a small-scale protein source that requires little in the way of expensive machinery, insect production has been touted as a possible answer to food insecurity. Compared to other forms of animal protein, insects are more environmentally friendly for gathering and provide substantial nutrition (protein, vitamins, and minerals) (Akhtar & Isman, 2018). Despite their potential, many places of the world still only cater to a small subset of the population when it comes to the consumption and production of edible insects. Some cultures may have preconceived notions about eating insects and lack enough information on the health advantages of this food source (Melgar-Lalanne et al., 2019). More study is required to comprehend how gender dynamics influence the edible insect value chain concerning food and nutrition security since the function of gender in the consumption and production of edible insects is little known.

Bungoma County, located in the Western region of Kenya, has been identified as a nutritionally-insecure region (Lutomia *et al.*, 2019). Previous studies have suggested that gender disparities, dispositions, practices, and power play in decision-making affect the edible insect value chain at the household level and, ultimately, food and nutrition security. Therefore, gender in the edible insect value chain ensures equal access to resources, empowerment through education and training, and decision-making power in nutrition.

According to DiPrete Brown *et al.* (2020), women face significant time constraints in many rural areas due to societal expectations. As such, their potential for agricultural and food productivity is constrained. Women's roles in dietary decision-making are critical, as they spend most of their

income on their children's nutrition (Gillespie & van den Bold, 2017). Therefore, it is important to recognize the roles and needs of both men and women to foster partnerships in meeting nutrition-related objectives. There is a need to understand the role gender plays in dietary decision-making and adapting entomophagy as it affects men's and women's social and economic status and, as a result, creates clear gender-influenced roles and disparity. Men generally control household decisions like how to use family assets. This includes land, finances, and time (Galiè *et al*., 2019). Whereas women have limited access to services, education, and resources, they do not own land, and some practices are constricted and culturally considered taboo for women to practice. This limits women's ability to achieve agricultural potential and productivity, given that women play a very important role in dietary decisions at the household level. This later plays a significant role since women spend most of their income on children's nutrition. When they cannot be productive, they become poor; hence, undernutrition and malnutrition are evident in children. Pregnant mothers may give birth to malnourished babies with stunted growth, regular disease attacks, or learning difficulties when they grow. The study was set to determine the roles of men and women in household decision-making, control over resources, access to education, and cultural norms that play a significant role in the edible insect value chain.

All the studies mentioned above have been able to look at the one-on-one relationship between gender, empowerment, and food security nexus within a single framework, leaving a gap in the literature, especially concerning edible insects. To fill this research gap, the present study focuses on assessing gender in the utilization of edible insects for food and nutrition security in Bungoma County.

1.2. Statement of the Problem

Kröger *et al.* (2022) conducted a study on the acceptance of insect-based food products in Western Societies to determine how edible insects could replace or substitute meat protein in Western diets. They used a systematic review to gain an analytical understanding of nutrients and nutrition values, and their findings indicate that edible insects as an alternative protein source are developing rapidly. However, subjective norms and social pressure have resulted in the perception of entomophagy as a food alternative to meat in developing countries. The researchers recommended that future studies adopt a comparative approach and explore multiple

protein sources. Notably, Bungoma County faces significant food insecurity challenges, with 42% of its population being food insecure and child malnutrition indicators deviating from national averages (KNBS, 2014; County Government of Bungoma, 2018; MoALFC, 2021). This malnutrition has roots in the limited diversification of food sources and an over-reliance on staple crops like maize, even as the County manages to produce surplus food. Numerous studies have highlighted the potential of edible insects as an innovative solution to food insecurity and malnutrition (Ayieko & Oriaro, 2008; Ayieko *et al*., 2010; Barsics *et al*., 2017; Batat & Peter, 2020; Adegboye *et al*., 2021; Alemu & Olsen, 2019; Ayensu *et al*., 2019; Bakkaloğlu, 2022). However, there is a distinct significant gap in understanding the role and influence of gender dynamics in the acceptance and utilization of edible insects in local settings, such as Bungoma County. Notably, Bungoma County faces significant food insecurity challenges, with 42% of its population being food and nutrition insecure and child malnutrition indicators deviating negatively from national averages (KNBS, 2014; County Government of Bungoma, 2018; MoALFC, 2021).In a normal home structure, gender gaps exist in dietary decision making, with expectation that women should lead decision-making of dietary plans at household levels.On the other hand, gender disparities continue to persist in decision making, roles and educational opportunities in relation to insect utilization with regard to resources, training and influence, hindering effetive integration of inscets in household nutrition. To bridge the gap in the edible insects value chain, understanding of role of gender in relation to decision making, roles and knowledge levels and information access is key to utilization of edible insects.Addressing these disparities is crucial to ensuring inclusive and effective utilization of insects, promoting gender equality and maximising the potential benefits of the insect industry.

1.3. Research Objectives

General Objective

To investigate the influence of gender in utilization of edible insects for food and nutritional security.

Specific Objectives

i. To establish the influence of gender in dietary decision-making on the utilization of edible insects for food and nutritional security.
ii. To assess the roles of different genders in the utilization of edible insects for food and nutritional security.
iii. To determine how different gender knowledge levels influence the utilization of edible insects for food and nutritional security.

1.4. Research Questions

i. How does gender play a role in dietary decision-making in the utilization of edible insects' food and nutritional security?
ii. How do gender roles affect the utilization of edible insects for food and nutritional security?
iii. To what extent does gender-influenced knowledge level influence the utilization of edible insects for food and nutritional security?

1.5. Justification

While studies by Ayieko et al. (2010) and Akhtar and Isman (2018) have highlighted the nutritional benefits and food security potential of edible insects, these studies did not explore how gender dynamics influence the utilization of insects as a food source. For example, Ayieko et al. (2010) demonstrated the significant role that edible insects play in providing essential nutrients in regions like Kenya, and Akhtar and Isman (2018) discussed how insects offer a sustainable alternative to conventional animal protein sources. However, both studies did not

analyze how gender roles, knowledge levels, and decision-making processes affect the adoption of edible insects in specific communities, such as Bungoma County. This gap underscores the importance of this study, which focuses on understanding the gender-related factors that influence edible insect consumption. This research adds value by providing insights to inform practical interventions in Bungoma County. By examining how gender dynamics impact the utilization of edible insects, the study offers actionable recommendations for improving food security through gender-sensitive approaches. The findings will be valuable to policymakers and stakeholders in designing strategies that promote equitable access to resources and opportunities for both men and women. Additionally, this research contributes new knowledge to the field by highlighting the intersection of gender and entomophagy, which has been underexplored in previous studies. The study aims to make its findings accessible to a wide audience, including practitioners, policymakers, and researchers. This study's results will benefit Bungoma County and serve as a reference for similar regions facing food security challenges. The insights gained from this research can guide future studies on gender and food security, helping to build a more comprehensive understanding of the role that gender plays in sustainable food systems. This study aligns with Kenya's Vision 2030, which emphasizes sustainable development and food security as key pillars of national growth. It also supports the Sustainable Development Goals (SDGs) 1 and 2, which focus on eradicating poverty and hunger, respectively, by promoting alternative and sustainable food sources like edible insects. Furthermore, this research is in line with Kenya's Agenda 4, particularly in enhancing food security and nutrition through informed policies and market information that can drive the consumption and production of edible insects as a viable food source.

1.6. Scope

The study was conducted in Bungoma County, located in the Western region of Kenya. The primary focus of the study was on gender dynamics, specifically examining how gender roles, responsibilities, and decision-making processes influence the utilization of edible insects for food security. While gender is a social construct influenced by culture, the study maintained its central focus on gender-related aspects rather than broader cultural factors. The target population for this study was farmers and farming households in Bungoma County, who are directly involved in the production, processing, and consumption of edible insects. Their perspectives provided critical

insights into how gender dynamics affect the utilization of edible insects for food security in the region. The results of this study will be used to inform policy interventions and implementations aimed at enhancing gender-inclusive approaches to improving food security in Bungoma County and other similar regions.

1.7. Limitations and Delimitations

The limitations of the study

1. The study's limited generalizability focuses on Bungoma County, and the findings may not be applicable to other regions where insect consumption is prevalent.
2. The potential for biased or inaccurate information from respondents could have influenced the research findings.
3. Reliance on local perceptions from Bungoma County may not accurately reflect situations in other regions with significant insect consumption.

The delimitations of the study

1. The study focused on cultural and gender-related factors influencing insect consumption specifically within Bungoma County.
2. Although the findings are context-specific, they may offer implications for policy interventions and implementations aimed at enhancing food and nutrition security in Bungoma County and comparable regions.
3. The study specifically examined gender dynamics in insect consumption, potentially providing insights to enhance the role of women in achieving household food security.

1.8. Definition of Terms

a. **Communities:** Groups of people who share common characteristics or live in the same area. In the context of this study, communities refer to social units that participate in the production, consumption, and cultural practices surrounding edible insects (FAO, 2020).

b. **Consumption:** The use of edible insects as goods and services by households. In this study, consumption refers to the intake of edible insects as part of the diet and the related practices that support this (Raheem et al., 2019).

c. **Entomophagy:** The practice of eating insects. This study explores entomophagy as a cultural and nutritional practice with potential to improve food security (van Huis, 2021).

d. **Food Security:** A state where all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and preferences for an active and healthy life (FAO, 2020). This study assesses food security through the lens of edible insect consumption.

e. **Food Insecurity:** A situation where individuals or households lack consistent access to sufficient, safe, and nutritious food, which hinders their ability to meet dietary needs and preferences for an active and healthy life. This study examines food insecurity as it relates to the availability and acceptance of edible insects (FAO, 2020).

f. **Gender:** Socially constructed roles, responsibilities, and status of individuals based on their sex. This study focuses on how gender influences decision-making, access to resources, and participation in the utilization of edible insects (World Health Organization, 2021).

g. **Perception:** The awareness and attitudes toward edible insects as a food source. In this study, perception encompasses the cultural and personal views that influence the acceptance of entomophagy (Raheem et al., 2019).

h. **Sustainability:** Ensuring a balance between economic growth, environmental care, and social well-being. In this study, sustainability is considered in the context of promoting the consumption of edible insects without compromising the needs of future generations (FAO, 2020).

i. **Utilization:** The practical and effective use of edible insects through the value chain, from production to consumption. This study explores how the utilization of edible insects contributes to food and nutrition security (van Huis, 2021).

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

Entomophagy, or eating insects, has grown worldwide, with Western Kenya being a prime example. Given global efforts toward sustainable food solutions and the need to diversify dietary sources, gender dynamics and the edible insect value chain are important themes in this perspective. This literature review aims to thoroughly examine the complex link between gender and the use of edible insects for food and nutritional security. The review examines cultural perceptions of entomophagy, gender, the edible insect value chain, and religious and sociological impacts on edible insect eating to get a comprehensive picture. It also examines consumer acceptance, preparation, availability, socio-demographic characteristics, and their effect on food insecurity. These subjects emphasize food diversification sustainability. This research also highlights regional differences, notably in Bungoma, while identifying the edible insect value chain for food and nutrition security's overall trends and variables. The goal is to expand academic dialogue, form intervention suggestions, and guide future research toward improved food and nutritional security.

2.2. Entomophagy

Edible insects have been a source of food for many cultures throughout history, and in recent years, there has been growing interest in the potential of entomophagy to address malnutrition and ensure food sustainability. Studies have shown that the practice of entomophagy has a rich cultural history, with evidence of insect consumption dating back thousands of years in many cultures around the world (Spary & Zilberstein, 2020). Mandal (2022) notes that entomophagy is widely practiced in many regions of the world, including Africa, Asia, and Latin America, and has been recognized as a traditional and culturally significant food source.

The cultural significance of entomophagy is further emphasized by Roccatello (2020), who highlights the importance of understanding the cultural practices and beliefs that underlie entomophagy. In addition, the potential of edible insects as a sustainable food source has been increasingly recognized in recent years due to their high protein content, low environmental impact, and relatively low production costs (Raheem *et al.*, 2019). Shine (2020) notes that despite its long history and cultural significance, the practice of entomophagy has yet to be

widely adopted globally. However, in recent years, there has been growing interest in the potential of entomophagy to address malnutrition and ensure food sustainability, leading to an increase in the global prevalence of entomophagy (Mandal, 2022). According to Raheem *et al.* (2019), entomophagy is currently practiced around the world, with the majority of insect consumption taking place in Africa and Asia.

Research has shown that edible insects are a rich source of protein, essential amino acids, vitamins, and minerals, making them an ideal food source for addressing malnutrition (Raheem *et al.*, 2019). Mandal (2022) highlights the high nutrition value of insects and the potential of entomophagy to contribute to the sustainable and safe production of food. Additionally, Grabowski *et al.* (2022) emphasize the environmental benefits of entomophagy, including its low carbon footprint and the potential to conserve biodiversity. Despite the nutrition and environmental benefits of entomophagy, the adoption of edible insects as a food source has been hindered by various cultural, social, and economic factors (Batat & Peter, 2020). These factors include consumer acceptability, which is influenced by cultural beliefs, personal preferences, and prior experiences (Batat & Peter, 2020). Research has shown that consumer education and exposure to insects as a food source could increase their acceptability (Batat & Peter, 2020).

Therefore, the existing literature has shown that entomophagy has a rich cultural history and is practiced in many regions of the world. Edible insects are a rich source of nutrition and offer numerous environmental benefits, making them a valuable food source for addressing malnutrition and ensuring food sustainability. Further research is needed to understand the factors that influence consumer acceptability and to promote the widespread adoption of entomophagy as a sustainable and nutritious food source. This research does so while focusing on gender relations to entomophagy.

Despite the potential and historical significance of entomophagy, there are inconsistencies in the global adoption of this practice, with some cultures embracing it while others resist due to social stigma. Furthermore, the environmental benefits and nutritional value are often overshadowed by cultural biases and economic barriers, leading to gaps in widespread adoption into modern diets.

2.3. Gender and Edible Insects

Several studies have explored the attitudes and consumption patterns of edible insects in relation to gender. Barsics *et al.* (2017) found that new information about the benefits of edible insects could have an impact on attitudes toward insect consumption and that there are differences in attitudes between genders. Similarly, Florença *et al.* (2021) found that there are differences in perceptions, attitudes, and knowledge of edible insects between Portuguese citizens of different genders. Another study by Florença *et al.* (2022) investigated the motivations for consumption of edible insects and found that there may be gender-influenced differences in motivations.

The role of gender in the preparation and consumption of edible insects has also been explored. Pambo *et al.* (2018) found that intentions to consume insects as food could vary between genders and that gender roles and responsibilities play a role in the consumption of insects. Schäufele *et al.* (2019) also found evidence to suggest that there may be differences in the acceptance of edible insects based on the species and that these differences may vary by gender. Finally, the impact of gender on cultural beliefs and practices related to entomophagy has also been examined. Bartkowicz (2020) investigated the attitude towards food in relation to the consumption of edible insects and found that there are gender differences in the perception of risks and benefits associated with insect consumption.

The studies reviewed suggest that gender could have a significant impact on attitudes and consumption patterns of edible insects, as well as on gender roles and responsibilities in the preparation and consumption of insects. Additionally, cultural beliefs and practices related to entomophagy could also vary between genders. These findings highlight the importance of understanding the impact of gender on entomophagy and its role in the use of insects as a food source. Further research is needed to fully and exclusively understand the gender-influenced differences in roles, attitudes, behaviors, and beliefs related to entomophagy in order to promote the widespread adoption of insects as a sustainable and nutritious food source, especially in Bungoma County.

The literature reveals a gap in understanding how gender roles specifically influence the acceptance and utilization of edible insects within different cultural contexts. Additionally, there are contradictions in the findings regarding gender-influenced preferences and behaviors towards

entomophagy, suggesting the need for further research to clarify these inconsistencies and to develop gender-sensitive approaches to promote edible insect consumption.

2.4. Religion and Edible Insects

The following is a review focusing on the religious beliefs and teachings regarding the consumption of insects, the influence of religion on attitudes toward entomophagy and insect consumption, and the intersection of religious beliefs and cultural practices related to insect consumption. According to Ogal *et al.* (2022), religion has a significant impact on the consumption of edible insects among selected communities in Western Kenya. The study found that religious beliefs and teachings play a crucial role in shaping the attitudes of consumers toward insect consumption. For example, some religious teachings discourage the consumption of insects, while others allow for it, and these differing beliefs could influence whether individuals choose to include insects in their diets.

Similarly, Kusia *et al.* (2021) explored the community knowledge, perceptions, and practices of entomophagy in Kenya. They found that cultural and religious beliefs have a significant impact on the adoption of insect consumption. Some religious communities view insects as unclean or forbidden, which could be a barrier to the adoption of insect consumption. However, for those who do consume insects, their religious beliefs could provide guidance on which insects are considered acceptable for consumption and which should be avoided, which sometimes varies by gender. In Zimbabwe, Manditsera *et al.* (2018) found that religion could also impact the availability of insects as a food source. The study found that in some rural areas, insects are collected and consumed based on cultural and religious beliefs, with some communities only consuming insects considered appropriate according to their religious teachings.

Oyaro *et al.* (2022) also investigated the acceptability of cricket consumption among riparian communities in Kenya and found that religious beliefs played a role in shaping attitudes towards insect consumption. The study found that individuals who held more conservative religious beliefs were less likely to adopt cricket consumption compared to those who held more liberal beliefs. In Kisumu, Kenya, Owino (2019) conducted a study on the socio-cultural determinants of food security and consumption patterns and found that religious beliefs and practices play a role in shaping food choices, including the consumption of insects. Overall, the literature

suggests that religious beliefs and teachings could have a significant impact on attitudes toward and adoption of insect consumption. Religious beliefs and practices could influence what insects are considered acceptable for consumption and how they are prepared, as well as the overall availability of insects as a food source. However, more research is needed to fully understand the intersection of religion and insect consumption, particularly in different cultural and religious contexts.

While the influence of religion on dietary practices is well-documented, there are contradictions in how different religious communities perceive and consume edible insects. Some religious teachings endorse the consumption of insects, while others discourage it, leading to inconsistent adoption patterns. This inconsistency highlights the need for more nuanced research that considers the intersection of religion, culture, and food security, especially in regions where food scarcity is prevalent.

2.5. Consumer Acceptability

Edible insects are increasingly being considered as a sustainable and alternative food source. However, their acceptance by consumers is a crucial factor that needs to be addressed for the success of insect-based food products. Kröger *et al.* (2022) conducted a systematic review to explore the acceptance of insect-based food products in Western societies. They found that although many people were hesitant to try insect-based foods at first, once they tasted them, a significant portion reported positive attitudes toward incorporating insects into their diets. The study also found that factors such as familiarity with insects, the way they are prepared, and their nutritional value played a role in determining consumers' willingness to try them.

On the other hand, Ayieko *et al.* (2010) examined the impact of climate change on the abundance of edible insects in the Lake Victoria region, while Ayieko and Oriaro (2008) focused on the consumption, indigenous knowledge, and cultural values of the lakefly species in the same region. These studies highlight the important role that insects play in the diets and cultures of many communities and the potential impacts of environmental changes on the availability of edible insects.

According to Orsi *et al.* (2019), the determinants of consumer acceptance of edible insects as a sustainable food source include factors such as the perceived health benefits, sustainability, taste, and cultural acceptability of insects. Halonen *et al.* (2022) conducted a case study from Finland. They recognized potential pathways to increasing the consumption of edible insects, including consumer education, product availability, and consumer perception of the environmental benefits of edible insects.

Florença *et al.* (2022) conducted a systematic review of the motivations for consumption of edible insects. They found that factors such as convenience, taste, and the perceived health benefits of insects were the key drivers of consumer acceptance. Modlinska *et al.* (2021) investigated the relationship between the acceptance of insects as an alternative to meat and the willingness to consume insect-based food among the Polish population. The study found that there was a positive correlation between the acceptance of insects and the willingness to consume insect-based food products. Alemu *et al.* (2017) combined product attributes such as taste, texture, and smell, as well as the recommendations of friends and family, were important factors influencing consumer preferences for insect-based food products.

Ngo and Moritaka (2021) conducted a review of consumer attitudes and acceptance of insects as food and feed. The study found that marketing strategies, such as branding and labeling, were important for promoting insect-based food products and increasing their acceptability among consumers. Legendre and Baker (2022) investigated the impact of trust, risk-benefit, and purchase activism on legitimizing edible insects for human consumption. The study found that building trust, highlighting the benefits, and creating a sense of social responsibility through purchase activism were crucial for promoting the acceptability of insect-based food products among consumers. The literature reviewed suggests that several factors, including the perceived health benefits, sustainability, taste, cultural acceptability, and product attributes, influence consumer attitudes toward edible insects and their willingness to consume them. Additionally, marketing strategies such as branding, labeling, and creating a sense of social responsibility through purchase activism could play a crucial role in increasing consumer acceptance of insect-based food products. A combination of various factors needs to be addressed to promote the acceptability of edible insects among consumers and to ensure their success as a sustainable food source.

The literature shows significant gaps in understanding the factors that influence consumer acceptability of edible insects across different regions and cultures. Additionally, there are inconsistencies in how consumers respond to insect-based foods, with some studies showing high acceptability while others indicate strong resistance. These contradictions suggest a need for more targeted research to identify the underlying factors that drive consumer behavior toward insect-based foods.

2.6. Edible Insects Preparation and Availability

Edible insects are a promising alternative to traditional protein sources, with potential benefits for human health and the environment. However, there are a number of challenges associated with the production and supply of insects as food and feed, including seasonal availability, processing, and preparation methods, scaling up production, and the development of a robust supply chain and market. This review examines the research on the availability, processing, preparation, and preservation methods for edible insects, the challenges and opportunities for scaling up the production and supply of insects for food and feed, and the existing supply chain and market for edible insects. First, the postharvest processing methods of edible insects in Africa are reviewed in the paper by Mutungi *et al.* (2019). The authors examine the implications of processing methods for nutrition, safety, and product development and highlight the need for further research to optimize postharvest processes in Africa.

Żuk-Gołaszewska *et al.* (2022) provide an overview of the edible insect farming industry in the context of EU regulations and marketing. The authors discuss the challenges associated with scaling up the production and supply of insects for food and feed, including regulatory barriers and market barriers. Lange and Nakamura (2021) examine the chances and challenges associated with edible insects as future food, including the need for processing and preservation methods to ensure food safety and quality, as well as the need to scale up production to meet growing demand. Dobermann *et al.* (2017) examine the opportunities and hurdles associated with edible insects as food and feed, including the need to overcome cultural barriers to acceptance and the development of a robust supply chain and market.

Baiano (2020) provides an overview of the nutrition characteristics, safety, farming, production technologies, regulatory framework, and socio-economic and ethical implications of edible

insects. The author highlights the need for further research to address the challenges and opportunities associated with the scaling up of insect production and supply for food and feed. Wade and Hoelle (2020) review the industrialization of edible insects, including scales of production and the implications for sustainability. The authors discuss the need for sustainable and scalable production systems to meet the growing demand for insect-based products. Guiné *et al.* (2021) examine the role of edible insects in mitigating challenges for sustainability, including the potential to reduce pressure on traditional protein sources and contribute to food security.

Finally, Nsevolo *et al.* (2022) review the current state of entomophagy in the Democratic Republic of Congo, including species and host plant diversity, seasonality, patterns of consumption, and the challenges of the edible insect sector. The authors highlight the need for further research to support the development of the edible insect industry in the region. In conclusion, the research reviewed in this review highlights the potential of edible insects as a sustainable alternative to traditional protein sources, as well as the challenges associated with scaling up production and supply for food and feed. Further research is needed to address these challenges and support the development of a robust and sustainable insect-based food and feed industry.

The preparation and availability of edible insects face significant challenges, including inconsistent processing methods and seasonal availability. The literature highlights gaps in the scalability of insect farming and inconsistencies in the regulatory frameworks governing insect production and consumption. These challenges underscore the need for standardized practices and policies to ensure the sustainability and safety of insect-based foods.

2.7. Socio-demographic Factors and Entomophagy

In recent years, entomophagy (the practice of consuming insects as food) has received increasing attention as a sustainable and nutritious food source. However, the adoption of entomophagy varies among different populations and is influenced by various socio-demographic factors such as income, education, culture, and ethnicity. This review aims to examine the relationship between income, education, and entomophagy, explore the influence of cultural, social, and demographic factors on attitudes toward insect consumption, and compare insect consumption

patterns among different ethnic and cultural groups. According to a study by Omemo *et al.* (2021), socio-economic factors play a significant role in the adoption of entomophagy in Nambale Sub County, Kenya. The study found that individuals with higher income and education levels were more likely to adopt entomophagy compared to those with lower income and education levels. Similarly, Alemu and Olsen (2019) found that consumers with higher levels of education were more likely to show a positive attitude towards insect-based food products.

Cultural and social factors could play a significant role in shaping attitudes toward insect consumption. For example, Bakkaloğlu (2022) found that Turkish consumers had negative attitudes towards entomophagy due to cultural and social factors such as disgust and lack of exposure. In contrast, Manditsera *et al.* (2018) found that the consumption of edible insects was culturally accepted in rural and urban areas of Zimbabwe. Studies have shown that insect consumption patterns vary among different ethnic and cultural groups. For example, Anyuor *et al.* (2021) found that the utilization of alate termites as a food source was culturally accepted and widespread in Vihiga County, Kenya. However, Detilleux *et al.* (2022) found that entomophagy was not culturally accepted in Gabon, where insects were primarily consumed as a food source during times of food scarcity.

The study by Ngo and Moritaka (2021) found that consumer attitudes and acceptance of insects as food and feed vary greatly and are influenced by factors such as disgust, lack of exposure, and cultural beliefs. Sogari *et al.* (2019) conducted a scoping review on the methods used to measure consumer acceptance of edible insects. They found that taste, texture, and appearance play a significant role in determining consumer acceptance. Seitz and Keul (2021) proposed a psychological framework to explain the relationship between nutrition knowledge and entomophagy in Western societies. The study found that individuals with higher levels of nutrition knowledge were more likely to adopt entomophagy and had a positive attitude toward insect-based food products.

Pambo *et al.* (2018) found that product information could play a significant role in determining consumer acceptance of insect-based food products. The study found that providing information on the nutrition benefits and taste of cricket-flour-containing buns improved consumer sensory

evaluation and expectations. In conclusion, this review has shown that the adoption of entomophagy is influenced by various socio-demographic factors such as income, education, culture, and ethnicity. Cultural and social factors play a significant role in shaping attitudes toward insect consumption, and insect consumption patterns vary among different ethnic and cultural groups.

Socio-demographic factors play a crucial role in the adoption of entomophagy, yet there are significant gaps in the literature regarding how these factors interact across different cultures and economic strata. Additionally, inconsistencies in the data on insect consumption patterns across various socio-demographic groups suggest the need for more comprehensive studies that consider the diverse influences on entomophagy.

2.8. Food Insecurity

Food insecurity has been on the rise globally, especially due to climate change, rapid industrialization, and urbanization, which takes up space for agriculture. With the rapid population increase, resources have become limited and, therefore, not able to sustain the current population. Yet it is estimated to be at 9 million by 2050. On the other hand, it is speculated that there is enough food to feed the world; however, it is unevenly distributed. During drought and adverse weather conditions, some regions experience famine, severe hunger, and, in extreme cases, death. Food insecurity is not only defined by having an insufficient amount of food but also a diet that lacks quality variety or desirability of food (Tara, 2021). According to FAO (1996), food security exists when all people at all times have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (Pérez-Escamilla, 2017). The World Health Organisation (WHO) recommends a diverse diet, including food from at least four food groups, four times a weak. There is, therefore, a great need to achieve sustainable development (SDG) goal two of Zero Hunger.

The growing demand for protein-rich foods has intensified the need for alternative protein sources in both developed and developing countries. Meeting the demand for proteins is difficult because animal proteins are expensive, take a lot of time to mature, and also require a lot of space for production with massive environmental impacts, making it unsustainable. This has

prompted the need for an alternative source of proteins in our diet. Magara *et al.* (2021) reviewed the distribution, nutrition value, and other benefits of edible crickets (Orthoptera) around the world, highlighting their potential as a source of food and nutrition. Halloran *et al.* (2018) compared aspects of cricket farming in five countries and discussed the challenges and opportunities of this industry. Ayensu *et al.* (2019) conducted a systematic review of the health effects of entomophagy beyond just nutrients. They found that insects could be a rich source of protein, fats, vitamins, and minerals and could contribute to food and nutrition security. Caniato *et al.* (2017) reviewed the challenges and opportunities of new energy schemes for food security in humanitarian contexts, emphasizing the need for sustainable solutions to food insecurity.

Chanza and Musakwa (2022) discussed the importance of revitalizing indigenous ways of maintaining food security in a changing climate, reviewing the evidence base from Africa. Okoye and Oni (2017) also highlighted the challenge of food security in Africa and the need for the promotion of indigenous food preservation and processing knowledge. In conclusion, the review suggests that edible insects have the potential to play a significant role in addressing food insecurity and malnutrition, especially in crises and emergencies. More research is needed to fully understand the challenges and opportunities of utilizing insects as a food source in food-insecure communities and to develop sustainable programs and initiatives in this area.

While edible insects offer a promising solution to food insecurity, there are gaps in understanding how to effectively include them into food systems in both developed and developing countries. Furthermore, there are contradictions in the literature regarding the nutritional adequacy of insects compared to traditional protein sources, highlighting the need for more rigorous research to validate the potential of insects to address global food security challenges.

2.9. Gaps, Contradictions, and Inconsistencies in the Literature Reviewed

In reviewing the literature on entomophagy, several gaps, contradictions, and inconsistencies were identified, reinforcing the significance and relevance of the completed study on the Influence of Gender on the Utilization of Edible Insects for Food and Nutritional Security. First, while the historical and cultural significance of entomophagy is well-documented, there was a noticeable gap in understanding the barriers to its global adoption, particularly in the context of

gender. Cultural biases, economic factors, and environmental concerns were not consistently addressed across studies, leading to conflicting views on the feasibility of widespread entomophagy. This gap underscored the importance of examining how gender influences the acceptance and utilization of edible insects, a perspective that had been insufficiently explored. Moreover, the role of gender in entomophagy presented contradictions in the literature. Some studies highlighted significant gender-influenced differences in attitudes and behaviors toward insect consumption, while others suggested minimal impact. These inconsistencies underscored the need for further research to reconcile these findings. The completed study was, therefore, highly suitable as it specifically addressed these contradictions by providing empirical data on gender's influence in a local context, thereby filling a critical void in the existing literature.

Religious influences on insect consumption also presented inconsistencies. While some religious groups embraced entomophagy, others resisted it, creating a complex landscape that varied widely across regions and cultures. This variation suggested a gap in the literature that failed to adequately address the intersection of religion, culture, and food security, particularly through the lens of gender. By focusing on gender dynamics, the study was uniquely positioned to explore how these factors interact, offering new insights into the challenges and opportunities for promoting edible insects as a viable food source. Consumer acceptability of edible insects was another area where contradictions abounded. Studies offered mixed results on the willingness of consumers to adopt insect-based foods, with some showing high levels of acceptability and others indicating strong resistance. These inconsistencies highlighted the need for more focused research on the factors that influence consumer behavior, particularly how these factors are moderated by gender. The study's focus on gender-related attitudes and behaviors provided crucial insights into this aspect, making it a significant contribution to the field.

Lastly, the literature on edible insect preparation and availability revealed gaps in the scalability and standardization of insect farming. Inconsistencies in processing methods, regulatory frameworks, and market access hindered the development of a sustainable insect-based food industry. By exploring the gendered aspects of these challenges, the study added a critical dimension to the understanding of how these barriers could be overcome, thus contributing to the broader discourse on food security and sustainability. The literature reviewed indicated significant gaps, contradictions, and inconsistencies that needed to be addressed to fully

understand the potential of edible insects as a sustainable food source. The completed study was not only suitable but essential in resolving these issues by focusing on the influence of gender, an often-overlooked but crucial factor. By doing so, the study provided valuable insights that could promote the widespread adoption of entomophagy and its into global food systems, ultimately contributing to food and nutritional security.

2.10. Theoretical Framework

Theory of Planned Behaviour (TPB)

The TPB was used to explain the factors that influence an individual's decision to utilize edible insects for food and nutrition security. This theory states that behavioral intentions are driven by three factors: attitudes, subjective norms, and perceived behavioral control. According to Bosnjak, Ajzen, and Schmidt (2020), attitudes refer to an individual's positive or negative evaluation of the behavior, subjective norms refer to the social pressure to perform or not perform the behavior, and perceived behavioral control refers to an individual's perception of their ability to perform the behavior. The TPB was used to investigate how gender roles, personality dispositions, and knowledge of edible insects influence an individual's intention to utilize edible insects for food and nutrition security.

Gender and Development Theory

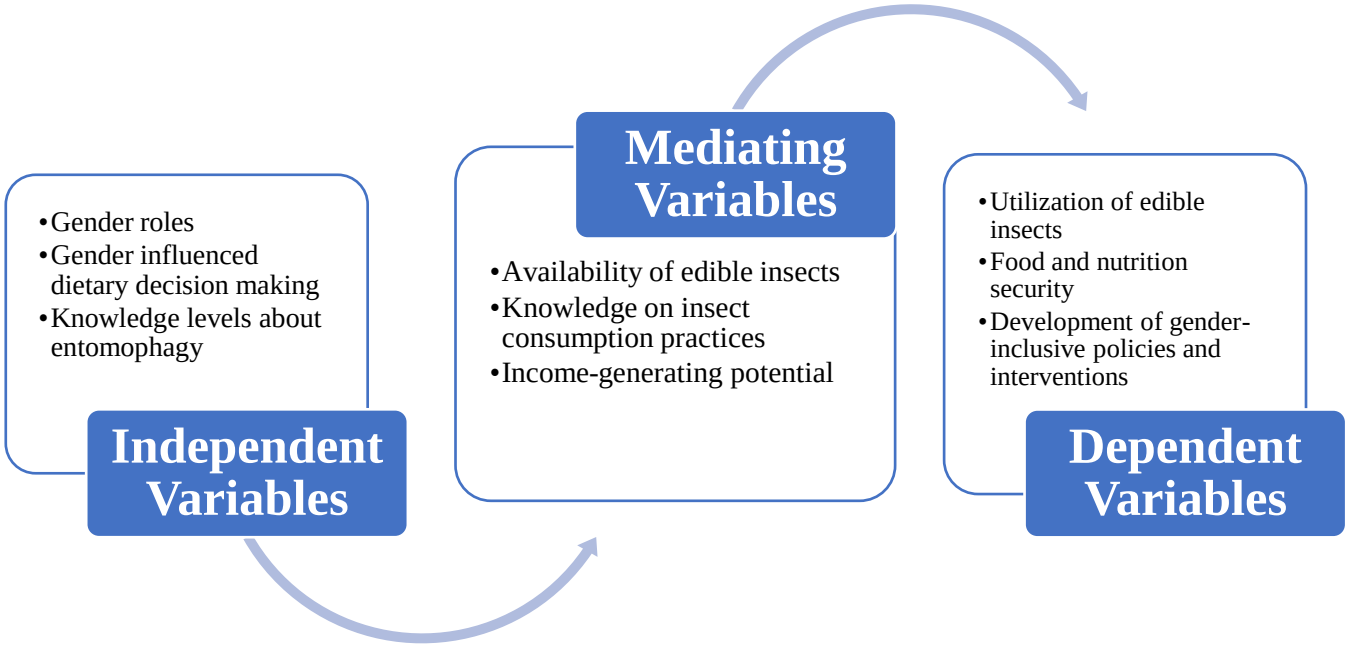
This theory was used to investigate the impact of gender roles, power dynamics, and cultural norms on the edible insect value chain for food and nutrition security. According to Scott (2022), the Gender and Development theory highlights the unequal distribution of power, resources, and opportunities between men and women and how this affects development outcomes. The theory recognizes the importance of addressing gender disparities in development interventions. It was used to investigate how gender could be properly implemented to promote gender equality and gender inclusivity and improve productivity, food security, and income.

Social Cognitive Theory

This theory was used to investigate the role of knowledge of edible insects and their utilization for food and nutrition security through the value chain. The Social Cognitive Theory emphasizes

the importance of learning and knowledge acquisition in driving behavior change (Schunk & DiBenedetto, 2020). It states that behavior change is influenced by individual, behavioral, and environmental factors and that individuals learn from the social and physical environment. This theory was used to investigate how knowledge of edible insects affects their utilization, particularly through the value chain, and how this knowledge could be effectively disseminated to promote their utilization for food and nutrition security.

2.11. Conceptual Framework (Figure 1.0)



Independent Variables:

Gender roles in this study refer to the specific responsibilities and expectations assigned to men and women within households, particularly in the context of insect collection, preparation, and consumption. These roles influence how each gender participates in the edible insect value chain, including decisions about whether and how insects are used as a food source. For instance, women may be more involved in food preparation and making dietary decisions, whereas men

may influence decisions regarding the purchase and consumption of edible insects. Gender-influenced beliefs variable examines the cultural and societal beliefs tied to gender, particularly those influencing attitudes towards entomophagy. These beliefs could determine whether certain genders are more inclined or resistant to consuming edible insects, based on cultural taboos, perceptions of masculinity or femininity, and historical practices. For example, in some cultures, insect consumption might be seen as more appropriate for one gender over the other, affecting overall adoption rates. Knowledge levels about entomophagy refers to the level of awareness and understanding that different genders have about the nutritional benefits, risks, and cultural significance of consuming edible insects. This knowledge can significantly influence the willingness to incorporate insects into diets. For instance, higher knowledge levels might lead to greater acceptance and utilization of edible insects as a sustainable food source.

Mediating Variables:

The availability of edible insects is influenced by factors such as seasonal abundance, ease of access, and market distribution. This variable mediates how gender roles and beliefs are acted upon; for instance, if insects are not readily available, even those with positive gender-influenced beliefs and knowledge may not utilize them effectively. Knowledge on insect consumption practices includes understanding how to properly prepare, cook, and consume edible insects to maximize their nutritional benefits while minimizing risks. It also includes cultural practices associated with insect consumption. This mediating variable influences how the independent variables translate into actual consumption behavior. Income-generating potential variable considers the economic opportunities associated with insect farming, processing, and selling. It mediates the relationship between gender roles and the utilization of edible insects, as the potential to generate income may encourage or discourage engagement with insect-based food sources depending on the economic incentives perceived by different genders.

Dependent Variables:

Utilization of edible insects represents the extent to which edible insects are actually consumed within households, reflecting the impact of gender roles, knowledge, and availability. Utilization is measured by the frequency and diversity of insect consumption and is a direct outcome of the interaction between the independent and mediating variables. Food and nutrition security measures the broader impact of insect consumption on household food security and nutritional outcomes. It includes factors like dietary diversity, nutritional adequacy, and the reduction of

malnutrition within the community. The study explores how gender influences the ability to achieve food and nutrition security through the utilization of edible insects. Development of Gender-Inclusive Policies and Interventions aims to create policies that address gender disparities in the utilization of edible insects, ensuring equitable access to resources, decision-making, and participation for both men and women. These policies could include encouraging women's involvement in insect farming and providing training programs that enhance knowledge and skills in edible insect production and consumption for all genders.

CHAPTER 3: METHODOLOGY

3.1. Introduction

The chapter discusses the research design, research area, target population, sample size, data collection, and analysis methods that have been adapted to meet the objectives of the research.

3.2. Research design

The study adopted a mixed-method research design. This research design combined both quantitative and qualitative approaches, allowing for a comprehensive understanding of the factors affecting the gender dynamics in the utilization of edible insects in Bungoma County (Creswell & Poth, 2018). A mixed-method research design was well-suited for this study as it sought to provide a more in-depth understanding of the cultural and gender-related factors influencing the consumption of insects, which was critical in informing policy interventions and implementations aimed at enhancing food and nutrition security in Bungoma County and other similar regions. The quantitative component of the study involved the collection and analysis of numerical data, such as the frequency of edible insect consumption and the influence of gender dynamics on food security. Quantitative data was collected using questionnaires administered to a representative sample of individuals in Bungoma County. This component allowed for the generalization of findings to the larger population and provided a basis for policy interventions. The qualitative component of the study explored the lived experiences, beliefs, and attitudes of individuals in Bungoma County regarding the consumption of edible insects and the influence of gender dynamics on food security. Qualitative data was collected using in-depth interviews, enabling the researcher to triangulate the findings and enhance the credibility of the study. By adopting a mixed-method research design, the study gave a rich and in-depth understanding of the current state of edible insect consumption and its relationship to gender dynamics and food security in Bungoma County. This approach enabled the development of more robust policy interventions and implementations, informed by a comprehensive and rigorous analysis of the factors influencing edible insect consumption in the region.

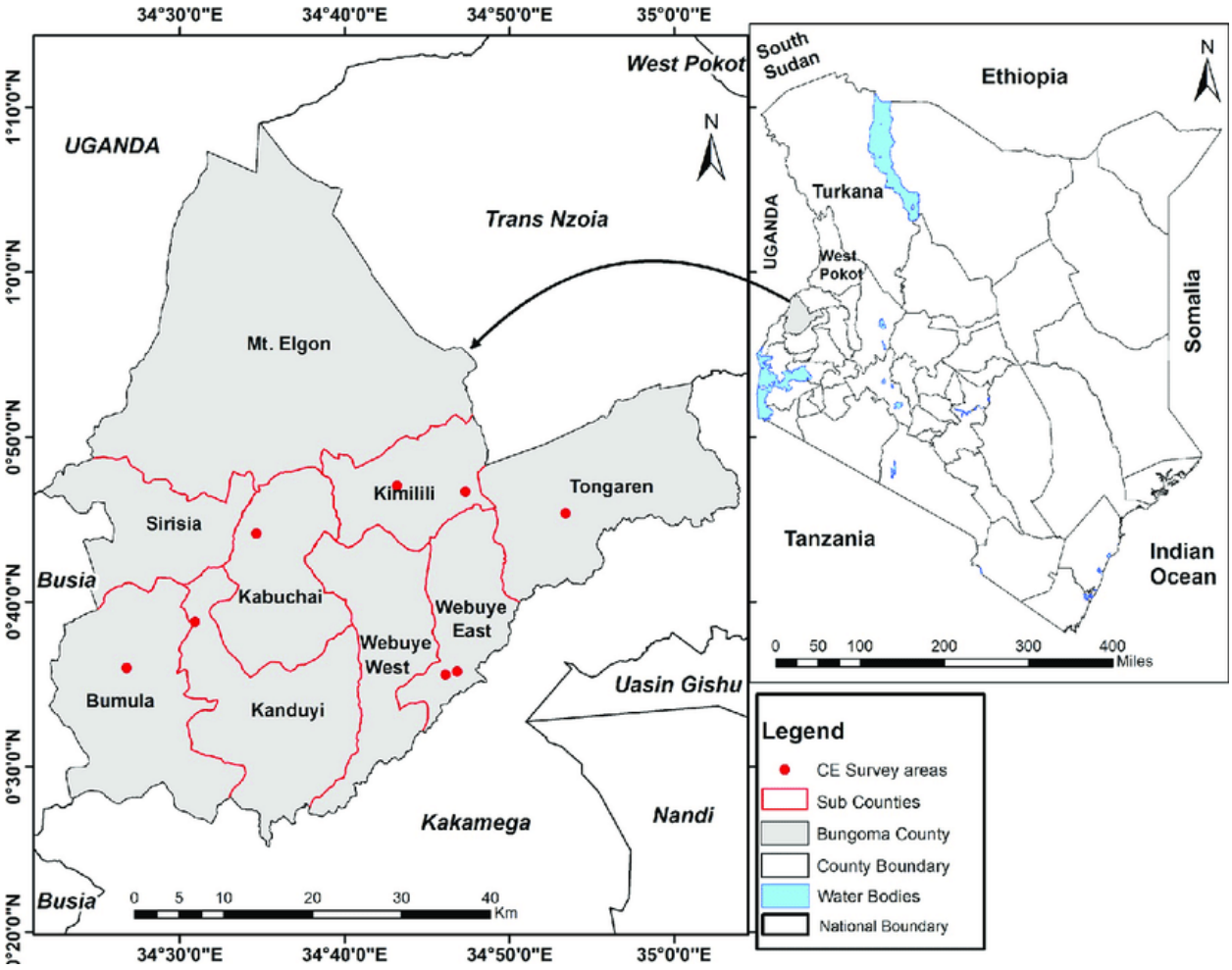


Figure 2.0 Map of Kenya, Western Kenya: Bungoma County (MoALFC., 2021).

3.3. Study area

This was a mixed study proposed to be conducted in Bungoma County, which has an approximate population of 1670570 (KNBS, 2019a). The region is in western Kenya, which hosts a community that has traditionally consumed edible insects and boarders' counties that have hosted interventions to promote food from edible insects through pilot trials under "FlyingFoods," "INSFeed," and "GREEiNSECT" Projects (Ayieko *et al.*, 2010; Kinyuru *et al.*, 2013), also borders Eastern Uganda; key insect consuming region, hence suitable for this

research. It is also a rural town that still strongly conserves its culture with fewer lifestyle changes. The County covers a land area of 3032.4 km^2, of which 618 km^2 is a gazetted forest reserve, 61 km^2 is non-gazetted forest, and 50.7 km^2 is Mt. Elgon National Park. The County's major physical features include Mt. Elgon; Chetambe, Sang'alo, and Kabuchai hills; the Nzoia, Kuywa, Sosio, Kibisi and Sio-Malaba/Malakisi rivers; and waterfalls like Nabuyole and Teremi (MoALFC., 2021). The altitude of the County ranges from 1,200 m above sea level to 4,321 m above sea level at the summit of Mt. Elgon (County Government of Bungoma, 2018). Bungoma County in western Kenya is characterized by diverse agroecological zones, with altitudes ranging from 1,200 to 2,000 meters and annual rainfall between 1,200 mm and 1,800 mm. The county's climate varies from cool and humid in the highlands to warm and wet in lower areas, supporting a variety of agricultural activities. Fertile, well-drained soils, especially in higher altitudes, are ideal for crops like maize, beans, and tea, while the lower zones have more variable soils, including clay. The region supports both crop and livestock farming, with challenges such as declining soil fertility, pests, and climate change impacts making sustainable agricultural practices increasingly important for maintaining productivity.

3.4. Target population

Bungoma County has a population of 1,670,570 people, of which 49% are males and 51% are females (KNBS, 2019a). The population density is 454 people/km2, making the County the fifth most populated in Kenya. There are a total of 358,796 households, the average size of which is five individuals (KNBS, 2019a). The study targeted 280,445 farmer-households that formed 78% of all households in Bungoma County (KNBS, 2019b) that are likely to be consumers of edible insects and have participated in edible insect interventions programmes within Bungoma county. Interacting with a selection of these people is important for the development of effective policy interventions and implementations aimed at enhancing food and nutrition security in Bungoma County and other similar regions.

3.5. Sample size determination and sampling procedure

A sample size of 383.64 rounded to 384 respondents was selected using KREJCIE -MORGAN FORMULA from Morga (1970);

n= [x^2Np(1-p)]/[e^2(N-1) +x^2p(1-p)]

Chi-square =3.841

ē-margin of error = 0.05

The Krejcie-Morgan formula is used to determine the required sample size for a given population size with a desired level of precision, given the margin of error, confidence level, and the proportion of the population with a certain characteristic. In this case, the population size was N=280,445, and we wanted to calculate the sample size using the formula, assuming a proportion of p=0.5 (maximum variability).

The formula for calculating the sample size using the Krejcie-Morgan formula is:

n = [Z^2 * N * p * (1 - p)] / [e^2 * (N - 1) + Z^2 * p * (1 - p)]

Where:

- n is the required sample size
- Z is the critical value for the desired confidence level (at 95% confidence level, Z=1.96)
- N is the population size
- p is the proportion of the population with the characteristic of interest (assumed to be 0.5 for maximum variability)
- e is the desired margin of error

Substituting the given values into the formula, we get:

n = [(1.96) ^2 * 280,445 * 0.5 * (1 - 0.5)] / [(0.05) ^2 * (280,445 - 1) + (1.96) ^2 * 0.5 * (1 - 0.5)]

Simplifying this expression, we get:

n = 383.64

n=384

Subsequently, the study used a purposive sampling technique. The used personal judgment to choose cases that helped answer research questions and achieve research objectives. Snowballing sampling was employed during data collection to identify the next respondents for the interviews through referrals. The study utilized a purposive sampling technique to select respondents who were most likely to provide relevant information that directly aligned with the research objectives. This method was chosen because it allowed the researcher to intentionally target individuals within farming households who are involved in the production, processing, and consumption of edible insects, and who had previously participated in edible insect intervention programmes in Bungoma County. By selecting participants with specific characteristics and experiences, the research aimed to gather in-depth and focused data that would contribute to a comprehensive understanding of the subject matter. In addition, snowball sampling was employed during data collection to identify further respondents through referrals from initial participants. This method was particularly useful for reaching participants who might be less accessible through traditional sampling methods, such as those with specialized knowledge or involvement in informal networks related to edible insect consumption. Snowball sampling facilitated the inclusion of diverse perspectives from key informants who had knowledge and had previously participated in edible insects interventions and programmes within the county. The Chi-Square value of 3.841 in the Krejcie-Morgan formula is used to determine the appropriate sample size at a 95% confidence level. This value, along with factors like population size and margin of error, ensures the sample size is statistically valid. Understanding the symbols in the formula, such as Z for confidence level and p for population proportion, is essential for accurate sample size calculation.

3.6. Research Instruments

Interview Guide and Questionnaires

Key informant interviews were conducted at times convenient for the informants, allowing for flexible and in-depth data collection on the study's subject matter. These interviews were designed to extract detailed qualitative information. In addition, questionnaires were employed to collect quantitative data from a broader sample of participants. The questionnaires included closed-ended questions aimed at gathering demographic information and insights into attitudes, knowledge, and practices related to insect consumption. A total of 250 questionnaires were physically distributed, and 134 were distributed electronically, depending on the respondents' preferences and accessibility. A total of 30 qualitative in-depth interviews were carried out.

The research instruments were carefully developed in consultation with field experts and supervisors specializing in food security and gender studies. To ensure precision and relevance, the instruments were pre-tested with a small sample of respondents similar to the study population in Kakamega County. Kakamega was selected for pre-testing due to its similar socio-cultural and economic context, which allowed for refining the instruments before their deployment in Bungoma County. This pilot test ensured the instruments accurately captured the variables of interest and that the questions were clear and understandable to the respondents.

3.7. Testing for Validity and Reliability

Validity

To establish the validity of the research instruments, the researcher engaged with academic supervisors and subject matter experts in gender studies, food security, and entomophagy. These experts critically reviewed the instruments for clarity, relevance, and alignment with the study's objectives. The feedback received from these consultations was used to refine the questionnaires and interview guides. The pre-testing in Kakamega County further helped assess the instruments' precision, ensuring they effectively captured the data needed to answer the research questions.

Reliability

Reliability was assessed through a test-retest method, where the instruments were administered to the same respondents in Kakamega County at two different points in time. This method was chosen to determine the consistency of the responses. The findings from the pre-test were compared, and adjustments were made to improve the reliability of the instruments. The

consistency of the responses in relation to the study's variables indicated that the instruments were reliable for the main study.

3.8. Data Collection Procedures

The data collection process utilized a mixed-methods approach, combining both qualitative and quantitative data collection techniques. The field team comprised five trained individuals, including three research officers and two field supervisors, who were all well-versed in the study's objectives and methods. Fieldworkers were responsible for distributing questionnaires and conducting initial interactions with respondents. They played a crucial role in reaching the broader sample population. Research officers were tasked with conducting interviews and managing data collection processes, ensuring that the information gathered was accurate and consistent with the study's objectives. They worked closely with the fieldworkers to address any issues that arose during data collection. Field supervisors oversaw the entire data collection process, ensuring that protocols were followed, and data quality was maintained. They reviewed the collected data regularly and provided guidance to the research officers and fieldworkers.

The interviews were conducted by the research officers, who had received specific training on how to handle sensitive questions and ensure respondent comfort. The interviews were conducted in the respondents' preferred language, either English or Swahili, with translation services provided where necessary. Additionally, the researcher employed an observation checklist to document the consumption, preparation, and storage practices related to edible insects. This checklist helped to capture non-verbal data that complemented the interviews and questionnaires. Respondents were selected based on purposive sampling criteria, focusing on individuals directly involved in the production, processing, and consumption of edible insects. Selection criteria included the respondent's knowledge of insect consumption practices, involvement in household food decision-making, and willingness to participate in the study. Those who did not meet these criteria were excluded from the study. The pre-testing of questionnaires, initially mentioned in the data collection section, was part of the instrument

validation process and has been moved to the testing for validity and reliability section to avoid redundancy.

3.9. Data analysis

The study utilized a mixed-method research design, combining questionnaires and interviews to gather data on attitudes, perceptions, and cultural beliefs about insect consumption in Bungoma County. The collected data underwent both quantitative and qualitative analysis to deeply understand gender dynamics and cultural factors influencing edible insect consumption. For the quantitative aspect, data from the questionnaire was entered into Excel for cleaning and coding. Afterwards, they were transferred into the Statistical Package for Social Sciences version 25 for analysis.

The study generated descriptive statistics such as frequencies, percentages, means, and standard deviations that were applied to derive basic insight regarding the respondents and the study's themes. These results were presented in Tables and figures where appropriate. The study also derived statistics to evaluate the significance of gender dynamics in relation to the theme of utilization of edible insects for food and nutrition security. The statistics derived were the Chi-Square test and the Kruskal-Wallis H test. Chi-Square tests were done to evaluate whether significant differences existed among gender groups when the data type of the outcome factor of interest was in the nominal scale. Conversely, the Kruskal-Wallis H test was conducted when the outcome variable was in the ordinal scale. Post-Hoc tests were done using Dunn's test in the event a significant finding was gained in the Kruskal-Wallis H test and the groups being considered were more than two.

For the qualitative data from interviews, the study employed thematic analysis. During data familiarization, the study conducted a deep analysis of the interview transcripts, images, and field notes to grasp participants' narratives and experiences. This was done through the highlighting of significant elements in these narratives, such as characters and events. A coding scheme was then crafted to label and categorize key phrases within the narratives, drawing from research objectives and emerging patterns. Following this, codes were grouped into overarching themes that captured core concepts and relationships in the data. Connections between these themes were then explored, considering factors like culture, gender, and social norms. After

synthesizing key insights from the data, the study compared my findings to existing literature and sought feedback from participants and peers to ensure accuracy and relevance. This validation step ensures the findings' credibility. The final report presents a detailed account of participants' experiences, beliefs, and attitudes clearly and compellingly.

3.10. Ethical Considerations

The study sought approval from the board of post-graduate studies at Jaramogi Oginga Odinga University of Science and Technology (JOOUST) and received clearance from the JOOUST ethical review committee. Additionally, research permits were obtained from the county's Ministry of Agriculture and Livestock Development to ensure the study complied with all local regulations. Before commencing data collection, the study adhered to strict ethical protocols, beginning with obtaining informed consent from all participants. Respondents were fully informed about the purpose of the study, the procedures involved, and their rights as participants. They were provided with consent forms to sign, confirming their voluntary participation and agreement to the use of the data collected. The consent process explicitly included permission to audio record the interviews. Participants were assured that they could decline to be recorded or withdraw from the study at any time without penalty. Regarding data storage and security, all collected data, including audio recordings, were securely stored on password-protected devices. Access to the data was strictly limited to the primary researcher and research supervisors. Research assistants involved in data collection signed confidentiality agreements to ensure that they would not disclose any sensitive information obtained during the research. The confidentiality forms emphasized the importance of protecting participants' privacy and maintaining the confidentiality of all data, including personal identifiers. Data, including audio recordings, will be stored for a specific period (usually five years) as required by university regulations, after which they will be securely deleted. During this time, data will only be accessed for academic purposes and by individuals directly involved in the study, as outlined in the consent forms provided to participants. This ensures that all ethical standards for confidentiality and data protection are rigorously upheld throughout the research process.

CHAPTER 4: RESULTS AND DISCUSSIONS

4.1. Introduction

This chapter presents the study's results based on the themes outlined in the research objectives. The study sought to evaluate the influence of gender in the utilization of edible insects for food nutrition and security.

4.2. Results

Socio-Demographic Descriptive Results

This section presents the findings from socio-demographic analysis, which comprised of gender, age, education level, occupation, and location.

Table 4.1 Socio-Demographic Attributes of Study Participants

Demographic	Frequency	Percentage
Gender		
Male	193	50.3
Female	191	49.7
Age		
18-24	83	21.6
25-34	139	36.2
35-44	69	18
45-54	33	8.6
55 and above	60	15.6
Education level		
Primary school	47	12.2
Secondary School	116	30.2
Technical School	31	8.1
Diploma	137	35.7
Bachelor's	40	10.4
Master's degree and above	13	3.4
Occupation		
Self-employed	135	35.2
Employed	115	29.9
Unemployed	74	19.3
Student	60	15.6
Location		
Rural area	232	60.4
Urban area	152	39.6

Table 4.1 indicates that 50.3% of the participants were from the male gender, with those from the female gender accounting for 49.7% of the total response rate. The 25-34 age group was the most represented with 36.2%, while the least represented age group was the 45-54 age group with 8.6%. Respondents with diplomas accounted for 35.7% as the most represented group in educational level analysis, with those with master's degrees being the least represented at 3.4%. Higher education levels were generally found to be slightly low, with those with Bachelor's degrees accounting for 10.4% of total respondents. The study found that most respondents were self-employed, representing 35.27%, with the employed accounting for 29.9%, the unemployed at 19.3%, and students at 15.6%. The majority of the respondents, representing 60.4%, indicated that they lived in areas generally considered rural, while 39.6% indicated living in urban areas. The demographic analysis indicates that the typical respondent that participated in the study was male between the ages of 25-34, possessed a diploma as the current highest education level, was self-employed, and lived in rural areas. The findings on education levels are similar to Wanjala *et al.* (2023), who found that the education levels in four Western Counties, among them Bungoma, were commonly up to secondary and tertiary levels, with higher education levels being very low.

Objective 1: Qualitative Results and Analysis

This section presents the findings on dietary practices and food security. The results are presented in tables and figures, while the narratives collected from interviews are added to enrich the findings.

Dietary Practices and Food Security

Protein Consumption

The respondents were asked to indicate their frequency of consuming proteins as part of their diets. The findings are presented in Figure 4.1.

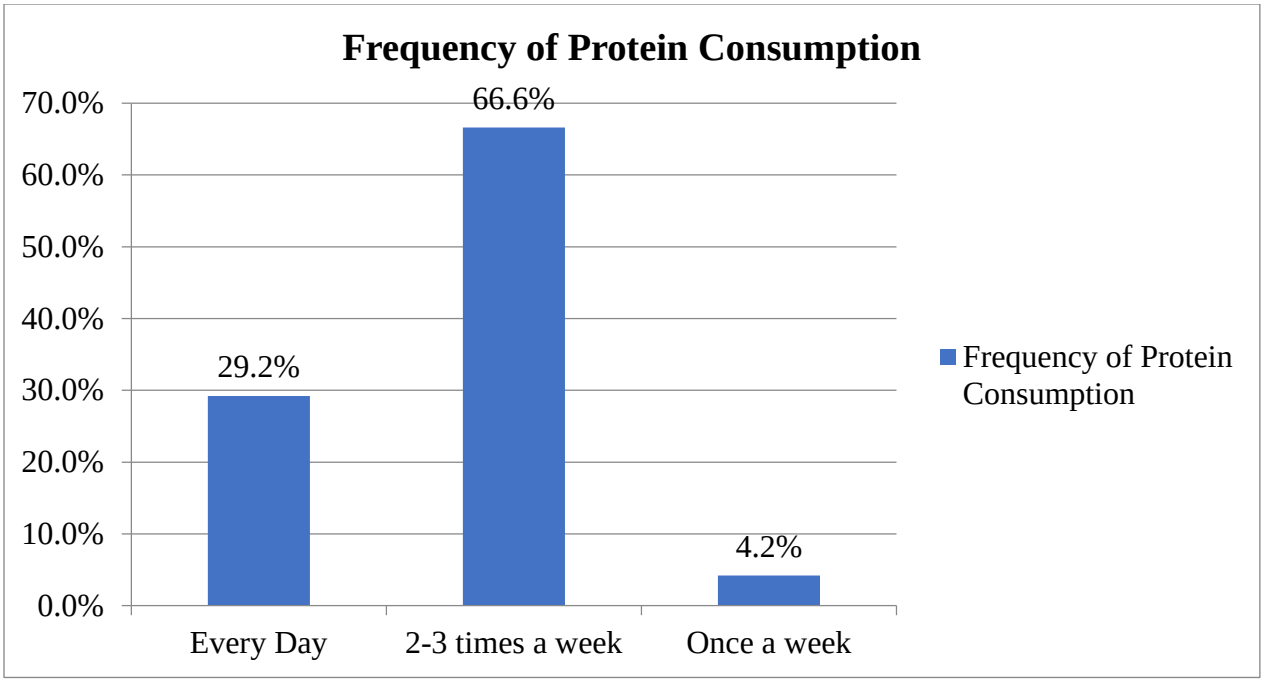


Figure 4.1 Protein Consumption Frequency

Figure 4.1 indicates that the largest section of respondents, accounting for 66.6%, ate proteins at least 2-3 times each week, with 29.2% indicating that they ate proteins daily. It also emerged that 4.2% ate proteins at least once a week. The respondents indicated that the protein sources came from animal, insect, and plant sources. Animal sources were largely poultry, chiefly indigenous chicken, beef, and goats, and plant-based protein sources came from legumes such as beans, peanuts, and lentils. The findings indicate that protein sources came from expensive and inexpensive sources, with most respondents indicating that they took legumes due to their relatively low expense and ability to satiate. The findings are consistent with Bungoma County's profile on the relevance of small-scale farming toward regional diets (MoALFC, 2021). Proteins from poultry and legumes were either directly sourced from small-scale farming activities or from neighbors who had a surplus.

Challenges in accessing Protein-Rich foods

The respondents were asked whether they ever experienced challenges accessing or affording protein-rich foods. The results are presented in Table 4.2.

Table 4.2 Challenges in accessing Protein-Rich foods

“Have you ever faced challenges in accessing or affording protein-rich foods?”	**Frequency**	**Percentage**
Yes	121	31.5%
No	229	59.6%
Maybe	34	8.9%
Total	**384**	**100**

Table 4.2 indicates that the majority of respondents, 59.6%, felt that they did not face challenges in accessing or affording protein-rich foods, with 31.5% indicating that they did face challenges. A partly 8.9% were unsure whether accessing or affording protein-rich foods was challenging. The findings confirm Klappes & Marsch (2020) that protein availability was not a significant challenge in the Western Region of Kenya, with the largest challenge being related to macronutrient sufficiency, which was noted to be below recommended levels by WHO. Upon further prompting on the specific challenges to those that indicated it was a challenge, the dominant response was that the proteins they would naturally want to consume more of were expensive. Red and white meat products constituted a large part of their budgets when purchased. The size of families for those with dependents was a big part of the consideration, as it would require large quantities of red or white meat beyond their means. The other challenges indicated were related to availability as some preferred sources of proteins, such as some types of fish, could not be found in rural markets. Further, some respondents indicated they could not store proteins in bulk as their storage required specialized facilities such as deep freezers and regular power sources, which were not readily available, especially in rural locations.

Missed Meals

The respondents were asked to indicate the frequency of missed scheduled meals. The findings are presented in Table 4.3.

Table 4.3 Missed Meals

"**How often do you miss food?"**	**Frequency**	**Percentage**
Every day	14	3.6%
several times a week	39	10.2%
Once a week	58	15.1%
Rarely	226	58.9%
Never	47	12.2%
Total	**384**	**100**

Table 4.3 indicates that the majority of the respondents, 58.9%, rarely missed scheduled meals or their meal schedules. In comparison, only a small minority, 3.6%, indicated they missed their daily meal schedules. The results contrasted with Olatunji *et al.* (2022), who noted that 58% of households in Western Kenya faced challenges in achieving food security. Upon inquiry, those who indicated they missed meals every day indicated that on most days, they did not eat when they preferred to eat. For instance, some respondents indicated that on busy days, they would have preferred to have meals, but they did not find adequate time to prepare one or find eating establishments that catered to their specific wants. Further, respondents in urban areas indicated that the main reason for skipping meals when they did not necessarily want to skip meals was associated with financial considerations, as good meals had increased in costs within the past year.

Viability of Edible Insects for food security

The study sought to investigate the perception of insects as a viable solution to reduce hunger. The findings are presented in Table 4.4.

Table 4.4 Viability of Edible Insects for Food Security

"Do you think that insects could be a viable solution to reduce hunger?"	**Frequency**	**Percentage**
Yes	136	35.4%
No	245	63.8%
Maybe	3	0.8%
Total	**384**	**100**

Table 4.4 indicates that the majority of respondents, 63.8%, did not think insects could be viable in reducing hunger, whereas 35.4% indicated that insects could be a viable solution to reducing hunger. A marginal 0.8% was undecided on whether insects could be a viable solution to hunger. The findings confirmed those of Kusia *et al*. (2021), who found that those who practiced entomophagy in western, eastern, coastal, and central Kenya did not also think that insects could be viable for food security but rather that they best functioned as complements.

Those who disagreed that it could offer a viable solution indicated that insects were perceived as being pests first and foremost rather than beneficial, making the food source essentially unwanted. Additionally, those who disagreed indicated that some insects, such as grasshoppers/locusts, had adverse effects on crops that reduced their appeal and enhanced the perception that they were dangerous to food security and their uncontrolled growth needed to be discouraged. Some respondents indicated that insects by nature had to be collected in large quantities, especially for large households. This reduced their viability as the time could be utilized in other activities such as farming.

The respondents further indicated the availability of insects in terms of quantity also contributed to their relative invisibility as offering a channel of satiation. Insects such as termites were seasonal, so they would not offer a reliable solution to hunger, while beetles were found in small quantities, making them relatively unreliable. The respondents also indicated that insect farming was not extensively adopted so that people could purchase them when needed, making them largely an unavailable food source. Respondents noted that insects were generally perceived as

complementary rather than main food items, making them less considered viable food sources. The lack of generally accepted safety standards related to insects as food was also noted to reduce the viability of insects as people not connected with the beliefs or norms of insect-eating communities would not find it easy to include insects in their diets.

The respondents supporting the viability of insects as a food source indicated insects were a source of vitamins, fats, and proteins, and these nutrients could make the source of food, at the very least, act as a complement in mitigating hunger. Further, respondents indicated that insects' relatively high reproduction rates could be leveraged to make them a source of food viable. However, when agreeing, the respondents noted that it would require the creation of specialized containment areas to mitigate any externalities resulting from letting insects grow with no control. The respondents suggested that insects required less care or resources than other types of meat farming, such as poultry and livestock, making them cost-effective. Therefore, insects could allow a cheap food source, and the additional resources could be used to purchase or procure other food items.

Association between gender, the challenge in accessing protein-rich food and insects as a viable alternative

The study conducted a Chi-square test of association to determine if there existed significant differences among genders with concern to gender-related challenges in the utilization of insects as a viable alternative. Table 4.5 presents the results.

Table 4.5 Gender, Challenge in accessing proteins and utilization of insects as a viable alternative

Challenges in accessing proteins			Utilization of Insects as a viable alternative			Total		
			Yes	No	Maybe		χ^2	p-value
Yes	Gender	male	17	39		56	0.820	0.365
		female	15	50		65		
	Total		32	89		121		
No	Gender	male	58	61	0	119	8.422	0.015**
		female	35	73	2	110		
	Total		93	134	2	229		
Maybe	Gender	male	5	13	0	18	1.706	0.426
		female	6	9	1	16		
	Total		11	22	1	34		
Total	Gender	male	80	113	0	193	8.699	0.013**
		female	56	132	3	191		
	Total		136	245	3	384		

Note ** indicates a significant association at a 95% confidence level

Table 4.5 indicates that challenges in accessing or affording protein-rich food were significantly associated with the utilization of insects among genders as a viable alternative for those who indicated that they did not find challenges in accessing rich protein food sources χ^2=8.422, *P*=0.015).

Male respondents showed a greater agreement of insects as a viable alternative, with women less agreeing of insects as a viable alternative. This supports Florença *et al*. (2021) that males generally perceived insects as good sources of protein, which led to higher levels of acceptability compared to women. Further, gender was significantly associated with the utilization of insects as a viable alternative χ^2=8.699, *P*=0.013). The majority of agreement regarding the utilization of insects was also from the male gender.

Objective 2: Qualitative Results and Analysis

Gender Dynamics and Cultural Beliefs

This section presents the findings on gender dynamics and cultural beliefs. The results are presented in tables and figures, while the interview narratives are added to enrich the findings.

Food Purchase Decisions

The study sought to understand the food purchase decisions of households in Bungoma County. The findings are presented in Table 4.6.

Table 4.6 Food Purchase Decisions

"Who makes decisions about food purchasing (provides food) in your household?"	**Frequency**	**Percentage**
The male head of household	59	15.4%
Female head of household	146	38%
Jointly	179	46.6%
Total	**384**	**100**

Table 4.6 indicates that in most of the households, decisions regarding food purchases were made jointly at 46.6%, with 38% indicating that the female head of the household made the decision. In comparison, 15.4% indicated that the male head of the household made the purchase decisions. These findings deviate from Pambo *et al*. (2016) that women in Western Kenya were the primary food purchase decision makers. However, the findings indicate that the decision was more than double that of male household decision-making when not done jointly.

The interviewees indicated that joint purchase decisions would take place after a short consultation of what was generally needed or required. The majority of the responses indicated that the male head of the household was expected to finance the purchasing activities. In most cases, the final decisions of purchases would be made by the female member as market factors could influence the availability of products, which could be subject to change. Further, the interviewees indicated that purchase decision-making tended to vary with the occasion. For

instance, male heads of households would have greater input in purchase decisions if the food was for a special occasion.

Meals Preparation Responsibility

The respondents were asked to indicate who had the responsibility of preparing food in households. Table 4.7 presents the findings.

Table 4.7 Meal Preparation Responsibility

"Who is responsible for preparing meals in your household?"	**Frequency**	**Percentage**
Male	18	4.7%
Female	255	66.4%
Jointly	111	28.9%
Total	**384**	**100**

Table 4.7 indicates that in most of the households, the responsibility for meal preparation was on the female members, as indicated by 66.4% of the respondents. 28.9% of the respondents indicated that both male and female members of the household were responsible for the preparation of meals in their household. In comparison, 4.7% indicated that the male members of the household held the responsibility for meal preparation. The findings supported those of Ogutu *et al.* (2022) on the significant role women had in households in Western Kenya in relation to the preparation of food.

The interviews indicated that the meal preparation duties were naturally considered as the role of the female members. This was indicated as being a result of upbringing as girls were tasked with helping the female members of the households in preparing food. These roles were, therefore, internalized by both genders and in most cases, they came about through expectations rather than through explicit division of labor. The respondents who indicated that the role was jointly done indicated that work-related factors were the main cause of both genders working on meal preparation. However, in most cases, the female member would also be expected to prepare meals.

Access to Nutrition-related Resources

Respondents were asked whether they felt their gender influenced their access to resources or education related to agriculture or nutrition. The findings are presented in Table 4.8.

Table 4.8 Access to Nutrition-related Resources

"Have you ever faced challenges in accessing resources or education related to agriculture or nutrition due to your gender?"	**Frequency**	**Percentage**
Yes	104	26.9 %
No	207	54%
Unsure	73	19.1%
Total	**384**	**100**

Table 4.8 indicates that 54% of the respondents did not consider their genders as influential in whether they could access resources or education related to agriculture and nutrition. 26.9% of the respondents indicated that their gender influenced their access to resources or education related to agriculture or nutrition. 19.1% were unsure whether their gender was a source of challenges in accessing resources or education related to agriculture or nutrition. Waswa *et al.* (2015) noted that educational interventions in Western Kenya had facilitated increased knowledge of nutrition. The availability of such interventions could explain why more respondents felt that they did not face challenges or were unsure. Most respondents indicated that information on nutrition or agriculture was generally available or shared among generations or from resource personnel such as agricultural officers. Further, nutritional information was freely available, especially for the female gender, as nutrition in the household was associated with female roles.

The respondents that indicated gender was a challenge noted that it arose from the utility of the information being sought. Those seeking information on large-scale farming practices and were members of the female gender felt that information was not given out with the same seriousness or clarity as given to the male gender. The expectation was that the female gender would be more concerned with small-scale farming oriented towards feeding the family members, which aligned with the dominant perception. Furthermore, some respondents indicated that the male household

heads expected to provide information or resources, placing females in a position where only one avenue could be used to gain knowledge or resources. Going outside the hierarchy could be negatively perceived or become a source of friction in the family.

Objective 3: Qualitative Results and Analysis

Attitudes and Perceptions of Edible Insects

This section covers the analysis of attitudes and perceptions of edible insects. The results are presented in tables and figures, while narratives collected from interviews and images are added to enrich the findings.

Insects Consumption

The respondents were asked whether they had ever eaten insects. Respondents who indicated they had been further asked to indicate which types of insects they had eaten. The findings are presented in Table 4.9.

Table 4.9 Insect Consumption

Insect consumption	**Frequency**	**Percentage**	**Types Eaten**	**Frequency**	**Percentage**
Yes	325	84.6	Termites	274	84.4
			Grasshoppers	188	57.8
			Crickets	41	12.5
			Caterpillars	20	6.3
			Ants	46	14.1
			Beetles	46	14.1
No	59	15.4			
Total	**384**	**100**			

Table 4.9 indicates that the majority of the respondents, 84.6%, had eaten insects at one point, with 15.4% indicating that they had never consumed them. The findings concur with Kisaka (2018), who found that edible insects constituted a significant part of the diet of residents in Bungoma County. On closer evaluation of the type of insects that the respondents had eaten, it emerged that termites (*chiswa*) were the most eaten at 84.4%, grasshoppers at 57.8%, ants and Beetles *(kamasirili*) at 14.1%, crickets at 12.5% and caterpillars (*Lisa*) at 6.3%. The findings reflect those of Kusia *et al.* (2021) concerning which insects were majorly consumed in Kenya as

termites and grasshoppers were the most consumed, and crickets and grubs such as beetles were consumed at lower rates. As indicated in plate 4.1, termites had the most availability among the types of insects indicated, as they were easily found. The findings indicate that entomophagy was still embraced, suggesting that the various generations in Bungoma County still viewed it as a viable practice for nutrition.

Plate 4.1. Mobile Vending and Fixed Selling of Termites

Perception of Insects as food

The study asked respondents to indicate their perception of the various types of insects as food. The findings are illustrated in Table 4.10.

Table 4.10 Perception of Insects as food

Insect	Disgusting	Neutral	Tasty
Termites (Chiswa)	1.6%	17.2%	81.3%
Grasshoppers (Litete)	6.3%	34.1%	59.6%
Crickets (Sichinjiriva)	17.1%	42.9%	40%
Caterpillars (Lisa)	66.7%	13.3%	20%
Ants (Kamake)	31.0%	37.9%	31.0%
Beetles (Kamasivili)	40.7%	40.7%	18.5%

The findings in Table 4.10 illustrate that Termites (chiswa) were perceived favorably by most respondents, as 81.3% labeled them as tasty and only 1.6% labeled them as disgusting. The findings also indicated that grasshoppers were perceived as tasty by 59.6%, with crickets perceived as tasty by 40% of respondents. The findings also illustrate that ants were perceived as tasty by 31%, caterpillars at 20%, and beetles as tasty by 18.5%. The findings indicate a large section of respondents also felt that caterpillars were disgusting at 66.7%, with beetles being perceived as 40.7% disgusting and neutral. The interview responses explained why beetles and caterpillars were perceived as being disgusting, with most respondents pointing out that their appearances did not particularly make them seem tasty. Further, beetles were associated with decomposing organic material, which made respondents associate them with disgust for decomposing matter.

Protein Comparisons

The respondents were asked their thoughts on insect protein value in comparison to other types of proteins. The findings are presented in Table 4.11.

Table 4.11 Protein Comparisons

Rating	Frequency	Percentage
Better	136	35.4
About the same	217	56.5
Worse	28	7.3
Not sure	3	0.8
Total	**384**	**100**

Table 4.11 indicates that a large section of respondents, 56.5%, attached the nutritional value of insects as protein sources to be almost similar to other forms of protein. Those who thought insects as protein sources were better accounted for 35.4%, while those who thought it was worse were only 7.3%, and those not sure accounted for 0.8%. The interview findings indicated why some respondents felt that insect proteins were better, with some explaining that they could be sure that insects had no extra chemicals or preservatives. This was attributed to the preparation process for insects as they were preserved by traditional means. Consuming tainted proteins was not a risk that they felt they had to consider, which enhanced its nutritional perception. Further, some respondents indicated that insects seemed preferable to other proteins as they were not associated with negative implications to health, such as heart diseases and diabetes.

The level of fats found in insects compared to other protein sources such as beef was also considered by respondents as low, which increased their favourability as a better source of protein. However, some respondents indicated that they viewed insects as poor sources of proteins as they had to be consumed in larger quantities than other protein sources. Further, some respondents felt that the lack of information regarding insects as proteins compared to other sources also influenced their perception of whether they offered much better protein.

Willingness to try Insect-based food products

The study sought to determine respondents' willingness to try out insect-based food products. The findings are illustrated in Figure 4.2.

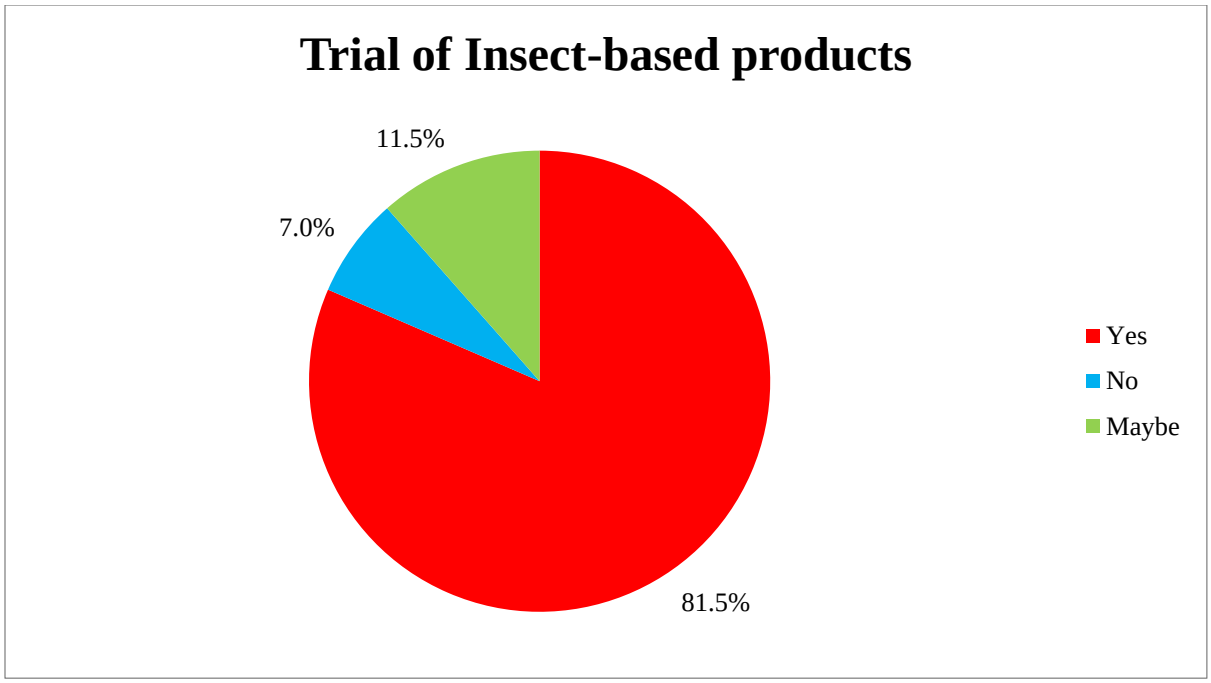


Figure 4.2 Trial of Insect-based products

Figure 4.2 indicates that most respondents, 81.5%, were open to trying out new insect-based food products, with 11.5% indicating that they were unsure whether they would want to try out insect-based products. 7% of the respondents indicated they were not open to trying new insect-based products. The interviewees suggested that new insect products could be well-packaged, which could raise their levels of acceptability as it would require them to become certified as being safe for consumption. As Figure 4.3 indicates, packaging for insect food was done at the selling point in plastic bags. The concern of some of the interviewees was that the present methods through which ready-to-eat insects were made available could not provide assurances that they were prepared with high levels of hygiene. As Figure 4.2 also indicates, insect products currently being sold within the study area were vulnerable to contamination from elements such as dust within the environment of selling. Interviewees also indicated they would consider trying out new insect products if they were sure they were not poisonous.

Plate 4.2. Insects Packaging and Selling in the Open-Air Market

Summary of Association between Gender, Gender Knowledge of Insects, and Prior Consumption of Insects

The study conducted a Chi-square test of association to determine if there existed significant differences among genders with concern to their gender knowledge in consumption of insects. Table 4.5 presents the results.

Table 4.12 Association between Gender, Gender Knowledge of Insects, and Consumption of Insects

Knowledge of insects as protein sources			Insect Consumption		Total		
			Yes	No		χ^2	P-Value
Better	Gender	Male	54	19	73	7.815	0.005**
		Female	32	31	63		
	Total		58	50	136		
About the same	Gender	Male	103	1	104	1.092	0.296
		Female	113	0	113		
	Total		137	1	217		
Worse	Gender	Male	12	2	14	1.714	0.190
		Female	9	5	14		
	Total		12	7	28		
Don't Know	Gender	Male	2	0	2	3.000	0.083
		Female	0	1	1		
	Total		1	1	3		
Total	Gender	Male	171	22	193	4.693	0.030**
		Female	154	37	191		
	Total		325	59	384		

Note ** indicates a significant association at a 95% confidence level.

Table 4.12 indicates that the different gender knowledge levels regarding edible insects as protein sources compared to other protein sources were statistically associated with prior consumption of insects. Specifically, knowing insect sources as better sources of protein had a significant association with previous consumption of insects among genders χ^2=7.815, P=0.005). The chi-square association test on gender and insect consumption indicates that there were significant differences among males and females concerning the consumption of insects χ^2=4.693; P=0.030). This indicated that being male or female had a significant association with having consumed insects. The findings confirmed Kusia *et al.* (2021) that gender was a significant factor in the practice of entomophagy, while awareness of the rating of the protein source partly confirmed the fact that information gaps did influence whether insects were viewed as an appropriate protein substitute.

Plate 4.3. Gender Knowledge of Insects and Consumption of Insects

Overall Objectives Qualitative Results and Analysis

Cultural Beliefs and Norms

The study asked respondents to indicate the cultural beliefs and norms associated with the consumption of insects in their community. The responses could be broadly categorized into responsibility, gender relationship, medicinal value, nutritional value, and superstition-related factors. Concerning responsibility, the respondents indicated that women and children were primarily considered to be the ones responsible for gathering or collecting the insects. Men were relatively not expected to be responsible for collection and preparation, but some forms of preparation, such as roasting, could be considered a male responsibility. There were varying responses concerning the relationship between insect eating and their value to the different genders. Some responses disagreed on whether women were allowed to eat insects, with the majority indicating that insects were nutritious for women so they could partake of them, especially when pregnant. Some insects were considered enriching to those of the male gender as insects such as grasshoppers strengthened male virility.

Several respondents indicated that insects were believed to have medicinal value in preventing seasonal ailments. For instance, winged termites came about during the rainy season related to seasonal illnesses and were thought to have aspects of preventive medicine. Respondents also indicated that they ate insects for nutritional value as they were generally associated with good health when prepared well. The nutritional value of insects was not determined through scientific methods. Rather, it was passed down through the behaviors and narrations of how nutritious they were. Respondents also learned how to prepare the insects in ways that would ensure the nutritional value was not lost through traditional methods. Thus, some respondents believed that insects were only as nutritional as the preparation methods used followed traditions. Superstition-related factors also impacted the consumption of insects, with one respondent indicating that:

> *"There was a bigger locust than all known by the name Namurunda, which was said that when you have all your parents alive, you should not eat it. But in case you eat it, your parents will die."*

Influence of Cultural Beliefs and Norms

The respondents were asked to indicate the type of effect cultural beliefs and norms had on the consumption of insects. The findings are presented in Figure 4.5. Table 4.13 further evaluates the association between cultural beliefs and insect consumption using a Chi-square test of association.

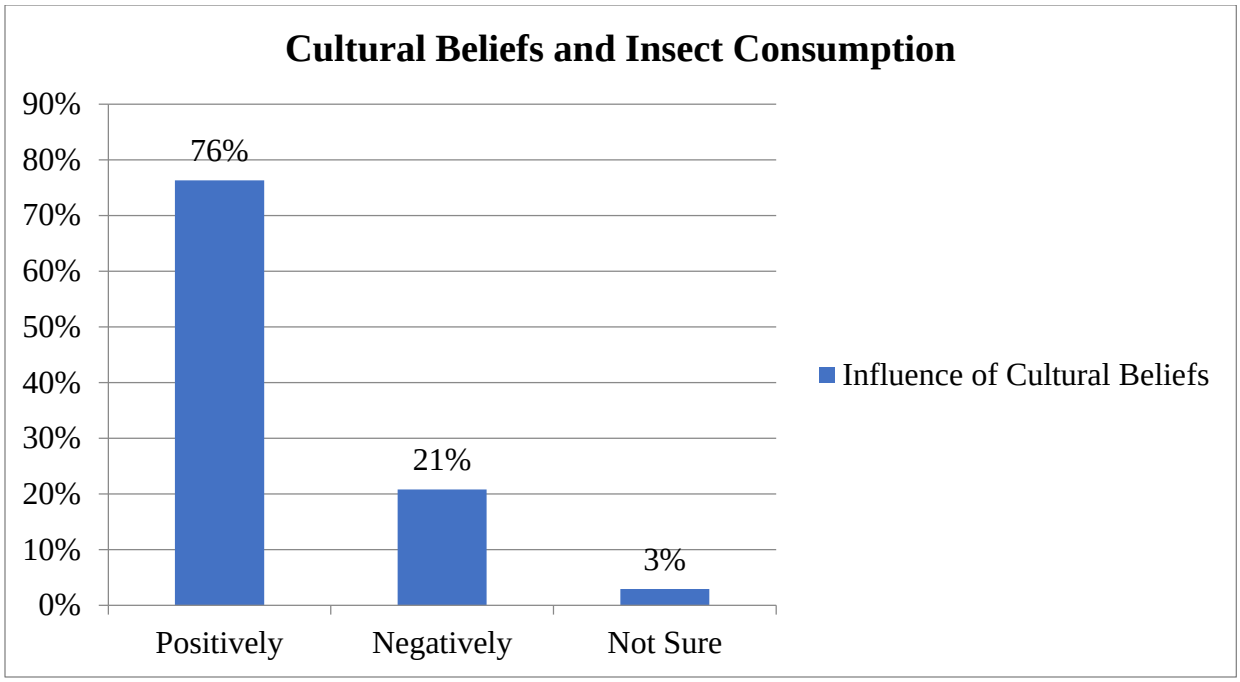


Figure 4.5 Cultural Beliefs and Insect Consumption

Figure 4.5 indicates that the majority of the respondents, as given by 77%, generally found that existing norms and beliefs were positively related to insect consumption. This indicated that it was not unexpected for people within the community to eat insects, and the general attitude of the community towards insect consumption was favorable. 21% of the respondents indicated norms and beliefs were negatively related to insect consumption. In comparison, 2% of the respondents stated that they were unsure of the influence of cultural beliefs and norms on insect consumption. These findings confirm Wanjala *et al.* (2023) that insect consumption in Western Kenya was culturally influenced as new generations adopted the practice. The interviewees who indicated norms and beliefs were positively associated with the consumption of insects noted that it made it easier for community members to adopt the practice as it was familiar and accepted. Furthermore, respondents indicated that they did not have to determine whether the insects were poisonous, as they had already consumed them as a cultural delicacy. The respondents also indicated that the modes of preparing the insects served to make the dishes tasty so that the practice of consuming insects was still prevalent after being passed on through successive generations.

Several respondents indicated that norms and beliefs caused insect consumption to be negatively perceived. The prevailing norms and assumptions regarding the roles of genders were skewed negatively toward women as they would be charged with collecting and preparing while being locked out from partaking in some of the delicacies. Conversely, men were framed as the ones with the most benefit as consumers of the delicacies and whether or not other family members should share in the meal. The respondents also noted that male heads' food eating preferences arising from their cultural and religious beliefs were emphasized more than women's. This made it difficult for some respondents to embrace insect consumption as it reinforced stereotypical gender expectations.

Further, some respondents indicated that the superstitions attached to insect consumption negatively influenced how they were perceived. Some respondents indicated they did not want to risk consuming insects that could result in unwanted occurrences. Respondents also indicated that norms and beliefs made insect consumption appear an archaic practice that had no place in modern society. Thus, the norms and beliefs could have negative implications on their attractiveness and acceptability to younger generations.

Association between Cultural Attitudes and Insect Consumption

The study conducted a Chi-square test of association to determine if there existed significant differences in respondents' cultural attitudes as it related to insect consumption. Table 4.9 presents the results.

Table 4.13 Association between Cultural Attitudes and Insect Consumption

Respondent attitudes concerning cultural beliefs and norms		**Edible Insect Consumption**		**Total**		
		Yes	**No**		χ^2	**p-value**
Attitudes	Positively	239	54	293	9.225	0.010**
	Negatively	75	5	80		
	Don't know	11	0	11		
Total		**325**	**59**	**384**		

Note ** indicates a significant association at a 95% confidence level

Table 4.13 indicates that cultural attitudes were significantly associated with the consumption of edible insects χ^2=22.622, *P*= 0.010. The results from cross-tabulation show that positive cultural attitudes had the highest response associated with the consumption of edible insects.

Involvement in Decision-Making

The respondents were asked to indicate whether it was essential to involve both men and women in decision-making related to nutrition. The results are illustrated in Figure 4.6.

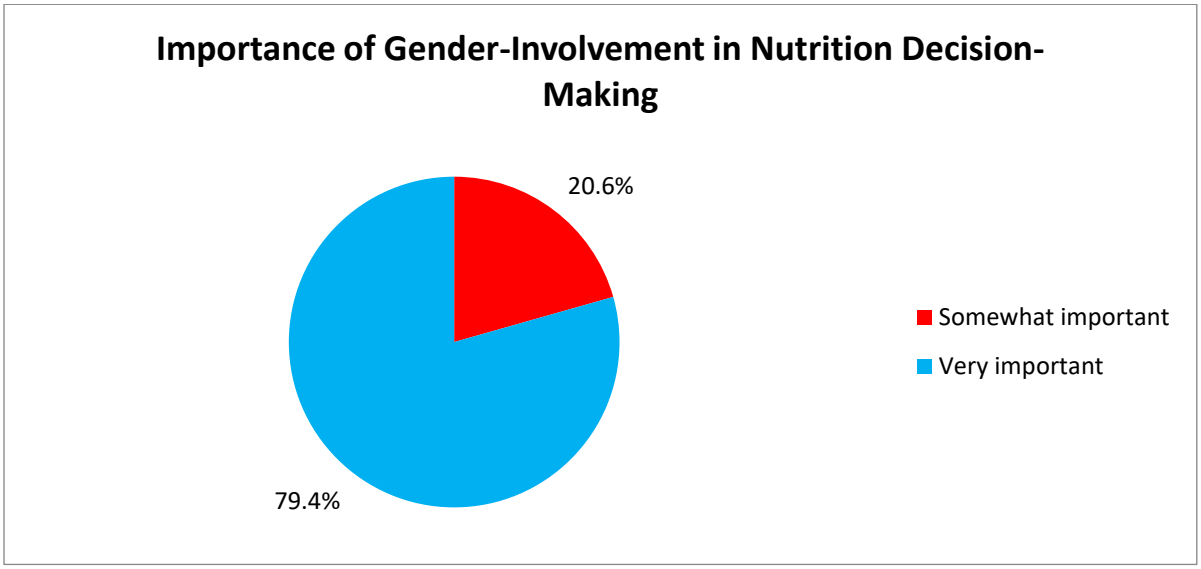


Figure 4.6 Importance of Gender-Involvement in Nutrition Decision-Making

Figure 4.6 indicates that 79.3% of respondents agreed that involving both genders in nutrition decision-making was essential. 20.7% of the respondents stated that both genders needed to be involved in decision-making related to nutrition. Further, deliberations with the interviewees indicated that most supported both genders being involved due to the complexity of nutritional needs in the household. Men and women had different preferences concerning their diet needs and would want to have those preferences reflected in the food prepared in the home. It was also apparent that nutritional decisions were associated with gender roles and responsibilities. For instance, the food to be prepared could require different types of inputs from men or women; the increase in joint responsibilities, especially in younger families, could see men take more significant roles in preparation as women also increased their input in providing resources.

The respondents also indicated that the nutritional goals of a family were much easier to accomplish if both genders had a basic understanding or agreement on how they would be achieved, therefore supporting the logic for joint participation in decision-making. Additionally, a health nutrition expert indicated that the different genders had nutrition-related health concerns that needed to be considered when making nutritional decisions at home. For instance, men would require more energy-giving foods if their daily activities were strenuous.

Association between Gender Roles and Insect Consumption

This section provides the results from Chi-square association tests between gender roles and edible insect consumption after cross-tabulation between the gender roles in food purchasing decision-making and food preparation and insect consumption. The findings are presented in Table 4.14 and Table 4.15.

Table 4.14 Association between Food Purchasing Decision-Making and Insects Consumption

Decisions about food purchasing		**Edible Insect Consumption**		**Total**		
		Yes	**No**		**χ^2**	**p-value**
	Male head	46	13	59	5.179	0.075
	Female head	129	17	146		
	Jointly	250	29	179		
Total		**325**	**59**	**384**		

Note ** indicates a significant association at a 95% confidence level

Table 4.14 indicates that gender-influenced decision-making roles were not statistically associated with whether or not a household consumed insects χ^2=5.179, *P*= 0.075. The cross-tabulation results suggest that joint gender-influenced decision-making had the most responses in agreeing with insect consumption.

Table 4.15 Association between Food Preparation Responsibility and Insect Consumption

Responsibility for Food preparation		Edible Insect Consumption		Total		
		Yes	No		χ^2	P-value
	Male	18	0	18	22.622	0.000**
	Female	200	55	255		
	Jointly	107	4	111		
Total		**325**	**59**	**384**		

Note ** indicates a significant association at a 95% confidence level.

Table 4.15 indicates that gender-influenced food preparation was significantly associated with the consumption of edible insects χ^2=22.622, *P*= 0.000). The cross-tabulation results suggest that female responsibility in food preparation had the highest correspondence in number with consumption of edible insects. The findings support Wanjala *et al.* (2023) that households, where female members prepared the meals found them more nutritious, tasty, and in line with culture, which significantly affected the consumption of insects.

Utilization of Edible Insects for Food and Nutrition Security

This section presents the findings on the level of acceptance of edible insects for food and nutrition security, benefits and drawbacks of insect-based diets, steps to encourage insect consumption, and challenges women encounter in utilizing insects as food.

Level of Acceptance of Edible Insects for Food and Nutrition Security

The study sought to evaluate the level of acceptance of using edible insects for food and nutrition security. The respondents were asked to give their rating of the following statements on a scale of 1-5, where 1 strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 strongly agree. The findings are presented in Table 4.16.

Table 4.16 Utilization of Edible Insects for Food and Nutrition Security

Statements	Mean	Std. Dev
I am open to consuming insects if it contributes to food and nutrition security	4.4922	.74043
Gender norms should not influence who can access resources for food security.	4.6953	.62446
Women and men should have equal decision-making power regarding nutrition and food security	4.6693	.56669
Cultural beliefs and practices need to be respected when advocating for the consumption of insects as food.	4.1484	.96754
Both men and women should receive education and training to promote the use of insects as a food source.	3.1042	1.78610
Overall Mean	**4.2219**	**0.93704**

Table 4.16 indicates that respondents were open to consuming insects if they contributed to food security as the mean of 4.4922 and S.D of 0.74043 indicates. The respondents agreed that gender norms ought not to influence who could access resources for food security, as the mean of 4.6953 and SD of 0.62446 suggest. The respondents agreed that women and men should have equal decision-making power regarding nutrition and food security, as the mean of 4.6693 and SD of 0.56669 indicate. Respondents indicated that cultural beliefs and practices needed to be respected when advocating for the consumption of insects as food, as supported by the mean of 4.1484 and SD of 0.96754. However, respondents were neutral on whether both men and women should receive education and training to promote the use of insects as a food source, with a mean of 3.1042 and SD of 1.78610. The overall mean of 4.2219 and SD of 0.93704 indicates that respondents generally agreed with the statements concerning the acceptance of edible insects for food security and nutrition.

Benefits and Drawbacks of Insect-Based Diets

The respondents were requested to indicate the benefits and drawbacks associated with insect-based diets. Concerning benefits, the respondents indicated that insects had nutritional value and could be used as a source of nutrients, with some of the insects, such as termites and ants, being good energy sources. Further, some of the responses pointed out that insects are less resource-intensive or less costly as a source of food compared to other common protein sources, making

them highly beneficial for budget-constrained households. Some respondents indicated that insect-based diets were less exposed to chemical agents as the insects were preserved through traditional means, making them a healthy source of nutrients. Insects were promoted as having health benefits as they were believed to have immunity-strengthening qualities.

Insect-based diets were, however, noted to be limited due to the hazards and risks they posed to humans if not well prepared. The respondents also indicated that while some insects could be eaten raw, there were instances when they could instigate allergic reactions and potential poisoning. The risk of eating poisonous insects due to lack of information was another challenge that negatively impacted insect-based diets. Respondents indicated that some species of a given insect could be eaten, and some could not. The existing information barriers reduced what people understood about insect diets, as such information could only be utilized by people with strong cultural roots. Insect-based diets were also perceived as generational, with the new generations not particularly drawn towards eating insects. Younger generations felt that the activities related to collecting and preparing insect-based diets were too time-consuming.

In comparison, older generations felt that the incoming generations were not aware of the cultural significance of entomophagy, which was a drawback for the continuation of the practice. The respondents also indicated that the lack of regulatory or safety practices in ensuring insect-based diets were safe also posed a disadvantage. People not used to entomophagy would find it risky even if they saw insects being sold in open-air markets.

Encouraging Insect Consumption

The respondents were asked to describe several specific ways or actions that could be applied or done to encourage the consumption of insects in Bungoma County and the community. The respondents indicated that there needed to be increased promotion of insect breeding as a viable economic activity so that the source of protein could be accessed by more people who did not necessarily have the time to collect it themselves. Increased breeding of insects for nutritional purposes would also reduce costs, ultimately influencing more people to consider insects as a cost-effective source of proteins. Furthermore, respondents indicated that health and nutrition agencies in the County could conduct educational and awareness campaigns to provide insight into the nutritional benefits of entomophagy, as it was primarily viewed as a cultural practice

rather than a practice that promoted good health in its own right. The government, national and County, could also support entomophagy by coming up with supportive policies for breeding insects. Providing incentives or special forms of support, such as agricultural forums, would raise insect feed availability and insects' appearance in diets.

Respondents further suggested that changing cultural perceptions could increase the acceptability of insect-eating to religions or cultures that had not adopted entomophagy. The promotion of insect-based products or the exploration of how insect ingredients could be added to everyday products such as flour and snacks was also cited as a way to encourage the consumption of insects in the County. The respondents indicated that increased incorporation of insects in menus by food providers both for the local and high-end clientele would lead to more people being aware of insects as food items and promote the consumption of insects. Some respondents indicated that the County should carefully apply insecticides and pesticides so that natural insect habitats would not be destroyed by mistake. The uninterrupted growth of insects in their natural habitats would pose beneficial outcomes on insect harvesting and consumption. Furthermore, the meat of collected insects would not be tainted by potentially harmful chemicals.

Challenges encountered by women in utilizing insects as food

The respondents were asked to indicate the various challenges women encountered when seeking to access or utilize insects as food in their community. Some respondents stated resource dependence on men as the financial providers generally restricted women's access to insects. In most cases, the food would be bought from sellers, which was more convenient than harvesting. The respondents further indicated that women could face challenges in having adequate time to harvest and prepare insects for food while still being expected to take care of the household and work semi-permanent and permanent jobs to supplement the household's income. Therefore, the workload in other roles could reduce the time available for preparing insects as food. The respondents also indicated that the position of women as secondary heads of the households could influence their decisions on whether insects would be part of the household diet.

"We follow the eating preferences of father and what he likes."

The decision-making role of the male heads among communities in Bungoma would, therefore, pose a challenge to the females' decisions regarding utilizing insects as food sources. The respondents also indicated that women's knowledge and awareness of the nutritional aspects of various kinds of insects could pose a problem in the utilization of insects. Health practitioners noted that the insect's nutritional value was mostly culturally based and informal. This meant that most women did not consider specialized information when deciding on insects as food, given that most had reached secondary school and tertiary levels as the highest levels. Having concrete information on the nutritional value of various types of insects could very well see their greater utilization in diets. The lack of knowledge or information on nutritional aspects by women due to relatively low levels of education, therefore, meant that food choices were less based on their overall value in nutrition and more due to other factors such as habitual preparation and convenience.

4.3. Kruskal-Wallis Tests (Quantitative Analysis)

This section provides the results of significance testing among various aspects of gender in relation to the study's main outcome statement: "I am open to consuming insects if it contributes to food and nutrition security."

Gender and Acceptance of Edible Insects for Food and Nutrition Security

The study sought to evaluate whether there were significant differences among genders in relation to the level of acceptance of edible insects for food and nutrition security. The statement, "I am open to consuming insects if it contributes to food and nutrition security," was compared among the two genders. The study evaluated the distribution of the two genders to determine if the assumption that they both should follow similar distribution patterns was met. Figure 4.7 provides the findings.

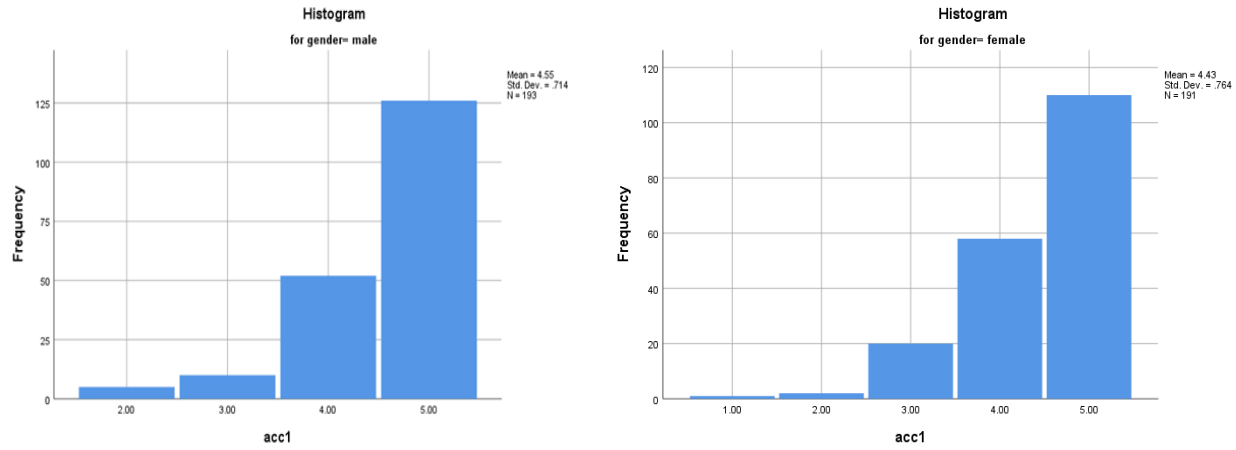


Figure 4.6 Gender Distribution

Figure 4.5 indicates that the assumption that the groups being evaluated should follow a similar distribution was met. The study, therefore, conducted the Kruskal Wallis test to determine if significant differences existed among genders concerning the utilization of edible insects for food and nutrition security. The results are presented in Table 4.17.

Table 4.17 Kruskal-Wallis Test for Gender and Utilization of Edible Insects for Food and Nutrition Security

		N	Mean Rank
Level of acceptance of edible insects for food nutrition and security	**Male**	193	200.52
	Female	191	184.39
	Total	384	
		Test Statistics[a,b]	
Level of acceptance of edible insects for food nutrition and security			
Kruskal-Wallis H		2.726	
Df		1	
Asymp. Sig.		.099	
a. Kruskal Wallis Test			
b. Grouping Variable: Gender			

The Kruskal-Wallis H evaluation indicates that there was no statistically significant differences in the level of acceptance of edible insects for food nutrition and security between the two

genders, H (1) = 2.726, P=0.099. The findings illustrate that gender differences were not significantly influential in whether or not edible insects were accepted for food nutrition and security. These findings were different to those of Verbeke (2014) who indicated that gender was a significant determinant in the utilization of insects in the context of sustainable sources of proteins.

Objective 1: Quantitative Results and Analysis

Gender-influenced Decision-Making and Acceptance of Edible Insects for Food and Nutrition Security

The study sought to evaluate whether there were significant difference across households whose food purchase decisions were either made by the male-head, female-head or jointly. These differences were evaluated with relation to the level of acceptance of edible insects for food and nutrition security. The statement, "I am open to consuming insects if it contributes to food and nutrition security" was compared across the three household types. The study evaluated the distribution of the three groups to determine if the assumption that they both should follow similar distribution patterns was met. Figure 4.7 provides the findings.

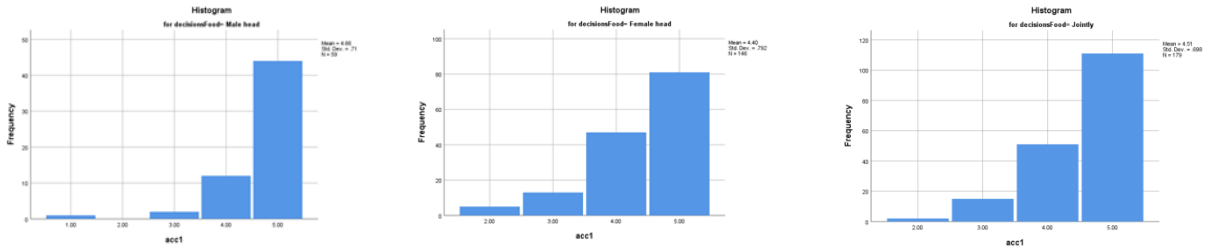


Figure 4.7 Distribution of Male-Headed, Female-Headed and Joint Decision-Making Households

According to the findings illustrated in Figure 4.7, the distribution among the three groups was similar which allowed the study to evaluate whether there existed significant differences using the Kruskal-Wallis test. The findings from the test are presented in Table 4.18.

Table 4.18 Kruskal-Wallis Test for Gender–Based Decision Making

		N	Mean Rank
Level of acceptance of edible insects for food nutrition and security	**Male head**	59	218.58
	Female head	146	180.22
	Jointly	179	193.92
	Total	384	
Test Statistics [a,b]			
Level of acceptance of edible insects for food nutrition and security			
Kruskal-Wallis H		6.821	
df		2	
Asymp. Sig.		.033	
a. Kruskal Wallis Test			
b. Grouping Variable: Gender based Decision-Making			

Table 4.18 indicates that there were statistically significant differences in the level of acceptance of edible insects for food nutrition and security within gender-influenced decision making. *H* (2) = 6.821, *P*=0.033 where the highest mean ranking was from male-head decision making with 218.58. The second highest rank was from joint decision making with 193.92 and the third ranking was female head with 190.22. The study further conducted a Post-Hoc analysis using Dunn's test to ascertain among the three groups which two pairs had significant differences among them indicated in Table 4.19.

Table 4.19 Dunn's Test

Pairwise Comparisons of Gender-influenced decision making					
Sample 1-Sample 2	**Test Statistic**	**Std. Error**	**Std. Test Statistic**	**Sig.**	**Adj. Sig.[a]**
Female head-Jointly	-13.709	10.676	-1.284	.199	.597
Female head-Male head	38.361	14.768	2.597	.009	.028
Jointly-Male head	24.652	14.371	1.715	.086	.259
Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.					
a. Significance values have been adjusted by the Bonferroni correction for multiple tests.					

According to Table 4.19, the difference between female-headed households and male-headed households was significant, *P*= 0.028. This indicates that gender-influenced decision-making among households was significant when the decisions were either made by the female head or the male head.

Objective 2: Quantitative Results and Analysis

Gender-influenced Food Preparation Responsibilities and Acceptance of Edible Insects for Food and Nutrition Security

The study sought to evaluate whether there were significant difference across households whose food preparation responsibilities were either held by a member who was male, female or when done jointly. These differences were evaluated with relation to the level of acceptance of edible insects for food and nutrition security. The statement, "I am open to consuming insects if it contributes to food and nutrition security" was compared across the three household types. The study evaluated the distribution of the three groups to determine if the assumption that they both should follow similar distribution patterns was met. Figure 4.8 provides the findings.

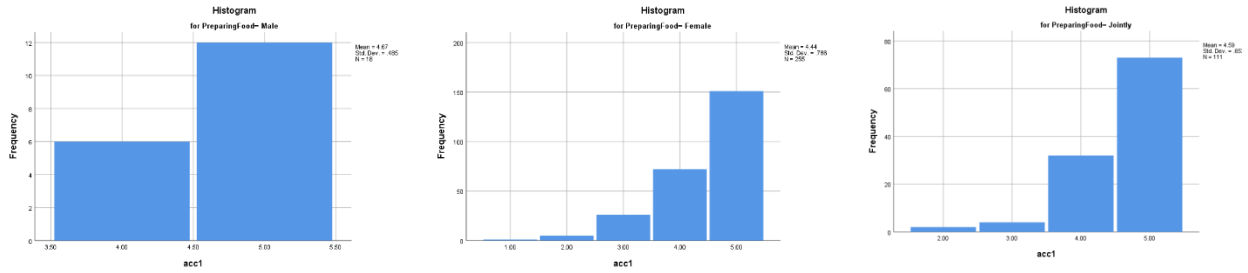


Figure 4.8 Distribution of Gender-influenced Food Preparation Responsibility

According to the findings illustrated in Figure 4.8, the distribution among the three groups was similar which allowed for the evaluation of differences using the Kruskal-Wallis test. The findings from the test are presented in Table 4.20.

Table 4.20 Kruskal-Wallis Test for Gender–Based Food Preparation

		N	Mean Rank
Level of acceptance of edible insects for food nutrition and security	**Male**	18	208.83
	Female	255	186.71
	Jointly	111	203.16
	Total	384	
		Test Statistics [a,b]	
Level of acceptance of edible insects for food nutrition and security			
Kruskal-Wallis H		2.833	
df		2	
Asymp. Sig.		.243	
a. Kruskal Wallis Test			
b. Grouping Variable: Food Preparation Roles			

Table 4.20 provides that there was no significant differences among households due to food preparation responsibilities falling to a specific gender as well as when done jointly, H (2) = 2.833, P=0.243. The findings illustrate that the gender-influenced food preparation roles were not significantly associated with whether a household elected to utilize edible insects for food and nutrition security.

Objective 3: Quantitative Results and Analysis

Gender-influenced Challenges and Acceptance of Edible Insects for Food and Nutrition Security

The study sought to evaluate whether there were significant difference across individuals who had faced challenges in accessing educational resources related to agriculture or nutrition against those who did not. These differences were evaluated to investigate whether they were significant in the acceptance of Edible Insects for Food and Nutrition Security. These differences were evaluated with relation to the level of acceptance of edible insects for food and nutrition security. The statement, “I am open to consuming insects if it contributes to food and nutrition security” was compared across the two groups. The study evaluated the distribution of the two groups to determine if the assumption that they both should follow similar distribution patterns was met. Figure 4.9 provides the findings.

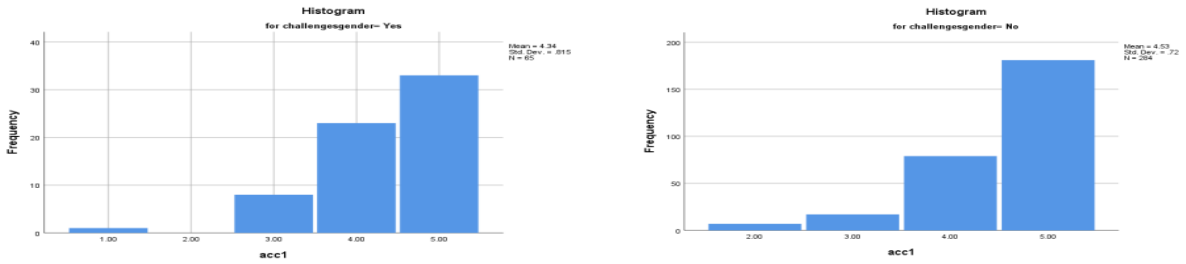


Figure 4.9 Distribution of Gender-influenced Challenges

According to the findings illustrated in Figure 4.9, the distribution among the two groups was similar which allowed for the evaluation of differences using the Kruskal-Wallis test. The findings from the test are presented in Table 4.20

Table 4.21 Kruskal-Wallis Test for Gender–Based Challenges in Accessing Resources

Ranks			
		N	**Mean Rank**
Level of acceptance of edible insects for food nutrition and security	Yes	65	155.62
	No	284	179.44
	Total	384	
Test Statistics [a,b]			
Level of acceptance of edible insects for food nutrition and security			
Kruskal-Wallis H		3.963	
Df		1	
Asymp. Sig.		.047	
a. Kruskal Wallis Test			
b. Grouping Variable: Gender based Challenges			

Table 4.20 indicates that there were significant statistical difference in the level of acceptance of edible insects for food nutrition and security within groups that faced challenges due to gender, $H(1)= 3.963$, $P= 0.047$. The highest rank of 179.44 was attributed to the group which indicated that they faced no challenges while those that said yes had the rank of 155.62. The findings indicate that challenges experienced in accessing resources and education concerning agriculture and nutrition due to gender were significant in whether edible insects were accepted for food nutrition and security. Having no gender-influenced problem in accessing knowledge that

informs nutrition and agricultural practices is therefore more likely to determine whether individuals select to use edible insects as opposed to having a problem of accessing knowledge due to gender.

Conclusive Summary of Results and Analysis

The purpose of the study was to examine the effect of the factor gender in the use of edible insects for food and human nutrition and also to profile if women are more receptive to accepting and using the edible insects for those purposes. For gender distribution the participants were nearly equal with slightly over half the participants being male (50.3%) and the rest female (49.7%). Most of them were young people below the age of 35 years with diploma as their highest level of education. A large proportion of the respondents were from rural settings and most of them were involved in business. In this study, while women experience more severe barriers to obtain protein-rich foods, their willingness to accept novel protein sources such as insects was more prominent than men. This was more evident among women who were involved in the preparation of meals were more inclined to search and introduce new proteins especially to their households in the country.

Household food preparation was exclusively done by women with a 66.4% converging in doing most of the meal preparation. This traditional role played a big role in shaping their perception and willingness to diversify their diets using more prohibitive meals like insects. This study concluded that because women are the main preparers of meals in most households they are more likely to embrace the use of edible insects due to the desire to provide for their families. The culture, traditions, and practices that people held influenced the acceptance of edible insects. Although some cultural expectations presented challenges to intervention, women had a greater ability to challenge these cultural beliefs due to their responsibility in providing food for their families. Higher acceptance levels for edible insects were received from women with a positive attitude towards these insects and aware of the nutritional value these insects could provide. This was particularly evident especially in such households whereby women had authority in the decisions regarding the foods to be brought at home.

The study also identified that there was gender disparity in terms of willingness to consume insects for food and nutritional needs. Female participants and particularly those in female

headed households had a higher acceptability and willingness to try the edible insects as compared to the male participants. This was evidenced by Kruskal-Wallis test results whereby the mean rank for the females-group (female-headed households) was statistically higher than the males in acceptance for the use of edible insects for food and nutritional security ((H = 6.821, P = 0.033). For instance, challenges like time constraints and dependence on resources saw women embrace and search for edible insects as an alternative source of protein. This aspect showed that their willingness to engage in new food sources was forced by the need to counter these challenges for nutrition security for their families. The study very clearly points out that the women are more receptive and willing to use these insects for food and nutrition needs as compared to the men. As the major decision-makers on what to prepare for meals, women are well-placed to champion the use of insects as protein sources due to their receptiveness to new ideas about food options. This shows that women should be targeted in the interventions meant to encourage them to embrace the consumption of edible insects for nutrition.

CHAPTER FIVE: SUMMARY , RECOMMENDATIONS AND CONCLUSIONS

The study sought to evaluate the influence of gender on the utilization of edible insets for food and nutrition security. This section presents the summary and discussion based on the presented results. This chapter also provides the conclusions of the study and recommendations based on the findings related to the study objectives.

5.1. Gender in Dietary Decision Making and Utilization of Edible Insects for Food and Nutrition Security

The study derived insight into the influence of gender in dietary decision-making on the utilization of edible insects for food nutrition security. The findings indicated that gender was not significant in whether edible insects were utilized for food and nutrition security. Being male or female was not influential in whether households accepted insects for food and nutrition security. The influence of gender became more pronounced when the dynamic of decision-making was introduced which was found to be significant when comparing male-headed and female-headed households. The findings indicated that decision-making done by male headed households ranked higher than decision-making done by female-headed households. These findings imply that male gender decision-making influenced the consumption and utilization of edible insects to a greater extent. These findings align with Gebre *et al.* (2021) that due to the endowment effects connected to males in the household, their decisions had a higher probability of resulting in success in terms of nutrition and food security. The decision to adopt edible insects to ensure food security would also see increased channeling of resources dedicated to making the choice a success.

The responses from the interviews largely provided the perspective that dietary decision making was done with the contribution of both genders, albeit in different ways. Women selected and decided what food to eat, while the men were framed as financiers of the choice made by women. However, the findings suggest that the relationship is more complex than outlined by the interviewees that the contribution of men in nutrition and food decisions was much lower than that of women. The findings also point out that men hold the decisive voice in the household, which implies that the financial heads of the homes will have more sway in essential home decisions such as what will be eaten or considered for nutrition. Anyour (2022) also found that

the socio-economic status of the household heads was a significant determinant of the consumption choices of insects in Vihiga County.

Cultural beliefs were significantly associated with consumption of insects. The findings supported the interviewees' perspective that cultural beliefs, such as who was supposed to prepare the meals or how the insects were supposed to be cooked, played a part in whether insects were utilized for nutritional purposes and food among households. Particularly, the interviewees indicated that the male-gender's cultural beliefs informed the beliefs of the family in relation to utilization of edible insects. These findings align with Coley *et al.* (2020) that cultural factors influence how insects are approached as a potential source of nutrition and sustenance by the family. The context of their consumption is a critical facet. From this study, the male head's cultural food preferences tended to have greater influence than if the female members dictated them. Therefore, whether insects were perceived as acceptable by a family was in the purview of the male decision-maker. These findings indicate that gender's influence on decision-making was supported by the family's cultural orientation or belief system.

5.2. Gender Roles and Utilization of Edible Insects for Food and Nutrition Security

The study assessed the roles of different genders in the utilization of edible insects for food security. The findings indicated that food decisions were mostly shared among the genders, with food preparation roles mostly done by those of the female gender. The consumption of insect was noted to be significantly associated with the role of food preparation, majorly attributed to those of the female gender. However, the study found that food preparation responsibilities among genders did not translate to significant differences in whether edible insects were utilized for food and nutrition security. These findings suggest that meal making roles were not influential on whether edible insects were utilised in the long-term rather their role was in short-term consumption. These findings deviated with those of Wanjala *et al*. (2023) that since the different genders approached preparation of insects differently, meal making according to gender influenced perceptions concerning their nutrition benefits, taste and cultural appropriateness. As a consequence, households would prefer insect-based meals prepared by one gender as opposed to another. These elements are determined as crucial determinants for long-term adoption of insects as food (Feng *et al,* 2018; Van Huis, 2015). The findings indicate that the responsibility

of preparation of meals according to gender does not have a significant effect on the utilization of edible insects for food and nutrition security.

The decision-making role in the household in regard to food purchases was done jointly (46.6%) with the findings indicating that women made more decisions (38%) than men (15.4%). The interviews indicated that the male gender participated in financing after the decision had been made on what food items ought to be purchased. These roles were seen to have varying influence on the utilization of edible insects as food sources. Among the three type of household groups based on food purchase decision-making, male-headed households were determined as ranking higher than female-headed households. These two specific groups were determined to possess significant difference with concern to the utilization of insects for food and nutrition security. These findings are contrary to those of Akullo *et al.* (2017) on what functions were expected from the different genders, with a significant difference seen in the purchase decisions being done by those of the female gender. The adoption of expanded roles by the female gender is recognized as favorable households. According to Sraboni *et al.* (2014) households whose decision-making roles were handled by women also had greater diet diversity and increased spending on food for the household. The findings indicate that there existed significant differences in gender-influenced decision making and that female decision-making had lower ranks compared to male-decision making roles in influencing the utilization of edible insects for food and nutrition security.

5.3. Gender Knowledge Levels and Utilization of Edible Insects for Food and Nutrition Security

The study evaluated the role of gender-influenced knowledge on the utilization of edible insects for nutrition and food security. According to the findings there was a significant association between gender knowledge of insects as a protein source with consumption of insects. This was particularly seen in those that compared insects as better sources of protein. Further, existence of challenges in accessing knowledge due to gender differences was noted to be significant in whether edible insects were utilized for food nutrition and security. Having no gender-influenced challenges in accessing knowledge ranked higher in whether edible insects were accepted

compared to those who indicated they faced challenges. Knowledge was transmitted through formal and informal methods.

Culture as a key factor in dissemination of informal knowledge in the community was found to be significantly associated with insect consumption. The interviews indicated that information held by the different genders on insects as food was drawn from cultural beliefs and community gender roles. These findings affirm Kelemu *et al.* (2015) on the crucial nature cultural beliefs play in the transmission of knowledge with regard to the utility of insects which promotes their utilization for food nutrition and security. This affected how various insects were viewed as food sources as superstitions, gender norms, and nutritional and medicinal value also determined their value to members of the society. Therefore, information on the benefits accruing from consumption of various types of insects was largely anecdotal as educational evidence was rarely cited when benefits of insects to respondents was being elicited from the respondents. The findings imply that knowledge of insects as a food source originated from community beliefs pointing out to the influence of culture. These findings confirmed Detilleux *et al.* (2021) that cultural factors were influential in whether insects were consumed. The findings further affirm that knowledge on insects as a traditional resource or as a traditional food source were not restricted. The interviews affirmed that informal knowledge regarding insects was held equally across genders with those in a rural setting holding greater knowledge than those in urban settings.

The study determined that constraints in accessing more formal types of knowledge related to agriculture or nutrition due to gender was significant in the utilization of edible insects for food and nutrition security. The findings echoed those of McKenzie *et al.* (2022) of the need to promote equitable access to nutrition related resources to enhance community food security. Further, the lack of equitable transmission of information among genders has high likelihood of perpetuating the power imbalance against women in agricultural activities (Tavenner & Crane, 2018). Therefore, lack of access to entomophagy resources potentially constrains women from participating in entomophagy-related economic activities such as insect rearing, processing and repackaging. This not only has consequences on the eligibility of insects for nutrition and food security, but it also carries consequences to general food security and nutrition as women are majorly understood to invest their resources towards the nutrition of the family (Anke, 2016).

5.4. Implications of the Study

The implications present the uniqueness of this study and how it will it contribute to the world. This study stands out due to its in-depth exploration of cultural beliefs and norms associated with the consumption of insects, particularly its examination of elements such as responsibility, gender relationships, medicinal value, nutritional value, and superstitions. One of the standout features is the study's nuanced analysis of gender dynamics, shedding light on how gender relationships play a pivotal role in influencing insect consumption patterns. It delves into gendered responsibilities associated with insect collection, preparation, and consumption, presenting a fresh perspective on how deep-rooted cultural practices shape dietary habits. Furthermore, the research elegantly bridges the gap between traditional beliefs and contemporary perspectives by probing into the perceived medicinal and nutritional values of insect consumption. Additionally, the inclusion of specific superstitions, such as that about the locust "Namurunda," provides a vivid illustration of the profound cultural values and beliefs underpinning dietary choices. The employment of quantitative tools, like the Chi-square tests, offers an empirical foundation, anchoring the study in solid data while examining the intricate relationship between cultural beliefs, gender roles, and insect consumption.

Moreover, by presenting both the positive and negative perceptions surrounding insect consumption, the study fosters a balanced view, crucial for policymakers or practitioners keen on promoting entomophagy. Its emphasis on the potential of edible insects to ensure food and nutrition security places the research at the crucial intersection of culture, nutrition, and sustainability. In terms of global contributions, this study is poised to influence several domains. The insights could serve as a roadmap for promoting sustainable food sources, especially in the face of looming global food and resource challenges. Policymakers, especially in regions where insect consumption has historical roots, can utilize these findings to formulate culturally sensitive policies or interventions. The highlight on gender disparities in insect consumption practices can pave the way for promoting gender equity in food and nutrition decisions. Additionally, by conserving and shining a spotlight on indigenous food-related knowledge, the study bridges traditional wisdom and modern scientific insights. Lastly, by surfacing potential medicinal benefits and health concerns, the research might steer further studies that could influence health and nutritional guidelines. In essence, this research not only presents a

multifaceted view of insect consumption but also has the potential to significantly shape discussions on global food security and sustainability.

5.5. Conclusion

The first objective evaluated the influence of gender in dietary decision-making on the utilization of edible insects for food and nutrition security. Gender in dietary decision-making was significant in influencing the utilization of insects for food nutrition and security when it was compared among female-headed and male-headed households in Bungoma County. The study determined that female decision-making ranked lower than male decision-making in the utilization of edible insects for food nutrition and security. The findings illustrated that food security decisions were largely effectual when done by the male heads of the household, even though most households indicated that women made the majority of food purchase decisions. This suggests that power differentials in households still persist in households in Bungoma County, influencing the adoption of insects in diets. The factors supporting male decision-making stem from cultural beliefs, norms, and resource-holding. Therefore, the primary resource holder would allocate more financial resources to ascertain success from decisions. The lack of equal footing between the genders meant that women could not assert their authority in determining the long-term diets of the household. This study contributes an evidence-based perspective that the gender of the decision-maker in the household also determines the adoption of entomophagy for food and nutrition security. The study concludes that gender-decision making significantly influences dietary decision-making on the utilization of edible insects for food security and nutrition.

The study's second objective evaluated the roles of different genders in the utilization of edible insects for food security and nutrition. The meal preparation responsibility role among the male and female gender was found to have an insignificant association with the utilization of edible insects for food security and nutrition. The female members of the households were expected to collect the insects from the markets or natural habitats and prepare them. The tasks of collecting and preparing insects were generally not expected from the male members of the households, but they contributed albeit minimally. The food purchase decision making role was found to significantly associate with the utilization of edible insects for food security and nutrition.

Specifically, food purchase decisions made by the male head had a higher ranking than when by women. The study concludes that the food preparation roles attributed to the female gender had an insignificant association with the utilization of insects for food security and nutrition. The study contributes the view that food preparation roles compared to decision making were not influential in use of insects for long-term food and nutrition security. The study also concludes that food purchase decisions were significant in the the utilization of insects for food security and nutrition.

The study's third objective evaluated the extent gender-influenced knowledge influenced the utilization of edible insects for food security and nutrition. The study found that gender-influenced knowledge levels significantly associated with the utilization of edible insects for food and nutrition security. The information held by the community on insects as a source of nutrition and as a food complement originated from cultural beliefs. This was emphasized more in rural locations, compared to urban locations, as they consumed insects more. It stands to reason that rural locations had higher likelihood of utilizing insects for food since it was assumed they had stronger ties to cultural beliefs related to insect consumption. The study determined that gender challenges in accessing nutritional and agricultural information significantly affected the utilization of edible insects for food and nutrition security. Thus, the lack of equitable access to information related to insects as a food source due to gender is a significant factor affecting the use of edible insects for food security and nutrition. The study concludes that gender-influenced knowledge levels significantly influence the utilization of edible insects for food and nutrition security. The study therefore contributes the view that gender related challenges are detrimental towards insects being accepted as a viable solution for food and nutrition security.

5.6. Recommendations

1. Gender-influenced decision-making was found to significantly influence the utilization of edible insects for edible food security and nutrition security. The study recommends that:
    - County nutritional programs targeting the promotion of entomophagy should ensure that both genders are invited to participate in sensitizations and discussions on nutrition within the community. This will also mitigate the perception that men do not contribute

to the family's nutritional needs and ensure household nutritional decision making are done from a more informed position.

- There is a need for further investigations to determine ways community perception related to female decision-making could be changed. This will ensure the contribution of both genders to food security and nutrition will be valued.
- There is need for County Action plans that target food and nutrition security through the facilitation of activities at the community level that promote household/family collaboration in decision-making. This will ensure that joint decision-making in households also contributes to food and nutrition security.

2. Challenges in accessing nutrition and agricultural knowledge due to gender significantly affect the utilization of edible insects for food security. The study recommends that:
    - Counties should ensure that information relating to nutrition and agriculture is made readily available to mitigate exclusion due to gender.
    - Nutrition and agricultural interventions related to entomophagy should address the imbalance in gender-related access to information. Some interventions promoting insect breeding for household use and small-scale business production could be catered to women to improve their knowledge levels on entomophagy.
    - Community sensitizations on the value of edible insects as a viable source of nutrition should be done so that community perceptions of its role as a complement rather than a primary food source are changed. Given that the community based their consumption on informal sources of information, formal information on insects, such as their micronutrient composition and calorie content, could shift the perception of insect viability for food security and nutrition.

3. This study sought to investigate the influence of gender as it pertains to dietary decision-making, roles and knowledge levels influenced the utilization of edible insects for food and nutrition security. The study recommends that:
    - Further studies should be done among other Kenyan Counties to investigate how gender-influenced decision-making affects the utilization of edible insects for food security and nutrition.

- Further studies should be done to investigate what other determinants influence the utilization of edible insects for food and nutrition security in Bungoma County.
- Further studies may investigate how cultural attitudes may influence the utilization of edible insects for food and nutrition security among non-traditional insect eating communities in Kenya.

5.7. New Knowledge Created by this Study

This research explores gender dynamics and cultural factors to uncover new understanding about edible insects and their function in food and nutrition security.

- Intersectionality of Gender and Culture: The adoption and use of edible insects depends on gender dynamics and cultural factors. The intersectionality of these two variables changes entomophagy views, attitudes, and behaviors, highlighting the complex factors affecting food and nutrition.
- Gender-Specific Challenges and Opportunities: Social norms and financial constraints can hinder women from accessing and using edible insects, presenting opportunities for interventions promoting gender equality in food choices and nutritional access.
- Cultural Narratives and Acceptance: The research highlights the impact of cultural narratives, superstitions, and beliefs on edible insect perceptions and acceptance. It shows how good cultural narratives may promote acceptance and how negative superstitions might discourage insect ingestion.
- Statistical Correlations and Insights: Chi-square and Kruskal-Wallis Tests reveal significant associations and disparities in cultural attitudes, household decision-making, and gender roles in insect consumption, shedding light on varied influences on edible insect consumption.
- Education, Awareness, and Utilization: The research shows that education and awareness play a crucial role in molding attitudes and acceptance of edible insects, and that fair information access increases insect consumption. Entomophagy needs thorough awareness efforts to spread knowledge and acceptance.
- Holistic Approaches to Promote Insect Consumption: This study emphasizes the need for a multifaceted approach to promote insects as a sustainable food source, incorporating

cultural awareness, gender equality, and innovative solutions to overcome challenges and barriers.

- Policy Implications and Recommendations: The findings provide a solid foundation for policymakers, practitioners, and researchers to use the insights to develop gender-inclusive and culturally sensitive policies, strategies, and interventions to promote the sustainable use of edible insects for food and nutrition security.
- Groundwork for Future Research: This study provides a solid foundation for future research on the gendered and cultural aspects of edible insect consumption. It offers opportunities to explore diverse contexts, innovative methodologies, and interdisciplinary approaches to advance knowledge and promote sustainable food practices and nutritional security.
- Empirical Contribution to Gender Dynamics and Nutritional Security: This work contributes to understanding gender dynamics and their impact on dietary choices and security. Edible insect eating from a gender viewpoint strengthens gender studies, nutritional sciences, and sustainable food practices.

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APPENDICES

Consent Statement for In-depth Interviews

Dear Participant,

Thank you for considering participation in this research study on the utilization of edible insects for food and nutrition security in Bungoma County, Kenya. This study aims to investigate the role of gender dynamics, personality disposition, and cultural norms on the utilization of edible insects, particularly among households facing food insecurity and malnutrition challenges.

Your participation in this study, through interviews, is essential in providing insights into the different gender roles, cultural norms, and beliefs that shape the utilization of edible insects in Bungoma County. Your input will help inform the development of gender-inclusive policies and interventions that promote gender equality and enhance the exploitation of locally available edible insects. The study findings will be relevant to policy-makers, development organizations, and communities in developing strategies that promote gender equality, improve productivity, sustainability, food security, and income.

Please note that your responses will be kept confidential, and no identifying information will be shared or used in the research report. Your participation in this study is voluntary, and you may withdraw at any time.

By agreeing to participate, you provide your informed consent for the researcher to use the information you provide during interviews as part of the research study.

Thank you for your time and valuable contribution to this research study.

Appendix A: Interview Guide

Section 1: Demographic Information

1. Please tell me about yourself (age, gender, occupation, education, and living area).

Section 2: Attitudes and Perceptions of Edible Insects

2. Have you ever eaten insects? If so, which types?
3. What are your thoughts and feelings about eating insects?
4. How do you think insects compare to other sources of protein in terms of nutrition?
5. Would you be open to trying new insect-based food products? Why or why not?

Section 3: Dietary Practices and Food Security

6. How often do you consume protein in your diet?
7. Have you ever faced challenges in accessing or affording protein-rich foods? If so, please describe the challenges.
8. How often do you miss meals?
9. Do you think insects could be a viable solution to reduce hunger? Why or why not?

Section 4: Gender Dynamics and Cultural Beliefs

10. Who makes decisions about food purchasing and meal preparation in your household?
11. Have you ever faced challenges in accessing resources or education related to agriculture or nutrition due to your gender? If yes, please describe the challenges.
12. Can you describe any cultural beliefs and norms that influence the consumption of insects in your community?
13. How do these cultural beliefs and norms influence the consumption of insects in your community?
14. How important do you think it is to involve both men and women in decision-making related to nutrition?

Section 5: Open-Ended Questions

15. In your opinion, what are the advantages and disadvantages of incorporating insects into the diet?
16. How do you think gender roles affect the utilization of insects as food in your community?

17. What do you think can be done to promote the consumption of insects as food in your community?
18. How do cultural beliefs and practices shape the acceptance or rejection of insect-based foods in your community?
19. Are there any specific challenges that women face in accessing or utilizing insects as food?

Appendix B: Questionnaire

Dear Participant,

Thank you for taking the time to participate in this survey on the utilization of edible insects for food and nutrition security in Bungoma County, Kenya. This survey is part of a research study that aims to investigate the role of gender dynamics, personality disposition, and cultural norms on the utilization of edible insects, particularly among households facing food insecurity and malnutrition challenges.

Your participation in this survey is essential in providing insights into the different gender roles, cultural norms and beliefs that shape the utilization of edible insects in Bungoma County. Your responses will help inform the development of gender-inclusive policies and interventions that promote gender equality and enhance the exploitation of locally available edible insects. The study findings will be relevant to policy makers, development organizations and communities in developing strategies that promote gender equality, improve productivity, sustainability, food security, and income.

Please note that your responses will be kept confidential, and no identifying information will be shared or used in the research report. Your participation in this survey is voluntary, and you may withdraw at any time.

Thank you for your time and valuable contribution to this research study.

Kindly fill below as appropriate.

Section 1: Demographic Information

1.1. What is your gender?
A. Male
B. Female
C. Prefer not to say

1.2. What is your age?

A. 18-24

B. 25-34

C. 35-44

D. 45-54

E. 55 and above

1.3. What is your highest level of education?

A. Primary school or less

B. Secondary school

C. Technical training

D. Diploma

E. Bachelor's degree

F. Master's degree or above

1.4. What is your occupation?

1.5. Where do you live?

A. Rural area

B. Urban area

Section 2: Attitudes and Perceptions of Edible Insects

2.1. Have you ever eaten insects?

A. Yes

B. No

2.2. If yes, which types of insects have you eaten? (Please select all that apply)

A. Termites

B. Grasshoppers

C. Crickets

D. Caterpillars

E. Ants

F. Beetles

G. Other (please specify)

2.3. What are your perceptions of insects as food?

A. Termites

i. Disgusting
ii. Neutral
iii. Tasty

B. Grasshoppers

i. Disgusting
ii. Neutral
iii. Tasty

C. Crickets

i. Disgusting
ii. Neutral
iii. Tasty

D. Caterpillars

i. Disgusting
ii. Neutral
iii. Tasty

E. Ants

i. Disgusting
ii. Neutral

iii. Tasty

F. Beetles

i. Disgusting
ii. Neutral
iii. Tasty

G. Other (please specify)

i. Disgusting
ii. Neutral
iii. Tasty

2.4. How do you think insects compare to other sources of protein in terms of nutrition?

A. Better

B. About the same

C. Worse

D. Don't know

2.5. Would you be willing to try new insect-based food products?

A. Yes

B. No

Section 3: Dietary Practices and Food Security

3.1. How often do you consume protein in your diet?

A. Every day

B. 2-3 times a week

C. Once a week

D. Rarely

3.2, Have you ever faced challenges in accessing or affording protein-rich foods?

A. Yes

B. No

3.3. If yes, what challenges?

3.4. How often do you miss food?

A. Every day

B. Several times a week

C. Once a week

D. Rarely

E. Never

3.5. Do you think insects could be a viable solution to reduce hunger?

A. Yes

B. No

C. Don't know

Section 4: Gender Dynamics and Cultural Beliefs

4.1. Who makes decisions about food purchasing (provides food) in your household?

A. Male head of household

B. Female head of household

C. Jointly

4.2. Who is responsible for preparing meals in your household?

A. Male

B. Female

C. Jointly

4.3. Have you ever faced challenges in accessing resources or education related to agriculture or nutrition due to your gender?

A. Yes

B. No

If yes, which challenges?

4.4. Which cultural beliefs and norms influence the consumption of insects in your community?

4.5. How do cultural beliefs and norms influence the consumption of insects in your community?

A. Positively

B. Negatively

C. Don't know

4.6. How important do you think it is to involve both men and women in decision-making related to nutrition?

A. Very important

B. Somewhat important

C. Not very important

D. Not at all important

Section 5: Level of Acceptance (1-5)

Please rate the following statements on a scale of 1-5, where 1 indicates strong disagreement and 5 indicates strong agreement.

5-point scale:

1 - Strongly Disagree

2 - Disagree

3 - Neutral

4 - Agree

5 - Strongly Agree

5.1. I am open to consuming insects if it contributes to food security.

5.2. Gender norms should not influence who can access resources for food security.

5.3. Women and men should have equal decision-making power regarding nutrition and food security.

5.4. Cultural beliefs and practices need to be respected when advocating for the consumption of insects as food.

5.5. Both men and women should receive education and training to promote the use of insects as a food source.

Section 6: Open-Ended Questions

6.1. What are the specific benefits and drawbacks of including insects in your diet?

6.2. Can you describe how gender roles might influence the use of insects as food in your community?

6.3. What specific actions do you think could be taken to encourage the consumption of insects as food in Bungoma County and community?

6.4. In what ways do cultural beliefs and practices within this community impact the acceptance or rejection of insect-based foods?

6.5. Can you identify any particular challenges that women encounter when trying to access or utilize insects as food in your community?