

A Gendered Perspective of Pro-poor Innovation Adoption among Subsistence Farmers in Kenya

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ABSTRACT

Pro-poor agricultural innovations, including improved seeds, new crops, fertilisers and enhanced access to resources and markets, are widely promoted as solutions to food security challenges faced by subsistence farmers. Despite their potential, however, adoption rates remain low. While limited physical and economic access to innovations has been widely recognised as a barrier, the influence of gender relations is significant but remains under-researched. This gap is particularly significant given the central role women play in agricultural production, especially in developing countries. Understanding how gender relations shape the perception, adoption, and diffusion of pro-poor agricultural innovations requires greater attention to the experiences and perspectives of subsistence farmers themselves.

This research, therefore, aims to explore how gender relations influence the adoption and diffusion of pro-poor agricultural innovations among subsistence farmers in Kenya. Using an ethnographic approach, this research explores the lived experiences of subsistence farmers in two under-researched sub-Counties in Kenya: Mbeere North and Tigania East. Through prolonged immersion, participant observation, and sustained engagement with farming communities, the research explores how farmers adopt product, process, or institutional innovations. Ethnography was chosen for its strength in generating in-depth, context-sensitive insights into the social realities of subsistence farming and to reveal dimensions of innovation adoption that are often overlooked by quantitative approaches. The ethnographic approach also offers unique advantages for understanding adopters of pro-poor agricultural innovations in subsistence contexts, where livelihoods are precarious, resources are scarce, and adoption decisions are closely tied to survival strategies, social structures, and cultural norms. In

particular, the approach illuminates how gender roles, identities, and interactions shape everyday agricultural practices, while also making visible hidden power structures concerning resource control, decision-making authority, and labour contributions.

The findings of this research reveal that women and men evaluate pro-poor agricultural innovations in relation to their socially constructed roles and responsibilities within the household. As such, the perceptions of innovation value differ by gender. Understanding these differences is important because gender extends beyond biological distinctions and reflects socially constructed identities, expectations, and relationships that shape how innovations are perceived and utilised. The research further demonstrates that subsistence farmers are not a homogeneous group. Four distinct adopter profiles emerged from the data: necessity-driven adopters, left-behind adopters, experienced adopters, and knowledgeable adopters. These profiles highlight the diverse motivations, constraints, capabilities, and meanings associated with the adoption of innovation in contexts characterised by resource scarcity, gendered responsibilities, and local knowledge systems.

The findings also show that intra-household power relations significantly influence innovation adoption. Gendered power imbalances frequently limit women's access to and control over innovations, thereby constraining their ability to adopt practices that could enhance agricultural productivity and household food security. Existing innovation adoption models, such as the Diffusion of Innovation (DOI) and the Technology Acceptance Model (TAM), tend to treat gender as a dichotomous variable and focus primarily on aggregate gender differences in access to resources and decision-making. As such, these models may fail to capture the relational and

socially embedded dynamics through which gender shapes innovation adoption within households and communities.

The research contributes novel theoretical and practical insights by illuminating the gendered perception and adoption of pro-poor agricultural innovations in three keyways: First, it advances innovation adoption and subsistence marketplace scholarship by demonstrating that the perceived value and drivers of pro-poor agricultural innovations are not uniform across genders. Women and men prioritise innovations differently based on their socially constructed roles, suggesting that innovation design and dissemination strategies should be aligned with gender-specific priorities and needs. By adopting an ethnographic approach and treating gender as a social construct, the research moves beyond binary and survey-based understandings of gender to provide a more nuanced account of innovation adoption.

Second, the research contributes to a deeper understanding of who adopts pro-poor agricultural innovations and why. The identification of distinct adopter profiles provides a basis for more targeted interventions, including subsidies for necessity-driven adopters, peer-learning initiatives for left-behind adopters, and collaborative farm trials involving knowledgeable and experienced adopters. Finally, the research shifts the attention from individual-level explanations of non-adoption towards the structural and institutional arrangements that reproduce gender inequalities. By highlighting how gendered power relations shape access to information, resources, and decision-making authority, the research highlights the need for more equitable innovation dissemination strategies. Such strategies may include gender-awareness programmes, efforts to address structural barriers within households and

communities, and the deployment of female extension agents who may be better positioned to engage rural women through shared experiences and identities.

The findings have implications for multiple stakeholders. First, Subsistence farmers, particularly women and other marginalised groups, may benefit from more inclusive innovation policies and programmes that reflect their priorities and constraints. Second, the research contributes to academic discourse by extending existing innovation models through empirically grounded, gender-sensitive insights. Finally, the research provides practical guidance for policymakers, development organisations, and research institutions involved in the design and dissemination of pro-poor agricultural innovations, supporting the development of interventions that are more responsive to the diverse realities of farming communities.

DECLARATION

This thesis is my own work and has not been presented in any previous application for a Doctor of Philosophy (PhD) elsewhere.

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LIST OF ACRONYMS

AFCA	Asia Financial Cooperation Association
AFCA	Asia Financial Cooperation Association
BRAC	Bangladesh Rural Advancement Committee
CARE	Cooperation for Assistance and Relief Everywhere
CBK	Central Bank of Kenya
CBOP	Contextualised Bottom of the Pyramid
DOI	Diffusion of Innovation
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic product
GoK	Government of Kenya
GPS	Global Positioning Systems
IFAD	International Fund for Agricultural Development
K4D	Knowledge for Development
KFS	Kenya Fisheries Service
KIPPRA	Kenya Institute of Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
MBOP	Marginalised bottom of the pyramid
NDMA	National Drought Management Authority
NIPFN	National Information Platform for Food Security
OECD	Organisation for Economic Co-operation and Development
SDG	Sustainable Development Goals
SSA	Sub-Saharan Africa
TAM	Technology Acceptance Model
TPB	Theory of Planned Behaviour
TRA	Theory or Reasoned Action
UN	United Nations
UNICEF	United Nations International Children's Emergency Fund

USAID	United States Agency for International Development
IPCC	Intergovernmental Panel on Climate Change

DEFINITIONS OF KEY CONCEPTS AND TERMINOLOGY

Innovation is defined as an idea, practice, or object that is perceived as new to potential adopters.

Adoption is the decision to accept or reject and the subsequent implementation, modification and discontinuation of innovation by an individual or an organisation.

Diffusion is the spread of agricultural innovation from farmers to farmers or from external sources to farmers through various channels over time.

Dissemination is the active push and promotion of innovation toward members of a social system.

Food security at the individual, household, national, regional, and global levels is achieved when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for a healthy and active life.

Gender is understood as the social (rather than biological) attributes, norms, roles and attitudes considered appropriate for groups of men and women by a given society at a given point in time and learned through socialisation. Gender shapes and reinforces power relations between and among these different groups.

Gender relations are the ways in which a culture or society defines rights, responsibilities, and the identities of women and men in relation to one another and reflect power relations within households.

Subsistence farming is a form of farming that occurs on small farms of up to 10 hectares found in rural areas, and food is grown primarily for home consumption, with very limited amounts sold in the local markets to generate income for the households.

CHAPTER ONE

INTRODUCTION

1.1 Background

This research aims to explore the impact of gender relations on the adoption and diffusion of pro-poor agricultural innovations among subsistence farmers in Kenya. By doing so, it contributes to the intersection of innovation adoption, subsistence marketplaces, and gender dynamics within the context of subsistence agriculture. The primary objective is to gain a nuanced understanding of how gender dynamics influence the adoption of pro-poor agricultural innovations, ultimately contributing to improved food security outcomes. Innovations, as defined by Rogers (1983, p. 11), are ‘ideas, practices, or objects that are perceived as new by an individual or other unit of adoption.’ Thus, innovations do not have to be novel to the world; they need only be perceived as new by the adopter, such as a solar-powered battery. More broadly, innovations are considered catalysts for economic and social transformation (Kawarazuka & Prain, 2019; Pecis & Berglund, 2021).

In subsistence marketplaces, pro-poor innovations are described as ‘products and services that satisfy the essential needs of the poor, which include food, water, healthcare, housing, and sanitation, or innovations that enhance productivity and income generation capacity’ (Ramani *et al.*, 2012, p. 678). This research focuses specifically on pro-poor agricultural innovations, which have been shown to improve farm productivity and overall agricultural growth, thereby enhancing the well-being of rural, subsistence communities (Curry *et al.*, 2021; Ruzzante *et al.*, 2021; Nyairo *et al.*, 2022). Despite their potential, the adoption of pro-poor agricultural innovations remains notably low in many developing countries (Hermans *et al.*, 2021; Osewe

et al., 2021; Crudeli *et al.*, 2022; Nyairo *et al.*, 2022; Bilal & Jaghdani, 2024). Understanding the factors contributing to this low adoption is essential for informing research, practice, and policymaking aimed at improving rural livelihoods. In this research, the term ‘livelihoods’ follows the definition by Chambers and Conway (1991), denoting the ways people make a living based on their capabilities, assets, and activities. Additionally, the research draws on Wang and Tang's (2020) perspective, which considers the specific living conditions of targeted social groups.

The concept of pro-poor innovation has often been discussed within the framework of the Bottom of the Pyramid (BoP) approach (Prahalad & Hart, 2010), where firms develop products and services to serve the poor as profitable consumers. Typical examples of pro-poor innovations include mobile phones, internet services (Hasan *et al.*, 2020), mobile money platforms such as M-Pesa (Hove & Dubus, 2019) and bKash (Hasan *et al.*, 2020), as well as fuel-efficient stoves (Khandelwal *et al.*, 2017), and biogas energy solutions (Anditi *et al.*, 2022). In the context of pro-poor agricultural innovations, subsistence farmers adopt such innovations as a means to produce food for survival, a role Steinfield and Holt (2019) described as that of subsistence-user producers. This approach contrasts with the bottom of the pyramid (BOP) logic by focusing on survival-driven production rather than profit-driven consumption. Thus, the current study draws inspiration from Viswanathan's (2017) subsistence approach, which reflects the lived experiences and marketplace interactions of individuals striving to meet their basic consumption needs. While research has grown around consumers in social enterprises within subsistence contexts (Viswanathan *et al.*, 2014; Venugopal & Viswanathan, 2021; Chatterjee *et al.*, 2024), fewer studies have examined subsistence farming through the subsistence lens.

Drawing from Ramani *et al.*'s (2012) concept of pro-poor innovations, pro-poor agricultural innovations are essential in addressing food shortages among subsistence farmers (e.g., Beuchelt, 2016; Farhall & Rickards, 2021). These innovations are crucial for enhancing farm productivity, a driver of both food security and rural economic growth (Loevinsohn *et al.*, 2012; Ruzzante *et al.*, 2021). Subsistence farmers, who typically operate on small farms to produce food for home consumption, often rely on agriculture, fishing or agroforestry (FAO, 2012; Farrell & Hill, 2018). However, they face a range of constraints, including limited financial capital, inadequate access to productive inputs, outdated technologies, and heavy dependence on family labour (Beuchelt, 2016; Doss, 2018; Farhall & Rickards, 2021; Ingutia & Sumelius, 2022). Despite these limitations, subsistence farming accounts for approximately 80% of the food production and provides critical employment opportunities in rural sub-Saharan Africa (Davis *et al.*, 2017; Louhichi *et al.*, 2020). In Kenya, where the economy is predominantly agrarian, subsistence farming contributes approximately 21% of the gross domestic product (GDP) and supports approximately 75% of the national labour force (Laichena *et al.*, 2022; Nyairo *et al.*, 2022).

Notably, subsistence farmers' dependence on natural resources renders them vulnerable to environmental disruptions, including climate change (e.g., Venugopal & Chakrabarti, 2022). Such disruptions may reduce or eliminate the capacity of ecosystems, either temporarily or permanently, to support agriculture (Martin & Paul Hill, 2012; Venugopal & Chakrabarti, 2022). In this context, agricultural innovations have been proposed as viable solutions to improve productivity (Beuchelt, 2016; Curry *et al.*, 2021; Ruzzante *et al.*, 2021) but also for building resilience against environmental shocks (Curry *et al.*, 2021; De Oca Munguia *et al.*, 2021; Venugopal & Chakrabarti, 2022). Beyond environmental pressures, subsistence farmers also face chronic constraints in financial and informational resources, reinforcing the

interconnectedness of poverty, food insecurity, and environmental vulnerability. Yet, despite these limitations, many subsistence farming communities maintain strong social networks that provide mutual support and resource-sharing (Viswanathan, 2017; Viswanathan & Sreekumar, 2019).

Agricultural innovations have been categorised into three main types (Badstue *et al.*, 2018; Iza *et al.*, 2019). The first type is product innovations, such as improved seed varieties (e.g., drought-resistant seeds), new crops, fertilisers, and other agricultural inputs (Iza *et al.*, 2019). The second category is process innovations, including new farming methods, strategies for accessing resources, such as farmers' groups, cooperatives or self-help groups (Iza *et al.*, 2019). The third category is market-related innovations, involving better access to markets and market information (Badstue *et al.*, 2018; Iza *et al.*, 2019). This research focuses on product and process innovations. These innovations are incremental in nature, meaning they offer a greater relative advantage compared to the existing alternatives (Rogers, 2003). While these innovations may not be novel globally, they are considered new and beneficial within specific local or regional contexts (Garcia & Calantone, 2002), particularly for farmers. Although process innovations (e.g., farmers' groups) may not be physically tangible, they are treated as innovations insofar as they represent new organisational or behavioural practices that improve livelihoods, consistent with Ramani *et al.* (2012) conceptualisation of pro-poor innovation in subsistence contexts.

Most importantly, despite the crucial role of pro-poor agricultural innovations, their adoption remains low among subsistence farmers, including in Kenya (Hermans *et al.*, 2021; Osewe *et al.*, 2021; Crudeli *et al.*, 2022; Nyairo *et al.*, 2022; Bilal & Jaghdani, 2024). Adoption of high-

yielding seed varieties, improved farming techniques, and access-enhancing processes remains limited (Osewe *et al.*, 2021; Ingutia & Sumelius, 2022; Nyairo *et al.*, 2022). As a result, subsistence farming communities continue to experience low food output, food shortages, and malnutrition (Makini *et al.*, 2016; Nyairo *et al.*, 2022).

Interestingly, some innovations have diffused rapidly among subsistence communities despite income constraints. Mobile phones, mobile money services, and internet technologies are notable examples (Hasan *et al.*, 2020). Their success is often attributed to affordability, utility, and user-centric design. This contrast raises important questions: Why are certain pro-poor innovations widely adopted, while others, particularly pro-poor agricultural innovations, face significant resistance? Addressing this question requires a deeper understanding of subsistence farmers and the unique socio-economic and cultural contexts in which these innovations are introduced. The following section examines the characteristics of subsistence farmers and the environment in which agricultural innovations are adopted.

1.2 Characteristics of Subsistence Farmers

The existing literature highlights that millions of subsistence farming communities in developing countries, particularly in rural Africa, experience chronic food insecurity (Beegle & Christiaensen, 2019; Fan & Rue, 2020; Visser & Wangu, 2021). These communities are often overlooked in development policies, with their challenges receiving insufficient scholarly attention (Fan & Rue, 2020; Visser & Wangu, 2021). This neglect is not limited to Africa; similar issues are evident in rural regions of Asia, such as Indonesia (Yusriadi & Cahaya, 2022) pointing to a broader, systemic issue.

Food security, defined as access to safe and nutritious food (FAO, 2015; Adeyeye, 2017), is a key principle in the United Nations Agenda for Sustainable Development Goals (SDGs), specifically Goal 2 (UN, 2020). As a fundamental prerequisite for health and survival (Rankoana, 2017; Voola *et al.*, 2018; Fanzo & Davis, 2021), food remains inaccessible to many subsistence farming communities who struggle with consumption adequacy - the capacity to meet their basic dietary needs due to poverty, marginalisation, and lack of basic resources (Fan & Rue, 2020; Venugopal & Chakrabarti, 2022). Subsistence farmers typically grow food for home consumption, selling any surplus in local markets to generate income. However, current food systems have been widely criticised for failing to ensure food security among subsistence producers, particularly in sub-Saharan Africa (Fanzo & Davis, 2021; Visser & Wangu, 2021). Food systems include all processes and actors involved from production to consumption (FAO, 2018), with subsistence farmers, who produce much of the food in developing countries, remaining significantly marginalised and under-researched (FAO, 2018; Beegle & Christiaensen, 2019).

At the core of subsistence farming in many regions are women farmers, who constitute a significant proportion of the global agricultural labour force (Fan & Rue, 2020; FAO, 2023). Despite their centrality to food production, they remain among the most marginalised populations worldwide (Bastos *et al.*, 2009; Germann *et al.*, 2024), with those in sub-Saharan Africa (SSA) experiencing the most severe disadvantages (Visser & Wangu, 2021; Chikweche *et al.*, 2023). Compared to men, rural women face greater barriers, including limited-generating opportunities, restricted access to productive resources, and lower literacy levels (Chikweche *et al.*, 2023; FAO, 2023). These constraints are rooted in longstanding structural inequalities that have limited their educational, economic, and social mobility. Furthermore, entrenched socio-cultural norms and patriarchal systems further restrict women's agency and impede their

ability to adopt and benefit from agricultural innovations (Ndiritu *et al.*, 2014; Masamha *et al.*, 2018). Collectively, these intersecting challenges highlight the urgent need for research, policy attention and targeted interventions that address women's specific circumstances and enhance their capacity to adopt new products and services, including pro-poor agricultural innovations. Strengthening women's access to such innovations is essential not only for improving their own livelihoods but also for advancing broader household and community well-being. The next section highlights the gendered dimensions of agricultural innovations, including the influence of socio-cultural constraints.

1.3 Gender and Agricultural Innovations

Several studies suggest that persistent gender inequalities continue to constrain the adoption of pro-poor agricultural innovations, particularly across developing regions (FAO, 2012; Beuchelt, 2016; Farhall & Rickards, 2021). In SSA, women occupy a central position in agricultural production while simultaneously carrying a disproportionate share of domestic responsibilities compared to their male counterparts (Fan & Rue, 2020; FAO, 2020; Visser & Wangu, 2021). Their daily responsibilities typically extend beyond farming to include household maintenance, caregiving, tending to animals, food processing, and marketing agricultural products, activities essential to sustaining rural livelihoods. Despite women's centrality to household food security, women's limited access to productive resources and decision-making abilities, combined with the heavy burden of domestic responsibilities, places a heightened pressure on them to ensure the availability of food for their families. These intersecting demands and constraints illustrate how gender norms and relations, which structure roles, responsibilities, and acceptable behaviours, do more than simply influence agricultural innovation adoption outcomes. They actively shape the opportunities through which pro-poor innovations are introduced, negotiated,

and ultimately adopted. In response, scholars increasingly emphasise the importance of targeting rural women farmers, who remain both vulnerable and systematically overlooked by researchers, practitioners, and policymakers due to their unique and unfamiliar circumstances.

Although women have been recognised as central to development initiatives since the 1970s, exemplified by the Grameen Bank model pioneered by Mohammad Yunus, which provides microloans to women (Hulme & David, 2008), the specific ways in which women adopt innovations remain poorly understood and often not the focus of innovation adoption studies. Previous studies (e.g., Bernasek, 2003; Bastos *et al.*, 2009; Doss, 2013) indicate that women often demonstrate better borrowing behaviours, including higher loan repayment rates and household-focused decision-making that benefits their families, despite their limited access to and control over household resources. However, critiques of microfinance-based approaches have emerged. Shohel *et al.* (2021, 2023) argue that in some instances, men appropriate funds intended for women, leaving women burdened with loan repayment responsibilities and thereby exacerbating their economic vulnerability. In contrast, other gender-focused initiatives, such as welfare programs in India (Chatterjee *et al.*, 2024) and health intervention programs implemented by the Bangladesh Rural Advancement Committee (BRAC) (Ahmed, 2008; Sarma *et al.*, 2020), for instance, have shown more positive outcomes for women. These findings indicate that women are both willing and capable of adopting pro-poor innovations that improve their own well-being and that of their families. Yet, a crucial question persists: Why does the adoption of pro-poor agricultural innovations remain limited among subsistence farmers, the majority of whom are women?

A central barrier lies in persistent gender inequalities in access to innovative agricultural inputs, which restrict women's ability to adopt improved products and practices that could help address food insecurity in subsistence communities. Feminist scholars (e.g., Benschop & Verloo 2015; Pecis, 2016; Pecis & Berglund, 2021; Stewart *et al.*, 2021) argue that inequalities are deeply rooted in social interactions shaped by gender roles, identities, and power dynamics between women and men. These dynamics directly influence how women and men engage with and adopt pro-poor agricultural innovations. Consequently, this research seeks to answer the research question:

‘How do gender relations influence the adoption of agricultural innovations among subsistence farmers in Kenya?’

1.4 Innovation Adoption in Subsistence Context

Models of innovation adoption primarily focus on two dimensions: the characteristics of innovations and the traits of the adopters. The Diffusion of Innovation (DOI) theory (Rogers, 2003) and the Technology Acceptance Model (TAM) (Davis, 1989) primarily emphasise innovation attributes, whereas adopter-centric models such as the Theory of Reasoned Action (TRA) (Fishbein & Ajzen (1975), and the Theory of Planned Behaviour (TPB)(Ajzen, 1991) focus on the behavioural and social characteristics of adopters. More integrative models, including the extended TAM, referred to as TAM2 (Venkatesh & Davis, 2000) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al.*, 2003), combine innovation attributes with behavioural and social dimensions of adoption.

More specifically, Rogers' (2003) seminal work on DOI, which originated in the 1960s and evolved from earlier studies on agricultural innovations, including research conducted in Bangladesh (e.g., Rahim, 1961), identified five key innovation attributes that influence adoption: relative advantage, compatibility, complexity, trialability, and observability. The DOI conceptualises innovation adoption and diffusion as fundamentally a social process. 'Adoption' refers to an individual's decision to fully utilise, modify, or discontinue the use of innovations, while 'diffusion' describes the communication process that facilitates the spread of innovations through social systems (Rogers, 2003; Pannell *et al.*, 2006). Similarly, TAM emphasises instrumental factors, particularly perceived usefulness and ease of use, as determinants of adoption behaviour. However, both DOI and TAM models tend to depict adopters as rational actors who make decisions primarily based on anticipated utility. This assumption may not adequately capture the realities of subsistence contexts, where adoption decisions are strongly shaped by social relations and gendered power dynamics (Kilic *et al.*, 2015; Shibata *et al.*, 2020). Studies by Locke *et al.* (2017) and Kwarazuka and Prain (2019), for example, demonstrate that gender relations significantly influence the adoption of pro-poor agricultural innovations. Although DOI and TAM acknowledge socio-psychological variables such as gender, these are often reduced to a dichotomy of 0/1 due to the necessity of statistical modelling, thus oversimplifying complex social relations.

Conversely, adopter-centric models such as the TRA (Fishbein & Ajzen, 1975) and TPB (Ajzen (1991) place greater emphasis on behavioural intentions and social influence. TRA highlights the importance of attitudes towards behaviour and subjective norms, defined as the perceived social pressure to behave in a certain way (Fishbein & Ajzen, 1975). TPB extends TRA by incorporating perceived behavioural control, which refers to an individual's perceptions of factors that facilitate or constrain behaviours, and self-efficacy, which is the perceived level of

personal power to facilitate or inhibit behaviour (Ajzen, 1991). TAM2 further integrates cognitive and social dimensions of adoption by introducing factors such as job relevance, output quality, result demonstrability, perceived ease of use, subjective norm, voluntariness (the extent to which potential adopters perceive the adoption decision to be non-mandatory) and image (the degree to which use of an innovation is perceived to enhance one's status in one's social system) (Venkatesh & Davis, 2000). Similarly, UTAUT identifies four key determinants of adoption behaviour: performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC), such as access to resources and infrastructure (Venkatesh *et al.*, 2003). These constructs draw on earlier theories, with performance expectancy related to DOI's relative advantage and TAM's perceived usefulness, while social influence reflects the subjective norms emphasised in TRA and TPB. UTAUT also identifies gender, age, experience, and voluntariness of use as moderating variables affecting the key determinants.

While TRA, TPB, TAM2, and UTAUT recognise the importance of social influence, particularly subjective norms; their treatment of gender remains limited. In UTAUT, for instance, gender is primarily conceptualised as a moderating variable influencing perceived performance and effort, with women portrayed as more susceptible to external social influence. Typically, these models focus mainly on external pressures while neglecting the internal social dynamics within households shaped by gender, including roles, power hierarchies (Benschop & Verloo, 2015), and control over resources. These dimensions are critical for understanding behavioural constraints and enablers in rural settings. Moreover, the DOI, TAM, TAM2, TRA, TPB, and UTAUT generally conceptualise adoption as an aggregated individual-level decision-making process, thereby overlooking the socially embedded and relational nature of gender as enacted through everyday interactions.

While the above models have been largely developed within high-income contexts, the Contextualised Bottom-of-the-Pyramid (CBOP) framework proposed by Nakata and Weidner (2012) explicitly considers the realities of low-income and resource-constrained environments. For instance, the CBOP considers innovation characteristics better suited for these contexts, such as affordability, visual comprehensibility, and adaptability to deprivation and environmental uncertainty. In addition, the framework incorporates contextual factors such as social capital, collective needs, local distribution challenges, flexible payment mechanisms, and atomised distribution strategies that enhance access to innovations in remote and marginalised areas (Nakata & Weidner, 2012). An example of such decentralised dissemination mechanisms is the use of female extension workers to improve outreach among rural populations.

Despite its contextual sensitivity, however, the CBOP model does not account for the complex gender dynamics that influence rural livelihoods and the adoption of innovations. Furthermore, the framework remains largely conceptual and lacks robust qualitative empirical validation. As a result, it does not fully capture the diverse motivations, experiences, and constraints faced by female and male adopters in subsistence contexts. Women in rural contexts, for instance, often encounter greater barriers in accessing agricultural inputs, credit, and extension services, and they typically have lower literacy levels than men (Beuchelt, 2016; Ingutia & Sumelius, 2022; Chikweche *et al.*, 2023; Chatterjee *et al.*, 2024). These structural inequities, reinforced by entrenched gender norms, restrict women's ability to adopt and benefit from pro-poor agricultural innovations.

These realities highlight the heterogeneity of adopters, which existing models, including DOI, TAM, TAM2, TRA, TPB, UTAUT, and CBOP, tend to obscure by implicitly assuming uniformity among users. Consequently, the frameworks fail to fully account for the context-specific and socially embedded nature of adoption decisions. By contrast, this research adopts a more nuanced approach to explore how gender relations shape the adoption of pro-poor agricultural innovations among both female and male farmers in Kenya, an area that remains under-researched. This focus not only addresses a critical gap in the literature but also raises the second research question:

‘What are the profiles of farmers who adopt pro-poor agricultural innovations?’

1.5 Statement of the Problem

Despite the central role that rural women in sub-Saharan Africa (SSA) play in subsistence farming, gender concerns in this context remain under-researched, particularly from a social constructionist perspective (Visser & Wangu, 2021; Njuki *et al.*, 2022). Many studies on agricultural innovations continue to treat farmers as a homogeneous group, and even those that account for gender often reduce it to a dichotomous variable (e.g., Doss & Morris, 2000; Ndiritu *et al.*, 2014; Gaya *et al.*, 2017; Gebre *et al.*, 2019). Such an approach fails to engage with the structural arrangements and socially constructed norms that shape gendered roles, identities and power relations (Benschop & Verloo, 2015). Furthermore, much of the existing studies focus narrowly on resource access or decision-making authority, without fully exploring how gender dynamics, including gender roles and norms, intersect with the adoption of pro-poor agricultural innovations, particularly in relation to food security in African contexts (Doss, 2013; Shibata *et al.*, 2020; Ruzzante *et al.*, 2021; Nyairo *et al.*, 2022). The oversimplification of gender dynamics obscures the lived experiences of subsistence farmers,

especially women, who are not just recipients of innovations but also active agents in shaping agricultural practices, resource use and household outcomes.

In response to growing calls for a deeper and more nuanced exploration of gendered dimensions in agricultural innovations (Kawarazuka & Prain, 2019; Visser & Wangu, 2021), this research aims to advance understanding of how gender relations influence the adoption of pro-poor agricultural innovations among subsistence farmers. By adopting a social construction approach to gender (Benschop & Verloo, 2015), the current research seeks to provide insights that are inclusive, contextually grounded, and responsive to the diverse needs of marginalised farming communities in developing regions. This research will be guided by the following research questions:

- (1) How do farmers perceive pro-poor agricultural innovations?
- (2) What are the profiles of farmers who adopt pro-poor agricultural innovations?
- (3) How do gender relations affect the adoption of pro-poor agricultural innovations?

1.6 Methodological Approach

This research explores how gender relations shape the adoption of pro-poor agricultural innovations among subsistence farmers in Kenya, an area that remains under-researched, particularly from qualitative and social relational perspectives. Drawing on ethnographic methods, including participant observations, focus group discussions, and in-depth interviews and discussions, the study was conducted in Mbeere North and Tigania East sub-counties. These regions, characterised by arid and semi-arid conditions, face persistent food insecurity due to environmental unpredictability and severe resource constraints (Embu County

Government, 2019; National Information Platform for Food Security and Nutrition (NIPFN) and Kenya Institute of Public Policy Research and Analysis (KIPPRA), 2021; County Government of Meru, 2023).

Acknowledging the limitations of treating gender as a 0/1 variable in typical modelling approaches (Gebre *et al.*, 2019; Teklewold *et al.*, 2020; Ge *et al.*, 2023), this research adopts a relativist ontological stance that views reality as multiple and socially constructed (Crotty, 2003; Oyeinkorikiye *et al.*, 2017) allowing for a nuanced understanding of how subsistence farmers perceive their realities. Guided by interpretive epistemology, this research seeks to understand how subsistence farmers make sense of their experiences with pro-poor agricultural innovations. This approach frames pro-poor agricultural innovations not as an isolated individual behaviour driven solely by access to resources, but as a process embedded within the wider socio-cultural and structural contexts. This research develops a grounded theoretical framework based on the lived experiences of farmers while attending to the complex gender dynamics that influence innovation adoption.

The purposive selection of Mbeere North and Tigania East allowed for the exploration of innovation adoption within different subsistence farming contexts. Although both sites share similar environmental, agroecological, and socioeconomic challenges, they differ in the crops cultivated. This comparative design allowed the study to examine how gender relations shape the adoption of different pro-poor agricultural innovations across varying contexts. It also recognises subsistence farmers as a heterogeneous group whose innovation decisions are influenced by diverse needs, opportunities, and constraints. Although the study began with this comparative intention, the pro-poor agricultural innovations identified emerged inductively

from farmers' experiences of low food productivity and environmental challenges. The improved cassava, developed from indigenous varieties, plays an important role in strengthening household food security, particularly during periods when maize, the principal staple crop, fails (Parmar *et al.*, 2017; Apata, 2019; Osewe *et al.*, 2021). Despite its importance, cassava is often overlooked by researchers and policymakers due to its association with subsistence-level production. *Muguka*, a variety of Khat, has more recently been introduced in Mbeere North. Although traditionally known for its psychoactive properties (Berihu, 2015), farmers increasingly cultivated *Muguka* for its income-generating potential, making it an important livelihood diversification strategy. To the best of the researcher's knowledge, this research is likely the first to examine *Muguka* as a pro-poor agricultural innovation that supports rural livelihoods in this region.

In Tigania East, farmers formed *Mlango*, a community-based farmers' group whose name means 'door' in Swahili. The group represents an innovative form of collective action designed to improve market access, strengthen social learning, and enhance household food security. As a process innovation, *Mlango* illustrates Garcia and Calantone's (2002) concept of incremental innovation by demonstrating how locally developed institutional arrangements can address the challenges faced by subsistence farmers. Unlike Mbeere North, where innovation adoption occurred primarily through household-level decision-making, the farmers' group in Tigania East provides an additional institutional mechanism that facilitates information sharing, training, access to resources, and the diffusion of innovations. While the findings are not intended to be statistically generalisable, they aim to generate transferable insights into the gendered processes shaping pro-poor agricultural innovation adoption. By foregrounding the lived experiences of subsistence farmers and the relational nature of gender, this research

contributes to a more context-sensitive and socially grounded understanding of innovation adoption.

1.7 Study Contribution

The growing body of literature increasingly highlights the critical role of gender in improving food systems and facilitating the adoption of agricultural innovations (Badstue *et al.*, 2018; Visser & Wangu, 2021; Njuki *et al.*, 2022). As Voola and Voola (2021) argue, the transformative potential of agricultural innovations, particularly their ability to enable poor rural communities to achieve food self-sufficiency, can be undermined when gender relations that shape roles, identities and power dynamics remain unaddressed. Gender relations, the social processes embedded in everyday interactions, (re)produce gender inequalities (Benschop & Verloo, 2015). This remains a persistent yet underexplored aspect, particularly within the micromarketing and innovation adoption research.

By adopting the perspective of gender as a social construction, in which female and male identities are continuously shaped through social interactions (Benschop & Verloo, 2015; Jenkins *et al.*, 2019), this research makes the following theoretical contributions to the understanding of pro-poor agricultural innovations. First, it integrates three streams of literature - innovation adoption, gender, and subsistence agriculture - in a novel way to provide a more nuanced and contextualised understanding of how gender relations influence the perception and adoption of pro-poor agricultural innovations. Secondly, the research offers insights into the profiles of subsistence farmers adopting pro-poor agricultural innovations, demonstrating how adoption varies across contexts characterised by resource constraints, gender roles, and local knowledge systems. In so doing, the adopter profile challenges the assumption of a

homogeneous farmer and instead highlights the diversity of experiences, motivations and constraints influencing innovation uptake. Third, through ethnographic methodology and a social constructionist lens, the research provides an in-depth exploration of how gendered identities, roles, and power dynamics mediate innovation adoption processes in subsistence contexts. This approach foregrounds the lived experiences of both women and men, while making visible the social structures that facilitate or inhibit access to innovations.

Beyond its theoretical contributions, this research also offers practical insights into the design and implementation of gender-sensitive agricultural interventions. By recognising the local socio-cultural, economic, and environmental contexts that shape adoption, the research informs strategies aimed at equitably benefiting both women and men. The research further advocates for contextually appropriate communication channels, such as peer learning and community-based approaches, rather than standardised top-down approaches that may inadvertently marginalise certain groups of farmers. Together, these contributions underscore the importance of developing a more inclusive and contextually grounded frameworks for innovation adoption that adequately reflect the gendered realities of subsistence farming systems.

Thesis overview

The thesis is structured as follows:

Chapter One introduces the purpose of the study by outlining the research background and presenting the problem statement. It highlights the significance of the study, its methodological approach, and the potential contributions to the literature on innovation adoption in subsistence marketplaces.

Chapter Two critically reviews existing literature on innovation adoption in subsistence contexts, with a particular focus on agricultural innovation. It examines gender dynamics in adoption processes and identifies gaps that the study aims to address, thereby setting the foundation for the research objectives.

Chapter Three details the research methodology, describing the ethnographic approach, research context, data collection and analysis methods, and considerations of validity. It also reflects on the researcher's identity and role within the field.

Chapter Four presents the study's findings through the lens of the social construction theory of gender (Benschop & Verloo, 2015). It explores how the experiences and interactions of male and female farmers influence the perception, diffusion, and adoption of innovations.

Chapter Five synthesises the findings and discusses them in relation to existing literature and theoretical frameworks. It emphasises the role of gender relations in shaping innovation adoption within subsistence farming contexts, leading to the development of a new innovation framework.

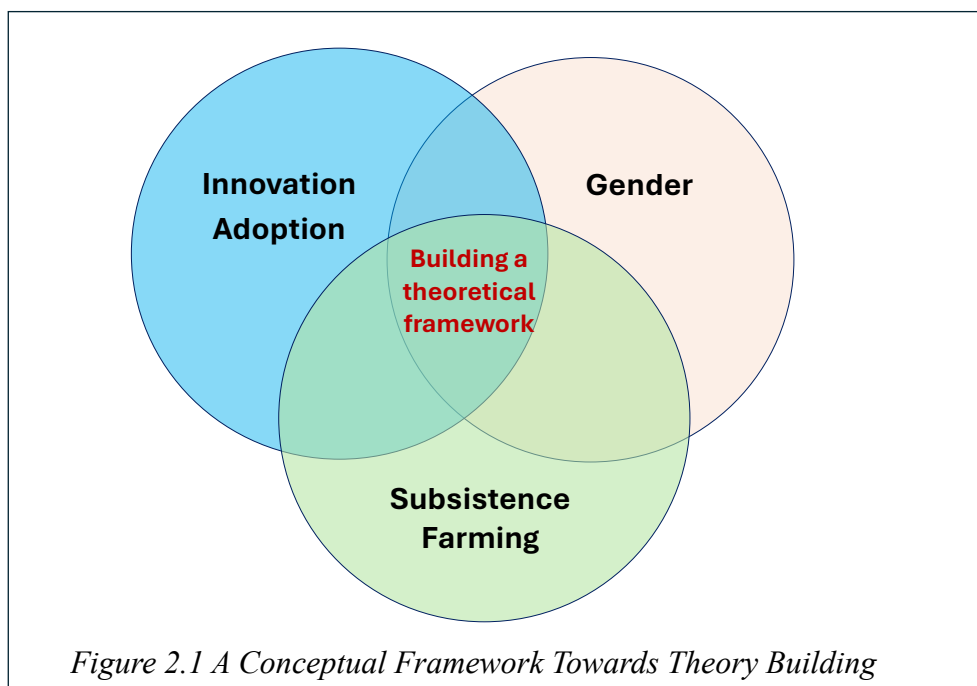
Chapter Six concludes the dissertation by summarising key findings and contributions. It also outlines implications for theory and practice and suggests avenues for future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This research employs an integrative literature review to synthesise perspectives and insights from on innovation adoption, subsistence marketplace, and gender literature to address the question of how gender relations shape the adoption of pro-poor agricultural innovation in subsistence farming contexts. By critically integrating these perspectives, the review addresses a significant gap in innovation adoption research: the influence of gender relations, which remains underexplored. In so doing, this research contributes to scholarship at the intersection of innovation adoption and gender by responding to calls for research that examines the social dimension of innovation, specifically ‘gendered power relations’ (Kawarazuka & Prain, 2019, p. 224). The review further aims to provide the conceptual foundation for the development of a theoretical model (Snyder, 2019) of innovation adoption among subsistence farmers, as illustrated in Figure 2.1 below.



The literature review begins by examining existing literature on innovations within subsistence marketplaces, with a particular focus on pro-poor innovations agricultural innovations and how they are conceptualised and operationalised. It then explores the contextual realities of subsistence adopters, followed by a discussion of innovation adoption theories relevant to subsistence consumers' adoption behaviour. Finally, the review analyses gender as a social construct and its influence on innovation adoption processes.

2.2 Innovations in the Subsistence Marketplace

Innovations, as defined by Rogers (2003), are 'new ideas, practices, or objects perceived as new by an individual or another unit of adoption' (p. 11). In the simplest form, innovation refers to new products, services, or ideas that adopters perceive as new within their respective contexts. Crucially, it is the perception of newness by the user that matters most, not an objective measure of innovativeness. Innovativeness, therefore, is contextually dependent and may be evaluated based on the viewpoint of the adopter, whether an individual or a collective unit (Garcia & Calantone, 2002). In this research, innovativeness refers to the extent to which agricultural innovations are perceived as new by subsistence farmers, who are the end users. This subjective lens is critical in subsistence contexts, where even an incremental improvement can represent significant change. Moreover, innovations are widely understood to function as catalysts for positive transformation, fostering social and economic development (Pecis & Berglund, 2021).

The central idea behind innovations in subsistence contexts is to improve the lives of impoverished communities. This perspective is grounded in the developmental dimensions of

innovation, which Ramani *et al.* (2012) describe as pro-poor innovations. Pro-poor innovations, as defined by Ramani *et al.*, include new products and services designed to meet the basic needs of low-income populations, including food, water, healthcare, housing, and sanitation. They also seek to enhance productivity and income capacity. Typically, innovations aimed at improving productivity and income involve firms or organisations that serve the poor as profitable consumers (Prahalad & Hart, 2010). However, they also involve adopters who produce goods and services primarily to meet their own consumption needs, referred to as subsistence user producers (Steinfeld & Holt, 2019). While increasing attention has been paid to innovation in subsistence contexts, the innovation adoption process from the perspective of subsistence user-producers is limited. This research focuses on subsistence user-producers, specifically subsistence farmers who adopt pro-poor agricultural innovations to produce food. Such innovations are expected not only to increase agricultural productivity but also to address basic needs, particularly food security. Despite this, the role of subsistence producers who adopt the pro-poor agricultural innovations to produce food remains underexplored in the innovation adoption literature. Moreover, the existing agricultural innovation literature has largely focused on commercially oriented farmers whose primary objective is profit generation. Consequently, limited attention has been paid to subsistence farmers who adopt agricultural innovations primarily to produce food for household consumption and food security. This limited focus may partly explain why many subsistence farming communities continue to experience food insecurity (e.g., Fan & Rue, 2020).

Pro-poor innovations have also been regarded as social innovations in several studies, including those by Steinfeld and Holt (2019) and Hölsgens (2022), due to their role in addressing societal challenges. Hölsgens (2022) defines social innovations as ‘processes, solutions, methodologies, products or strategies for social change’ (p. 248). Consequently, social innovations are linked

to emerging initiatives (e.g., innovations) that address global societal challenges, such as poverty, food insecurity, and environmental issues (Steinfeld & Holt, 2019; Hölsgens, 2022). Within this framework, agricultural innovations for subsistence farmers can also be considered social innovations, as they address the critical societal challenge of food insecurity. This connection links agricultural innovations to the changes and adjustments individuals make in order to adopt innovations (Kawarazuka & Prain, 2019), which Kochetkov (2023) refers to as the strategic aspect of innovations.

Innovations in subsistence contexts encompass a wide range of activities and processes, which can be broadly categorised into four groups. The first category, product innovation, involves changes or additions to goods or services delivered to consumers (Duncombe, 2014; Suri & Jack, 2016; Hove & Dubus, 2019; Hasan *et al.*, 2020; Chatterjee *et al.*, 2024). Examples include products like mobile technology that enable individuals living in subsistence to stay connected (Duncombe, 2014), as well as money mobile transfer services, such as M-Pesa (Suri & Jack, 2016; Hove & Dubus, 2019) and bKash (Hasan *et al.*, 2020) that support livelihoods by facilitating accessible and secure financial transactions. The second category is process innovation, which involves new methods of production, service delivery or access to information (Organisation for Economic Co-operation and Development (OECD), 2013; Barzola Iza *et al.*, 2019). An example is the adoption of government welfare services in Bangladesh through local women entrepreneurs (Chatterjee *et al.*, 2024). This model transforms how public services are accessed, communicated and implemented, making delivery more efficient, inclusive, and responsive to local socio-cultural contexts.

The third category, marketing innovation, relates to changes in how goods and services are promoted, positioned, or sold (OECD, 2013). For instance, Ume (2023) demonstrates how improved market arrangements enable smallholder farmers to sell more produce reliably, at higher prices, and with better quality control. The final category is organisational innovation, which encompasses changes in an organisation's structure, internal processes, or relationships with external stakeholders (Klerkx *et al.*, 2010; Yun, 2020). However, organisational innovations typically focus on firms rather than the end-users of innovations. While product, process, and market innovations often highlight end-user engagement, the dominant perspective still tends to reflect the positions of organisations or scholarly interests in efficiency and profitability. This orientation frequently overlooks the meanings and value that adopters themselves attach to these innovations, which is the focus of this research.

2.2.1 Role of Agricultural Innovations

In agriculture, innovations are generally introduced to enhance food productivity, which is critical for food security and economic development (Loevinsohn *et al.*, 2012; Ruzzante *et al.*, 2021). These innovations are commonly grouped into three broad categories.

The first category, new agricultural products, includes the introduction of new crops and improved varieties (e.g., cassava, maize, rice) (Ahmed *et al.*, 2016; Gebre *et al.*, 2019; Osewe *et al.*, 2021), new farm inputs (e.g., fertilisers and pesticides) (Ndiritu *et al.*, 2014), the transformation of farm outputs into new products (e.g., processing maize seeds into flour) (Adeyeye, 2017; Knorr *et al.*, 2020) and compliance with emerging quality standards at the farm level (Iza *et al.*, 2019); The second category, process innovation, involves the adoption of new farming practices or information, such as conservation agriculture or improved pest

management practices (e.g., Ndiritu *et al.*, 2014; Curry *et al.*, 2021), as well as new ways to access resources and information, such as the formation of farmers' groups (Ingutia & Sumelius, 2022). The third category, market innovation, refers to the development of new market channels or marketing arrangements that expand farmers' opportunities to sell their produce (e.g., Aku *et al.*, 2018; Barzola Iza *et al.*, 2019; Ume, 2023). Importantly, some process innovations, such as farmers' groups, may not be immediately visible or tangible to farmers. However, they are still considered innovations under Rogers' (2003) definition, as they represent new ideas, practices, or arrangements perceived as novel by potential adopters.

Typically, these agricultural innovations, often described as technology practices, represent incremental improvements to existing products or practices designed to meet farmers' evolving needs. Previous studies (e.g., De Oca Munguia *et al.*, 2021) indicate that farmers adopt such innovations in response to changing farming conditions, including declining crop yields, which create pressure to introduce new technologies and practices. Thus, the adoption often results in the replacement of existing products or practices and requires intentional behavioural change, as innovation uptake rarely happens by chance. In the context of this research, the agricultural innovations discussed are not new to the world but are new to the farmers and their specific farming systems. Unlike commercial farmers, who typically adopt agricultural innovations for profitability, subsistence farmers adopt or develop new agricultural innovations primarily to enhance farm productivity and improve household food security. For this reason, innovations targeted at subsistence farmers can be understood as pro-poor innovations (Ramani *et al.*, 2012), as they directly support the well-being of subsistence farmers who face persistent challenges in meeting their basic food needs. Accordingly, this research uses the term pro-poor agricultural innovations to refer specifically to innovations that help subsistence farmers secure their livelihoods and improve food security.

According to Beegle and Christiaensen (2019) and Fan and Rue (2020), subsistence farmers, who primarily farm for their own food, are among the most affected by food insecurity. This vulnerability stems largely from their dependence on natural resources, which are highly sensitive to environmental disruptions (Venugopal & Chakrabarti, 2022). These disruptions can arise from natural causes, including climate change and extreme weather events (e.g., droughts, floods, and rising temperatures), as well as human-driven processes, including agricultural intensification, deforestation, population pressure, and industrialisation (Maurya *et al.*, 2020). Food insecurity among subsistence farmers is further compounded by poverty, which is driven by multiple constraints. These include limited access to financial and productive resources, a lack of employment opportunities, and insufficient institutional support (Doss, 2013; Beuchelt, 2016; Venugopal & Chakrabarti, 2022). Addressing food insecurity is therefore not only a global priority under Sustainable Development Goal 2 but also an urgent local challenge for the majority of subsistence farming communities in developing countries.

Under conditions of resource constraints and environmental stress, pro-poor agricultural innovations become essential for subsistence farmers, who often have few alternatives for sustaining their livelihoods (e.g., Fan & Rue, 2020). Consequently, these innovations are typically necessity-driven (Locke *et al.*, 2017; Steinfeld & Holt, 2019). Examples may include improved varieties of crops like cassava, maize, and rice (Ahmed *et al.*, 2016; Gebre *et al.*, 2019; Osewe *et al.*, 2021), new farm inputs like fertilisers and manure (Ndiritu *et al.*, 2014), value-added processing such as cassava flour production (Odey and Lee, 2020), and enhanced pests and disease management practices (Curry *et al.*, 2021). Collectively, these innovations offer pathways for farmers to improve productivity and meet household food needs. Despite their potential, adoption rates of such pro-poor agricultural innovations remain persistently low (Hermans *et al.*, 2021; Osewe *et al.*, 2021; Crudeli *et al.*, 2022; Nyairo *et al.*, 2022; Bilal &

Jaghdani, 2024). This gap underscores the need to better understand the factors shaping adoption decisions among subsistence farmers.

Conversely, the literature on pro-poor innovations in subsistence marketplaces highlights the widespread adoption of technologies or innovations like mobile money transfers and internet-based solutions, largely because they offer a compelling value proposition relative to existing alternatives (Hove & Dubus, 2019; Hasan *et al.*, 2020). A central driver of this adoption is the comparatively low cost associated with these innovations compared to traditional fixed infrastructure alternatives (Hasan *et al.*, 2020). Affordability is particularly critical for subsistence users, who typically operate with limited financial resources. For example, in rural regions of countries like Kenya and Bangladesh, where resource scarcity is prevalent, individuals can access mobile money services like M-Pesa, a leading mobile money transfer service in Kenya and bKash, a mobile banking service for the poor in Bangladesh. These services are made accessible through low-cost mobile phone models, inexpensive SIM cards, affordable mobile internet, and the widespread basic technical skills related to mobile phone use (Hove & Dubus, 2019; Hasan *et al.*, 2020).

As a result, individuals living in poverty increasingly rely on these technologies due to their perceived benefits. Mobile phones have evolved beyond simple communication tools into multifunctional platforms supporting mobile money transfer, remittances and internet-based banking, services that offer critical financial lifelines for those seeking alternative income streams under subsistence conditions (Suri & Jack, 2016; Hove & Dubus, 2019). Despite these advancements, existing studies (e.g., Hove & Dubus, 2019; Hasan *et al.*, 2020) tend to oversimplify the role of gender by treating it as a binary variable, a common limitation of

quantitative research. Consequently, these studies fall short of capturing the nuanced ways in which gender, as a socially constructed system of roles, expectations, and power relations, shapes how women and men evaluate and adopt pro-poor goods and services. Addressing this gap, this research moves beyond a narrow focus on gender as a biological identity to explore how gender roles and power dynamics shape the adoption of pro-poor agricultural innovations.

In subsistence contexts, numerous innovations that have demonstrated potential benefits for developing countries have nonetheless encountered resistance. Mukeshimana *et al.* (2021) observe that such resistance is particularly pronounced in many African nations, including Kenya, compared to more successful adoption patterns in several Asian countries such as China, India, Nepal, and Bangladesh. For example, the adoption of clean, renewable energy sources like biogas and solar energy in Kenya (Kiprop *et al.*, 2019; Anditi *et al.*, 2022) has been slow despite their advantages over traditional wood-fuelled stoves. Clean energy sources offer more reliable fuel supplies, long-term cost savings, and substantial environmental benefits. They also provide critical health benefits by reducing respiratory illnesses, eye problems caused by carbon emissions, physical strain from collecting firewood, and mental stress linked to inadequate lighting and heating (Anditi *et al.*, 2022). However, while environmental and health risks associated with biomass energy may appear abstract or distant for individuals living in subsistence conditions (Viswanathan & Sreekumar, 2019), adoption is further hindered by issues of accessibility and affordability. These challenges disproportionately impact women, as they are more involved in cooking in both rural and urban areas, in addition to having low incomes. Moreover, the collection of firewood presents safety risks for women and girls, exposing them to threats of assault in both urban and rural areas (Anditi *et al.*, 2022). These patterns suggest that, beyond economic constraints, a complex interplay of socio-cultural and structural factors shapes the pace and pattern of pro-poor innovation adoption. Understanding

these dynamics is therefore essential for explaining why certain pro-poor innovations struggle to gain traction in subsistence contexts despite their clear potential benefits.

The existing literature recognises the potential of pro-poor agricultural innovations to enhance food security among subsistence farmers; however, the dominant narrative remains largely technocratic. Most of this work focuses on how government agencies and development partners develop and disseminate innovations to rural populations, often portraying farmers as passive recipients rather than active agents (Kaliba *et al.*, 2020; Khoza *et al.*, 2021; Ruzzante *et al.*, 2021). This top-down approach overlooks the nuanced ways in which both female and male subsistence farmers interpret, evaluate, and assign meaning to new innovations. Persistently low adoption rates point to the limitations of this technocratic top-down perspective. A more comprehensive understanding requires attention to how gender as a social construct, shaped by roles, norms, and power dynamics, influences perceptions of and responses to innovations. Without integrating these dimensions, efforts to promote pro-poor innovation risk reinforcing existing inequalities and failing to address the specific needs and lived realities of the communities they aim to support. The next section, therefore, explores the nuanced experiences of subsistence farmers in relation to pro-poor agricultural innovations.

2.3 The Nuances of Subsistence Farmers

Subsistence farming is a dominant agricultural practice in rural areas of developing countries, especially across Africa, where market economies remain underdeveloped (Curry *et al.*, 2021). This form of agriculture is often associated with smallholder and low-input farming systems and is described using terms such as traditional, low-income, resource-poor, and low-

technology agriculture (Singh-Peterson & Iranacolaivalu, 2018). According to Beegle and Christiaensen (2019), World Bank Group (2019) and FAO *et al.* (2022), subsistence farming typically occurs on small farms of up to 10 hectares and includes a mix of activities such as crop production, livestock rearing, fishing, and agroforestry (Steger, 2000). Globally, small farms account for more than 80 percent of the estimated 570 million farms worldwide (Fan & Rue, 2020; Stringer *et al.*, 2020). In SSA, many farms are even smaller, often less than 1 hectare, although relatively larger farms are found in arid and semi-arid regions with less arable land (Giller *et al.*, 2021). The FAO (2012) defines subsistence farmers as individuals who primarily produce food for their own consumption and rely heavily on family labour. This reliance on household labour aligns with Kilic *et al.*'s (2015) classification of farming within households (or family farmers), as a distinct form of farm organisation.

FAO and IFAD (2019) further broaden the category of family farmers to include pastoralists, fishers, indigenous peoples, and other food producers in both developed and developing regions. However, subsistence farmers are overwhelmingly concentrated in developing contexts (Fan & Rue, 2020). Consequently, several studies use farm size as a key indicator of farmers' ability to meet household food security and income needs (Dahana *et al.*, 2018; Chikweche *et al.*, 2023). However, this emphasis on farm size may overlook other important social and structural factors, particularly gender inequalities, that have been acknowledged to constrain the adoption of pro-poor agricultural innovations (Locke *et al.*, 2017; Kwarazuka & Prain, 2019; Visser & Wangu, 2021).

Globally, the majority of the subsistence farmers are among the poorest populations, with an estimated 75% relying on agriculture as their primary source of livelihood (Beegle &

Christiaensen, 2019; Fan & Rue, 2020). Subsistence farming also provides employment for approximately 56% of the population in developing countries (Davis *et al.*, 2017; Louhichi *et al.*, 2020). In sub-Saharan Africa, the agricultural sector produces nearly 80% of the region's food, making it a vital contributor to both regional and global food security (Beegle & Christiaensen, 2019). In Kenya, where agriculture is central to the national economy, smallholder farming contributes around 21% of the national gross domestic product (GDP) and employs roughly 75% of the national labour force (Onyalo, 2019). These figures illustrate the critical role of subsistence farmers as both key investors in agricultural production and the backbone of rural economies. As such, they are pivotal to achieving Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty) and SDG 2 (Zero Hunger) (UN, 2015).

Women play a particularly significant role in subsistence farming, constituting a significant share of the agricultural labour force worldwide (Fan & Rue, 2020; FAO, 2023). FAO (2023) estimates that women make up between 42% and 65% of this labour force worldwide. In Eastern Africa, women contribute approximately 50% of agricultural labour, often working both on their own account and as wage workers on and off farms (Christiaensen & Demery, 2018; Masamha *et al.*, 2018). Beyond primary food production, women also manage household responsibilities, care for livestock, process food, and participate in marketing agricultural products (Farhall & Rickards, 2021; Visser & Wangu, 2021). These roles highlight the gendered nature of labour within subsistence farming systems.

Although subsistence farmers play a central role in food production, they remain trapped in cycles of poverty and food insecurity (Fan & Rue, 2020; Giller *et al.*, 2021; Visser & Wangu, 2021). They face constraints, including limited access to resources, poor market access,

inadequate technology, and increasing environmental disruptions. In particular, women face greater challenges due to social and structural constraints (Locke *et al.*, 2017; Kwarazuka & Prain, 2019; Visser & Wangu, 2021). Collectively, these challenges severely undermine subsistence farmers' ability to produce sufficient food for household consumption, let alone generate surplus for income or build long-term resilience.

Studies show that subsistence farmers mainly rely on indigenous crops, many of which are often commonly associated with poverty and are therefore often labelled as 'poor man's crops' (Parmar *et al.*, 2017; Akinola *et al.*, 2020; Omuse *et al.*, 2024). These crops include root, tuber, and bananas (RTB) crops, such as cassava, sweet potatoes, yams, and bananas; cereals such as sorghum and pearl millet; legumes like cowpea and Bambara groundnut; indigenous vegetables such as amaranth, spider plant, pumpkin, okra, and African nightshade; oilseeds such as sesame and African oil bean; and edible insects including ants, grasshoppers, crickets, and termites (Reincke *et al.*, 2018; Akinola *et al.*, 2020; Aworh, 2023; Ngigi *et al.*, 2023; Mativavarira *et al.*, 2024; Omuse *et al.*, 2024). These crops are primarily cultivated for household consumption and local markets. However, their contribution to food security in SSA remains constrained by low productivity and limited investment (Parker *et al.*, 2019).

The marginalisation of indigenous crops is closely linked to shifts in agricultural priorities following the Green Revolution in the 1960s. Since then, agricultural development policies and investments have largely focused on conventional staple crops such as maize, wheat and rice (Akinola *et al.*, 2020; Aworh, 2023; Omuse *et al.*, 2024). This shift contributed to the widespread replacement of many locally cultivated varieties and resulted in limited scientific research, policy support, and technological investment in indigenous crops across Africa

(Akinola *et al.*, 2020; Aworh, 2023). According to Akinola *et al.* (2020), the transition by subsistence farmers towards modern crops, such as wheat, maize, and rice, has increased agronomic, ecological, nutritional, and economic risks, particularly given the growing impacts of climate change on agricultural systems. Climate change is widely recognised as a major threat to agricultural productivity, crop yields, and farming sustainability (Habtemariam *et al.*, 2017; Venugopal & Chakrabarti, 2022).

The Intergovernmental Panel on Climate Change (IPCC, 2023) identifies SSA as one of the region's most vulnerable to climate change and environmental variability. In this context, indigenous crops such as cassava, millet, and sorghum are more resilient than exotic crops because of their adaptability to harsh and diverse ecological conditions (Akinola *et al.*, 2020). Their resilience positions them as viable alternatives for strengthening food security under changing climatic conditions. In addition, indigenous crops are locally accessible and relatively affordable, making them particularly important for resource-constrained communities. Studies suggest that these crops continue to feed over one billion people globally and remain integral to the diets of many African communities (Feleke *et al.*, 2016; Akinola *et al.*, 2020; Bokelmann *et al.*, 2022; Aworh, 2023).

Beyond their resilience, indigenous crops also possess important nutritional value. Research shows that many indigenous crops contain higher levels of micronutrients, vitamins, and dietary fibre than commonly consumed staples such as maize, wheat, and rice (Reincke *et al.*, 2018; Akinola *et al.*, 2020; Aworh, 2023; Ngigi *et al.*, 2023; Mativavarira *et al.*, 2024; Omuse *et al.*, 2024). Akinola *et al.* (2020) and Aworh (2023) further classify these crops as functional

foods because of their potential to reduce the risk of diet-related and non-communicable diseases, including obesity, diabetes, hypertension, and cardiovascular diseases.

Indigenous crops also hold significant socio-economic and cultural roles. A systematic review by Onomu *et al.* (2023) found that about 80% of South Africans use indigenous foods for medicinal purposes. The study further revealed that indigenous crops contribute to poverty reduction, particularly among women, 75% of whom are stated to earn their incomes from selling these crops. Moreover, indigenous crops are deeply embedded in the local cultural identities and traditional knowledge systems of various ethnic groups across African communities (Aworh, 2023; Onomu *et al.*, 2023). As such, they do not require specialised technical skills to cultivate, making them especially suitable for communities with limited access to formal agricultural training or technical information. This is particularly relevant in subsistence contexts, where many farmers have limited literacy skills (Aworh, 2023). Their continued use and preservation support not only food and livelihood security but also the safeguarding of Africa's cultural heritage (Akinola *et al.*, 2020). Promoting these crops strengthens resilience, sustains local knowledge systems, and enhances the socio-economic well-being of the communities that rely on them.

Despite these benefits, indigenous crops remain underutilised. Their declining prominence is often linked to weak policy support, underdeveloped markets, and limited dissemination of innovations and technologies necessary to improve production and utilisation (Parmar *et al.*, 2017). Against this background, the present research explores improved cassava varieties, as an example of the enhancement of indigenous crops, as well as marketing of bananas, another

indigenous crop, facilitated through the *Mlango* farmers' group among subsistence farmers in Tigania East.

The next section discusses how resource constraints impact the adoption of pro-poor agricultural innovations.

2.3.1 Resource Constraints and Innovation Adoption

The subsistence marketplace literature indicates that individuals living in subsistence contexts lack not only basic material resources but also essential non-material assets necessary for a decent standard of living (Prahalad & Hart, 2010; Viswanathan *et al.*, 2012; Viswanathan, 2017). Subsistence farmers, like many low-income populations, face interconnected constraints, including limited access to healthcare and education, scarce employment opportunities, and poor infrastructure, particularly in transportation and telecommunication system, conditions that differ markedly from those in developed economies (Kaliba *et al.*, 2020; Chikweche *et al.*, 2023). As Manggat *et al.* (2018) argue that basic infrastructure plays a critical role in shaping the well-being of rural communities by improving access to social services, including education, health, and agricultural support. Consequently, poor infrastructural systems significantly limit farmers' abilities to access, engage with and benefit from pro-poor agricultural innovations.

A critical determinant of innovation success in subsistence settings is the extent to which innovations are compatible with existing infrastructural conditions. For instance, at the farm level, subsistence farmers typically cultivate marginal lands characterised by poor soil quality and limited access to essential farming inputs, such as improved seeds, fertilisers and pesticides (e.g., Mburu *et al.*, 2016). Their access to credit and information about agricultural innovations

is also severely limited (Ruzzante *et al.*, 2021), further constraining agricultural productivity and food security. In addition, low literacy and numeracy levels remain prevalent in many rural communities, which affects farmers' ability to engage with abstract or technical information (Mbiti, 2016; Steinfield & Holt, 2019; World Bank, 2022). Nakata and Weidner (2012) and Steinfield & Holt (2019) observe that decision-making in these subsistence contexts tends to rely on concrete, experiential information. Steinfield and Holt (2019) further note that low literacy may lead to anxiety or hesitation when farmers interact with external actors, limiting their ability to seek clarification or ask questions about new innovations. These challenges underscore the importance of accessible innovations and the use of concrete tools, such as pictorial or visual aids, to support farmers' adoption and comprehension of pro-poor agricultural innovations.

The adaptability of technologies to local conditions plays an important role in shaping innovation uptake and the outcomes, as emphasised by Viswanathan & Sreekumar (2019). Yet, despite growing recognition of these contextual influences, existing innovation frameworks do not individually account for the combined effects of socio-cultural, infrastructural, and cognitive constraints on innovation design and dissemination. Models such as the DOI (Rogers, 2003) and TAM (Davis, 1989), predominantly emphasise technical characteristics of innovations, including relative advantage and perceived usefulness (the overall utility of the innovation). The UTAUT framework (Venkatesh *et al.*, 2003) extends these models by highlighting the importance of facilitating conditions, such as access to resources and supportive infrastructure. However, these models fail to explain the adoption patterns in subsistence contexts.

For example, in Ethiopia, the adoption of high-yield hybrid maize seeds remained low despite their relative agronomic advantages, largely because the seeds were vulnerable to climate-related risks such as drought, pests, and diseases (Gebre *et al.*, 2019). For subsistence farmers, who face heightened exposure to environmental shocks and possess limited fallback options (Venugopal & Chakrabarti, 2022), these risks outweighed the perceived benefits of the innovation. This illustrates that adoption decisions in subsistence contexts cannot be explained by technical attributes alone. Instead, adoption decisions are shaped by a complex interplay of resource constraints, risk exposure, and the lived realities of farmers whose livelihoods depend on managing uncertainty.

Nakata and Weidner (2012) further argue that innovation design for subsistence markets must account for everyday living conditions, including affordability and the need for visually comprehensible innovations. While pictorial information or visual cues can help overcome literacy barriers (Nakata & Weidner, 2012; Hasan *et al.*, 2017), visual cues may be prone to misinterpretation due to cultural sensitivities and local context. Viswanathan & Sreekumar (2019) therefore stress that pro-poor innovations should not only be easy to demonstrate, simple to learn, communicated in local languages and embedded within existing social networks. Yet, the existing adoption models, including TRA (Fishbein & Ajzen, 1975), TBP (Ajzen, 1991), and TAM2 (Venkatesh & Davis, 2000), tend to conceptualise subjective norms primarily as external social influence, overlooking the deeper, community-embedded knowledge systems that shape decision-making in subsistence settings.

Local communities in subsistence contexts are stated to rely on strongly embedded farming knowledge and long-standing practices to sustain their livelihoods (Venugopal & Chakrabarti,

2022). These are different from Nakata and Weidner's (2012) concept of interpersonal relationships. However, these systems are frequently overlooked in mainstream innovation theories. This omission creates theoretical blind spots, obscuring how contextual realities fundamentally shape adoption processes. Understanding these contexts requires engaging with the perspectives of the adopters themselves. This highlights the value of ethnographic approaches, as adopted in this research, which provide in-depth insight into the lived experiences of adopters and enable a richer understanding of the social, cultural, and infrastructural environments shaping pro-poor innovation adoption. Ethnographic aligns closely with subsistence marketplace approaches (Viswanathan et al., 2012), which advocate for bottom-up, contextually grounded understanding of innovation use.

Given the unique contexts subsistence communities live in, the social networks emerge as critical channels that help to mitigate adoption barriers. The next section explores this role in greater depth.

2.3.2 Social Networks and Innovation Adoption

An emerging body of literature challenges the conventional view of subsistence contexts as defined solely by deprivation. Studies by Nakata and Weidner (2012), Hunecke *et al.* (2017) and Viswanathan (2017) and Kos *et al.* (2023) reveal that individuals in these contexts often possess rich and robust social networks. These networks deeply influence their everyday lives, serving not simply as responses to material scarcity but as foundational elements of their way of life (Viswanathan, 2017; Viswanathan & Sreekumar, 2019). Grounded in trust and reciprocity, these social networks help individuals cope with resource scarcity and navigate uncertainties, such as food insecurity and environmental challenges, by fostering mutual

support and resource sharing (Nakata & Weidner, 2012; Viswanathan *et al.*, 2012; Barrios & Blocker, 2015).

Among subsistence farmers, these social networks represent a key dimension of social capital, broadly defined as the ‘interrelationships that promote cooperation and coordination for mutual benefit through shared norms, trust, and networks’ (Hunecke *et al.*, 2017, p. 222). In subsistence contexts where market mechanisms may be underdeveloped, these networks facilitate access to resources and the exchange of information (Hunecke *et al.*, 2017; Kos *et al.*, 2023). This illustrates the inherently social nature of subsistence farming, which is embedded in strong interpersonal relationships within and across households, that significantly influence the adoption of pro-poor agricultural innovations (Hunecke *et al.*, 2017; Kos *et al.*, 2023).

The literature identifies three primary forms of social relations among farmers: familial, peer-based, and group networks. Familial networks centre on regular interactions among close family members (Claridge, 2020; Kos *et al.*, 2023). These ties play a pivotal role in shaping decisions around food production, the adoption of pro-poor agricultural innovations, and the marketing of farm produce (Shibata *et al.*, 2020). Typically led by the household’s decision-makers, often the husband and wife, these relationships are built on trust and facilitate resource access and information sharing. However, they are also shaped by hierarchical and gendered power dynamics that frequently marginalise women in both decision-making and innovation adoption. These gendered inequalities remain underexplored in the innovation adoption literature. To address this gap, the present research adopts a social relations perspective to examine the complex intra-household dynamics that shape the adoption of pro-poor agricultural innovations.

Peer networks provide a critical social support within rural communities. Formed among individuals with shared interests and livelihood concerns, they foster collective identity and mutual assistance (Claridge, 2020; Kos *et al.*, 2023). Given their vulnerability and limited resources, subsistence farmers tend to be risk-averse; therefore, peer networks help mitigate this risk by enabling shared learning, trial observation, and mutual encouragement (Hunecke *et al.*, 2017; Kos *et al.*, 2023). These exchanges are especially valuable for farmers with limited literacy, who rely on oral communication and demonstrations. Viswanathan and Sreekumar (2019) describe these as problem-focused interdependencies that facilitate collaborative and low-cost solutions to shared challenges.

The final form of social network, the group networks, represents both informal and formal structure for collective action. From a social capital perspective, group networks involve organised interactions among individuals who share common goals within an institutional or semi-institutional settings (Claridge, 2020). Unlike the close-knit personal ties found in familial or peer-based networks, group networks are typically grounded in relational trust built through membership and shared norms (Hunecke *et al.*, 2017; Kos *et al.*, 2023). The group networks are particularly effective in mobilising collective responses to systemic challenges in subsistence farming (Aku *et al.*, 2018; Ingutia & Sumelius, 2022). Viewed through the lens of innovation, group networks function as process innovations and following Garcia and Calantone's (2002) typology of innovation, they provide incremental benefits to subsistence farmers by enhancing coordination and access to markets. Other notable examples of group networks include community-based village associations initiated by the Bangladesh Rural Advancement Committee (BRAC), which extend microcredit, healthcare services, and business training services to the poor (Ahmed, 2008; Sarma *et al.*, 2020). ‘Chamas’, informal

savings and credit groups in Kenya designed to reduce poverty through mutual financial support (Mwiti & Goulding, 2018), is another example of a group network.

While these three types of social networks, familial, peer, and group, serve as valuable entry points for innovation and development, they are also profoundly shaped by gender dynamics. Feminist scholars (Acker, 1990; Martin, 2006; Benschop & Verloo, 2015; Stewart *et al.*, 2021) argue that social interactions are inherently gendered, often characterised by unequal power structures that reinforce systemic exclusion. The gender norms and expectations can restrict participation and access to resources, particularly for women, thereby shaping how innovations are adopted or resisted within social networks. However, limited research examines how gender relations mediate the uptake of pro-poor agricultural innovations. To address this gap, the present research draws on the social construction theory of gender, which views gender as a socially produced and continually reinforced system of meaning. This theoretical lens enables a critical exploration of how gendered interactions, especially within households, shape innovation adoption.

In sum, the interplay between resource availability and the strength of social networks can both enable and constrain the adoption of agricultural innovations aimed at improving food security. While pro-poor agricultural innovations are urgently needed, their success depends on being grounded in the realities of subsistence communities, where social relationships are not merely coping strategies but fundamental to everyday existence. As these relationships are shaped by complex and often unequal gender relations, a deeper understanding of how women and male farmers engage with pro-poor agricultural innovations is essential. Capturing these nuances

requires a bottom-up, immersive approach that engages directly with the lived experiences of subsistence farmers to uncover the social dynamics that support or hinder innovation adoption.

2.4 Innovation Adoption Models in Subsistence Marketplaces

This section reviews models of innovation adoption in subsistence marketplaces. These models are categorised into those that focus primarily on innovation attributes, including Rogers' (1983) Diffusion of Innovation model (DOI) and Davis' (1989) Technology Acceptance Model (TAM). Within this category, the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh *et al.* (2003) is also discussed, as it extends earlier models by incorporating facilitating factors such as resources and infrastructure, as well as moderating factors including gender, age, experience and voluntariness of use. The socio-psychological theories, such as the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), the Theory of Planned Behaviour (TPB) (Ajzen, 1991) which account for the influence of social norms and perceived behaviour control on adoption behaviour are reviewed. In addition, the extended Technology Acceptance Model 2 (TAM2) by (Venkatesh & Davis, 2000) is considered because it also incorporates social influence and voluntariness to use innovation and image. This section concludes the review of the Contextualised Bottom-of-the-Pyramid model by Nakata and Weidner (2012), which emphasises the broader social context and adoption realities shaping innovation adoption in subsistence contexts.

2.4.1 Innovation Adoption Models Focusing on Instrumental Determinants of Adoption Decisions.

The literature on the adoption of agricultural innovations can be traced back to early studies on the spread of new technologies in developing countries, particularly in Bangladesh (e.g., Rahim, 1961). During this period, technology was increasingly recognised as central to national development, prompting researchers, the private sector, and public stakeholders to collaborate as change agents, encouraging farmers to embrace new agricultural practices (Rogers, 1983). Much of this early work focused on understanding farmers' adoption behaviours in rural villages across developing countries such as Pakistan (e.g., Rahim, 1961). It is within this context that Rogers (1983) introduced the Diffusion of Innovations theory (DOI), which explains how innovations are communicated and adopted within a social system over time. Rogers identified five key attributes shaping adoption decisions: relative advantage, compatibility, complexity, trialability, and observability. These attributes remain relevant to contemporary research on pro-poor agricultural innovations and are reviewed below.

Relative advantage relates to the extent to which potential adopters perceive an innovation as better than existing options (Rogers, 2003). Although relative advantage is related to Davis' (1989) notion of perceived usefulness, the two are distinct. Relative advantage focuses on the incremental benefit of an innovation over previous practices, such as an improved crop variety. In contrast, perceived usefulness is the degree to which an individual believes that using an innovation will enhance performance, such as improved productivity or efficiency (Khoza *et al.*, 2019). For instance, Osewe *et al.* (2021) found that farmers in Kisumu, Kenya, viewed improved cassava varieties, TMS 30575, TM/14, and MH93/OVA as having a relative advantage over indigenous varieties due to higher yields, shorter maturity periods, and greater pest and drought resistance. Similarly, Gebre *et al.* (2019) reported that Ethiopian farmers

recognised the benefits of improved maize varieties such as BH540, BH660, and Pioneer due to their higher yields. However, the perceived relative advantage does not fully explain farmers' adoption decisions due to the incremental costs or sacrifices involved. Osewe *et al.* (2021) observed that improved cassava varieties were incompatible with farmers' traditional cooking patterns and food tastes, changes they were reluctant to make. Since women often carry out cooking in many rural communities, this highlights how gender roles shape not only the perceived relative advantage and usefulness of pro-poor agricultural innovations but also their adoption. What appears advantageous at the household level may not align with women's daily practices, labour responsibilities, or preferences.

Gebre *et al.* (2019) also found that improved maize varieties were vulnerable to climate-related risks such as drought and pests, leading to dissatisfaction and low uptake. Studies show that women are disproportionately affected by climate-related risks due to limited access to productive resources and restrictive participation in decision-making processes (e.g., Anjum & Aziz, 2025). These constraints exacerbate existing gender inequalities, intensifying women's exposure to food and water insecurity and increasing their caregiving burdens. Taken together, these findings suggest that relative advantage must be understood alongside compatibility, particularly with women's needs and constraints in subsistence contexts where they face significant risks and constraints compared to men.

Innovation compatibility refers to the extent to which an innovation aligns with the existing socio-cultural values, beliefs, experiences, ideas, and needs of potential adopters (Rogers, 2003). In subsistence marketplaces, individuals are more likely to prioritise innovations that are compatible with their everyday practices and constraints. For example, Hasan *et al.* (2019)

found that mobile money services, such as bKash, were widely adopted because they aligned with the users' low incomes and limited access to advanced technology infrastructure. While the UTAUT model (Venkatesh *et al.*, 2003) extends DOI and TAM by incorporating facilitating conditions, such as access to resources and infrastructure, these factors are primarily conceptualised as external enablers of technology use. Consequently, UTAUT does not fully capture the internal, socio-cultural, and relational constraints that shape adoption in subsistence contexts. For instance, Curry *et al.* (2021) found that Cocoa Pod Borer pest management failed in Papua New Guinea was constrained not only by farmers' limited financial resources but also by labour shortages arising from the gendered division of labour. These labour arrangements, embedded within local social norms and gender roles, influence the capacity of households to implement innovations, yet are often overlooked in mainstream technology adoption models. This review, therefore, illustrates that pro-poor agricultural innovations must be compatible with the realities of subsistence living, including low incomes, labour shortages, environmental risks (e.g., Gebre *et al.*, 2019), and weak infrastructure, while also aligning with prevailing social values and behavioural practices, as highlighted by Osewe *et al.* (2021). Compatibility, thus, moderates the effects of relative advantage in DOI and perceived usefulness in TAM. This challenges the implicit assumption within these models that adoption attributes operate independently of socio-cultural context and affect all potential adopters in a gender-neutral manner.

Complexity, as defined by Rogers (2003), is the perceived difficulty of understanding and using an innovation, including factors such as ease of use and the knowledge and skills required for implementation (Eastwood & Renwick, 2020). In subsistence contexts, where access to infrastructure, technical support, and education is limited, complexity can constitute a significant barrier to adoption. Hasan *et al.* (2020), in their study on pro-poor services such as

mobile money and internet technologies, found that complexity had a considerable impact on adoption decisions in rural communities, largely due to infrastructural and contextual constraints. This stands in contrast with more developed contexts, where exposure to technology and stronger infrastructure reduces the impact of complexity (Arts *et al.*, 2011). In agriculture, complexity is often associated with the technical knowledge and practical skills required to implement innovations. Steinfeld & Holt (2019) found that farmers were able to replicate simple solar cookers due to their simple design, but experienced difficulties constructing water ponds, which required specialised knowledge of runoff management and gradient alignment to minimise siltation. As a result, many farmers discontinued the use of water ponds, illustrating that complexity can hinder not only initial adoption but also the long-term sustainability of innovations.

Although the DOI model (Rogers, 2003) identifies complexity as a key determinant of adoption, it implicitly assumes that the perception of complexity is broadly uniform across adopters. Similarly, TAM (Davis, 1989) conceptualises ease of use as an instrumental characteristic influencing technology acceptance, while UTAUT (Venkatesh *et al.*, 2003) incorporates gender as a moderating variable affecting effort expectancy and behavioural intention. However, these frameworks provide limited insights into the internal structural and social factors that shape how complexity is experienced in subsistence contexts. In particular, they do not adequately account for how gendered inequalities in education, labour, and decision-making influence individuals' ability to engage with innovations.

Educational disparities illustrate this limitation. Rural women often have lower levels of educational attainment than men (FAO, 2018; Chikweche *et al.*, 2023), reducing their access

to knowledge and skills necessary to adopt more complex innovations. While studies such as Kaliba *et al.* (2020) and Ayisi *et al.* (2022) recognise the importance of education in shaping adoption decisions, they largely overlook gendered differences in educational access, which are crucial for understanding adoption dynamics in subsistence rural contexts.

Complexity can also be understood in terms of the physical and temporal effort required to use an innovation. Khoza *et al.* (2019) found that women farmers in Malawi and Zambia struggled to adopt climate-smart agricultural technologies due to the labour-intensive nature of their daily activities. Similarly, Ndiritu *et al.* (2014) reported low adoption rates of manure application, a key sustainable intensification practice (SIP), among female-headed households in Kenya, largely because of the physical effort involved. While these findings align with Davis' (1989) and model Venkatesh *et al.*'s (2003) concept of ease of use, they reveal dimensions of complexity that extend beyond technical usability. Khoza *et al.* (2019) highlight the time constraints arising from women's dual responsibilities in agricultural production and household care, whereas Ndiritu *et al.* (2014) emphasise the physical demands of innovation implementation, which can disproportionately affect women. This also relates to the UTAUT model (Venkatesh *et al.*, 2003), which suggests that perceived use is more significant for women than for men.

These studies suggest that complexity is not solely an intrinsic characteristic of an innovation but is also shaped by the social and material conditions of potential adopters. Contrary to the assumptions embedded within DOI and TAM, women and men may experience the same innovations differently because of disparities in education, time availability, labour capacity, and social roles. Consequently, the perceived complexity of pro-poor agricultural innovations

is socially constructed and gendered, influencing both the evaluation and sustainability of adoption in subsistence contexts.

Trialability, as defined by Rogers (2003), refers to the ease with which an innovation can be tested on a small scale before full implementation. This attribute is particularly important in subsistence contexts, where adopting an innovation often requires substantial investments of time, labour, financial and material resources, and varying levels of literacy. Trialability reduces perceived risks by allowing farmers to assess an innovation's relevance and effectiveness before making a full commitment. Given their vulnerability and limited fallback options, subsistence farmers tend to be risk-averse, and the opportunity costs associated with these decisions can be significant.

Empirical studies reinforce the importance of trialability in influencing innovation adoption. Hasan *et al.* (2020) found that trialability significantly influenced the adoption of pro-poor technologies, such as mobile money service bKash, particularly among users facing high levels of complexity and unfamiliarity. In such contexts, opportunities to experiment with an innovation can help build confidence and reduce barriers associated with learning and use. Although TAM2 (Venkatesh and Davis, 2000) and UTAUT (Venkatesh *et al.*, 2003) do not explicitly incorporate trialability as a construct, both models recognise the importance of social influence (including TRA (Fishbein & Ajzen, 1975) and TPB (Ajzen, 1991)) in shaping innovation adoption decisions. Social influence may indirectly enhance trialability by encouraging experimentation and reducing uncertainty through peer support and shared experiences. However, social influence as conceptualised in these models can directly and indirectly enhance trialability by encouraging experimentation and reducing uncertainty

through peer support and shared experiences. This is important for women who are stated to rely more on social support to implement innovations (Badstue *et al.*, 2018).

Similarly, Steinfield and Holt (2019) observed that subsistence farmers with low literacy levels showed a stronger preference for trialability because they relied more on experiential and social learning than written or abstract information. This aligns with findings by Kos *et al.* (2023), who highlight the role of social networks in facilitating observational learning. In close-knit rural communities, farmers frequently learn from the experiences of others, allowing them to assess the benefits and risks of an innovation before adoption. Hasan *et al.* (2020) further argue that social interactions are particularly important in collectivist settings, where observing the experiences of peers can reduce uncertainty and increase confidence in an innovation. The literature, therefore, suggests that trialability is not solely a characteristic of the innovation itself but is also shaped by the social environment in which adoption occurs. For resource-constrained and low-literate farmers, as well as women, opportunities for experimentation are often enabled through social networks, peer learning, and community interactions. Consequently, the present research emphasises the role of social networks as a key mechanism through which trialability reduces uncertainty and facilitates the adoption of pro-poor agricultural innovations. However, the social networks, in particular gender relations, remain under-researched in the innovation adoption studies.

Another important innovation attribute is uncertainty, which concerns reliability, functionality, and overall effectiveness of an innovation (Eastwood & Renwick, 2020). In agriculture, uncertainty is closely linked to whether an innovation is fit for purpose and capable of delivering meaningful outcomes. Ruzzante *et al.* (2021) associate functionality with the ability

of agricultural innovations to enhance production, emphasising the importance of tangible performance outcomes. This emphasis on expected improved productivity aligns closely with Davis' (1989) concept of perceived usefulness, which refers to the degree to which an individual believes that using an innovation will enhance performance. For subsistence farmers, who are highly vulnerable to food insecurity (Fan & Rue, 2020), uncertainty extends beyond technical performance and productivity. Given their limited resources and high levels of vulnerability, adoption decisions are often closely tied to household survival and food security. Consequently, farmers must assess not only whether an innovation works, but also whether it can reliably contribute to food availability, income stability, and livelihood resilience. The potential consequences of failure are particularly severe in subsistence settings, where unsuccessful innovation investments may threaten household well-being and increase exposure to food insecurity.

The significance of uncertainty is further shaped by gender roles and responsibilities within rural households. Women frequently bear primary responsibility for food production, food preparation, and household nutrition (Voola *et al.*, 2018; Visser & Wangu, 2021). As a result, women may evaluate agricultural innovations not only in terms of productivity gains but also according to their potential to improve household food security and reduce livelihood risks. An innovation that offers uncertain outcomes may therefore be perceived as less useful and riskier by women, particularly when household welfare depends on its success. While TAM conceptualise perceived usefulness primarily as an individual assessment of performance enhancement (Davis, 1989), evidence from subsistence agriculture suggests that perceptions of usefulness are embedded within broader livelihood concerns and social responsibilities. Similarly, DOI and UTAUT pay limited attention to how uncertainty is experienced differently across social groups. In practice, perceptions of reliability and effectiveness are shaped not

only by the technical characteristics of an innovation but also by farmers' vulnerabilities, resource constraints, and gendered responsibilities. Consequently, uncertainty should be understood as a socially situated construct that influences adoption decisions through its relationship with livelihood security, risk exposure, and perceived usefulness.

In this regard, the innovation models proposed by Rogers (2003), Davis (1989), and Venkatesh *et al.* (2003) provide valuable insights into how the characteristics of innovations influence adoption decisions. DOI model highlights attributes such as relative advantage, complexity, compatibility, observability and trialability, while TAM and UTAUT emphasise perceived usefulness, ease of use, facilitating conditions, and social influence. These frameworks have significantly advanced understanding of innovation adoption by explaining how individuals evaluate the desirability and usability of innovations. However, their explanatory power is more limited in subsistence agricultural contexts. While DOI, TAM, and UTAUT acknowledge instrumental factors and, to varying degrees, social factors for UTAUT, they do not fully capture the socio-economic, cultural, environmental, and relational conditions that shape adoption among resource-constrained populations. In these settings, food insecurity is closely linked to poverty, environmental uncertainty, unequal access to resources and information, and limited livelihood alternatives. Adoption decisions are therefore influenced not only by the perceived attributes of an innovation but also by broader vulnerabilities and contextual realities that extend beyond the scope of these models.

Another limitation is the emphasis placed on individual decision-making. DOI and TAM largely assume that adoption results from autonomous and rational evaluations of innovation characteristics (Rogers, 2003; Davis, 1989), while UTAUT (Venkatesh *et al.*, 2003)

conceptualises social influence primarily as an external determinant of behavioural intention. Such assumptions do not adequately reflect the collective and relational nature of decision-making in many rural communities, particularly in sub-Saharan Africa. Empirical evidence suggests that adoption decisions are embedded within social networks, household relationships, and community interactions (Kawarazuka & Prain, 2019; Badstue *et al.*, 2020; Shibata *et al.*, 2020). Moreover, these interactions are shaped by gendered norms, roles, and power relations, with gender constituting a central organising principle of social life (Benschop & Verloo, 2015). Consequently, the models pay insufficient attention to how gendered social relations influence access to resources, labour allocation, decision-making authority, perceptions of risk, and ultimately innovation adoption.

The foregoing discussions demonstrate that pro-poor agricultural innovations cannot be adequately understood through instrumental innovation attributes alone. Rather, adoption emerges from the interaction between innovation characteristics, individual capabilities, livelihood vulnerabilities, social relationships, and gendered power structures. A more comprehensive understanding, therefore, requires attention to both the attributes of innovations and the socio-cultural contexts within which adoption decisions are embedded. The next section reviews innovation adoption theories that focus more explicitly on the characteristics and behavioural intentions of adopters, including the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) and the Theory of Planned Behaviour (TPB) (Ajzen, 1991).

2.4.2 Socio-psychological Theories in Agricultural Innovations

The socio-psychological theories, such as the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) and Theory of Planned Behaviour (TPB) (Ajzen, 1991) have been applied in

various agricultural contexts to understand the behavioural drivers of innovation adoption. TRA posit that individuals' behaviours are primarily determined by their intentions, which are shaped by their attitudes toward the behaviour and subjective norms (Davis, 1989). In an investigation of improved grassland management among dairy farmers in Mexico found that farmers' attitudes, Martínez-García *et al.* (2018) found that farmers' attitudes, especially perceptions of the usefulness of grassland management practices, significantly influenced adoption decisions. The study further revealed that established farmers' intentions were strongly shaped by social pressure from influential individuals, whereas new adopters were influenced more by their beliefs about the innovation and farm-specific characteristics. However, while the TRA provides useful insights into the formation of behavioural intentions, intentions alone do not necessarily translate into actual adoption, as various contextual constraints may prevent farmers from implementing innovations.

Evidence from other agricultural settings further highlights the limitations of the TRA in explaining adoption behaviour. For example, Van Hulst and Posthumus (2016), in their study of conservation agriculture adoption in Kenya, found that while attitudes and perceived usefulness strongly shaped adoption intentions, subjective norms had no statistically significant effect. Given the collective nature of subsistence contexts, one would expect social norms to significantly influence the adoption of agricultural innovations. One possible explanation is that farmers may not perceive the innovation as sufficiently beneficial or assess that the costs of adoption outweigh the potential benefits, thereby diminishing the influence of social influence. More fundamentally, the TRA conceptualises subjective norms primarily as external social pressures and therefore provides limited insight into internal and structural factors that shape decision-making, such as resource constraints, unequal access to productive resources, and gendered power relations. This suggests that the predictive power of TRA components may

vary considerably depending on the specific context. This limitation is particularly important in subsistence farming systems, where adoption decisions are often influenced by complex interplay of social, economic, and institutional constraints. As such, TRA offers only limited guidance on factors that most strongly influence the adoption of pro-poor agricultural innovations in subsistence settings.

To address some of these limitations, Zeweld *et al.* (2017) applied the decomposed Theory of Planned Behaviour (TPB), an extension of the TRA, to explore the adoption of agricultural technologies among subsistence farmers. The TPB introduces the concepts of perceived behavioural control, which refers to an individual's belief in their capacity to perform a behaviour and reflects the role of self-efficacy in decision-making (Ajzen, 1991). This concept is salient in subsistence contexts, where farmers operate under significant resource and institutional constraints. In particular, Zeweld *et al.* (2017) found that farmers' intentions to adopt new agricultural technologies were influenced by their attitudes towards innovation, including perceived usefulness, ease of use, and compatibility, as well as their perceived control, encompassing personal efficacy, access to resources, and social capital. While Zeweld *et al.*'s (2017) study demonstrated that farmers' confidence in their abilities and skills positively impacted their adoption decisions, it also revealed that constraints such as limited resources, labour shortages, and time pressures could significantly hinder the uptake of innovations. In subsistence farming, these constraints often disproportionately affect women farmers, who frequently face greater barriers in accessing productive resources and are time and labour-constrained due to greater responsibilities within households. These studies highlight a persistent gap between intention and behaviour in resource-constrained settings, underscoring the importance of perceived control in shaping adoption decisions.

Nevertheless, despite offering a more comprehensive explanation of adoption behaviour than the TRA, the TPB shares a key limitation with both the TRA and the Diffusion of Innovations (DOI) framework: it does not explicitly incorporate gender dynamics. Gender relations shaped by roles, norms and expectations can significantly influence attitudes towards innovations, access to resources, perceived behavioural control, and ultimately adoption decisions. Recognising this limitation, Zeweld *et al.* (2017) suggested the inclusion of gender consideration in subsequent studies to better understand how gendered social structures affect innovation adoption. Addressing this gap represents a key objective of the current study, which seeks to examine how gender dynamics shape the adoption of pro-poor agricultural innovations among subsistence farmers.

Next, the study reviews the Contextualised Bottom-of-the-Pyramid (CBOP) model by Nakata and Weidner (2012).

2.4.3 The Contextualised Bottom of the Pyramid Model and Agriculture Innovations

The CBOP model developed by Nakata and Weidner (2012) is the only framework specifically designed to explain innovation adoption within subsistence and bottom-of-the-pyramid (BoP) contexts. The model integrates Rogers' (2003) diffusion of innovation theory with Sen's (1999) Theory of Poverty to provide a more context-sensitive understanding of how low-income consumers adopt new products and innovations (Figure 2.2 below). By combining insights from both theories, the CBOP model acknowledges that adoption decisions are shaped not only by the characteristics of an innovation but also by the broader socio-economic and environmental realities that characterise subsistence marketplaces. The model incorporates multiple factors that influence adoption behaviour, including contextual conditions, new

product characteristics, social dynamics, and elements of the marketing environment. In so doing, it recognises that individuals living in poverty face unique constraints and opportunities that can affect their capacity and willingness to adopt innovations. The CBOP model, therefore, represents an important advancement over traditional adoption frameworks, which often assume relatively unconstrained decision-making environments and pay limited attention to poverty-related factors.

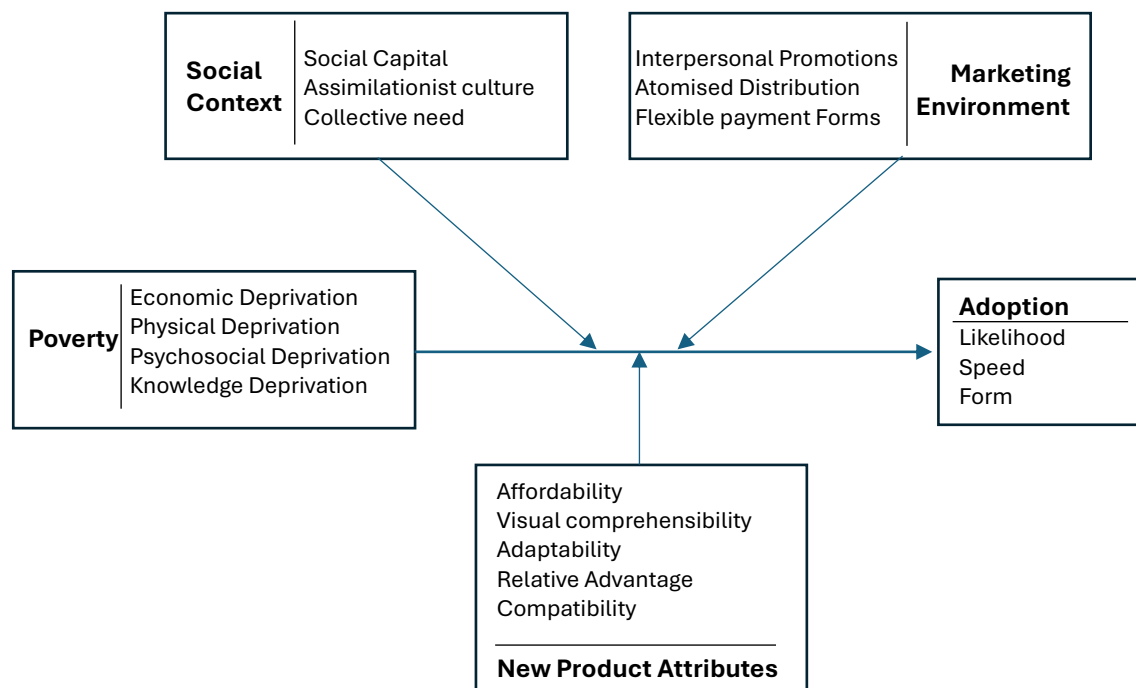


Figure 2.2 Contextualised Bottom of the Pyramid Model (Nakata & Weidner, 2012)

However, although the model was not developed directly from the perspectives and experiences of subsistence consumers themselves, it reflects a growing academic interest in understanding consumption and innovation adoption within subsistence marketplaces. Its integration of poverty-related considerations makes it particularly relevant for examining adoption behaviour among subsistence farming communities. The next section reviews how poverty intersects with innovation adoption within the CBOP framework.

2.4.3.1 Poverty and Adoption in Subsistence Context

The Contextualised Bottom-of-the-Pyramid (CBOP) model focuses on the factors that influence and enhance the adoption of innovations, particularly in ways that minimise the effects of poverty while leveraging the strong social capital in the subsistence contexts. Nakata and Weidner (2012) identify four primary categories that can inhibit the likelihood, speed, and proper uptake of innovations. The first is poverty, which represents the absence of essential material needs for a good life, including personal freedom, health, security, and quality relationships (Sen, 1999; World Bank, 2009). Nakata and Weidner (2012) outlined four interrelated dimensions of poverty that influence adoption behaviour in subsistence contexts: (1) Financial resources, (2) physical deprivations related to health and safety, (3) psychosocial deprivations such as anxiety, stress, and uncertainty, and (4) knowledge deprivation, which includes low reading and writing skills. These dimensions collectively shape how individuals respond to innovations, indicating that the CBOP framework moves beyond simplistic economic dimensions of poverty and brings attention to the lived realities of individuals living in subsistence conditions.

The literature on the adoption of agricultural innovation in subsistence marketplaces consistently highlights the lack of financial and material resources, as well as low levels of education, as major barriers to adoption (FAO, 2018; Curry *et al.*, 2021; Kos *et al.*, 2023). These challenges are further exacerbated for women, who tend to have less access to and control over productive resources, face greater time poverty, and possess lower educational attainment skills than men (Visser & Wangu, 2021; Chikweche *et al.*, 2023). Consequently, women in rural subsistence settings are more deeply marginalised across all dimensions of poverty. This suggests that all dimensions of poverty outlined in the CBOP framework,

economic, physical, psychosocial, and knowledge, tend to impact women more severely than men. However, the CBOP framework treats poverty as a gender-neutral condition, overlooking the gendered nature of deprivation and marginalisation in subsistence contexts.

This omission obscures the structural inequalities that differentiate how women and men experience and respond to poverty and innovation. For example, the cognitive dimension of the framework considers low literacy as a barrier but does not interrogate how gendered disparities in education, rooted in patriarchal norms and roles, further marginalise women's participation in innovation processes. By treating poverty as a homogenous, depersonalised experience, the CBOP underrepresents the complexity of intersectional disadvantage, particularly at the intersection of gender and poverty.

2.4.3.2 Innovation Attributes and Adoption in the Subsistence Context

In their Contextualised Bottom of the Pyramid (CBOP) framework Nakata and Weidner (2012), propose that innovations targeted at subsistence consumers should be designed with specific product attributes that reflect their socio-economic realities. These attributes include affordability, visual comprehension, adaptability, relative advantage, and compatibility. While this framework makes an important contribution by contextualising product design for low-income populations, it falls short in addressing how gender relations intersect with these attributes, particularly in rural agricultural settings.

Affordability is a core product attribute within the CBOP framework, recognising that subsistence consumers operate with extremely limited cash flows and irregular incomes

(Nakata & Weidner, 2012). However, the framework assumes uniform financial constraints across consumers, overlooking the gendered nature of financial access and control. In many rural agricultural households, men typically control household incomes and make key spending decisions, while women may only have access to limited and often informal income streams (Doss, 2013, 2018; Shibata *et al.*, 2020; Visser & Wangu, 2021). Even when women generate income from the sale of farm produce, their earnings are often directed towards household needs, or men control the money generated (Doss, 2013, 2018; Visser & Wangu, 2021), leaving them with little or nothing to invest in innovations. Thus, a product that is deemed ‘affordable’ in general terms may still be inaccessible to women, who lack decision-making power or independent access to capital. The CBOP framework fails to interrogate these intra-household financial dynamics, resulting in overgeneralised and potentially ineffective affordability strategies.

The CBOP framework rightly emphasises visual comprehension, including icons, pictographs, colours, and photos, as essential for low-literacy consumers (Nakata & Weidner, 2012). This is particularly relevant in agricultural contexts where formal education levels are low, especially among rural women, who are disproportionately affected by educational deprivation (Visser & Wangu, 2021; Chikweche *et al.*, 2023). However, while visual aids are necessary, they are not sufficient. The framework underestimates how access to visual and demonstration-based learning opportunities is shaped by gendered norms. Women may not be present in public spaces where demonstrations occur or may be excluded from group training sessions dominated by men. Furthermore, if visual content is designed without an understanding of local gender roles and cultural or language sensitivities, it risks reinforcing stereotypes or failing to communicate effectively with women. This reinforces the importance of a gender-sensitive approach to visual comprehension, which would not only adapt content to low literacy levels

but also design and deliver visuals within inclusive and women-accessible platforms such as community-based groups (Ingutia & Sumelius, 2022) or female facilitators (Chatterjee *et al.*, 2024).

Adaptability with the CBOP refers to the ability of an innovation to function in diverse conditions and be modified to suit local use (Nakata & Weidner, 2012). Adaptability is a crucial feature in fragmented and heterogeneous subsistence settings; however, the CBOP framework fails to account for how gender roles influence the criteria for adaptability. For example, women in agriculture often perform different tasks than men, such as weeding, planting, and post-harvest processing (Andersson *et al.*, 2016; Masamha *et al.*, 2018) and tend to cultivate crops primarily for home consumption, known as subsistence crops (Parmar *et al.*, 2017; Akinola *et al.*, 2020; Omuse *et al.*, 2024). Additionally, women farmers face time and labour constraints due to their responsibilities for household chores and caregiving tasks (Locke *et al.*, 2017; Visser & Wangu, 2021). Adaptability is often evaluated from an instrumental perspective, privileging innovation performance over considerations of time and labour saving or suitability for women's adoption situations. As such, what constitutes an adaptable innovation may differ significantly between female and male farmers. The CBOP framework thus overlooks how gender-differentiated roles and constraints shape perceptions of an innovation's relevance and flexibility.

Relative advantage, which refers to how much better an innovation is compared to existing practices, is central to the CBOP framework. However, Nakata and Weidner (2012) treat relative advantage as objectively demonstrable, ignoring the fact that perceived innovation advantages are socially constructed and shaped by gendered priorities. For male farmers, the

relative advantage of agricultural innovations, such as improved productivity, may be defined in terms of increased yield or commercial profitability. In contrast, women often prioritise food security, household nutrition, and reduced labour burdens; thus, their relative advantage may lie in reduced food risk, labour-saving features or compatibility with domestic responsibilities (Andersson *et al.*, 2016; Masamha *et al.*, 2018; Visser & Wangu, 2021). This indicates that relative advantage is evaluated differently by gender, and it is also acted upon differently depending on gendered power relations.

Compatibility is the extent to which an innovation aligns with local values, past experiences, and the needs of potential adopters (Nakata & Weidner, 2012). In subsistence agricultural settings, gender norms strongly influence roles, responsibilities, and the appropriateness of innovations. For example, while conservation agriculture can significantly enhance farm productivity, women may avoid using it if they find it difficult to implement, regardless of its benefits (Ndiritu *et al.*, 2014; Murray *et al.*, 2016; Khoza *et al.*, 2021). The functional assessment of compatibility within the CBOP overlooks gendered constraints in time and labour because it is built on gender-blind assumptions, which can limit its applicability, especially in rural agricultural contexts.

In summary, each attribute, affordability, visual comprehension, adaptability, relative advantage, and compatibility, interacts with gendered systems of power, access, and decision-making. This highlights the necessity of reconceptualising the CBOP framework through a gender perspective, an approach adopted in the present research.

2.4.3.3 Social Context and Adoption in Subsistence Setting

The social dimension within the CBOP framework by Nakata and Weidner (2012) recognises the importance of social capital, collective needs and assimilationist culture in shaping the adoption behaviour of individuals living in subsistence conditions. In such contexts, where formal institutional structures are weak or inaccessible, social interactions based on trust and reciprocity play a central role in shaping adoption behaviours (Hunecke *et al.*, 2017; Kos *et al.*, 2023). For subsistence farmers, whose livelihoods are intricately tied to subsistence farming, the adoption of pro-poor agricultural innovations is often driven by a shared goal of achieving household and community-level food security, rather than individual status, making the assimilationist culture irrelevant in this context. As such, social networks facilitate cooperation, coordination, mutual support, and the sharing of scarce resources, all of which are vital for innovation uptake (Hunecke *et al.*, 2017; Kos *et al.*, 2023).

While Nakata and Weidner's (2012) CBOP framework rightly positions social relationships as critical to subsistence decision-making, its conceptualisation of the social dimension is limited by the assumption of homogeneity in access to and benefits from social capital. The CBOP framework presents social capital as an inherently positive and evenly distributed resource, accessible to all community members irrespective of their positionality. However, studies show that social networks are not neutral spaces, as they are shaped by hierarchies, exclusions, and power asymmetries, particularly along gender lines (Acker, 1990; Benschop & Verloo, 2015; Stewart *et al.*, 2021; Voola & Voola, 2021). In many rural contexts, patriarchal norms dictate who can participate in key decision-making spaces, access information, or mobilise resources through networks. Women in rural areas have greater domestic responsibilities, which restricts their mobility, thus constraining their ability to engage with external sources of innovations or

influential networks. Instead, they are more likely to be confined to informal, peripheral networks, which may offer emotional support but lack the structural power to influence innovation outcomes. This differential access means that the same network that facilitates innovation adoption for some may reinforce exclusion for others, especially women and marginalised social groups.

Moreover, while the CBOP framework emphasises collective needs as a driver of adoption, it fails to interrogate how these needs are constructed, negotiated, and prioritised within households and communities. The notion of collective need is treated as a unified, consensual construct when in fact it is often the result of gendered bargaining processes within households and broader social institutions. For instance, while the pursuit of food security may be a shared goal in subsistence farming communities, the intra-household negotiation of priorities and labour is often gendered (Kawarazuka & Prain, 2019; Shibata *et al.*, 2020; Farhall & Rickards, 2021). Women, who have disproportionate responsibility for household food production and unpaid labour, often have limited voice or decision-making power when it comes to the adoption of agricultural technologies or practices (FAO, 2018; Shibata *et al.*, 2020). Thus, while the CBOP framework correctly highlights collective needs, it overlooks the conflicting interests and unequal agency within households and communities that shape innovation outcomes. Without accounting for who is included, who is excluded, and how power is exercised within networks, the framework risks oversimplifying the role of social relations in innovation adoption.

2.4.3.4 Marketing Environment and Adoption within the Subsistence Context

In the CBOP framework, Nakata and Weidner's (2012) highlight the marketing environment as a critical dimension influencing the adoption of innovations among individuals in subsistence marketplaces. The marketing environment is conceptualised through three central features: interpersonal interactions, atomised distribution, and flexible payment options. These mechanisms are designed to address the structural, informational, cultural and financial barriers typically faced by low-income consumers in underdeveloped markets. In rural areas, such challenges include the cultural and linguistic diversity of these communities, as well as poor road infrastructure (Chikweche *et al.*, 2023), which often limit the reach of conventional distribution channels

However, the CBOP framework assumes that once channels are localised, innovations will be equitably accessible to all individuals within a community. For instance, atomised distribution refers to decentralised and locally embedded channel structures designed to overcome logistical and socio-cultural barriers, thereby ensuring that innovations reach remote and underserved individuals (Nakata & Weidner, 2012). This perspective overlooks how existing power structures and gender hierarchies influence who controls and participates in these distribution networks. Structural arrangements often position men as heads of households, granting them greater access to productive resources such as land, credit, and extension services (FAO, 2018; Visser & Wangu, 2021). In addition to the structural constraints that limit women's interactions with male extension officers, they face further exclusion due to mobility and time constraints arising from domestic responsibilities (Locke *et al.*, 2017; Visser & Wangu, 2021). As a result, atomised distribution risks reinforcing existing inequalities if it is not intentionally designed with gender-sensitive or inclusive strategies.

The CBOP framework also recognises that interpersonal interactions are central to communication and trust-building in low-literacy, low-infrastructure contexts. However, it treats these interactions as universal enablers, without interrogating the social conditions under which such interactions occur. In patriarchal subsistence settings, women may be discouraged or even prohibited from interacting directly with male extension officers, sales agents, or marketers (Mudege *et al.*, 2015; Hasan *et al.*, 2020). Consequently, communication pathways are often mediated through husbands or male relatives, limiting women's direct access to information and constraining their decision-making authority. While interpersonal engagement is undoubtedly important, the framework fails to account for the socio-cultural constraints that shape participation in such interactions and influence how information is interpreted and acted upon.

The inclusion of flexible payment systems represents another strength of the CBOP marketing environment (Nakata & Weidner, 2012). Such systems are especially relevant where cash liquidity is low and income is seasonal, as is often the case among smallholder subsistence farmers. However, the framework provides insufficient attention to how financial agency is distributed within households. Even where flexible payment systems exist, women may lack control over financial resources, particularly in male-headed households. Moreover, low levels of financial literacy, especially among women, can restrict access to and confidence in using, for example, mobile-based or informal financial services (e.g., Hove & Dubus, 2019). Therefore, payment flexibility alone is not sufficient; what is required is a nuanced understanding of intra-household decision-making processes and financial literacy disparities to explain how market participation is enabled or constrained.

Overall, the CBOP conceptualisation of the marketing environment offers a largely technocratic view of marketing that overlooks the cultural embeddedness of exchanges, the influence of local institutions, and the agency of rural actors. In doing so, it underestimates the extent to which interpersonal and market interactions are shaped by gendered power dynamics, social norms, and broader structural inequalities. To enhance the CBOP's applicability, especially in rural agricultural contexts, the framework needs to be reconceptualised through a gender-aware, context-sensitive, and relational lens. Such an approach would move beyond logistical considerations to engage deeply with the social realities that shape subsistence livelihoods and market participation, including adoption of innovations.

In summary, the adoption of pro-poor agricultural innovations in subsistence marketplaces is shaped by the complex interplay of innovation attributes, the social context, and the marketing environment. In agriculture, these dimensions are not gender-neutral; rather, they are embedded within gendered systems of power, access, and decision-making that influence how individuals engage with and benefit from innovations. Recognising the limitations of the CBOP framework by Nakata and Weidner (2012), this research aims to reconceptualise the framework by incorporating the social constructionist theory of gender by Benschop and Verloo (2015). In doing so, the research extends subsistence marketplace scholarship by foregrounding gender as a constitutive element of innovation adoption rather than a background demographic variable. Integrating these perspectives enables a more contextually grounded understanding of innovation adoption by capturing the lived realities and gendered experiences of subsistence farmers. By situating the analysis within farmers' everyday experiences, this research aims to reveal how gendered roles, responsibilities, and constraints shape access to resources, influence motivations, and condition adoption pathways. Rather than treating gender as a fixed demographic characteristic, the study conceptualises it as a dynamic and relational social

process that structures opportunities, access, and decision-making within subsistence farming households and communities. Drawing on the gaps identified in the existing literature and innovation adoption models; the research addresses the following questions.

(1) How do farmers perceive pro-poor agricultural innovations?

(2) What are the profiles of farmers who adopt pro-poor agricultural innovations?

In the next section, the study reviews the existing literature on gender and the adoption of innovations, with a specific focus on agricultural innovations.

2.5 Gender and Innovations

The literature on subsistence farming overwhelmingly highlights the significant contribution of women in food production (e.g., Fan & Rue, 2020; Visser & Wangu, 2021). Despite this recognition, gender remains inadequately theorised within studies of agricultural innovations. Gender refers to both biological differences between females and males, as well as the socially constructed meanings, roles, identities, and expectations associated with femininity and masculinity that often generate and sustain social inequalities (Benschop & Verloo, 2015). However, studies on agricultural innovation adoption have largely focused on differences between women and men as biological categories, providing descriptive accounts of gender disparities in access and adoption of agricultural innovations (Doss & Morris, 2000; Ndiritu *et al.*, 2014; Gaya *et al.*, 2017; Gebre *et al.*, 2019). While these studies provide important insights, they offer only a partial understanding of the complex social processes that shape innovation adoption. By focusing primarily on differences between women and men, they often overlook the gendered roles, responsibilities, structural positions, and power relations that influence

participation in agricultural marketplaces. Feminist scholars, including Acker (1990), Martin (2006), Benschop and Verloo (2015) and Pecis (2016) emphasise that gender is socially constructed through everyday interactions and institutional practices. From this perspective, gender does not merely describe differences between women and men; rather, it organises social relationships and reproduces power hierarchies by assigning differential value, authority, and access to resources (Acker, 1990). Understanding gender as a social construct, therefore, draws attention to the subjectivities arising from individuals' experiences, interactions, and actions that continually produce and reproduce social inequalities within social organisations (Martin, 2004).

In the context of the current study, the household is conceptualised as a key social organisation through which gender relations are enacted and negotiated. Gender relations shape decision-making processes, production activities, resource allocation, and consumption practices (Benschop & Verloo, 2015), thereby influencing opportunities to access and adopt pro-poor agricultural innovations (Locke *et al.*, 2017; Badstue *et al.*, 2018; Kawarazuka & Prain, 2019). Examining these processes is essential for understanding how innovation adoption is embedded within broader systems of social organisation and power.

Acker's (1990) concept of gendered organisations provides a useful lens for analysing gender relations. She argues that 'patterns of advantage and disadvantage, exploitation and control, action and emotion, and meaning and identity are often influenced by distinctions between female and male, or feminine and masculine roles' (p. 146). Within farming households, these distinctions manifest in structural arrangements that privilege men as household heads and primary farmers, granting them greater access to and control over resources. Women, by

contrast, are relegated to the status of helpers or ‘farmers’ wives,’ reinforcing their dependence on male household members and reproducing subordinate social positions. Gender norms further delineate the appropriate roles and behaviours for women and men, legitimising unequal power relations. These dynamics marginalise women, limiting their opportunities to engage with and adopt innovative products and practices in agriculture (Micheels & Nolan, 2016; Stewart *et al.*, 2021). Understanding these gender dynamics is crucial for promoting the adoption of pro-poor agricultural innovations that can potentially address the food security challenges subsistence farmers face. The next section traces the evolution of gender scholarship in agricultural innovations studies and examines how these perspectives have shaped contemporary understanding of innovation adoption.

2.5.1 Gender Analysis and the Trend in Agriculture

Gender concerns in agriculture have deep historical roots, particularly within the gender and development frameworks that emerged in the 1970s. These frameworks sought to integrate an understanding of gender dynamics into development theory and practice. Contemporary agricultural development agendas have increasingly intersected with broader challenges, such as climate change and food insecurity, particularly in the Global South (Farhall & Rickards, 2021). This intersection has intensified the focus on gender issues within development discourse and led to the rise of the Women in Development (WID) movement, which was prominent from the 1970s to the 1980s. The WID paradigm advocated for women’s participation in economic growth, emphasising the need to address hunger, poverty, and disease through their contributions to household food production (FAO, 2013; UN Women, 2015; Farhall & Rickards, 2021).

Additionally, the WID framework advocated for decent work opportunities for women, aligning with liberal feminist principles that emphasise economic empowerment and labour rights (Benschop & Verloo, 2015). This approach challenged earlier perceptions of women as economic dependents primarily responsible for household tasks and family planning (Chua *et al.*, 2000). This led to the inclusion of women in rural community development initiatives. However, the WID approach has faced criticism for inadvertently reinforcing gendered divisions of labour and reproductive responsibilities by failing to adequately confront the structural inequalities embedded in development practices (Midgley, 2006). For example, while WID-led initiatives included women in agriculture and community development, they neglected to address women's disproportionate workloads and the continued devaluation of feminised labour, such as childcare and domestic tasks, including tending small livestock, which are frequently viewed as peripheral in development policies (Farhall & Rickards, 2021). Despite WID's advocacy for decent work, many women in Kenya and worldwide continue to face systemic barriers to full participation in pro-poor agricultural innovation and rural development. These barriers include poverty, gender-based violence, and entrenched socio-cultural norms that constrain women's mobility, decision-making, and access to resources (USAID, 2020).

In the 1980s, Ester Boserup (1989) examined how modernisation and colonisation affected the economic and social transformation of impoverished nations, particularly in Africa. She found that the introduction of new technologies often displaced women's labour, highlighting that technologies are not gender-neutral and that equal access remains a challenge for both men and women (Boserup, 1989). Following the adoption of the Beijing Platform for Action at the UN World Conference on Women in 1995, several priority areas were identified in agriculture. These included enhancing women's involvement in decision-making processes and promoting

gender equality in natural resources management and environmental protection (UN, 1995). These discussions ignited debates about the feminisation of agriculture and poverty, drawing criticism from feminists who contended that this perspective inadvertently trapped women in poverty.

In the 1990s, the Gender and Development (GAD) approach emerged in response to criticism of the WID framework. Unlike WID, who focused primarily on integrating women into existing development processes, GAD emphasised the social relations between women and men and recognised that sustainable development requires addressing underlying power imbalances and structural inequalities. This perspective led to the adoption of gender mainstreaming, which sought to integrate gender considerations across development policies and programmes, including agricultural knowledge production and resource management (IFAD, 2000). By examining how gender intersects with other social dimensions, gender analysis became a valuable tool for identifying disparities in access to resources, opportunities, and decision-making processes.

The overarching aim of the GAD approach was to foster a more equitable distribution of resources and development benefits. However, evidence from subsistence marketplaces and agricultural development contexts indicates that women continue to face significant disadvantages in accessing productive resources and benefitting equally from development interventions (Beuchelt, 2016; Doss, 2018; FAO, 2020). Furthermore, critics argue that GAD and gender mainstreaming approaches often assume that empowerment can lead to autonomy and free will that transcend existing social structures and cultural norms (Micheels & Nolan, 2016). In practice, however, women's decision-making power is frequently constrained by

gendered institutions and social expectations. As Mudege *et al.* (2015) contend, notions of autonomy that overlook these structural constraints provide only a partial understanding of empowerment. Consequently, contemporary gender analyses increasingly emphasise the need to examine how social norms, institutional arrangements, and power relations shape women's participation in agriculture and rural development.

2.5.2 Gender and the Sustainable Development Goals

There is a growing recognition that achieving the Sustainable Development Goals (SDGs), particularly those related to poverty reduction (SDG 1) and food security (SDG 2), requires the active participation and inclusion of marginalised communities, particularly rural women (Visser & Wangu, 2021). Rural women constitute a significant number of the global subsistence farming population and play a critical role in household food production, nutrition, and livelihood security (Beegle & Christiaensen, 2019; Fan & Rue, 2020). Consequently, development scholars and practitioners increasingly acknowledge that sustainable development cannot be realised without addressing the structural barriers that limit women's participation in agricultural and rural development processes. According to United Nations (UN) Women report (2021), progress across all 17 SDGs is closely linked to addressing gender inequality and promoting women's empowerment. Similarly, development organisations such as CARE (2021) and the World Food Programme (WFP, 2021) emphasise that sustainable food systems cannot be achieved without addressing the underlying gender disparities that shape access to resources, decision-making, and participation in agricultural production.

In response to persistent gender disparities, the Food and Agriculture Organisation (FAO, 2020) introduced a gender policy aimed at promoting women's economic empowerment and ensuring

equitable participation in rural institutions and organisations. Despite these efforts, a substantial body of literature consistently highlights that rural women face systemic disadvantages compared to men, including lower educational attainment, limited control over income, insecure land tenure and restricted access to productive resources (World Bank Group, 2016; FAO, 2020). These inequalities are further reinforced by entrenched social norms that designate men as the primary household decision-makers, thereby dictating what women can and cannot do in both public and private spheres (Alsos *et al.*, 2013; Mudege *et al.*, 2015). Moreover, women's disproportionate responsibilities for reproductive work, including childcare, food preparation, and household maintenance, further constrain their mobility, time, availability, and access to agricultural training, extension services, and innovation opportunities (Locke *et al.*, 2017; Badstue *et al.*, 2018; Ingutia & Sumelius, 2022). These intersecting social, economic, and cultural constraints contribute to the persistence of gendered poverty and food insecurity (Beuchelt, 2016; World Bank Group, 2016; FAO, 2018).

In light of these challenges, SDG 5 on gender equality emerges as central within the broader sustainable development objectives. Gender equality in agriculture is not only a development objective in its own right but also a critical enabler of progress across multiple SDGs. Evidence suggests that improving women's access to productive resources, agricultural technologies, education, and decision-making opportunities can enhance agricultural productivity, strengthen household security (SDG 2), reduce poverty (SDG 1), and stimulate inclusive economic growth through enhanced labour force participation and productivity (SDG 8) (Doss, 2018; FAO, 2020; UN Women, 2021). This helps promote social inclusion and resilience. More recently, discussions surrounding sustainable development have increasingly emphasised the role of science, technology, and Innovation (STI) in addressing complex global challenges. Academic and policy debates highlight the importance of gender-responsive innovation systems as

essential to tackling poverty, inequality, and food insecurity (Hendriks *et al.*, 2021; FAO, 2023). This shift reflects a growing recognition that technological and institutional innovations are not gender-neutral and that their impacts are shaped by existing social relations and power structures. As a result, inclusive and gender-sensitive innovation approaches are increasingly viewed as essential for ensuring that development interventions respond to the needs, priorities, and constraints of marginalised groups.

Against this backdrop, the present research contributes to ongoing debates on gender, agricultural innovations, and sustainable development by examining how gender influences participation and benefits derived from pro-poor agricultural innovations. By integrating a gender perspective into innovation analysis, the study seeks not only to improve understanding of innovation adoption outcomes but also to contribute to broader goals of social justice, equity, and sustainable development embodied within the SDG framework.

2.5.3 Gender and Innovation Inequality

In many rural and agrarian contexts, women contribute substantially to crop cultivation, food processing, and household nutrition. This role positions them as active economic actors and key contributors to food security issues (Fan & Rue, 2020; Visser & Wangu, 2021). Despite their substantial contributions, women often have limited control over resources generated through their labour, including income and agricultural inputs. Instead, these resources are frequently controlled by men, reflecting entrenched gender norms and unequal power relations within households and communities. Such disparities are not confined to developing countries; gendered inequalities in access to and control over productive resources persist across both developing and developed economies (Bastos *et al.*, 2009; Doss, 2013).

Recognition of these inequalities has led scholars and development organisations to increasingly examine gender disparities in resource distribution as a key determinant of agricultural development outcomes. The ‘Gender in Agriculture Sourcebook’ (World Bank *et al.*, 2009) provides a comprehensive review of gender-related concerns across the agricultural value chains. These include disparities in roles and activities, unequal access to and control over productive resources, limited participation in markets and rural organisations, and underrepresentation in leadership roles. Importantly, the sourcebook also identifies deeper structural issues, including socially constructed gender roles, cultural norms, and harmful beliefs, that sustain inequities and negatively affect agricultural productivity, biodiversity, and resilience (World Bank *et al.*, 2009).

While this body of work has significantly advanced the understanding of gender inequalities in agriculture, much of the literature continues to focus on measurable differences in access to resources and participation in agricultural activities. Less attention has been paid to the relational aspects of gender and the ways in which gender relations, agency, and household power dynamics influence the adoption and outcomes of pro-poor agricultural innovations (Locke *et al.*, 2017; Badstue *et al.*, 2018; Kwarazuka & Prain, 2019). Consequently, existing innovation adoption models often overlook the social processes through which innovation decisions are negotiated and enacted. To address this limitation, this research adopts a social-relational approach to explore how gendered interactions and power relations mediate the uptake of pro-poor agricultural innovations.

This perspective is particularly relevant in sub-Saharan Africa, where agriculture is predominantly small-scale and dependent on family labour (e.g., Beegle & Christiaensen, 2019;

Fan & Rue, 2020). Women a substantial share of agricultural labour and food production, often exceeding that of men (Onyalo, 2019; Visser & Wangu, 2021). Within households, women are typically responsible for cultivating indigenous and traditional crops such as roots and tubers (e.g., cassava and yams) (Parmar *et al.*, 2017), cereals (e.g., sorghum and millet) (Motsi *et al.*, 2022), legumes (cowpeas), and leafy vegetables like amaranth (Bokelmann *et al.*, 2022). These crops are not nutritionally important but are also climate-resilient and well-adapted to low-input farming systems. However, both women's contributions and the value of traditional crops remain marginal within agricultural innovation discourse, which tends to prioritise high-value cash crops often controlled by men (Andersson *et al.*, 2016; Masamha *et al.*, 2018). Unlike high-value foods, traditional foods are particularly important for women because they generally require fewer inputs, have shorter production cycles, and can be cultivated within the resource and time constraints associated with women's multiple productive and reproductive responsibilities. Furthermore, these crops enhance household resilience by providing food and income during periods of environmental and economic stress, thereby contributing significantly to food security when other systems fail (FAO, 2016; Parmar *et al.*, 2017; Motsi *et al.*, 2022).

Yet, when it comes to the modern pro-poor agricultural innovations, such as improved seeds, fertilisers, pesticides, or mechanised tools, decisions are often shaped by intra-household and broader societal power structures that privilege male authority (e.g., Beuchelt, 2016; Farhall & Rickards, 2021). In Kenya, for instance, many rural women depend on male relatives or spouses to gain access to agricultural inputs, extension services, training opportunities, and other resources necessary for innovation adoption (Onyalo, 2019). These barriers persist despite national and international commitments to promoting sustainable agriculture and

reducing hunger, revealing the extent to which gendered structures continue to be overlooked in agricultural innovation strategies (Doss, 2013; FAO, 2020).

At the same time, emerging challenges portray women as passive recipients of agricultural change. Studies by Locke *et al.* (2017), Badstue *et al.* (2018) and Kwarazuka and Prain (2019) have demonstrated that women actively participate in innovation-related decision-making, often negotiating their involvement within unequal household power structures. These findings highlight not only women's agency but also the relational nature of innovation adoption, revealing how decisions are shaped by the complex interplay of gendered roles, expectations, access to resources, and authority. Such evidence highlights the need to move beyond simplistic comparisons between women and men towards analyses that capture the social processes underlying innovation adoption.

Despite these advances, limited attention has been given to the gender relations that underpin agricultural innovations, particularly among subsistence farming households in Kenya. Existing studies (e.g., Ndiritu *et al.*, 2014; Ingutia & Sumelius, 2022) largely employ individualistic or binary analytical frameworks that focus on differences between women and men while overlooking the layered, negotiated, context-specific, and power-laden nature of innovation adoption. Building on emerging literature that centres on gender relations in agricultural innovation (e.g., Locke *et al.*, 2017; Kwarazuka & Prain, 2019), this research adopts a social-relational approach to examine how gender dynamics shape the adoption of pro-poor agricultural innovations among subsistence farming households in Kenya. In so doing, it addresses an important gap in literature and raises the third research question:

(3) How do gender relations impact the adoption of agricultural innovations among subsistence farmers?

2.6 Chapter Summary

The chapter reviewed the literature on agricultural innovations within the context of resource-constrained rural farming systems. In these settings, pro-poor agricultural innovations, such as improved seed varieties and the introduction of new crops that offer incremental advantages over existing alternatives, are designed to support farmers in meeting their basic livelihood needs, particularly amid escalating environmental challenges. Despite their promise, the adoption rates of these innovations remain consistently low (Hermans *et al.*, 2021; Osewe *et al.*, 2021; Crudeli *et al.*, 2022; Nyairo *et al.*, 2022; Bilal & Jaghdani, 2024). This persistent gap in uptake highlights the need for a deeper understanding of how farmers perceive the value of pro-poor agricultural innovations and the factors that shape their adoption decisions.

The review further demonstrates that subsistence farmers are not a homogeneous group (Ayisi *et al.*, 2022). Rather, their adoption behaviours are shaped by a range of social, cultural, and institutional contexts. Among these, gender emerges as a critical dimension, shaping not only access to innovations but also the extent, manner, and sustainability of their adoption. This indicates that the technical merit or innovativeness of an innovation alone does not fully explain variations in adoption outcomes. Instead, adoption is mediated by broader social and structural conditions, particularly those embedded within gender relations. Recognising this complexity, the present research moves beyond simplistic binary distinctions between adopters and non-adopters to explore the nuanced, context-specific motivations, constraints, and relational dynamics that influence farmers' decisions regarding agricultural innovations.

The literature review also reveals important limitations in existing innovation adoption models, including DOI (Rogers, 2003), TAM (Davis, 1989), TAM2 (Venkatesh & Davis, 2000),

UTAUT (Venkatesh *et al.*, 2003), TRA (Fishbein & Ajzen, 1975), TPB (Ajzen, 1991) and CBOP (Nakata & Weidner, 2012). While these frameworks offer valuable insights into adoption behaviour, they do not adequately account for the influence of gender dynamics on innovation adoption. To address this gap, this research adopts the Contextualised Bottom-of-the-Pyramid model as its guiding framework and integrates it with the social construction approach to gender (Benschop & Verloo, 2015). This interdisciplinary framework facilitates a critical exploration of how the adoption of pro-poor agricultural innovations is shaped by localised, socially embedded, and gendered experiences. By situating the analysis within the rural context of Kenya, the study aims to uncover how gendered power relations and institutional structures mediate innovation adoption processes, thereby contributing to a more inclusive and contextually grounded understanding of agricultural productivity and food security among subsistence farming communities.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter begins by explaining the research philosophy that guides the research process. It then provides details on the context of the study, research ethics, research strategy, and data collection methods. Next, it discusses data management and analysis, followed by research validity and credibility. Finally, it articulates the ethnographer's identity and roles in the research.

3.2 Research Philosophy

The main objective of this research is to gain insight into how gender relations impact the adoption of pro-poor agricultural innovations among subsistence farmers. The research is grounded in a social constructionist ontology and an interpretivist epistemology, which together provide the philosophical foundation for exploring the lived experiences of subsistence farmers in Kenya. Ontology concerns the nature of reality and what can be known about it (Crotty, 2003; Oyeinkorikiye *et al.*, 2017). This research adopts a relativist ontology position, which posits that reality is socially and subjectively constructed, meaning that individuals perceive and interpret their experiences based on their unique personal, cultural, and temporal contexts, resulting in multiple realities rather than a single objective truth (Crotty, 2003; Oyeinkorikiye *et al.*, 2017). Reality is therefore understood as emerging through individuals' interactions with their social world and the meaning they attach to those experiences (Crotty, 2003).

Within this ontological framework, gender is conceptualised not as a fixed biological attribute, but as a dynamic and socially constructed phenomenon. The social constructionist approach views gender as continuously produced and reproduced through everyday interactions, institutional practices, cultural narratives, and power relations (Benschop & Verloo, 2015; Voola & Voola, 2021). As Vera (2016) argues, ‘social construction is what individuals perceive to be real and what is taken for granted while conducting everyday life’ (p. 5). These perceptions are sustained by social institutions, legitimised through shared meanings, and reinforced by symbolic mechanisms that reflect and reproduce broader societal structures (Vera, 2016). Consequently, this perspective contrasts with the positivist paradigm, which assumes that reality is objective, observable, measurable, and independent of human perception (Fletcher, 2006). Whereas positivism seeks universal explanations, social constructionism acknowledges the contextual, contested, and evolving nature of social phenomena such as gender relations.

Closely linked to ontology is epistemology, which concerns how knowledge is generated and understood (Crotty, 2003; Oyeinkorikiye *et al.*, 2017). This research adopts an interpretivist epistemological perspective, which seeks to understand the subjective meanings individuals attach to their experiences within specific social contexts (Crotty, 2003; Oyeinkorikiye *et al.*, 2017). Interpretivism holds that reality is not simply discovered but actively constructed through human interaction and interpretation (Jarzabkowski *et al.*, 2014; Dumont, 2023). Accordingly, the researcher does not remain detached from the research process but engages with participants in the co-construction of meaning (Jarzabkowski *et al.*, 2014; Dumont, 2023). This epistemological stance is particularly suited to this research on gender relations in subsistence agriculture because meanings and practices are deeply embedded within social norms, cultural expectations, and everyday realities that cannot be separated from their context.

By privileging the participants' perspectives, especially those of groups whose voices are often marginalised, such as rural women, interpretivism enables a bottom-up understanding of how pro-poor agricultural innovations are perceived, negotiated and adopted.

Interpretivism differs significantly from objectivist and subjectivist approaches to knowledge. Objectivists assume that knowledge exists independently of the human mind and can be discovered through empirical observation, yielding findings that are verifiable, generalisable and free from social ideological influence (Crotty, 2003; Oyeinkorikiye *et al.*, 2017). Subjectivism, on the other hand, suggests that knowledge is derived from individual experiences and personal interpretations, often to the exclusion of shared or collective meaning (Crotty, 2003; Oyeinkorikiye *et al.*, 2017). Interpretivism occupies a middle ground by recognising that meanings are both individually experienced and socially produced. Thus, by situating the study within this ontological and epistemological stance, this research acknowledges that gender relations are fluid, relational, and deeply embedded in specific socio-cultural contexts. This perspective allows for a richer and more nuanced understanding of how both women and men experience, negotiate, and respond to pro-poor agricultural innovations in their everyday lives.

Consistent with these philosophical assumptions, this research employs a qualitative ethnographic approach. Ethnography entails immersive engagement with participants in their natural settings to understand how they interpret and navigate their social worlds (Jarzabkowski *et al.*, 2014; Dumont, 2023). Ethnography draws on multiple data collection methods, including participant observation, focus group discussions, in-depth interviews, informal discussions,

and ongoing interactions to uncover both what people do and how they make sense of their actions within their settings (Williamson, 2006; Jarzabkowski *et al.*, 2014; Dumont, 2023).

As Hammersley (2018) argues, a key strength of ethnography lies in its ability to provide direct, contextualised observations of behaviours, revealing not only what people say they do but also how they act and why. Such insights may not emerge through interviews and surveys alone. Ethnographic methods therefore, provide richer and more nuanced understanding of social phenomena than structured questionnaires and survey-based approaches (Hammersley, 2018). Since individuals are not always fully aware of their own practices or the environmental influences shaping them, direct observation provides a more nuanced understanding of participants' actions and practices (Hammersley, 2018). Firsthand engagement within participants' environments allowed for a context-sensitive interpretation of their lived experiences that might otherwise go unnoticed. In this way, the researcher becomes an active and attentive participant within the studied community or group, building trust and rapport to facilitate richer data collection (Dumont, 2023). Sustained field presence also supported methodological triangulation, allowing for the cross-validation of findings across multiple data sources, participant observation, in-depth interviews, focus group discussions, and Key Informant interviews, thereby enhancing the credibility and rigour of the research (Jerolmack & Khan, 2014; Hammersley, 2018; Dumont, 2023).

Ethnography, as a qualitative research methodology, involves the detailed description and interpretation of human behaviour and social life (Jarzabkowski *et al.*, 2014; Dumont, 2023). It is rooted in an inductive approach, where close engagement with participating subsistence farmers, through observations, focus group discussions, and interviews, allows patterns of

meaning or themes to emerge organically from the field data rather than being imposed a priori (Jarzabkowski *et al.*, 2014; Gioia *et al.*, 2013). This iterative process enabled theoretical insights to be grounded in participants' lived experiences, a key criterion of methodological rigour in qualitative research (Gioia *et al.*, 2013).

The analysis of the ethnographic data involved continual reflection, interpretation, and analysis of field data. Field notes were reworked and interpreted, and participants' direct quotes were integrated into broader narratives and thematic structures. The interpretations were further developed through the use of thick descriptions, a defining feature of ethnographic analysis, which captures not only observed behaviours but also the meanings assigned to these events by the participants and the researcher (Jarzabkowski *et al.*, 2014; Dumont, 2023). By weaving together these detailed descriptions, the research developed a coherent analytical account of how gender dynamics influence the adoption of pro-poor agricultural innovations among subsistence farmers in Kenya.

Ultimately, this interpretive process sought to produce findings that are both empirically grounded and analytically rich, linking participants' lived experiences with broader theoretical concepts and contributing to theory development (Jarzabkowski *et al.*, 2014; Dumont, 2023). The next section discusses the research context.

3.3 Research Context

The research was conducted in Kenya, specifically focusing on the agricultural sector, which plays a vital role in rural livelihoods, poverty reduction, and the achievement of national food

security (Onyalo, 2019; World Bank Group, 2019; National Information Platform for Food Security and Nutrition (NIPFN) and Kenya Institute of Public Policy Research and Analysis (KIPPRA), 2021; Central Bank of Kenya (CBK), 2024). Subsistence farming accounts for approximately 21% of Kenya's gross domestic product (GDP) (NIPFN & KIPPRA, 2021; CBK, 2024), and directly support around 70% of the rural population (World Bank Group, 2019; NIPFN & KIPPRA, 2021). Most rural households engage in small-scale subsistence farming, typically combining crop cultivation and animal husbandry on plots of less than one hectare. Agricultural production in Kenya is predominantly rain-fed, with only about 2 % of agricultural land under irrigation (CBK, 2024; KNBS, 2024). As a result, subsistence agriculture is highly vulnerable to environmental shocks, especially in arid and semi-arid (ASAL) regions, such as Mbeere North and Tigania East, where such disruptions tend to be more severe (IFAD, 2019). Consequently, agricultural yields fluctuate considerably with changes in rainfall patterns, leading to food shortages.

In Kenya, poverty is more prevalent in rural areas, affecting roughly 40% of the population, with women and youth being disproportionately impacted (IFAD, 2019). The ASALs, which cover more than 80% of the country's landmass and are home to nearly one-third of the population, experience some of the country's highest levels of poverty and food insecurity (IFAD, 2019). Women play a crucial role in the agricultural sector, comprising between 42% and 65% of the agricultural workforce, depending on the region and crop type, while simultaneously bearing the burden of domestic responsibilities (Onyalo, 2019). Yet, their contributions are often constrained by entrenched gender norms that prescribe the division of labour, access to productive resources and decision-making power. As a result, women continue to experience higher levels of economic, social, and political subordination, leading

to greater levels of poverty among women compared to men (World Bank Group, 2016; Onyalo, 2019; FAO, 2020).

Agricultural productivity in Kenya is further constrained by multiple systemic challenges, including high costs of agricultural inputs such as for seeds, fertilisers, and pesticides; limited access to finance; adverse weather conditions; high transport costs; and weak market access linkages (Central Bank of Kenya [CBK], 2024). Mechanisation remains minimal, with most farmers relying on manual labour and basic hand tools, while agricultural extension services are often understaffed and under resourced (IFAD, 2019; Central Bank of Kenya, 2024). Public investment in agriculture also remains relatively low, accounting for approximately 4% of its national budget, which falls below both the continental average of 4.5% and the 10% target established under the Maputo Declaration (IFAD, 2019). Although the Kenyan government initiatives, such as fertiliser subsidy programs, seek to improve agricultural productivity, access is often uneven due to supply shortages, administrative inefficiencies, and the preferential treatment of commercial farmers and cooperative members (CBK, 2024). Together, these intersecting structural constraints continue to undermine rural livelihoods and limit opportunities for inclusive agricultural development.

Against this backdrop, growing concerns about climate change and environmental degradation have intensified calls for innovations that strengthen the resilience of smallholder farming systems. This research, therefore, focused on two ASAL sub-counties - Mbeere North in Embu County and Tigania East in Meru County – where livelihoods depend heavily on rain-fed subsistence agriculture (NDMA, 2024; NIPFN & KIPPRA, 2021). Data were collected in Kanyuambora and Kianthenge sub-locations in Mbeere North and Mikinduri sub-location in

Tigania East. These sites were selected because subsistence agriculture constitutes the primary livelihood activity and farmers face recurrent environmental shocks that threaten food security and household wellbeing (NIPFN & KIPPRA, 2021).

Mbeere North is a rural constituency in Embu County with a population of 108,881 (KNBS, 2022). Settlement patterns are characterised by dispersed homesteads, resulting in a relatively low population density (KNBS, 2022). The primary economic activity in this region is subsistence agriculture, with most households cultivating ecologically marginal land primarily for home consumption (Embu County Government, 2019). Farmers grow a range of drought-tolerant crops, including maize, sorghum, pearl millet, beans, cowpeas, green grams, cassava, and sweet potatoes, often intercropping the crops to ensure a diverse nutrient supply (Embu County Government, 2019). Farmers also rear livestock, including cows, goats, and poultry, which also provides an additional source of food and income. Despite these livelihood strategies, the area's dependence on rain-fed agriculture renders the community highly vulnerable to climatic variability and environmental shocks, frequently resulting in seasonal food shortages (Embu County Government, 2019; Wandia, 2024). These challenges are further compounded by poor market access, which limits opportunities to generate income from selling surplus produce. As a result, poverty and food insecurity remain widespread, making Mbeere North a priority area for interventions aimed at enhancing agricultural productivity, resilience, and livelihood security (Ndungu, 2019; Wandia, 2024).

Tigania East, located in Meru County, has a population of about 72,549 people (KNBS, 2022). The sub-county lies within the lower Midland agroecological zone, where farming and livestock keeping constitute the main livelihood activities. Farmers cultivate bananas, often

intercropped with coffee and Khat (a psychostimulant plant), while also keeping cattle, sheep, goats, and poultry (County Government of Meru, 2023). Although agriculture forms the backbone of the local economy, many households experience persistent poverty and livelihood insecurity. Akwalu and Muchai (2020) attribute this to limited access to physical assets, low agricultural productivity, and restricted access to healthcare and education services. Agricultural production is further constrained by difficulties in accessing farm inputs such as fertilisers and improved seeds, as well as challenges in transporting produce to markets due to inadequate infrastructure (Kenya Agricultural Productivity Programme (KAPP), Republic of Kenya (RoK) and World Bank Group, n.d). These constraints reduce farmers' capacity to improve productivity and income, reinforcing cycles of poverty and vulnerability.

The two sites, Mbeere North and Tigania East, were selected because, although they share similar environmental, agroecological, and socioeconomic challenges, they differ in the types of crops cultivated. This enabled the study to explore how gender dynamics shape the adoption of different pro-poor agricultural innovations across contrasting farming contexts. The pro-poor agricultural innovations identified in this research emerged inductively from farmers' responses to low productivity and environmental challenges. The innovations included both product innovations, such as improved cassava varieties and *Muguka* (a newly introduced crop), and process innovations, particularly participation in farmers' groups to enhance market access.

A key difference that emerged between the two sites was the institutional context of innovation adoption. In Mbeere North, farmers have adopted improved cassava varieties and *Muguka* primarily through household-level decision-making, with limited collective mechanisms supporting innovation adoption. In contrast, Tigania East features an organised farmers' group

that provide an additional institutional layer that actively promotes innovation. The farmers' group functions not only as a new form of collective action and social learning, but also as a channel for disseminating information, providing training, improving access to resources, and facilitating the adoption of innovations. Therefore, the farmer's group helps accelerate innovation uptake beyond what household networks alone might achieve. This emerging comparative approach enabled the research to generate insights into whether subsistence farmers in different locations share similar enablers and barriers to adopting pro-poor agricultural innovations. Understanding these differing institutional contexts is particularly important when considering the gendered dimensions of adoption. Moreover, this understanding has important implications for policies and interventions that are better tailored to the institutional and gendered realities of different farming communities.

3.4 Research Strategy

This section discusses the sampling procedures and strategies used to gain access to the study location and the participants. It also explains the data collection methods, which include participant observations, focus group discussions, and key informant interviews.

3.4.1 Participant Selection and Sample Sizes

In ethnographic research, careful selection of informants who are knowledgeable about the phenomenon under investigation is critical to generating meaningful insights. This research employed purposive and snowball sampling to identify information-rich cases that could offer in-depth perspectives into the phenomenon under study (Williamson, 2006). The participants were selected because they possessed relevant lived experiences, were accessible to the

researcher, and were willing to participate in the research (Hammersley & Atkinson, 2007; Hammersley, 2018). Access was facilitated through previously established networks, which eliminated the need to seek formal permission from gatekeepers. The selection criteria specifically targeted subsistence farmers who reported having adopted pro-poor agricultural innovations. This approach was designed to elicit farmers' perceptions, experiences, and interpretations of innovations adopted, thereby directly responding to the research questions.

To overcome difficulties in recruiting participants, the selection process began with key local contacts, who provided information about some of the most active farmers in the study area. These initial informants subsequently introduced the researcher to other potential participants, making snowball sampling useful for identifying relevant cases. Although an initial sample size of 50 participants was estimated for planning purposes, including budgeting and scheduling data collection activities (Guest *et al.*, 2020), the final sample comprised 37 subsistence farmers. This was considered sufficient because the primary objective of the research was to gather in-depth insights into how gender relations influence the adoption of pro-poor agricultural innovations, rather than to quantify their effects. Of the 37 participants, 29 were women and 8 were men. The purpose of participant selection was not to achieve numerical balance between women and men, but to include individuals whose experiences could illuminate the social relations, cultural practices, and power structures shaping innovation adoption. This reflects the principles of ethnographic research, which prioritise depth over numerical breadth or demographic representativeness (Hammersley, 2018; Dahal *et al.*, 2024). Accordingly, participants were selected not to be statistically representative, but because they occupied roles relevant to the phenomenon under investigation. The sample included a larger number of female farmers, which is significant given their primary role in food production, as also documented in previous studies (e.g., Onyalo, 2019; Visser & Wangu, 2021). Despite their

significant contribution, women's experiences of adopting pro-poor agricultural innovations remain under-researched and poorly understood. The inclusion of 8 male participants was equally important, as their roles in household decision-making, ownership and control of productive resources, and positions of authority, as highlighted by Shibata *et al.* (2020) and Quisumbing & Doss (2021), provided valuable insights into the broader gender relations surrounding innovation adoption. While the sample size and composition may not have been balanced, it was appropriate for the ethnographic purpose of this research. Consistent with ethnographic research, the aim was to provide analytical depth, meaning, and contextual insights over numerical representativeness.

Consistent with immersive ethnographic research, the research began with farmers' own accounts of their identities, experiences, and local contexts. These accounts provided an entry point for understanding how pro-poor agricultural innovations are interpreted and adopted in everyday life. Participants were purposely selected to capture variation in gender, age, marital status, farming practices, and levels of engagement with agricultural innovations. The sample included adults aged 18 and above from both male-headed and female-headed households. While ethnographic research does not primarily seek representativeness across social groups and cultures (Dahal *et al.*, 2024), including participants with diverse backgrounds, enabled the researcher to observe a wider range of experiences, roles, and community dynamics than would have been possible with a more homogeneous sample. In particular, the inclusion of both women and men revealed underlying tensions, inequalities, and competing interests that influence how pro-poor innovations are perceived and adopted. These differences highlighted how gender norms, access to resources, and social networks shape decision-making processes related to pro-poor agricultural innovations.

As fieldwork progressed, the sampling strategy remained flexible and responsive to emerging findings. This iterative approach allowed the researcher to include participants whose experiences, practices, and perspectives became relevant for further questioning and observation. To deepen the analysis, five participants, four women (including two from Tigania East) and one man, were interviewed on two separate occasions. In addition, the daily routines of two female farmers from Mbeere North were closely observed. This iterative and context-rich approach generated a richer understanding of the diverse profiles of adopting farmers and the gendered dynamics that influence innovation adoption, directly addressing the study's second and third research questions.

Beyond the farmers participants, this research also included three key informants, comprising two sub-county government officials and one community leader. These individuals were selected because of their roles and experiences working closely with community members. In total, the research generated 45 interviews, comprising five focus group discussions, interviews with subsistence farmers and three key informants. In addition, two participant observations were conducted. These observations focused on farming activities, agricultural innovations in use, the influence of social and cultural practices on innovation adoption, gender dynamics related to farming activities and innovation, as well as farmers' interactions and behaviour towards pro-poor agricultural innovations. Overall, the sample size fell within the recommended range of 25-50 interviews for ethnographic research (e.g., Moser & Korstjens, 2018). To protect participants' privacy and confidentiality, all names used in this dissertation are pseudonyms and do not represent the actual names of participants involved.

3.5 Data Collection Methods

The data collection took place in Kanyuambora and Kianthenge location of Mbeere North sub-county, and Mikunduri in Tigania East. This process spanned 30 days across two years, specifically, in December 2021 and December 2023. The time of data collection coincided with the post-harvest season, when household food availability and cash flows were relatively stable following the harvest season. Despite these relatively favourable conditions, evidence of necessity-driven adoption of pro-poor agricultural innovations remained apparent among subsistence farmers. Participants frequently described adopting innovations as a means to meet their basic household food needs, generate income, and manage livelihood risks posed by climate change. This is consistent with Venugopal and Chakrabarti (2022), who observed that subsistence farmers often adopt adaptation strategies primarily to meet basic needs, such as food security and income generation. Observing such adoption behaviour during a comparatively secure post-harvest period strengthens the interpretation that the need to meet basic food requirements remained a central driver of innovation uptake. This suggests that necessity-driven adoption may be even more pronounced during other times of the year when food production and availability are lower, such as during drought.

The duration of the fieldwork was deemed sufficient to enable triangulation and verification of data collected through field observations, focus group discussions, interviews, and informal conversations. This approach allowed the researcher to compare participants' reported experiences with observed practices, thereby identifying and exploring variations between what participants said and what they did in practices (Adler & Adler, 2003). Meaningful engagement was further facilitated by the researcher's prior relationship with participants and familiarity with the local socio-cultural context. In addition, preliminary visits were conducted

before formal data collection to establish rapport, explain the research process, and prepare participants for their involvement in the study.

Data collection began once participants indicated their readiness to engage. The process began with focus group discussions, followed by informal interviews and conversations, participant observations, and finally, interviews with Key Informants. The inclusion of Key Informants was necessary as they provided broader contextual and stakeholder perspectives on community dynamics and the adoption of agricultural innovations. After initial data analysis, participant validation was undertaken to enhance the credibility of the findings. This involved presenting participants with interview transcripts, field notes from observed events, and visual images taken during field work to verify interpretations, clarifying emerging concepts, and addressing any potential misunderstandings arising from translation dilemmas.

Table 3.1 below summarises the data collection methods employed in this study, together with their strengths and limitations. A more detailed discussion of each method is provided in the following sections.

Table 3.1 Data Collection Methods

	Advantages	Disadvantages
Participant Observation	»Acquired rich contextual data through deep, firsthand understanding of behaviours, routines, and interactions within the participant's natural settings. »Gained insights into social dynamics, including power dynamics and gender roles, that participants could not express.	»Managing participant expectations. »Emotional strain of being unable to help participants with their challenges. »Role conflict, balancing between being a participant and an observer.
Focus Group Discussion	»Allowed for rich, diverse viewpoints regarding participants' experiences, attitudes, and beliefs. »Interaction-driven insights that encouraged participants to explain, question, and build on each other's responses, clarify ideas and contradictions, which led to deeper, unexpected insights. »Same gender FGDs fostered a sense of peer support and shared experiences, making participants more comfortable expressing their views. »Helped gain insights on gender norms, collective attitudes, and group consensus, which may not emerge in one-on-one interviews.	»Dominance of more talkative participants, particularly in mixed FGDs, where men tended to dominate discussions while women remained silent and less forthcoming. »Produced complex and overlapping conversations that were challenging to transcribe, code, and analyse.
Informal Conversations	»Informal conversations helped build support and trust with participants. »Captured insights that structured interviews may have missed in such dynamic and unpredictable settings.	»Due to their unstructured and spontaneous nature, these interactions easily drifted into unrelated topics, making it challenging to analyse data.
Key Informant Interviews	»Provided specialised knowledge and informed perspectives on pro-poor agricultural innovations. »Supplied information that is not documented or publicly available, particularly regarding participants in marginalised settings.	»There was a likelihood of presenting subjective opinions and biased views due to holding positions of power and authority. »Their perspectives sometimes did not reflect the views of the wider population, particularly the marginalised and less vocal groups. »Deliberate control or filtering of information provided to protect personal or institutional reputations, which affected the completeness of the data collected.

The use of multiple data collection methods, as outlined above, enabled the researcher to cross-check findings, thereby strengthening triangulation and enhancing the credibility and trustworthiness of this research.

3.5.1 Participant Observations

In social research, participant observation connects the researcher to fundamental human experiences by enabling the discovery of the ‘how’ and ‘why’ of human behaviour within specific contexts through immersion (Jarzabkowski *et al.*, 2014; Dumont, 2023). Dumont (2023) describes immersion as the active participation in the everyday lives of participants, allowing the researcher to experience their routines, challenges, and conditions firsthand. Through this process, the ethnographer assumes a social role by becoming directly or indirectly involved in the core activities in the field. In the present research, the researcher’s direct engagement in the daily activities of subsistence farmers provided valuable insights into their lived realities, deepening the understanding of agricultural innovation adoption from an insider perspective.

Participation in farmers' daily activities also fostered acceptance, which is essential for gaining access to participants’ intimate and authentic experiences (Jarzabkowski *et al.*, 2014; Langley & Klag, 2019; Dumont, 2023). Most importantly, familiarity with participants’ cultural practices facilitated a smooth entry into the field (Dumont, 2023). For instance, the researcher’s upbringing in a rural setting informed appropriate modes of dress and behaviour among participants. Wearing a headscarf and a *leso*, a brightly coloured wrap cloth commonly worn by women in East Africa, was particularly significant. While the *leso* carries varied cultural meanings across East Africa, rural women in Kenya often wear it around the waist as a modest

and practical work garment. By wearing a headscarf and *leso* (Figure 3.1 below), the researcher demonstrated cultural awareness and respect, helping participants feel at ease and fostering the trust necessary for building close relationships (Dumont, 2022).

Moreover, observing participants in their natural settings, particularly on their farms, enabled them to behave more naturally, thereby reducing the observer effect and allowing the researcher to capture genuine actions, interactions, and behaviours (Dumont, 2023). By prioritising observation during specific farming and household tasks, the researcher was able to better understand the social interactions and behavioural practices that shaped the adoption of pro-poor agricultural innovations. As such, participant observations offered first-hand experience and insights into practices that participants may take for granted and that often remain invisible to outsiders.

Participant observations were conducted over five consecutive days, with each session lasting approximately 5 hours. The immersion process combined direct observation with formal interviews and informal conversations, generating rich, context-specific insights. Two female subsistence farmers from Mbeere North were purposefully selected for observation due to the relevance of their perspectives during previous focus group discussions and their willingness to participate. Guided by an observation protocol, the researcher closely accompanied the participants, observing and documenting both farm and household activities. Particular attention was paid to the types of pro-poor agricultural innovations adopted and the ways in which gender and social roles are enacted in relation to these innovations. Observations were complemented by both formal and spontaneous conversations, which provided additional nuance and depth. This methodological approach allowed the researcher to uncover and

theorise broader social dynamics surrounding the adoption of pro-poor agricultural innovations through sustained engagement in the field (Bourgoin & Harvey, 2018). While care was taken to minimise interference with the farmers' daily activities, the researcher occasionally assisted with tasks, such as weeding or washing dishes, when appropriate. This gesture of participation helped build rapport and foster trust while maintaining a balance between observation and involvement. Consequently, the researcher gained a more grounded and critical analysis of how pro-poor agricultural innovations are adopted in everyday life.

The field notes below illustrate the initial experiences in farm participation and observation.

No amount of time spent working with rural communities as a consultant had prepared me for a day of learning from the participants. Luckily, having contact with me helped calm my nerves. When we arrived, our host had set up chairs and a stool that served as a table outside (see Figure 3.1 below). I had brought some food items, and our host, Betina, was glad to accept them. Betina's husband welcomed us and invited us to take a seat. No sooner had we sat down than he excused himself, saying he needed to leave to see a friend in the town centre. Betina offered us tea but apologised for not having enough milk to make it creamier. She lamented that milk prices had gone up, but since she was expecting me, she had to dig deep into her pocket. I felt guilty that she had to go the extra mile on my account. She was also quick to express her gratitude for the loaves of bread and other items I had brought. She spat on her chest as a sign of appreciation while muttering words of blessing to me. When she brought out the same bread I had brought to share, I politely declined, knowing it would be the family meal for the next day.

Spending five hours with Betina allowed me to appreciate the amount of work she accomplished in a day. Her activities revolved around farm activities (See Figure 3.2), including feeding and watering their only cow, ensuring the goats were well-fed, and securely tethering them to prevent them from wandering onto the neighbours' farm. She noted that her days were typically busy with farm work alongside household chores like

cooking and washing. This was evident as it was challenging to keep up with her pace. Betina shared that her grown children had migrated to urban areas in search of formal employment, leaving her and her husband to manage all the farm work at their advanced age. She mentioned that her husband often goes out to socialise with friends. As a result, she seeks help with the farm tasks from neighbours, who would be willing to accept food items as compensation when money is not available.

After a long day, Betina's husband returned home, visibly inebriated and struggling to walk steadily. He asked Betina, in what appeared rude tone, if she had prepared food for him. Not wanting to interfere with her responsibilities towards her husband, I expressed my gratitude for her time and politely requested to be allowed to leave. It was only after we had stepped out of Betina's homestead that my contact revealed that Betina's husband occasionally became violent when drunk' [Field notes, December 2023].

As noted in the field note, participation through immersion allowed the researcher to witness and describe what it means to be a woman in rural areas. This facilitated the conceptualisation and theorisation (Bourgoin & Harvey, 2018) of how the socially constructed gender roles impact pro-poor agricultural innovations. Observing and participating in the daily activities of the research participant, Betina, revealed the heavy workload women often undertake single-handedly (Figure 3.2 below). These observations highlighted how women's simultaneous responsibilities for farm work and household chores can restrict their time and mobility, thereby limiting their ability to access and engage with new agricultural innovations.

Furthermore, men's position as heads of households, with greater autonomy and authority over women, was evident in Betina's relationship with her husband. Betina's husband's expectation that she serves him food reinforced the hegemonic power relations that regulate and

subordinate women. According to the contact person, such dynamics are common in most rural households. These gender relations reflect broader patterns of social inequality that can adversely affect the adoption and diffusion of pro-poor agricultural innovations.

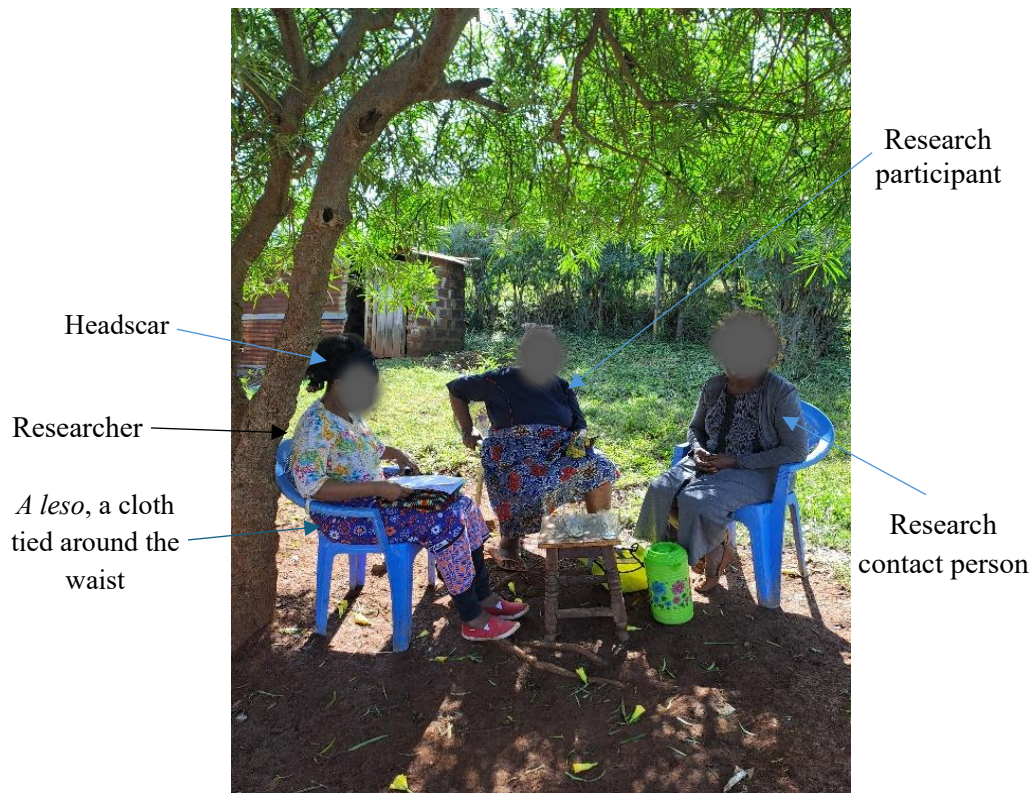


Figure 3.1 Participant observation briefing



Figure 3.2 Betina doing all the work on her farm while her husband is out socialising with friends.

As depicted in Figures 3.1 and 3.2, photographs and audio recordings were used to complement field notes, observations, and informal interviews (Storm-Mathisen, 2018). Prior to using any recording devices, the researcher obtained participants' consent and assured them that their identities would remain confidential. Photographs of crops and agricultural activities were taken to capture forms of 'backstage work' that could not easily be conveyed through words. To address the issue of selectivity in photography, where specific moments are chosen to be captured, the researchers used some of the photographs as discussion points in other interviews. This approach helped overcome limitations associated with observational data by providing additional context and offering multiple perspectives on the behaviours and phenomena being studied (Pink, 2007; Storm-Mathisen, 2018).

Audio recordings were also used to document informal discussions and conversations. These recordings provided data that could be referenced in subsequent interviews. In addition, the researcher found that spontaneous interactions captured through audio recordings revealed important aspects of participants' relationships that might otherwise have remained unnoticed. The combined process of data collecting, verification, and interpretation contributed to enhancing the credibility of the research findings.

3.5.2 Focus Group Discussions and Informal Interviews

Boddy (2005) defines Focus group discussions (FGDs) as groups of people brought together to discuss a specific area of interest. FGDs are valuable for gathering comparative insights by enabling participants to share their lived experiences in a group setting, therefore facilitating the exploration of diverse perspectives (Löhr *et al.*, 2020). In this research, FGDs were particularly relevant as they provided an opportunity to explore social dynamics among subsistence farmers in Kenya that remain insufficiently understood. Unlike structured individual interviews, FGDs allowed for an in-depth exploration of the research phenomenon without imposing a predefined conceptual framework (Nyumba *et al.*, 2018). FGDs were especially effective in examining community norms, collective attitudes, and areas of consensus that may not emerge in one-to-one interviews (Boddy, 2005; Nyumba *et al.*, 2018).

Five FGDs were conducted: three in Mbeere North sub-county, each comprising seven participants, and two in Tigania East sub-county, each comprising eight participants. Different scholars use varying numbers of participants and groups for FGDs. For instance, Locke *et al.* (2017) suggest six FGDs with eight to ten farmers per group, while Hermans *et al.* (2021) used

four FGDs with six to ten participants. Guest *et al.* (2017) pointed out that three to six focus groups are sufficient to capture the dominant themes within a study. Furthermore, Krueger and Casey (2014) and Guest *et al.* (2017) recommend having at least two focus groups for each demographic characteristic under investigation.

In this research, two FGDs from each sub-county included mixed-gender participants, while three groups consisted solely of women. There is an ongoing debate regarding the optimal composition of focus groups. Some scholars advocate for homogeneous groups to encourage openness and participation (e.g., Boddy, 2005), whereas others favour heterogeneous groups because they generate a wider range of perspectives (Forsyth, 2013; Krueger & Casey, 2014). To capture the strengths of both approaches, this research utilised both homogeneous and heterogeneous FGDs. Mixed-gender discussions provided varied perspectives on pro-poor agricultural innovations. The mixed groups also allowed the observation of how participants of different genders interact with one another to make meaning of social interactions, including ways of communicating, exchanging anecdotes, posing questions, and commenting on each other's experiences and viewpoints (Femdal & Solbjør, 2018). These interactions generated valuable insights into the social processes shaping agricultural innovations. In contrast, homogeneous female groups helped minimise gendered power dynamics that often emerge in mixed-gender settings. Feminist scholars argue that existing power hierarchies can result in women's voices being suppressed during data collection involving both women and men (Lokot, 2021). The women-only groups, therefore, provided a more conducive environment for participants to discuss their experiences openly and freely.

Findings from both types of FGDs were integrated to assess whether reported experiences were context-specific or reflected broader patterns across participants (Krueger & Casey, 2000). Combining the two approaches also helped reduce pressures associated with conformity and socially desirable responses, thereby encouraging more candid discussions. Each FGD lasted 60 to 90 minutes and was guided by a semi-structured interview guide (see Appendix 4: Focus Group Interview Guides). Discussions focused on how farmers evaluate pro-poor agricultural innovations, gender-based differences in these evaluations, and the influence of gender relations on innovation adoption. These themes were informed by gaps identified in the literature review and formed the basis for the research questions. Data collection concluded after five FGDs when recurring patterns became evident and no substantial new insights emerged, indicating theoretical saturation. With the participants' consent, all discussions were audio-recorded and transcribed shortly after each session.

While the FGDs provided rich and diverse accounts of participants' experiences with pro-poor agricultural innovations, several challenges were encountered. One challenge was the tendency for more vocal participants to dominate discussions, a limitation also identified by Nyumba *et al.* (2018). To address this issue, the researcher directed questions to quieter participants while acknowledging contributions from more vocal members in order to maintain group cohesion and encourage balanced participation. Additionally, FGDs generated complex and overlapping narratives that were time-consuming to transcribe, code, and analyse. However, the use of NVivo facilitated systematic data management and analysis. Figure 3.3 depicts an FGD with subsistence farmers in Mbeere North Sub-county, while Table 3.2, Table 3.3, Table 3.4, Table 3.5, and Table 3.6, provide details of participants in each focus group session.



Figure 3.3 A Focus group Discussion with subsistence farmers from Mbeere North

Table 3.2 List of participants - Mbeere North sub-County				
Focus Group Discussion 1				
No.	Pseudonym	Gender	Age	Family status
1.	Njiru	Male	67	Married with 5 children
2.	Ileri	Male	64	Married with 6 children
3.	Njagi	Male	60	Married with 6 children
4.	Muriithi	Male	44	married with 3 children
5.	Ngari	Male	56	Married with 4 children
6.	Murugi	Female	32	Single with 2 children
7.	Wanjiru	Female	32	Married with 3 children

Table 3.3 List of participants - from Mbeere North sub-County**Focus Group Discussion 2**

1.	Wanjira	Female	34	Married with 2 children
2.	David	Male	25	Not married
3.	Mbura	Female	42	Married with 3 children
4.	Wawira	Female	44	Married with 4 children
5.	Makena	Female	45	Married with 2 children
6.	Wanditi	Female	45	Married with 4 children
7.	Njoki	Female	54	Married with 4 children

Table 3.4 List of participants – Mbeere North sub-County**Focus Group Discussion 3**

1.	Betina	Female	57	Married with 4 children
2.	Wanja	Female	49	Married with 4 children
3.	Wathiga	Female	57	Married with 4 children
4.	Kagendo	Female	61	Married with 6 children
5.	Waturi	Female	55	Married with 4 children
6.	Mumbi	Female	58	Single/separated with 4 children
7.	Florence	Female	62	Widow with 4 children

Table 3.5 List of Participants -Tigania East sub-County**Focus Group Discussion 4**

1.	Julia	Female	45	Married with 4 children
2.	Gatwiri	Female	45	Married with 3 children
3.	Curubi	Female	45	Married with 5 children
4.	Gacheri	Female	45	Married with 2 children
5.	Makubu	Female	45	Married with 3 children
6.	Kinoti	Male	43	Married with 2 children
7.	Mugambi	Male	52	Married with 5 children
8.	Mutembei	Male	55	Married with 4 children

Table 3.6 List of participants -Tigania East sub-County**Focus Group Discussion 5**

1.	Kanana	Female	28	Married with 3 children
2.	Mwendwa	Female	33	Married with 4 children
3.	Norah	Female	33	Married with 2 children
4.	Nkirote	Female	35	Married with 2 children
5.	Karega	Female	43	Married with 3 children
6.	Kiende	Female	45	Single with 2 children
7.	Kanorio	Female	45	Married with 3 children
8.	Maiti	Female	45	Married with 4 children

3.5.2.1 Informal discussions

Informal conversations complemented the FGDs by providing more nuanced and in-depth accounts of participants' experiences. These interactions enabled the researcher to probe emerging issues and seek clarification on matters raised during formal data collection sessions. Participants were often more relaxed in informal settings and were not constrained by the structure or time limitations associated with formal interviews, creating opportunities for richer and more spontaneous discussions (Swain & King, 2022).

Informal discussions were particularly valuable following mixed focus group discussions, where participants' contributions were sometimes restrained due to intersecting power relations and social identities, including gender dynamics (Lokot, 2021). Mwititi and Goulding (2018) highlight the importance of informal discussions in qualitative research, noting that women are more willing to share personal experiences in informal interview contexts. Consistent with this observation, the informal discussions generated detailed accounts of how participants accessed pro-poor agricultural innovations, the challenges encountered, and the strategies used to overcome them (see Appendix 5: In-depth Interview Guides). The informal discussions and

interactions also fostered a sense of trust and rapport, allowing participants to feel genuinely listened to and valued as active contributors to the research process rather than merely as respondents. Consequently, the informal discussions generated insights that may not have emerged through more structured forms of data collection.

However, despite the benefits of informal discussions, the unstructured and spontaneous nature of these conversations on some occasions resulted in digressions into topics that were not directly relevant to the research objectives. This presented challenges for maintaining focus and analysing the resulting data. To address this limitation, only relevant information related to the study was retained during transcription and analysis. Informed consent was obtained prior to recording the informal conversations, ensuring that participants were aware of the research process while preserving the natural flow of dialogues.

3.5.3 Key Informant Interviews

Key informant interviews complemented the focus group discussions and informal discussions by providing multi-stakeholder perspectives grounded in specialised knowledge, professional experiences, and contextual understanding (Lokot, 2021) of agricultural innovation systems. Key informants were purposively selected based on their willingness to participate, their expertise, and their direct involvement in the dissemination and implementation of agricultural innovations within the study areas. Government officials from the Ministry of Agriculture were included because of their roles in delivering crop production services, including crop technologies, farmer training, and advisory support in line with national agricultural policies. These officials provided insights into the types of pro-poor agricultural innovations promoted to farmers within the study area, the communication channels used to reach farmers, and

patterns of farmer engagement with extension services. Their perspectives contributed to understanding the institutional processes that shape access to and uptake of agricultural innovations.

In addition, a community leader, who served as an appointed church representative and maintained close engagement with local community members, was interviewed. This informant provided a grassroots perspective on pro-poor agricultural innovations and offered insights that extended beyond official government narratives. Notably, the community leader challenged some of the assumptions expressed by government officials, including claims that *'Communities do not adopt good pro-poor innovations,'* by presenting alternative explanations grounded in the lived realities of subsistence farmers. These perspectives were consistent with accounts provided by farmers themselves and therefore contributed to a more balanced and nuanced understanding of the factors influencing innovation adoption.

The inclusion of key informants enabled the triangulation of data collected from farmers, government representatives, and community actors, thereby strengthening the credibility of the findings. Interview questions focused on: (1) the reason why different types of pro-poor agricultural innovations were considered important for subsistence farmers in the study locations, and (2) observed gender-based differences in the adoption and use of pro-poor agricultural innovations. A sample of the Key Informant Interview Guide is provided in Appendix 6: Key Informant Interview Guides. Each interview lasted between 45 to 60 minutes. With participants' consent, all interviews were audio-recorded and transcribed shortly after completion to ensure accuracy and facilitate their integration into the broader analytical process.

3.6 Data Management and Analysis

This section discusses how the data collected from the field was handled, cleaned, and analysed.

3.6.1 Emergent Design

This qualitative study aimed to understand the impact of gender relations on the adoption of pro-poor agricultural innovations. Multiple data collection methods were employed to capture participants' lived experiences through narratives of their actions and interactions within natural settings (Bluhm *et al.*, 2011; Jarzabkowski *et al.*, 2014; Lanka *et al.*, 2021). An emergent, inductive, interpretive, and naturalistic research approach was adopted to explore the everyday social realities of subsistence farmers in Mbeere North and Tigania East sub-counties (Watson, 2011; Dumont, 2023). Consistent with an emergent research design, data collection evolved in response to insights that arose during fieldwork and analysis, with the process guided by the research questions (Glaser & Strauss, 2017; Harley & Cornelissen, 2022; Cloutier, 2024). Following an inductive logic, findings were allowed to emerge organically from participants' accounts and experiences without the constraints of pre-defined hypotheses or rigid analytical frameworks (Thomas, 2006; Harley & Cornelissen, 2022).

Data collection and analysis proceeded iteratively through the continuous identification, comparison, and categorisation of themes across multiple methods, including participant observation, focus group discussions, informal discussions, and key informant interviews (Bluhm *et al.*, 2011; Jarzabkowski *et al.*, 2014; Lanka *et al.*, 2021). While grounded in participants' voices, the research also engaged with existing literature to contextualise and

interpret the findings. The following section outlines the procedures for data management and thematic analysis.

3.6.2 Data Transcription and Preparation

Audio recordings of the focus group discussions, informal and formal interviews and video clips were transcribed for analysis. Discussions conducted with farmers in the local languages, Kimbeere and Kimeru, were translated into English to facilitate analysis. Handwritten notes from informal conversations, field observations, individual interviews, personal reflections, and lived experiences were typed, categorised, and stored as Word documents. The transcripts (see a sample of interview transcripts for Mbeere North in Appendix 7: Example of Interview Transcript (Mbeere North sub-county)) preserved the authenticity of field occurrences and interactions by capturing contextual elements such as non-verbal cues, such as prolonged silences, heated debates, and moments of humour (Dumont, 2023). Reflective researcher notes on significant observations and events were also incorporated to enrich contextual understanding and maintain the integrity of participants' voices (Jarzabkowski *et al.*, 2014). In addition, photographs were sorted, duplicates removed and organised into folders according to the context in which they were taken. All textual data and photographs were subsequently uploaded into NVivo, a computer-assisted qualitative data analysis software (CAQDAS), to support data organisation, coding, categorisation, theme development, and systematic analysis (O'Kane *et al.*, 2021).

The use of CAQDAS tools such as NVivo has been widely recognised as valuable for managing qualitative data (O'Kane *et al.*, 2021), which are often voluminous, complex, and analytically

challenging (e.g., Li *et al.*, 2021). Thus, NVivo facilitated quick and easy coding, retrieval of coded data segments, data organisation, rapid text searches, and the maintenance of an audit trail (O’Kane *et al.*, 2021, p. 105). These features enhanced the transparency, rigour and credibility of the analytical process (O’Kane *et al.*, 2021). Data analysis was guided by the Gioia methodology for inductive theory building, which is described in the following section.

3.7 Data Analysis Using Gioia Methodology

To analyse the qualitative data collected from both locations, this research adopted the Gioia Methodology approach. Gioia *et al.* (2013) describe the Gioia methodology as a type of grounded theory that differs from the grounded approach in one key aspect. Whereas grounded theory generally discourages engagement with existing literature prior to data collection (Glaser & Strauss, 2017), the Gioia's methodology encourages researchers to consult relevant literature both before and during the research process (Gioia *et al.*, 2013; Gioia, 2021). Thus, the Gioia methodology provided a structured yet flexible framework for analysing ethnographic data, which are often complex and unstructured, by providing a systematic roadmap for linking raw field data to theoretical insights (Gioia *et al.*, 2013; Magnani & Gioia, 2023). Early engagement with literature helped identify research gaps and informed the development of flexible guiding questions (Appendices 4 and 5) that shaped data collection while allowing participants’ perspectives to drive the analytical process. These evolving protocols ensured that the research remained grounded in participants’ lived realities while creating space for surprising and unexpected findings to emerge, thereby contributing to inductive theory building (Deterding & Waters, 2021; Magnani & Gioia, 2023).

The Gioia methodology facilitated an iterative inferential process involving both induction and abduction. Through induction, concepts emerged from raw data, while abduction enabled the interpretation of findings in dialogue with existing literature and theoretical perspectives (Magnani & Gioia, 2023). The abductive sensemaking allowed surprising empirical insights to be evaluated against multiple theoretical explanations, facilitating the identification of the most compelling explanations (Behfar & Okhuysen, 2018). Importantly, the analysis prioritised participants' accounts over existing theoretical constructs, thereby mitigating the risk of imposing pre-existing knowledge onto the data (Gioia *et al.*, 2013).

By combining inductive discovery with abductive reasoning, the Gioia methodology provided a rigorous and transparent process for building theoretical insights from field data. This dual emphasis on 'knowing' and 'not knowing' (Gioia *et al.*, 2013) laid a robust analytical foundation that met established standards of trustworthy qualitative research (Pratt *et al.*, 2022; Magnani & Gioia, 2023). Figure 3.4 illustrates the application of the Gioia methodology in this research.

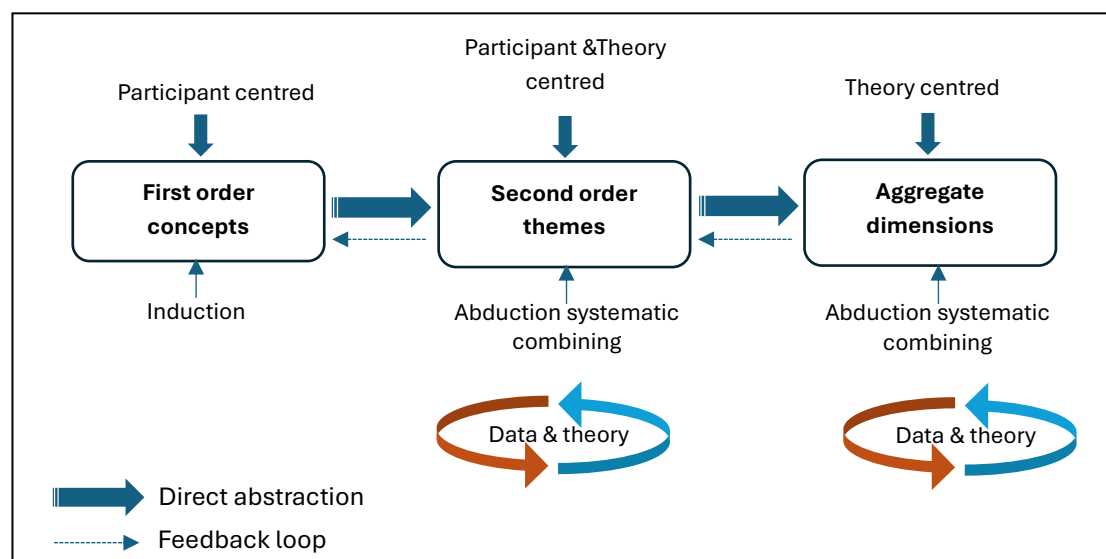


Figure 3.4 The inferential Process for developing a Data Structure - adapted from Magnani and Gioia (2023).

As shown in Figure 3.4, the first-order analytical concepts were directly derived from participants' quotes, reflecting a data-driven approach. Through iterative comparisons across data sources and study locations, second-order themes were generated abductively, integrating emergent findings with existing literature (Magnani & Gioia, 2023). These theory-driven second-order categories were then combined with the first-order themes to form aggregate dimensions, following the Gioia et al. framework. This iterative analysis involved repeatedly revisiting transcripts from focus group discussions, informal conversations, Key Informant interviews, and field notes, enabling the integration and cross-referencing of insights. By conducting and analysing data from two distinct communities, the research identified similarities and differences in experiences, perceptions, and behaviours related to pro-poor agricultural innovations. This comparative approach added a layer of understanding and revealed patterns that may not have emerged from a single community, enhancing the transferability of findings across contexts.

3.7.1 Generating First-order Themes

Qualitative data analysis commences with the transcription of all data sources, including participant observations, focus group discussions, key Informant Interviews, informal discussions, and field notes, and memos from both study locations. These transcripts were uploaded into NVivo, with separate projects created for each location. Analysis began with the Mbeere North dataset, utilising NVivo tools, such as query-by-example, word frequency searches, and text search functions to generate preliminary themes. Visual outputs such as text passages, word clouds, and cluster analyses facilitated the identification and organisation of key patterns. This procedure was replicated for the Tigania East dataset, and the text passages were merged for analysis. Table 3.7 provides examples of illustrative quotes and relevant text

excerpts from both study locations. Presenting participants' experiences in situ conversation is a key strength of ethnography (Jarzabkowski *et al.*, 2014), offering rich insights unattainable through surveys and questionnaires. These direct quotes also serve as evidence, which enhances the transparency and credibility of this qualitative research.

Table 3.7 First-order Analysis

‘For me, something new is like the new variety of cassava because it produces more roots and is more drought and disease-resistant. With cassava, children cannot sleep hungry’ (Female respondent).

‘I have been growing cassava for a long time, but the new idea of processing roots of the improved cassava varieties into flour is good because I use it to cook ugali, which my children enjoy a lot’ (Female respondent).

‘Something like *Muguka* farming is new because it brings in more income. I can take care of my family. Having something that I could sell and make money from is a good and new thing for me as well as a new experience’ (Male participant).

‘The farmers' group has made it easy for us to market our bananas easily. Dealing with middlemen used to be a headache; they took advantage of us and disrespected us. Now, I earn money that helps me feed my children’ (Female participant).

‘I no longer have to work on other people’s farms. The farmers’ group helps me earn from my own crop, giving me more time to take care of my children and my husband’ (Female participant).

Researcher Experience and Field Note

‘I noted that farmers strongly agreed that they adopted new innovations due to the benefits they provide. It was evident that women adopted innovations to help provide food for their families. It was not difficult to see why, as they are responsible for cooking. Men, on the other hand, emphasised innovations for income generation.’

Codes, defined as words or phrases used to label identified themes within the data (O’Kane & Lerman, 2021), were developed from participants quotes across diverse data sources. These codes were primarily anchored to the interview protocols; however, additional categories that emerged organically from the data were also incorporated. Emerging concepts and themes were then grouped based on thematic similarity to facilitate further analysis. For example, one of the primary objectives of this research was to explore how subsistence farmers perceive pro-poor agricultural innovations. Correspondingly, concepts reflecting these perceptions were grouped under the overarching code of ‘perception of innovations’ and linked to participant attributes such as gender (female or male farmer). This systematic coding process ensured comprehensive capture of emerging concepts. By integrating data across multiple sources, the analysis examined interrelationships within and between datasets, constructing a coherent chain of evidence to support data synthesis and interpretation (Gioia *et al.*, 2013). Following coding of both locations, the resulting themes were compared to identify similarities and differences in the adoption of pro-poor agricultural innovations. This comparative analysis provided a clear and practical structure for theme discovery and theory building (Gioia *et al.*, 2013).

3.7.2 Generating Second-order Categories

The first-order categories, which laid the foundation for analytical categories, emerged inductively through open-coding of participants’ quotes. Using NVivo, word frequency searches identify recurrent keywords to simplify complex textual data and highlight elements pertinent to the research questions. These keywords encapsulated core messages that were subsequently transformed into key themes (Locke *et al.*, 2022; Naeem *et al.*, 2023). For instance, when exploring farmers’ perceptions of pro-poor agricultural innovations in response

to research question one, in-vivo codes such as ‘*beneficial, benefits, feed, children, care, income, money,*’ were frequently observed, as shown in Table 3.8.

Table 3.8 Second-Order Analysis	
First-order category	Second-order category
‘For me, something new is like the new variety of cassava because it produces more roots and is more drought and disease resistant. With cassava, children cannot sleep hungry’ (Female respondent). ‘I have been growing cassava for a long time, but the new idea of processing roots of the improved cassava varieties into flour is good because I use it to cook ugali, which my children enjoy it a lot’ (Female respondent). ‘Something like <i>Muguka</i> farming is new because it brings in more income. I can take care of my family. Having something that I could sell and make money from is a good and new thing for me as well as a new experience’ (Male participant). ‘The farmers group has made it easy for us to market our bananas easily. Dealing with middlemen used to be a headache; they took advantage of us and disrespected us. Now, I earn money that helps me feed my children’ (Female participant). ‘I no longer have to work on other people’s farms. The farmers’ group helps me earn from my own crop, giving me more time to take care of my children and my husband’ (Female participant). Researcher Experience and Field Note ‘I noted that farmers strongly agreed that they adopted new innovations due to the benefits they provide. It was evident that women adopted innovations to help provide food for their families. It was not difficult to see why, as they are responsible for cooking. Men, on the other hand, emphasised innovations for income generation.	 Farmers view agricultural innovation as new products, ideas, and behaviours that help them provide food for families and generate income.

The frequency results were visualised through lists and word clouds (Table 3.8), which elucidated how farmers evaluated innovations and revealed gendered differences in perception.

These keywords served as the analytical backbone, converting raw data into manageable and insightful units (Naeem *et al.*, 2023). Key terms reflected farmers' evaluation of pro-poor agricultural innovations, such as improved cassava varieties, *Muguka* and participation in farmer groups, as beneficial due to their perceived value. This process facilitated the refinement of raw quotes into conceptual categories through axial coding, which examines similarities, differences, and relationships among categories (Locke *et al.*, 2022).

From an initial set of 50 key categories, the codes were condensed into 15 analytical categories (Table 3.9), aligning with recommendations by Gioia *et al.* (2013) to maintain fewer than 30 categories and Magnani & Gioia (2023) suggestion of fewer than 20. These analytical codes were further developed through comparison with existing literature and abductive reasoning, enabling explanation of emerging themes and novel concepts that lacked clear links to prior theory or were significant for new theoretical insights (Sætre & Van, 2021; Magnani & Gioia, 2023). For instance, while participants commonly viewed pro-poor agricultural innovations as beneficial, a notion consistent with prior studies, this research novelty connects these perceptions to farmers' gender roles within households. This finding reflects the relevance of the social construction theory of gender in explaining divergent perceptions of pro-poor agricultural innovations between female and male farmers.

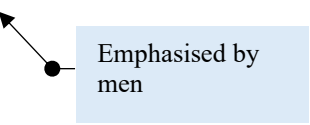
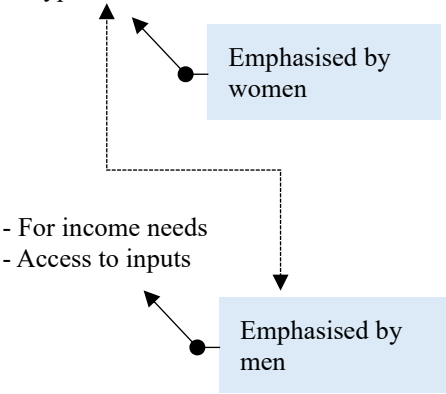
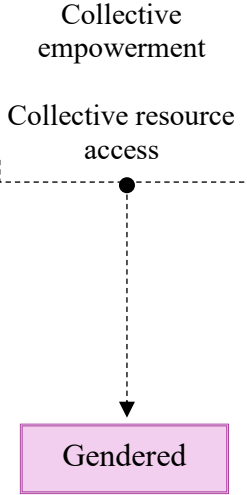
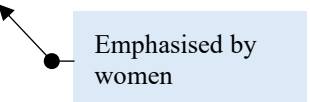
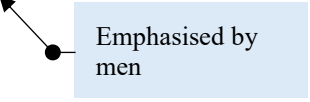
Table 3.9 Condensed Analytical Categories	
First-order concepts	Extracted Analytical Categories
‘New variety of cassava... produces more roots... drought and disease resistant.’	Adoption of improved crop varieties
“With cassava, children cannot sleep hungry.”	Innovation to ensure household food security
‘New idea of processing roots... into flour... my children enjoy it.’	Processing and use innovations that improve consumption
‘We depend on rain; if it fails, we harvest nothing.’	Climate dependence and environmental vulnerability
‘Muguka farming... brings in more income... a new experience.’	Income-focused innovation adoption
‘Farmers group has made it easy for us to market... no more dealing with middlemen.’	Collective marketing as a process innovation
‘Earn money that helps me feed my children.’	Economic gains linked directly to family welfare
‘Men decide which crops to grow, even though we do most of the work.’	Gendered decision-making in agriculture
‘Farmers’ group helps me earn from my own crop... more time to care for children and husband.’	Innovations improving control over time and labour
‘We learn from Florence, she has more experience with the improved cassava varieties.’	Peer learning
‘We share what we learn in the farmers’ group and help each other try new crops.’	Peer learning and collective experimentation
‘We get training about new products from government officials, that’s when I learned about processing cassava roots.’	Importance of external training and support
‘Young people don’t want to dig; they say it’s too hard and does not earn them money.’	Intergenerational disinterest in farming
Field note: women adopted innovations to feed families; men emphasised income generation.	Gendered motivations in innovation adoption
Field note: Adoption is driven by tangible benefits (food/income/time).	Perceived value and relevance of innovations

In addition to employing Gioia’s methodology to develop the data structure, this research utilised tables (i.e., Table 3.7, Table 3.8, Table 3.9, and Table 3.10), which are valuable in qualitative research for ‘enhancing transparency in data collection, analysis, and findings, as well as effectively organizing complex data’ (Cloutier & Ravasi, 2021, p.113).

3.7.2.1 Generating aggregate themes

The development of aggregate dimensions entailed combining data-driven first-order themes with theory-driven second-order themes to identify overarching themes and relationships that explain the phenomenon under study (Gioia, 2021; Magnani & Gioia, 2023). This analytical process yielded three key aggregate dimensions: (1) the perception of pro-poor agricultural innovations, (2) categories of adopters, and (3) gender relations in innovation adoption. By grounding these dimensions in participants lived experiences, the approach established a robust evidentiary basis for theory development. Table 3.10 illustrates the process of generating first-order concepts, second-order themes and aggregate dimensions. The Gioia structure for supporting institutions is provided in Appendix 13.

Table 3.10 Generating first-order concepts through to aggregate dimensions		
First-order Concepts	Second-order Themes	Aggregate Dimensions
With the new cassava variety, my children cannot sleep hungry [Female participant]. The farmers' group helps me earn from my crop. This helps me feed my children [Female participant]. With good harvests, we sell the surplus to generate income [Female participant]. Muguka farming brings in income [Male participant]. Farmers' group helps me earn money to take care of my family [Male participant].	Innovation as a means of sustenance - Food security outcomes - Feeding children - Maintaining household food stocks Emphasised by women - Income generation - Household provision through earnings Emphasised by men	Household livelihood enhancement Gendered Value creation through innovation
Processing cassava into flour is a new practice that ensures that roots can last longer [Female participant]. With cassava flour, it is available for cooking for up to three weeks [Female participant].	Innovation as Value Addition - Processing cassava for food outcomes - Flour storage - Reduction of post-harvest wastes Emphasised by women	

Processing improved variety roots is better because the roots are bitter to taste [Female participant]. My wife mixes cassava flour with maize flour, making the cooking flour last longer during maize shortages [Male participant]. The improved cassava variety has reduced cyanogen, which is good for selling [Male participant].	- Increased marketability and commercialisation 	
I joined the group to help meet my family's need for food. [Female participant] Through this group, I earn more money from the sale of surplus bananas [Male participant] The group has helped us bypass the middlemen [Male & Female participant]. We get access to farm inputs through the group [Male participants]. The group saves us time and money to access productive inputs [Female participants]. With the group, I no longer do farm labour [Female participants]. Through the group, we can access extension services [Female participant]. I find it easy to learn from my group members [Female participant].	Innovation as a Collective Effort - For food needs - For reduced labour and time - Mutual support - Help access extension services - Bypass middlemen 	Collective empowerment Collective resource access 
The improved cassava is drought-and disease-resistant. We cultivate it the same way we cultivate the local varieties [Female participant]. It is cheap to cultivate improved cassava varieties and does not require a lot of care [Female participants]. Improved cassava roots have reduced cyanogen levels, which means the roots do not deteriorate quickly [Key Informant]. Muguka is drought-resistant and cheap to maintain [Male participant].	Innovations as adaptable - Drought -and disease resistance to support household food supply - Low-cost production and labour reduction  - Drought- and disease resistance to support income stability - Low-cost production 	Innovation resilience and suitability to farmers' realities. 

3.8 Research Ethics Throughout the Data Collection Process

This section discusses the ethical concerns encountered during the research process, which shaped the research strategy, data collection and reporting processes. It introduces the ethical issues addressed throughout the duration of the research.

3.8.1 Pre-ethical Considerations and Measures

Given the social and qualitative nature of this study, ethical considerations were fundamental due to direct engagement with research participants. Researchers typically demonstrate their commitment to protecting the rights, dignity, and welfare of participants to research committees before entering the field (Bull *et al.*, 2024). Accordingly, ethical approvals KBSE. No. 1809 and 3139 were granted, demonstrating adherence to the University of Kent's code of ethics. Ethical forms were filled out (see sample in Appendix 1: Sample of Ethics Form) with written evidence that potential dilemmas had been considered and measures put in place to protect both participants and the researcher before, during, and after the fieldwork. These measures were employed throughout the research process.

3.8.2 Ethical Considerations and Measures Taken During Data Collection

Prior to data collection, all participants provided voluntary and informed consent (refer to the sample of participant consent form in Appendix 2: Sample of Participant Consent Form), confirming their willingness to participate after being assured their identities would remain anonymous. The research objectives and data collection methods were clearly explained, and participants were assured that their involvement would not expose them to harm or disadvantage. The participants were further informed that participation was entirely voluntary,

that the study was for research purposes only, and that they could withdraw at any time without needing to provide a reason.

Efforts were made to accommodate the participants' roles and responsibilities when scheduling focus group discussions, observations, and interview sessions, thereby fostering a sense of agency and control. Despite these precautions, the possibility of indirect harm remained. As noted by Robinson (2014) and Summers (2020), research participants may experience unintended emotional consequences such as stress, embarrassment, and diminished self-esteem, particularly when disclosing sensitive aspects of their lives. Previous studies (Summers, 2020; Chikweche *et al.*, 2023) have shown that some marginalised individuals may be eager to engage in research that explores their lived experiences, as it provides a platform to be heard and validated. Although the researcher established a strong rapport and trust with participants, reminders were given to avoid sharing any details that could lead to emotional distress or discomfort. It was also acknowledged that participants involved in focus group discussions, farm observations, and individual interviews likely sacrificed time that could have been spent earning income; therefore, they were compensated for their time and any travel expenses incurred (see Appendix 3: Participant Reimbursement Form).

3.8.3 Ethical Considerations and Measures taken in Data Interpretation and Reporting

The interpretation of data within an interpretive framework enables researchers to construct narratives that provide readers a sense of presence and contextual immersion (Jarzabkowski *et al.*, 2014). However, such interpretive work raises ethical concerns, particularly regarding the power imbalance between researchers and participants. Researchers may unintentionally

impose their own perspective on the data, thereby marginalising participants' voices and interpretations (Slettebø, 2021; Lindheim, 2022). As Jarzabkowski *et al.* (2014) emphasise, researchers need to remain faithful to the data, accurately represent participants' voices, and be transparent about the basis of their interpretations. In response to these concerns, participant validation was employed (as detailed in section 3.9.2) to verify interpretations drawn from the data. This process allowed participants to confirm, refine, and correct the researcher's interpretations, thereby reducing the risk of misrepresentation. Furthermore, Slettebø (2021) argues that participant validation should not merely affirm participants' existing views but also provide an opportunity for reflective engagement and the emergence of new insights. For instance, the male farmers were encouraged to reflect on the social norms and practices that marginalise women. Striking this balance was essential to the present research, as it facilitated a deeper understanding while respecting participants' interpretations of their lived experiences.

Another key ethical consideration during this phase concerned the anonymity and confidentiality of the participants. Anonymity ensures that participants cannot be identified from the information presented, while confidentiality means that all participants' personal data is securely stored, accessible only to the researcher and not disclosed to third parties (Slettebø, 2021; Lindheim, 2022). While external anonymity can generally be maintained, internal anonymity, where participants may recognise each other's contributions, can present ethical challenges in close-knit communities. This issue emerged in this research, as both women and men could potentially identify comments by members of the opposite gender or by neighbouring community members. To address these risks, all confidential information was securely stored and password-protected. In reporting the findings, participants' real names were omitted, and any photographs used were edited to blur participants' faces. While these measures reduced the traceability of participants' responses and enhanced their protection,

absolute anonymity could not be guaranteed (Murphy & Dingwall, 2001, cited in Mwiti & Goulding, 2018), although confidentiality was maintained throughout the research process.

Despite the implementation of ethical safeguards, it has been argued that the publication of research data may still inadvertently expose participants in ways that researchers may not anticipate or control. As Slettebø (2021) observes, ethnographic studies, by their nature, often include detailed descriptions, direct quotations, and portrayals of behaviours that may render participants identifiable, particularly within small or closely connected communities. Such disclosures can be exploited by those in positions of power, potentially reducing participants' contribution to mere data points rather than recognising their agency and capacity to express, reflect upon, and interpret their own lived experiences. These concerns highlight the inherent limitations of ethical protections in qualitative research. Given the unpredictable nature of research processes and outcomes, it is therefore reasonable to acknowledge that complete protection of participants cannot be guaranteed. Researchers must remain reflexively aware of these limitations and continuously assess the ethical implications of their representational choices throughout the research lifecycle (Slettebø, 2021).

3.9 Validity and Credibility

Data gathering and analysis using ethnographic qualitative methods require various measures such as extended fieldwork, triangulation methods, and participant validation (member checking) to strengthen the credibility of the study (Denzin & Lincoln, 2018). The ethnographic data collection methods have been explained in the section 3.5. Triangulation and informant validation are outlined next.

3.9.1 Triangulation

This research employed triangulation to enhance the credibility and validity of its findings by cross-verifying data obtained from multiple participants, including subsistence farmers, local leaders, and county-level government officials. A combination of data collection methods, such as focus group discussions, informal discussions, participants' observations, and key informant interviews, were utilised to develop a deeper and more nuanced understanding of the adoption of pro-poor agricultural innovations. In addition, the research was conducted across two sub-counties, Mbeere North and Tigania East, which represented different institutional arrangements which produce different gendered adoption outcomes. This multi-site approach enabled the researcher to compare perspectives across different actors and contexts, allowing for a comprehensive interpretation of the data through the identification of both convergences and divergences in participants' experiences and accounts. Despite the diversity of viewpoints, several consistent patterns emerged across the data sources and research sites, thereby strengthening the credibility and trustworthiness of the study's findings (Fielding, 2012; Carter *et al.*, 2014).

3.9.2 Informant Validation

Informant validation was employed to ensure the credibility, trustworthiness and authenticity of the data and interpretation generated through the research process (Birt *et al.*, 2016; Lindheim, 2022b). This research adopted an ontological stance grounded in the lived experiences of subsistence farmers within their natural environment, recognising knowledge as socially situated and co-constructed through interactions between the researcher and participants (Lincoln *et al.*, 2018). Consequently, the research process involved close

engagement with participants, enabling the collaborative construction of meaning and interpretation throughout data collection and analysis.

To capture cultural meanings more authentically, data collection was conducted using the local dialects, Kimbeere and Kimeru. These allowed the researcher to engage more deeply with participants' perspectives and everyday experiences. However, translating between English and the local dialects presented challenges, particularly where certain concepts, such as 'innovation' lacked direct linguistic equivalents. These translation dilemmas were further complicated by existing hierarchies of language power, which can shape or constrain how participants' experiences were expressed, interpreted and represented in research (Temple & Young, 2004). To address these challenges and maintain methodological rigour, participants were engaged in a process of interpretive validation. Preliminary interpretations and analysed data were shared with participants to assess whether they accurately reflected their intended meanings and experiences. This iterative process provided opportunities for clarification, refinement, and correction, thereby reducing the risk of misrepresentation arising from translation and interpretation. In addition, participant feedback contributed to a more nuanced understanding of local realities, enhancing the overall credibility, trustworthiness, and authenticity of the research findings (Birt *et al.*, 2016; Lindheim, 2022).

3.9.2.1 Validation of Focus Group Discussions

After the focus group discussions, a synthesised summary of the emerging themes, accompanied by anonymised quotes, was presented to selected participants for review, correction and comment. This process enabled participants to gain a clear understanding of how their responses were interpreted in relation to others (Birt *et al.*, 2016). Providing

participants with a broader contextual analysis was regarded as an ethical responsibility, ensuring transparency and reinforcing participants' understanding of how their contributions were used (Birt *et al.*, 2016; Lindheim, 2022). Moreover, this feedback loop not only validated the interpretations but also generated new and relevant data, as participants elaborated on or clarified their earlier responses, thereby enriching the overall quality and depth of understanding of the phenomenon under study (Birt *et al.*, 2016; Lindheim, 2022).

3.9.2.2 Validation of observations

Following the observation of incidents and behaviours related to pro-poor agricultural innovations, the researcher documented these in field notes and photographs. The documented observations were subsequently shared and discussed with participants during informal conversations. This process provided participants with the opportunity to offer additional context, clarify events, and articulate their own interpretations, thereby refining the researcher's understanding and enhancing the depth of analysis (Lindheim, 2022). For example, during one observation, the researcher accompanied a female farmer throughout her daily routine and found it difficult to keep pace with the range and intensity of tasks she performed. When this experience was later discussed as part of the validation process, the participant reflected critically on her everyday reality:

'That is a typical day for me. You noticed my husband left after we began this interview. Tasks run one after the other, very organically. Now, seeing myself through your eyes makes me feel like a slave in my own homestead. You understand why it is difficult for me to attend training outside my home. This is because when I return, all these tasks will be waiting for me' [Betina, 57-year-old female farmer-Mbeere North].

The validation interaction reinforced the emerging interpretation that female farmers often carry a disproportionate burden of both reproductive and productive work within their households. Significantly, the exchange illustrates how informant validation can facilitate the co-construction of meaning by creating space for participants to critically reflect upon their own experiences and contribute actively to the analytical process. Rather than simply confirming the researcher's interpretation, Betina's reflection generated additional insight into how gendered divisions of labour constrain women's participation in agricultural training and innovation-related activities.

The close rapport developed between the researcher and participant also enabled a partial shift in interpretive authority, allowing the participant to assume a more active role in shaping the analysis. This dynamic reflects a central principle of ethnographic research: that knowledge is generated through dialogue and collaboration between researchers and participants rather than produced solely by the researcher (Jarzabkowski *et al.*, 2014; Hammersley, 2018; Dumont, 2023). At the same time, Betina's reflection highlights an important ethical consideration. While such conversations may be empowering by fostering critical self-reflection and recognition of structural inequalities, they may also evoke feelings of vulnerability and emotional discomfort. This dual effect highlights the ethical complexity of engaging deeply with participants' lived realities, particularly when those realities involve experiences of marginalisation, inequality, or social disadvantage. Consequently, researchers must remain sensitive to both the empowering and potentially unsettling consequences of participatory and reflexive forms of validation.

3.9.2.3 Peer Debriefing

The credibility of this study was strengthened through peer debriefing, a process that involves engaging knowledgeable individuals familiar with the research phenomenon to provide critique and new perspectives (Figg *et al.*, 2009). Peer debriefing served as a valuable tool to help the researcher examine her methodology and the interpretation of data. Moreover, this helped the researcher navigate the inherent complexities of the ethnographic research. The process challenged and encouraged the researcher throughout the research journey, contributing to the overall rigour of the study (McLeod, 2024). Throughout the process, peer debriefing was facilitated through regular discussions with academic supervisors, doctoral peers at the university, and participation in doctoral colloquia and conferences. The researcher also presented development papers and posters in marketing-focused and interdisciplinary workshops. These engagements offered diverse viewpoints across different academic and practitioner audiences. This experience helped the researcher develop skills as a professional researcher by enhancing analytical thinking, improving communication skills, and fostering constructive academic dialogue.

3.10 Methodological Reflections

This section summarises methodological reflections that emerged throughout the research process that may provide useful insights for other researchers. These reflections centre on the ethnographer's identity and roles, the vulnerability of participants and the researcher and strategies for addressing them, and the importance of researcher positionality and reflexivity.

3.10.1 Ethnographer Identity and Roles

Studies by Jarzabkowski *et al.*(2014) and Dumont (2023) suggest that while in the field, the ethnographer primarily assumes the role of a researcher; however, this role may clash with certain identities imposed by the people they meet. In this research, the researcher's epistemological position as a relative insider, stemming from previous working relationships with the participants, facilitated easy access to study participants. However, re-entering the community and seeking an insider perspective created a conflict of roles and a sense of detachment that required reconstruction to mediate and negotiate the meanings constructed in relational interactions with the participants (Hammersley & Atkinson, 2007; Järventie-Thesleff *et al.*, 2016). The excerpt below, drawn from field notes, illustrates the views espoused by the researcher, which were subsequently reflected upon:

As I arrived at my study location, I couldn't help but feel a sense of helplessness, despite having established a positive relationship with some of the members of the Mbeere community. To truly observe and document the experiences of my subjects, I needed to distance myself from my own personal experiences, which often mirrored those of my participants. I made a conscious decision to take on the role of a witness researcher, striving to provide an authentic and unbiased account of the participants' stories without imposing my own thoughts or biases. Upon introducing myself to the participants, I clarified that my purpose was to collect data for my PhD research. I wore a dress, a headscarf and a cloth around my waist as a sign of respect and a willingness to learn from farmers. I aimed not only to listen to the farmers' stories but also to immerse myself in their daily activities and routines, an important gesture to convey that I was prepared to learn alongside them' [Field note, December 2021].

Although this was not the researcher's first visit with the subsistence farmers, the extended time spent with the participants proved enlightening. Previously, the researcher had worked as

a consultant with rural women in Kenya, training and advising them on pro-poor agricultural practices to improve food security. As a result, many participants initially expected the researcher to provide solutions to their farming challenges. However, the researcher's clear intention to learn from the farmers shifted this dynamic. By prioritising listening over instruction, the researcher elevated the participants' perspectives and encouraged open sharing of experiences, free from suspicion or mistrust. One participant stated, *'We will teach our teacher all she needs to know because she is very kind and gentle with us'*. Through this learning process, the researcher realised how much she did not know about these farmers. Two main factors contributed to this openness: first, the shared gender identity between the researcher and the female farmers created a sense of solidarity. Second, the ability to speak the farmers' local languages removed communication barriers and deepened the connection. This positive relationship is further illustrated in Figure 3.5, which shows the researcher receiving maize from a participant. Betina, who offered maize and stated, *'Please take these and cook for your family. They will enjoy.'* While the maize was a gift, a common gesture in many parts of rural Kenya used to maintain social and economic bonds, it also symbolised mutual respect and trust. Beyond its immediate meaning, the gift of food highlighted the central role of agricultural production in the lives of these women. This gesture underscored the importance of pro-poor agricultural innovations that support female farmers in feeding their families, reinforcing the core aim of the research.



Figure 3.5 Researcher interacting with a participant during field observation and receiving maize as a gift.

3.10.2 Participant and Researcher Vulnerability

Vulnerability has been conceptualised as a relational phenomenon that emerges through interactions between individuals and is shaped by circumstances such as economic, social, and political exclusion, which may be experienced at different points throughout the life course (Luna, 2019). Within an ethnographic research setting, Hammersley (2018) identifies various forms of vulnerability that participants may encounter both during and after the research process. These include risks related to harm, privacy, and constraints imposed by cultural and social norms. These ethical concerns were recognised in the present research, and appropriate measures were implemented to minimise potential risks, as outlined in the section 3.8.

Despite these precautions, another form of vulnerability emerged during the fieldwork, which the researcher experienced. Some participants assumed that, because of the researcher's affiliation with a foreign institution of higher learning, she possessed access to financial resources and was either able or expected to provide material support. In some instances,

participants believed that the researcher was selectively compensating certain farmers. These perceptions generated implicit expectations and occasionally created tensions within the community. They also placed pressure on the researcher to engage more deeply in participants' daily activities and social relationships in order to maintain trust and rapport.

A further ethical dilemma arose from the researcher's emotional response to participants' circumstances. Although participants received appropriate compensation for their time, the researcher often felt that she was not doing enough to support farmers facing significant economic hardship. As a PhD student with limited financial resources, the experience of learning from participants' lives and challenges without being able to offer tangible assistance generated feelings of guilt, helplessness, and emotional discomfort. This highlights the critical limitation of ethnographic research; despite well-intentioned measures to avoid harm and uphold ethical principles, the immersive and relational nature of ethnographic fieldwork can expose both participants and researchers to forms of vulnerability that are difficult to anticipate or fully mitigate.

The emotional complexity of ethnographic inquiry was also reflected in participants' responses. The remark from Betina, *'Now seeing myself through your eyes makes me feel like a slave in my own homestead,'* is such an example. This statement highlights how the research encounters can prompt participants to re-evaluate their lived experiences in ways that may be simultaneously illuminating and emotionally challenging. As Summers (2020) argues, such dynamics can be difficult to avoid, as the process of narrating and reflecting upon personal experiences may itself generate feelings of exposure, discomfort, or vulnerability.

These experiences demonstrate that vulnerability in ethnographic research extends beyond participants to encompass researchers as well. The emotional labour involved in listening to, interpreting, and representing participants' experiences can have profound personal and ethical consequences for researchers (Rossetto, 2014; Summers, 2020). Recognising these dynamics emphasises the importance of ongoing reflexivity throughout the research process. Reflexivity requires researchers to continually examine their positionality, emotional responses, and the ethical implications of their interactions with participants (Amis & Silk, 2008; Olmos-Vega *et al.*, 2023). Such reflexivity is essential for ethically navigating the complex power dynamics and emotional entanglements that often accompany qualitative ethnographic research, which are explained next.

3.10.3 Researcher's Positionality and Reflexivity

In qualitative research, the researcher is not a detached observer but an integral part of the research process whose social position, experiences, and interactions shape knowledge production (Dumont, 2023). Recognising this, reflexivity was maintained throughout the study to critically examine how the researcher's background, assumptions, and engagement with participants influenced data collection, interpretation, and analysis.

The researcher occupied a position of both familiarity and difference in relation to the participants. Having been raised in a rural Kenyan setting, the researcher possessed prior knowledge of local cultural norms, agricultural livelihoods, and gendered social practices. For example, understanding local expectations regarding dress and behaviour enabled the researcher to adopt culturally appropriate practices, such as wearing a headscarf and a *leso*, which helped participants perceive the researcher as respectful and approachable. Moreover,

having worked as a consultant with women and the farmers' groups, this familiarity facilitated entry into the field and contributed to the development of rapport and trust with participants. This insider cultural knowledge enhanced participants' willingness to share their experiences openly and allowed the researcher to better understand the meanings attached to everyday practices.

At the same time, the researcher remained aware that complete insider status was neither possible nor desirable, as also noted by Dumont (2023). As a university researcher, the researcher occupied a position associated with higher education and external expertise, which could influence how participants presented themselves, their farming practices, and their experiences with agricultural innovations. Participants may have altered their behaviour or emphasised particular aspects of their experiences due to the researcher's presence. Such experiences may hamper credible data collection. Acknowledging this possibility, efforts were made to minimise power imbalances (Burns *et al.*, 2012; Olmos-Vega *et al.*, 2023) by spending extended periods in the field, participating in routine activities, engaging in informal conversations, and adopting a respectful and non-judgmental stance throughout the research process.

Reflexivity was practised continuously during fieldwork through critical self-reflection and detailed field notes. The researcher regularly documented observations, personal reactions, assumptions, and emerging interpretations to distinguish participants' perspectives from the researcher's own experiences and expectations. These reflexive notes served as an important tool for identifying potential biases and ensuring that interpretations remained grounded in participants' accounts and observed practices (Olmos-Vega *et al.*, 2023).

Furthermore, participation in everyday activities such as weeding, household chores, and informal social interactions enabled the researcher to gain a deeper understanding of participants' lived realities while remaining conscious of the potential influence of such involvement on the research process. Rather than viewing this influence as a limitation, the study acknowledges that knowledge was co-constructed through interactions between the researcher and participants. Maintaining reflexive awareness throughout the study enhanced the credibility, transparency, and trustworthiness of the findings by making explicit the role of the researcher in shaping the research process and the knowledge generated.

3.11 Chapter Summary

This chapter has outlined the methodology approach adopted to explore how gender relations impact the adoption of pro-poor agricultural innovations. Situated within a qualitative ethnographic framework, the study employed an emergent, inductive, interpretive, and naturalistic research design that enabled an in-depth examination of participants' lived experiences within their everyday social contexts (Watson, 2011; Dumont, 2023). The chapter described the data collection methods utilised, including participant observation, focus group discussions, key informant interviews, and informal conversations, and explained how these methods facilitated the generation of rich and contextually grounded data.

The chapter also detailed the procedures for data management and analysis, highlighting the application of the Gioia methodology as a systematic and transparent approach to analysing ethnographic data (Gioia *et al.*, 2013). By combining inductive concept development with abductive interpretation, the Gioia methodology enhanced the rigour, transparency, and credibility of the analytical process. Ethical considerations were addressed through informed

consent procedures, the protection of participants' confidentiality and anonymity through the use of pseudonyms, and the secure storage of research data.

Additionally, the chapter has discussed how multiple strategies were employed, including methodological and data triangulation, participant validation, and prolonged engagement in the field, which strengthened the credibility of the research. The chapter further reflected on the methodological and ethical complexities of ethnographic research, particularly the opportunities and challenges associated with immersion, researcher positionality, and the negotiation of multiple identities and roles within the field. It also acknowledged the potential vulnerabilities that participation in research may create, both for participants and for the researcher, and emphasised the importance of ongoing reflexivity in navigating these ethical and relational dynamics.

Overall, the methodological approach adopted in this study provided a robust foundation for examining the gendered dimensions of agricultural innovation adoption. The reflexive and interpretive stance maintained throughout the research process ensured that the findings remained grounded in participants' lived realities while recognising the researcher's role in the co-construction of knowledge. Building on this methodological foundation, the following chapters present and analyse the empirical findings, exploring how gender relations shape access to, engagement with, and adoption of pro-poor agricultural innovations in the study communities.

CHAPTER FOUR

EMPIRICAL FINDINGS

4.1 Introduction

This chapter presents the findings from the ethnographic study conducted in Mbeere North and Tigania East sub-counties. This study sought to explore how gender relations influence the adoption of pro-poor agricultural innovations among subsistence farmers in these regions. To discuss the findings from a gender perspective, the social construction theory of gender (Benschop & Verloo, 2015) was employed and integrated with the contextualised bottom-of-the-pyramid model (CBOP) (Nakata & Weidner, 2012), which extends subsistence marketplace scholarship by emphasising how contextual realities of low-income communities influence adoption patterns. The integration of these frameworks, illustrated in Figure 4.1 provides a lens through which to understand the link between gender relations and the adoption of pro-poor agricultural innovations.

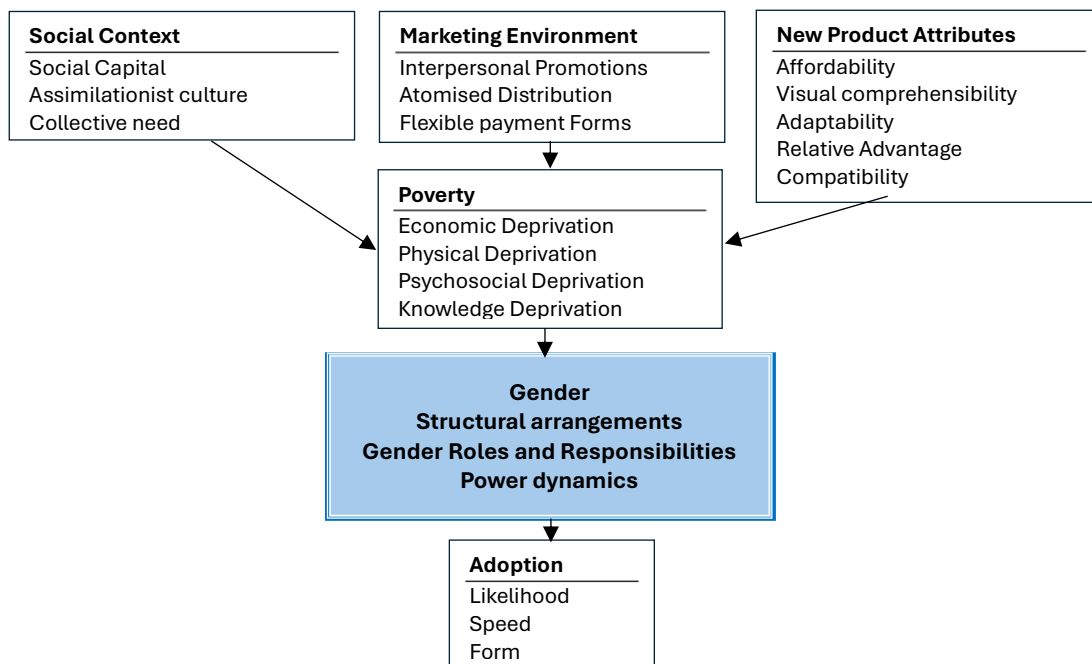


Figure 4.1 Framework for understanding adoption of agricultural innovations from a gendered perspective. Modified from Nakata and Weidner (2012).

Guided by this framework, the research sought to answer three key questions: (1) How do farmers perceive pro-poor agricultural innovations? (2) What are the profiles of farmers who adopt pro-poor agricultural innovations? and (3) How do gender relations affect the adoption of pro-poor agricultural innovations? This section presents the findings in relation to these questions and discusses the results under the corresponding thematic areas as outlined below.

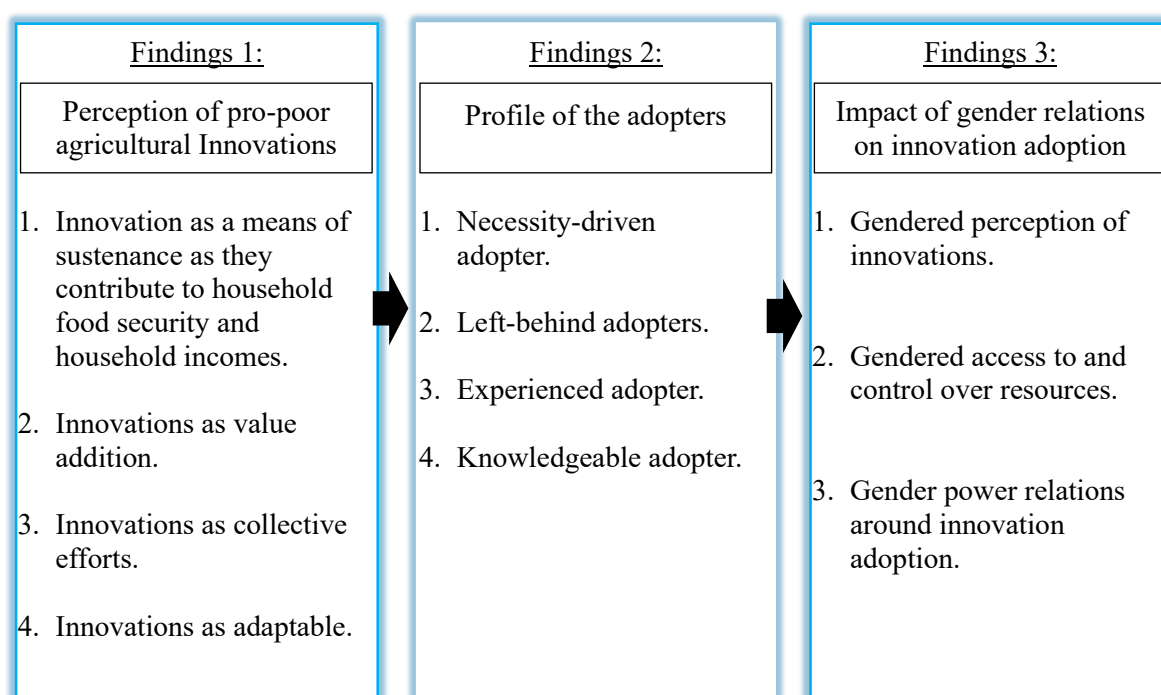


Figure 4.2 Structure for the research Findings

The chapter presents the findings as follows: First, section 4.1 presents the findings on how farmers perceive pro-poor agricultural innovations. This section outlines how farmers evaluate innovations and identifies the key drivers and factors influencing the adoption of pro-poor agricultural innovations. Second, section 4.2 explains the profile of subsistence farmers adopting agricultural innovations and their characteristics. Finally, section 4.3 discusses the findings on the role of gender relations in the pro-poor agricultural innovation adoption.

4.2 Perceptions of Agricultural Innovations among Subsistence Farmers

To uncover how subsistence farmers perceive pro-poor agricultural innovations, participants were asked to describe new agricultural products or ideas they have adopted and explain their reasons for adopting them. Since there was no equivalent word for ‘innovation’ in the local dialect, the study adopted Rogers' (2003) concept of newness to depict innovations. Rogers defines an innovation as an ‘idea, practice, or object that is perceived as new by an individual or unit of adoption’ (Rogers, 1983, p.11), as discussed earlier in the section 2.4.1. This question aimed to determine what else, beyond newness, depicts innovation for farmers in this context.

Specifically, the innovations explored in this study are pro-poor agricultural products and practices that serve the needs of poor communities and satisfy the criteria of Ramani *et al.* (2012). By asking participants to provide concrete examples, the researcher aimed to uncover the new agricultural innovations adopted by subsistence farmers and the underlying drivers for adoption. Some of the responses that emerged during the focus group discussions and interviews included ‘*We farm the improved cassava varieties. It produces more roots*’ [Njoki, a 54-year-old female farmer], another participant, Mbura, a 42-year-old female farmer, quipped, ‘*Processing cassava into flour is a new practice for me*’. Muriithi, a 44-year-old farmer, added, ‘*I now grow Muguka on my farm, I earn money from it.*’ Participants from Tigania East mentioned their farmers' group, *Mlango*, as a new strategy they use to sell their produce, as reinforced by Gatwiri, a 57-year-old female farmer, who stated, ‘*Our farmers' group is serving us well. We can sell our produce without much problem.*’

The participants’ responses align with studies that associate innovations with newness (e.g., Rogers, 2003). However, in this context, pro-poor agricultural innovations extend beyond mere

novelty to emphasise usefulness. This perspective is supported by literature that considers agricultural innovations to be both new and beneficial (Meijer *et al.*, 2015; Nyairo *et al.*, 2022). For instance, Meijer *et al.* (2015) noted that agroforestry practices were not only new but also beneficial due to their contributions to household food security, increased incomes, and reduced costs of agricultural inputs. Similarly, Nyairo *et al.* (2022) found that subsistence farmers consider agricultural basic tools, inputs, and practices to be new and beneficial because of their economic advantages and ease of use. The findings by Meijer *et al.* (2015) and Nyairo *et al.* (2022) suggest that perceptions of pro-poor agricultural innovations vary depending on the type of innovation and context. Notably, while Nyairo *et al.*'s study is grounded on the subjective view of subsistence farmers, making it closely aligned with the present research, Meijer *et al.*'s conclusions were drawn from a literature review.

This finding that pro-poor agricultural innovations are perceived as both new and beneficial by subsistence farmers in the current research also resonates with the existing literature from other contexts. For instance, Lowe and Alpert (2015) describe innovative products and services as novel and superior, while Sorescu *et al.* (2003) emphasise their novelty and consumer benefits. In the current research, innovation aligns with Garcia and Calantone's (2002) concept of incremental innovations, referring to innovations that offer benefits to those who adopt them. This finding, therefore, highlights specific pro-poor agricultural innovations or practices adopted by subsistence farmers to enhance food security and livelihoods.

The innovations identified in this research can be categorised into product and process innovation. Product innovations include the introduction of new farm inputs, such as new crops of seeds, as well as improved crop varieties in a region or farm (Iza *et al.*, 2019). For example,

Muguka, is regarded as an innovative product by farmers in Mbeere North because of its income-generating potential. Similarly, improved cassava varieties, such as the Kenya Agricultural Research Institute Mtwapa Early (KME) varieties, are valued for their contribution to household food security. Product innovation also extends to the transformation of agricultural outputs into new forms, such as processing cassava roots into flour (Iza *et al.*, 2019). Farmers, particularly women, viewed cassava processing as a beneficial innovation because it increases the shelf life and value of food products.

Despite these benefits, many participants perceived cassava processing as labour-intensive and time-consuming, which limited its widespread adoption, as later discussed in Section 4.2.2. This finding is consistent with Nyairo *et al.* (2022) and Lee and O'Connor (2003), who highlight the importance of perceived innovation difficulty in shaping adoption decisions. Innovation difficulty refers to how challenging a new practice is to implement (Lowe & Alpert, 2015) or the effort required to realise its benefits (Khoza *et al.*, 2021). In this present research, the perceived tediousness of cassava processing extends beyond Davis' (1989) concept of perceived ease of use within the Technology Acceptance Model, suggesting that labour demands and time requirements also influence adoption decisions among subsistence farmers.

The second category, process innovation, may include new approaches for accessing resources, organising production, and marketing activities (Badstue *et al.*, 2018; Barzola Iza *et al.*, 2019). An example from this research is the formation of a farmers' group in Tigania East. The group enable farmers to collectively address challenges related to market access and improve their bargaining position. Such innovations demonstrate that agricultural innovations are not limited

to physical products but also includes new organisational arrangements that enhance farmers' livelihoods.

The findings further demonstrate the importance of understanding pro-poor agricultural innovations from the perspective of farmers themselves. Farmers' perceptions of what constitutes an innovation provide valuable insights into why certain practices are adopted while others are rejected. In this research, subsistence farmers associated pro-poor agricultural innovations with products and processes that delivered tangible benefits to their households. Beyond economic and food-security outcomes, participants attached personal significance to these innovations. This observation supports Lowe and Alpert's (2015) argument that perceived personal relevance acts as a stimulus for adoption. Female farmers frequently emphasised the ability of innovations to improve household food provision and enable them to feed their children because of their role as mothers, whereas male farmers highlighted income-generation opportunities due to their position as providers. According to Lowe and Alpert's (2015) innovations perceived as lacking personal relevance are less likely to generate favourable attitudes among potential adopters, thereby reducing the likelihood of adoption.

The ways in which subsistence farmers perceived and defined pro-poor agricultural innovations generated the following themes:

4.2.1 Innovations as a Means of Sustenance

The research findings revealed a broad consensus among subsistence farmers regarding their evaluation of pro-poor agricultural innovations, such as the KME cassava variety, *Muguka*, and

the farmers' group on their roles in contributing to household food security and incomes. The analysis begins the analysis with food security.

4.2.1.1 Benefits of Food Security

In Kenya, the rainfall pattern features two rainy seasons: short rains from October to December and long rains from March to May (NDMA, 2024). In Mbeere North, where agriculture is predominantly rainfed, subsistence farmers are highly dependent on these seasonal rainfall patterns for crop production. Thus, inadequate rainfall and increasingly erratic weather conditions can result in poor harvests or complete crop failure, leaving households with little to consume until the next growing and harvest season. Within such contexts of climatic uncertainty, agricultural innovations that are drought-tolerant, high-yielding, and adaptable to changing environmental conditions become particularly important for sustaining household food supplies. Previous studies have shown that the adoption of improved agricultural technologies can enhance food security by increasing agricultural productivity and reducing vulnerability to climate-related shocks (Pan *et al.*, 2018; Ruzzante *et al.*, 2021).

The findings indicate that improved cassava varieties are valued by farmers primarily because of their contribution to household food security. Farmers consistently associated the improved varieties with reliable food availability, particularly during periods when other staple crops fail. One participating farmer, Njoki, a 54-year-old farmer from Mbeere North sub-county, explained, '*With the new early-maturing cassava variety, I can feed my family*', highlighting the importance of shorter maturation periods in ensuring a more dependable food supply compared to the local varieties that take longer to mature.

Similarly, Florence, a 62-year-old female farmer from Mbeere North, noted that, *‘The new cassava variety produces more roots; thus, one cannot sleep hungry’*. These accounts suggest that farmers perceive the improved cassava variety not merely as a crop with superior agronomic characteristics but as a safeguard against hunger and food shortages. This perception was reinforced by Emily, a 34-year-old community leader and farmer, who works with women and young people at a local church in Mbeere North, as stated, *‘If a cooked meal is not enough, cassava can quickly be harvested and added to the pot, ensuring enough food for everyone in no time’*. These responses illustrate the benefit of accessibility and more sustained yields from the improved cassava varieties, which aligns with the broader understanding of food security, which encompasses not only food availability but also physical and economic access to sufficient and nutritious food (Adeyeye, 2017; FAO *et al.*, 2023).

Farmers also emphasised the role of cassava processing in enhancing household food security. Mbura, a 42-year-old female farmer, explained, *‘I learned how to process cassava roots into flour. I use the flour to make ugali (Figure 4.3) for my children, especially when maize fails due to drought.’*



Figure 4.3 Ugali made with improved cassava flour.

This response demonstrates how the benefits of improved cassava varieties extend beyond primary production to include value addition through processing. Cassava flour is one of the main products derived from cassava roots, and food processing has been recognised as an important strategy for improving food security by extending shelf life, increasing utilisation options, and reducing dependence on a single staple crop (Adeyeye, 2017).

Ugali, a thick paste prepared from hot water and flour (including that from maize and millet), is a staple food consumed widely across many African countries (Parmar *et al.*, 2017; Reincke *et al.*, 2018). Farmers reported using cassava flour not only for ugali but also for chapatis, a type of flat bread, thereby expanding household dietary options. As Mbura further explained, *'We mix cassava flour with wheat to make chapatis.* The literature similarly documents the versatility of cassava flour in food preparation. Studies by Githunguri *et al.* (2017) and Klein (2017) note the use of cassava flour in producing bread, cakes, and other baked products. Klein (2017) further argues that cassava flour is a valuable gluten-free alternative for the production of baked foods and pasta, offering dietary options for gluten-intolerant consumers.

Thus, the diverse applications of cassava flour, ranging from ugali and chapatis to cakes and gluten-free products, demonstrate the multifunctionality of improved cassava varieties across the production and consumption chain. The varied uses highlight the crop's contribution to household food security among subsistence farmers in Mbeere North. Notably, discussions concerning food security were predominantly raised by female farmers. For these women, food encompasses not only agricultural production but also the preparation and provision of meals for their families. Their responses reflect their dual roles as farmers and caregivers,

underscoring how improved cassava varieties support household sustenance through higher yields, earlier maturity, and greater resilience to drought and disease.

For this reason, these findings suggest that farmers value improved cassava varieties not only because they produce higher yields and mature earlier than local varieties, but also because they support multiple pathways to food security. Through reliable production, year-round availability, and diverse processing and consumption options, improved cassava varieties enhance both the quantity and accessibility of food at the household level. The innovation, therefore, derives its value not solely from agronomic performance but from its capacity to strengthen household resilience in a climate-vulnerable farming system.

Another theme emerging from farmers' accounts was the use of cassava as livestock feed. One participant explained:

'This year marks my 47th year of farming, and among the crops I cultivate is cassava. I intercrop it with other crops, but primarily for my family's consumption. I also use cassava leaves to feed my pigs' [Ireru, a 64-year-old male farmer].

The versatility of cassava contributes to farmers' perceptions of the crop as an innovative agricultural product. Interestingly, despite recognising its value, farmers reported that cassava leaves are rarely consumed by households, even during periods of food scarcity, when it might be the only available vegetable. As Mumbi, a 58-year-old female farmer, stated, *'We do not eat cassava leaves; rather, we feed them to our animals.'* This observation aligns with finding by Andersson *et al.* (2016) and Parmar *et al.* (2017), who observed that cassava leaves are frequently underutilised despite their abundance and nutritional value. Parmar *et al.* (2017)

further noted that cassava leaves are often associated with the ‘poor man’s food’ tag, which may discourage their consumption when alternative vegetables are available. Consequently, cassava leaves are more commonly used as a livestock feed in the form of silage or pellets (Parmar *et al.*, 2017).

Unlike other vegetables, cassava leaves can be available throughout the year because cassava roots can remain unharvested in the ground for extended periods. This characteristic is linked to cassava’s ability to withstand harsh climatic conditions, one of the crop’s key relative advantages. Studies from Africa, Asia, and South America show that cassava leaves are widely consumed as vegetables and can be dried and processed into flour (Parmar *et al.*, 2017). Câmara and Madruga (2001) reported that cassava leaf flour has been blended with wheat and maize in Northeastern Brazil to address child malnutrition in low-income households. However, the studies by Câmara and Madruga (2001) and Parmar *et al.* (2017) have primarily focused on the nutritional and physiological characteristics of cassava. In contrast, the current research explores how farmers perceive improved cassava varieties and the value they attach to them, which influences their adoption or lack of adoption.

Thus, the findings from this research suggest that the limited consumption of cassava leaves in Mbeere North may be influenced by a combination of cultural beliefs and limited awareness of their potential uses. This interpretation is consistent with Reincke *et al.* (2018), who found that cassava’s contribution to food security in Tanzania was constrained by farmers’ limited knowledge of the crop’s diverse applications. The non-consumption of cassava leaves therefore represents a missed opportunity to maximise the food security benefits of the improved cassava variety. Nevertheless, realising the full potential of pro-poor agricultural innovations requires

farmers to make certain trade-offs, including adopting new practices and challenging established beliefs surrounding food consumption.

4.2.1.2 Benefit of Household Incomes

The economic benefits associated with pro-poor agricultural innovation also emerged as a significant factor shaping farmers' perceptions of innovativeness. Participants consistently linked innovation with the potential to increase production, generate surplus, and improve household income. For instance, Florence, a 62-year-old farmer, explained, *'When we have good harvests, we store food until the next harvest and sell surplus to generate income.'* This observation was corroborated by all participants, indicating that pro-poor agricultural innovations are valued not only for enhancing food security but also for their ability to support household livelihoods.

However, experiences in Mbeere North revealed important limitations to this income-generating potential. Although farmers widely adopted improved cassava varieties, cassava was primarily cultivated for household consumption rather than commercial purposes due to limited market access. As Muriithi, a 44-year-old male farmer, noted, *'We grow enough cassava for home consumption. Occasionally, we sell the surplus, but our biggest challenge is market access.'* While this response highlights the significance of improved cassava as a food-security crop, it also illustrates how inadequate market opportunities constrain farmers' ability to translate increased production into economic gains. Similar challenges have been documented among subsistence farmers elsewhere, where weak market integration limits incentives for commercialisation and innovation (Aku *et al.*, 2018; Singh-Peterson & Iranacolaivalu, 2018;

Ume, 2023). In such contexts, farmers' efforts remain largely focused on household sustenance, which also limits farmers' creativity for entrepreneurial expansion.

The influence of market constraints was further reflected in farmers' experiences with intermediaries (i.e., middlemen). Several participants reported that middlemen purchased cassava at exceptionally low prices before selling it on to larger traders at substantial profit margins. Kagendo, a 62-year-old female farmer, shared this challenge: *'We sell cassava to middlemen who buy it at very low prices and then sell the roots to large traders at higher profit margins.'* This observation supports earlier studies highlighting the exploitative role of intermediaries within agricultural value chains (Masters, 2008; Kalejaiye *et al.*, 2021). Farmers further described the irregular and unpredictable nature of cassava markets. Buyers often arrived on an *ad hoc* basis, creating uncertainty regarding both sales and prices. As Kagendo pointed out, *'One can never be sure when they will come.'* Such uncertainty discouraged farmers from expanding production, reinforcing a subsistence-oriented approach to cultivation. Unlike farmers in Tigania East, who had organised themselves into farmer groups to improve their bargaining position, farmers in Mbeere North remained largely unorganised and therefore more vulnerable to exploitative market relations.

The predominance of cassava as a subsistence crop may also help explain the relatively limited involvement of men in its cultivation. Previous studies have shown that men tend to become more actively involved when crops acquire commercial value and generate income (Andersson *et al.*, 2016; Masamha *et al.*, 2018). This trend is also seen with other crops such as maize, beans, and bananas. In Mbeere North, declining yields of traditional staples such as maize and beans, driven partly by environmental changes, prompted many households to seek alternative

income sources. Within this context, *Muguka* emerged as an attractive cash crop because of its strong market demand and capacity to supplement household incomes.

Muriithi, a 44-year-old male farmer, explained this motivation, *'We have taken to cultivating Muguka to help us generate income to take care of our families. This is very important for us as household heads.'* Similar views were expressed by other male participants, who emphasised that innovations were particularly valuable when they generated income. The research revealed that with limited sales of cassava roots due to a lack of market access, and low production of maize and beans, some male farmers are focusing on cultivating *Muguka*. Ngari, a 56-year-old male farmer, observed: *'We value innovations that help us bring money home. We need the money to pay school fees for our children and handle other expenses like hospital bills. If we cannot get the money from our maize and beans, we look for alternatives. This is what Muguka is to us.'* Likewise, David, a 25-year-old farmer and a mason, stated, *'I am happy to earn some income from Muguka, as I can take care of my mother. It makes me a good man,'*

These responses emphasise the importance of income generation in shaping perceptions of pro-poor agricultural innovations. Income enables farmers to satisfy basic household needs and contributes significantly to subjective well-being. This finding is consistent with Rojas *et al.* (2023), who tested Maslow's hierarchy of needs using the subjective well-being (SWB) approach and found that income significantly contributes to the fulfilment of the basic needs. However, the findings also reveal a gendered dimension to innovativeness. Male farmers were more likely to value innovations that generated cash income, reflecting their socially constructed roles as household providers. This observation aligns with studies showing that

men tend to favour commercially oriented innovations, whereas women often prioritise innovations that strengthen household food security (Andersson *et al.*, 2016; Masamha *et al.*, 2018; Visser & Wangu, 2021).

David's account provides a particularly insightful illustration of this dynamic. Although he continued to rely on his mother for many basic needs, his ability to earn income from *Muguka* enabled him to contribute financially to the household, albeit minimal. His mother allocated him a portion of land to grow *Muguka*, enabling him to earn money to take care of his personal needs, such as toothpaste and washing soap. Despite the help he receives from his mother, he perceives himself as a good man when he can contribute some of his earnings from the sale of *Muguka* to his mother. David's experience demonstrates how agricultural innovations can reinforce prevailing gender norms by enabling men to enact socially valued provider roles (Badstue *et al.*, 2018; Stewart *et al.*, 2021).

The appeal of *Muguka* was further strengthened by its reliable market demand and predictable purchasing arrangements. Male participants reported the crop offered relatively stable opportunities for income generation compared with staple crops. During focus group discussions, several men explained that when women assumed primary responsibility for household food provisioning, they were able to focus on income-generating activities such as *Muguka* cultivation. Consequently, *Muguka* was widely regarded by male farmers as an innovative crop because of its contribution to household financial security. Female farmers also recognised the value of income-generating innovations, particularly because access to income enhanced their autonomy, reduced dependence on their husbands and attenuated their

bargaining. For instance, Wanjiru, a 32-year-old female farmer, explained, *'If I have money, I am able to plan the house expenditure without asking my husband for money.'* Similarly, Kanorio, a 45-year-old female farmer from Tigania East, observed, *'Asking for money now and then from my husband breeds animosity. Having a little to buy salt without begging for money is a nice thing.'* These experiences echo Doss' (2013) argument that women's access to resources enhances their bargaining power and improves household decision-making outcomes. This means that when women can access income independently, the need to bargain diminishes, reflecting a greater autonomy and empowerment.

However, despite recognising the value of income, women frequently reported having limited control over earnings derived from agricultural production. Wanjiru described how income from farm sales was often appropriated by her husband, leaving her with little capacity to address household needs independently, as follows:

'The minute I sell anything, although I rarely sell farm products without my husband's knowledge, he asks for the money. He leaves me with a few shillings, making it challenging to manage household needs. This means asking for money to buy even the smallest items, like salt. I do not enjoy it, but I have no option' [32-year-old female farmer].

Kanorio similarly noted that although she managed banana production, her husband controlled both sales and revenue generated through the farmers' group, as noted:

'It is sometimes very challenging and demoralising for me because I take care of the bananas, but once they're ready, my husband manages the sale and the money. He leaves me with very little money' [45-year-old female farmer].

These experiences illustrate how male control over income undermines the ability of women, who often bear primary responsibility for food preparation and household management. This dynamic can have negative consequences for food production and their families' well-being. As a result, many women placed greater value on food production than on cash income. Wanjira, a 34-year-old farmer from Mbeere North, explained:

'We prefer to have food in the house rather than money. With food, we have planting inputs. With food, we have school fees for our children and medicine. Food in the house is everything to us.'

For women who bear primary responsibility for feeding their families, food represents a direct and reliable means of meeting household needs. Consequently, innovations that strengthen household food security are not only beneficial but often possess greater personal relevance for women than those focused primarily on income generation, in contexts where they have no control over the income generated. This finding supports Rojas *et al.* (2023), who found that the importance of income becomes modest when other essential needs are already met.

These contrasting priorities help explain women's ambivalent attitudes towards *Muguka*. Although the crop generates income, women often remain excluded from decisions regarding the use of that income, even when they are involved in its cultivation. Wawira, a 44-year-old farmer, expressed her frustration:

'Muguka has brought problems to my household. Unlike when we planted more maize from which I could slowly sell some for money to buy necessities like salt, the money we earn from Muguka is entirely controlled by my husband. He often misuses this money, leaving us with limited options for accessing food. When there is food in the house, it's easier for me because I manage it myself and I don't need to ask for money to buy food.'

Emily, a community leader, similarly reported that income from *Muguka* had contributed to household tensions, particularly where men misappropriated money for other uses rather than family welfare. She observed:

'I have witnessed cases where the money obtained from Muguka is tearing families apart. This is mainly because most male farmers tend to misuse the money generated from produce sales, indulging in alcohol consumption, which places their families in a difficult position regarding food security. This creates a greater burden on women to provide for the family, leading to frustrations and frequent incidents of domestic fights.'

These accounts highlight how financial aspirations can, at times, undermine food security among subsistence farmers. In particular, the adoption of *Muguka* appears to erode the incremental benefits from pro-poor agricultural innovations for some households, increasing their vulnerability and intensifying intra-household conflict. This finding resonates with Holmelin's (2021) caution that cash farming can also jeopardise household and community food security and weaken social cohesion despite its economic benefits.

The findings, therefore, reveal that *Muguka* is a contested pro-poor agricultural innovation. For many men in Mbeere North, it represents an innovative and profitable crop that supports their role as household providers. For many women, however, its benefits are less apparent because they often lack control over the income it generates while continuing to shoulder responsibility for household food security. Similar concerns have been documented by Curry *et al.* (2021), who found that mechanisms designed to increase women's control over agricultural income (e.g., *Mama card* or *Mama Lus Fruit (MLF)*, a money transfer system designed to compensate women for their labour) improved household relationships and reduced tensions arising from unequal benefit distribution.

Overall, these findings demonstrate that perceptions of innovativeness extend beyond agronomic performance and economic returns. Innovations acquire meaning through their relationship to locally embedded social roles, household power dynamics, and livelihood priorities. By foregrounding farmers' experiences, particularly the gendered dimensions of innovation, this research provides a more nuanced understanding of *Muguka's* role as an innovative cash crop. While *Muguka* offers clear economic advantages and responds to changing environmental and livelihood conditions, its benefits are not distributed equally. Consequently, innovations that appear successful from a productivity or income perspective may simultaneously reinforce existing gender inequalities and reduce their personal relevance for women.

4.2.2 Innovation as Value Addition

Another important dimension of how subsistence farmers perceive pro-poor agricultural innovations is related to their ability to extend food availability through value addition and processing. This theme emerged strongly from the experiences of farmers such as Mbura and Florence, who viewed cassava processing as an innovative practice that enhanced household food security. Mbura, a 42-year-old female farmer, explained:

'Processing cassava into flour is a new practice for me. I can now harvest several roots, unlike before and process them into flour, which lasts longer than cassava roots.'

Similarly, Florence, a 62-year-old female farmer, described how she had continued cassava-processing practices after moving to Mbeere North;

'Once the cassava roots are mature, I harvest enough to last me a month. I chop them into pieces, dry them in the sun, and then take them to the milling machine to be ground

into flour. This process ensures that I have flour available for cooking for at least three weeks.'

These accounts highlight how farmers transform a highly perishable crop into a more durable food product, thereby extending its availability and reducing the risk of food shortages. These findings support studies that identify food processing and preservation as critical strategies for improving household food access and strengthening food security (Adeyeye, 2017; Elevina Pérez *et al.*, 2017; Parmar *et al.*, 2017; Reincke *et al.*, 2018; Knorr *et al.*, 2020; Odey & Lee, 2020). Rather than viewing innovation solely in terms of crop production, farmers recognised innovation throughout the agricultural value chain, particularly in practices that improve storage, utilisation, and access to food.

A common preservation method reported by participants was the production of sun-dried cassava chips before milling. By reducing moisture content, sun-drying slows deterioration and prevents spoilage. As Aworh (2023) notes, sun-drying remains one of the oldest and most widely practised food preservation methods globally. Although more sophisticated dehydration technologies are available, sun-drying continues to play a vital role in many African farming communities because of its affordability and accessibility (Adeyeye, 2017; Aworh, 2023). For resource-constrained households, such low-cost preservation methods represent practical and locally appropriate innovations.

Processing also enhances the palatability and safety of cassava. Florence observed that, *'Processing the improved cassava variety is better because many people find the roots bitter to taste.'* This observation aligns with Pérez *et al.*'s (2017), who note that processing reduces

cyanogenic compounds and improves taste, making cassava safer and more acceptable for consumption. The findings, therefore, demonstrate that traditional processing practices are not merely cultural customs but function as locally relevant innovations that improve food quality, safety, and accessibility. This finding also supports the literature on food security, which acknowledges that the adoption of agricultural innovations extends beyond production; it also encompasses innovative practices throughout the production chain, including processing, storage, and marketing farm outputs (Adeyeye, 2017; Mwongera *et al.*, 2019).

Furthermore, processing cassava significantly improves its storage time. Most farmers reported that cassava flour could be stored for two to three weeks using locally available storage methods, including plastic containers and polyethylene packaging (see Figure 4.4).



Figure 4.4 This image illustrates a storage system for subsistence farmers

Florence noted that flour stored for longer periods often developed a bitter taste. Although rural storage conditions may not always be optimal, they nevertheless provide an important buffer against food shortages. Studies suggest that improved packaging and storage technologies can further extend shelf life to several months (Pérez *et al.*, 2017; Knorr *et al.*, 2020). Beyond reducing spoilage, cassava processing enables households to smooth food consumption between harvest periods, minimise post-harvest losses, and enhance food availability throughout the year (Adeyeye, 2017; Parmar *et al.*, 2017).

The benefits of processing also appeared to influence production decisions. Farmers who regularly processed cassava into flour reported cultivating larger quantities of cassava and maintaining production throughout the year. Florence remarked, *'You will never find a time when cassava is missing from my farm.'* Similarly, Makena explained:

'Before I learned how to process cassava, I did not take growing cassava seriously. I have planted the new varieties and staggered the planting season so that I have a continuous supply throughout the year.'

These responses suggest that processing knowledge increases the perceived value of cassava and encourages greater investment in production. Similar observations have been reported by Pérez *et al.* (2017), who found that value-addition opportunities and improved storage potential often stimulate increased cultivation.

Cassava's flexibility as a crop further strengthened its appeal among subsistence farmers. Unlike many staple crops that must be harvested within a narrow time frame, cassava can remain in the ground for extended periods until needed. Parmar *et al.* (2017) notes this period can range from six months in warmer regions and up to two years in cooler climates. Florence

noted, *'The main advantage of cassava is that you don't have to harvest it all at once.'* This characteristic effectively provides a form of in-ground storage, which is particularly valuable for households lacking refrigeration or unreliable power connectivity. Parmar *et al.* (2017) similarly note that cassava roots can remain unharvested for extended periods, allowing farmers to manage harvest according to household needs.

In Mbeere North, the most common form of value addition involved processing cassava into flour for preparing ugali. Farmers described cassava flour as versatile, affordable, and suitable for all household members. Njiru, a 67-year-old male farmer, remarked: *'Ugali made with cassava flour has a richer taste than that made with maize flour.'* Makena, a 45-year-old female farmer, noted *'My children tremendously enjoy ugali made with cassava flour. It's the only way they can eat cassava, as they can't chew the boiled roots because they are hard.'* These findings support previous studies highlighting cassava flour's versatility and suitability for diverse consumer groups, including children, older people, and individuals with dietary restrictions (Pérez *et al.*, 2017).

Farmers also demonstrated considerable ingenuity in adapting cassava flour to household needs. Many blended cassava flour with maize or wheat flour to reduce food costs and stretch limited resources. Florence explained: *'With everything becoming expensive to buy, I only buy a two-kilogram packet of wheat flour, which I blend with at least four kilograms of cassava flour.'* Similarly, Njiru noted that blending cassava and maize flour helped his household cope during periods of maize scarcity, as indicated: *'My wife mixes cassava flour with maize flour; this makes it last longer during maize shortage.'* Such practices reflect the growing trend in developing countries toward the use of composite flour products (Odey & Lee, 2020). They

also demonstrate how farmers creatively respond to rising food prices and environmental uncertainties while maintaining household food security.

For some households, cassava flour also provided important health benefits. Several participants reported adopting cassava flour because of digestive problems associated with wheat products. Mumbi, a 58-year-old female, explained:

‘Since I switched from chapatis made with wheat to those made with cassava flour, I no longer experience stomach issues.’

Other two participants, Kagendo (61 years) and Ireri (64 years), also noted they have switched from wheat products to cassava. This finding aligns with research demonstrating that cassava flour is naturally gluten-free and suitable for individuals with gluten intolerance or related dietary sensitivities (Pérez *et al.*, 2017; Parmar *et al.*, 2017; Odey & Lee, 2020). Consequently, farmers perceived cassava not only as a food-security crop but also as a healthier dietary alternative.

Beyond household consumption, cassava processing created opportunities for income generation. Florence reported, *‘I sell flour to my neighbours who find processing tedious’*, while Makena explained, *‘I make money from cakes prepared using cassava flour, which I sell to vendors during market days. This helps me generate some income.’* These examples demonstrate how value addition can simultaneously enhance food security and generate livelihood opportunities, reflecting the broader objectives of pro-poor agricultural innovations.

Overall, the findings demonstrate that subsistence farmers perceive innovation not only through increased production but also through practices that improve preservation, utilisation, and value addition. Processing cassava into flour extends food availability, reduces waste, improves dietary options, lowers household food costs, and creates opportunities for income generation. These benefits increase the personal relevance of improved cassava varieties and encourage their continued cultivation. However, despite these advantages, challenges associated with processing labour requirements and resistance to changing consumption habits continue to constrain wider adoption.

4.2.3 Innovations as Collective Effort -Farmers' group

The concept of a farmers' group in this research is understood as a form of process innovation, drawing on Garcia and Calantone's (2002) typology of innovations, particularly incremental innovations that address practical challenges faced by adopters. In Tigania East, Subsistence farmers organised the *Mlango* farmers' group to address persistent market access challenges, particularly in relation to banana marketing. Consequently, members perceive the group as innovative not only because of its organisational structure but also of its effectiveness in solving a shared problem. The formation of the *Mlango* community-based farmers' group was in part in response to the exploitative practices of banana buyers, who benefited from high demand in local Kenyan markets (Odhiambo, 2018). By organising collectively, farmers sought to regain control over marketing processes and improve their bargaining power in price negotiations.

At the time of the study, the group consisted of 100 members, including both women and men, who collectively marketed their bananas. According to Mugambi, a 52-year-old male farmer

and the group's secretary, the initiative evolved from a rotating savings and credit association (ROSCA) originally formed by 15 women. The group operates through a formal leadership structure consisting of elected officials, with members working collaboratively to create shared value. Clear obligations and expectations were embedded within the group's rules, consistent with Claridge's (2020) observations that group norms play a significant role in shaping behaviour. As Mugambi explained, '*All members are expected to abide by the rules of the group.*' These rules are enforced by the elected officials, who manage communication, coordinate group activities, and address any issues affecting members. In performing these responsibilities, the officials fulfil both administrative and social supervision roles, influencing and regulating members' behaviours in ways consistent with Fujishin's (2013) discussion of leadership in small groups. The role of the officials is socially integrative, helping maintain trust, accountability, and cooperation among members. Non-compliance with group norms may result in expulsion, reinforcing adherence to shared values and collective goals.

The *Mlango* farmers' group, as a registered entity recognised by the government, legitimises it as a legal entity whose actions conform to 'socially constructed systems of norms, beliefs, and definitions' (Klein, 2013, p. 5). Registration also provides legal protection in situations such as the buyer's default or non-payment. Claridge (2020) notes that legal, judicial, and law enforcement institutions play important roles in upholding these protections. However, Mugambi reported that weak governance structures and corruption within government institutions can sometimes undermine the effectiveness of these institutional safeguards.

Overall, the process innovation, such as farmers' groups have the potential to enhance not only economic outcomes but also food security and resilience within rural farming systems.

Participants in this research regarded the *Mlango* farmers' group as innovative because it contributes to household income generation and food security in different ways, outlined below.

4.2.3.1 Farmers' Group Contributes to Household Food and Income

During focus group discussions, farmers were asked why they joined the *Mlango* farmers' group. Female farmers primarily emphasised their ability to secure food for their families without relying on their husbands or male partners, while male farmers highlighted the opportunity to generate income. Gatwiri, a 67-year-old female farmer, shared:

'I joined this group for several reasons, but the main goal is to meet my family's need for food. Through this group, I am earning some money that helps me buy food for my family. Most of the time, I can buy food without having to wait for my husband or borrow money from him. Managing the household becomes a lot easier.'

This observation was corroborated by Gacheri, a 39-year-old female farmer, who remarked:

'It is very liberating to have some money in my pocket. It's not much, but it feels good to have some coins on me.'

These accounts demonstrate how collective action can create opportunities for women to participate in and benefit from pro-poor agricultural innovations. Income generated through group-based banana marketing contributes directly to household food provisioning while reducing the household bargaining that can occur when women must request money from their spouses. This finding aligns with Mudege *et al.* (2015) who observed that farmers' groups can help reduce gendered power disparities in Malawi's potato sector. However, Mudege *et al.*'s primarily focused on women's empowerment without accounting for how gender relations and norms, such as food preparation and caregiving, influence joining the farmers' group, which is the key focus of the present research.

Further insights from the focus group discussions and in-depth interviews revealed that female farmers valued the farmers' group not only for improving food access but also for the opportunity to enhance dietary diversity and support other household needs, including school fees and medical expenses. As Gacheri, a 39-year-old female farmer, explained:

'Bananas in this region are everything to us. The money generated goes toward buying other foodstuffs we do not grow here, such as carrots, potatoes, and cabbage. We are also able to cover some bills, such as hospital expenses and school fees for our children. Although the money is often not enough, a little is better than nothing.'

Another participant, Maiti, a 56-year-old female farmer, added:

'With this group, I earn more money from the sale of surplus bananas than I would from selling them individually. I can now plan a variety of diets for my family, and when sales are good, I buy rice to cook for my children, which they enjoy a lot. I also buy sugar to add to their porridge, which makes them very happy. This makes us not feel left behind.'

These narratives suggest that food security extends beyond the availability of food to include dietary diversity, nutritious quality, and the capacity to provide socially valued, defined standards of care. Maiti's account illustrates how the ability to purchase food items like rice and sugar, often associated with higher social status and modernity, symbolises both economic progress and social inclusion within the broader community. At the same time, this preference raises concerns about the influence of social constructs on food choices, where indigenous staple foods such as bananas are often devalued in favour of more 'modern' foods. Similar concerns have been noted by Akinola *et al.* (2020), Aworh (2023), and Omuse *et al.* (2024), who note the marginalisation of indigenous foods within African food systems and research agenda.

Nevertheless, the findings demonstrate that bananas remain both an important food crop and a significant source of household income. This observation aligns with Onomu *et al.* (2023), who observed that women derive substantial economic benefits from the production and sale of indigenous crops. In addition, bananas were widely regarded by participants as resilient to climate variability, providing a comparative advantage over crops like potatoes. This illustrates the roles that indigenous crops like bananas play in supporting food security, climate resilience, and poverty reduction, especially among women who depend on them for income generation.

In contrast, male farmers highlighted income generation and access to new agricultural knowledge and technologies as their primary motivations for joining the group. For instance, Mutembei, a 55-year-old male farmer, stated:

'I joined the group because I can sell my bananas and earn money to take care of my family. Through the group, I am also able to access new ideas and practices that I find beneficial.'

Similarly, Mugambi (52) observed,

'The group has boosted our ability to generate income for our households, allowing us to better manage our household affairs.'

For Kinoti (43), the participation was associated with social recognition and financial independence:

'I can stand among other men with pride now. I always have money in my pocket. Thanks to Mlango farmers group.'

These accounts suggest that men's participation in farmers' group is closely linked to socially constructed expectations of masculinity, particularly their roles as household heads, providers, and economic decision-makers. Consequently, the value of pro-poor agricultural innovations

is often assessed in terms of their ability to enhance productivity, generate income, and strengthen men's capacity to fulfil these responsibilities.

To this end, these findings reveal a gendered pattern in farmers' motivations for participating in the *Mlango* farmers' group. While women are primarily motivated by the need to secure food, improve dietary quality, and meet household welfare obligations, men place greater emphasis on income generation, productivity enhancement, and access to agricultural inputs. Despite these differences, both women and men perceive the farmers' group as innovative because it addresses critical livelihood challenges and creates tangible benefits for their households. In this respect, the farmers' group functions as a space for enhancing household food security and economic empowerment,

4.2.3.2 Farmers' Group Contribute to Bypassing Intermediaries

The study revealed that banana farmers in Tigania East consistently produce a surplus beyond household consumption and therefore depend heavily on market access to sell the surplus produce. This demand is bolstered by growing urban demand for bananas across Kenya (Odhambo, 2018; Nyabaro *et al.*, 2019). To capitalise on this opportunity, farmers have organised themselves into the *Mlango* farmers' group, enabling them to '*negotiate for favourable prices for their bananas*' as explained by Mugambi, a 52-year-old male farmer. This collective action represents an incremental benefit of group participation and aligns with Ramani *et al.*'s (2012) concept of pro-poor innovations, which not only provide solutions to challenges faced by low-income populations but also require behavioural changes among beneficiaries. In this case, farmers have shifted from acting individually to engaging in collective bargaining and coordinated marketing. Consequently, bypassing exploitative

intermediaries emerged as a key motivation for joining the group, ultimately enabling farmers to derive greater economic benefits from their crops, improve household food security, and generate income. Mugambi stated,

‘Selling our bananas for years had been a big challenge. We often encountered unscrupulous buyers who not only purchased our crop at extremely low prices but also disrespected us. This group has alleviated this problem for us.’

While previous studies have suggested that intermediaries can serve as viable market linkages for subsistence farmers (Singh-Peterson & Iranacolaivalu, 2018), the experiences of farmers in Tigania East indicate that the effectiveness of such arrangements is highly context dependent. Intermediaries may play an important role in consolidating produce from smallholder farmers, particularly where production volumes are low and farms are fragmented (Abebe *et al.*, 2016). However, participants in this research reported that poor infrastructure, such as poor rural roads and high transportation costs, significantly constrained their ability to access market independently. As Mugambi explained:

‘Our roads are in poor condition. Transporting small quantities to the markets is every expensive. You earn nothing.’

These infrastructural constraints increase farmers’ dependence on intermediaries and create opportunities for exploitation. As Mutembe, a 55-year-old male farmer, explained:

‘We are left with very little to reinvest in our farmers, which affects our ability to feed our families.’

Participants further described exploitative practices ranging from unfair pricing to verbal abuse and coercion, experiences that reinforced negative perceptions of intermediaries and heightened farmers’ vulnerability. Maiti, a 56-year-old female farmer, noted:

‘The brokers (middlemen) really use bad language on us. Other times, they confiscate our products if we refuse to sell to them at low prices.’

In response to these challenges, the *Mlango* farmers’ group has enabled members to consolidate produce (see Figure 4.5), satisfy market requirements in terms of both quantity and quality, and negotiate directly with traders at more competitive prices. This arrangement represents a significant behavioural and organisational shift, as farmers relinquish some degree of individual autonomy in favour of collective negotiation and gains. According to Mugambi: *‘The prices we negotiate for benefit all the members registered with our group.’*



Figure 4.5 Truckload of bananas consolidated from different subsistence farmers

Collective solidarity within the group is reinforced through informal governance structures. While members are not prohibited from selling outside the group, those who do so are generally unable to access group support when faced with marketing or logistical difficulties, as reported

by Mugambi. Such arrangements encourage commitment to collective objectives while preserving a degree of individual choice.

These findings support Ume's (2023) argument that food security and household well-being can be enhanced when subsistence farmers market surplus production and use the resulting income to meet household needs. Moreover, Ume *et al.* (2022) argued that, in contexts characterised by market inefficiencies, strengthening agricultural production for own consumption can be more beneficial than relying solely on market purchases. The present research extends these insights by demonstrating how market inefficiencies, including poor infrastructure, exploitative pricing practices, and disrespectful treatment by buyers, can contribute to food wastage, reduced incomes, and heightened vulnerability among subsistence farmers.

Viewed through the lens of pro-poor innovation, the *Mlango* farmers' group functions as more than a marketing arrangement. It provides an institutional mechanism through which farmers collectively overcome economic and logistical barriers, strengthen their bargaining power, and secure greater control over the value generated by their produce. In doing so, the group contributes not only to improved household food security and income generation but also to farmers' dignity, empowerment, and resilience in the face of structural market constraints.

4.2.3.3 Farmers' Group Contributes to access to productive inputs

Another important benefit provided by the farmers' group is improved access to productive resources, including high-quality planting materials, farm inputs like fertilisers, credit facilities,

and training opportunities. These resources are critical in enhancing farm productivity among subsistence farmers and strengthening their capacity to improve household livelihoods. Norah, a 33-year-old female farmer, explained:

‘We get access to farm inputs through the group, which helps me improve my banana production.’

For Norah, improved productivity translates directly into livelihood benefits:

‘With fertilisers and manure to improve outputs, I get to sell more bananas, and the money I earn helps me take care of my children and sick husband.’

Similarly, Kanana, a 28-year-old female farmer, noted:

‘Accessing farm inputs, training, and even credit has become easy through the group. We obtain farm inputs through the county government, either through funding or by purchasing them at subsidised prices.’

These accounts were corroborated by Mugambi, the group secretary, who described how collective purchasing arrangements improve affordability and accessibility:

‘We purchase farm inputs in bulk for our members, which allows us to get them at subsidised prices. The county government is also very supportive of our group. Sometimes we even receive free farm input donations. This would not be possible if we were not in a group. The inputs are delivered to us right here at our collection centre, which reduces transportation costs.’

These findings highlight how collective organisation creates economies of scale that enable subsistence farmers to access resources that might otherwise be unaffordable or unavailable. In this respect, the farmers’ group functions as a pro-poor innovation by reducing barriers to productive resources and facilitating access to agricultural support services. The findings also highlight the important role played by institutional partnerships, particularly with county government agencies, in extending resources to organised farmer groups.

The benefits of improved access are especially significant for women, who often face greater constraints in accessing productive resources due to social norms that favour men's ownership and control of agricultural assets (e.g., Beuchelt, 2016; Visser & Wangu, 2021; Chikweche *et al.*, 2023). By centralising the distribution of inputs and services at local collection centres, the group reduces transportation costs and the time required to obtain resources. These advantages are particularly important for women who balance agricultural activities with caregiving and domestic responsibilities. Norah, who cares for her sick husband and two young children, described these challenges:

'It is challenging to find time to travel far to access resources or information because of my caregiving responsibilities.'

Mwendwa, also a 33-year-old female farmer, echoed this experience:

'Not having to travel far to purchase inputs is a huge relief for me. It helps save on travelling costs. With the inputs delivered close to our homes, I can focus on my other tasks, such as tending to animals, taking care of my children, and managing domestic chores.'

These narratives illustrate how the gendered division of labour restricts women's mobility and limits their access to agricultural services and opportunities. By localising the provision of inputs and information, the farmers' group effectively reduces these constraints and creates conditions that enable women to participate more fully in agricultural production. The convenience and cost savings associated with local access to resources enhance women's ability to manage their reproductive responsibilities while maintaining their farming activities. These findings resonate with Aduwo *et al.* (2019) and Ingutia and Sumelius (2022), who found that domestic responsibilities significantly constrain women's mobility and access to farm inputs. Moreover, the findings extend the work of Aku *et al.* (2018), who identified distance as

an important determinant of market access among subsistence farmers but did not explicitly examine how such barriers impact women in particular. The present research demonstrates that logistical constraints are not experienced equally; rather, they intersect with gendered responsibilities to create additional obstacles for women farmers.

Therefore, beyond improving productivity and household food security, the farmers' group functions as a socially inclusive innovation that addresses both economic and gender-based barriers to resource access. By reducing costs, improving convenience, and facilitating access to inputs, credit, and training, the group enhances women's ability to participate in agricultural production and benefit from the opportunities generated through farming.

4.2.3.4 Farmers' Group helps overcome Behavioural and Cognitive Constraints

The findings further revealed that membership in the farmers' group significantly improved time management for female farmers by reducing their dependence on wage labour on other people's farms. During the focus group discussions and follow-up interviews, many women expressed their satisfaction that they no longer needed to engage in such work, frequently stating, *'We no longer work for income on other people's farms.'* Kanana, a 28-year-old female farmer, explained:

'I no longer do farm labour, which is a good thing for most of us. I used to spend the entire day working on other people's farms and earn very little. By the time I came home, I am so tired, and there were still household chores to do, like preparing food for the family, fetching firewood, and taking care of animals. Now, I take care of our bananas mainly, which gives me more time to take care of my family, and my husband is a lot happier.'

This transition has allowed women to devote more time to household responsibilities while maintaining a source of income through banana production and sales. The findings highlight the trade-offs that many women farmers face between income generation and domestic responsibilities. While casual agricultural labour has long served as an important supplementary livelihood strategy for female farmers (Christiaensen & Demery, 2018; Masamha *et al.*, 2018; Fan & Rue, 2020; FAO, 2023), the present research adds nuance by showing that it can also impose significant time and energy costs.

By enabling women to generate income locally and more flexibly through banana marketing, the farmers' group reduces the physical exhaustion and time burdens associated with external wage labour. This not only improves household functioning but also enhances women's well-being and their ability to fulfil caregiving responsibilities. As reflected in Kanana's experience, greater control over time improves women's ability to manage home life, leading to greater satisfaction among spouses. This strengthens intra-household relationships. Furthermore, the shift from labouring on other people's farms to managing their own agricultural products represents an important movement towards greater economic autonomy and entrepreneurship.

These findings suggest that the farmers' group helps alleviate women's time poverty by creating livelihood opportunities that are compatible with their caregiving responsibilities. In doing so, it reduces the strain associated with the double burden commonly experienced by rural women, who are expected to contribute both economically and domestically. The group therefore provides not only economic benefits but also greater flexibility, dignity, and control over livelihood activities.

Further analysis revealed that farmers with low literacy levels also benefit substantially from the group's collective learning environment. Although low literacy is often cited as a barrier to accessing agricultural information and innovations, the group helps overcome these constraints through peer learning, practical demonstrations, translation and social support. Curubi, a 75-year-old female farmer, shared her experience:

'I find it easy to attend meetings organised by extension officers. There is always someone whispering in my ear what is being said. The executive also ensures we have someone to translate if the agents speak in English. Other times, they organise agents who speak our language. But I find it easiest to learn from the group members because I can observe what they are doing. I particularly like learning from my fellow women in the group because I can ask all manner of questions without feeling intimidated.'

Curubi sentiments reflect the experiences of many low-literate farmers and highlight several mechanisms through which the group facilitates learning. First, visual learning enables farmers to observe and replicate farming practices, supporting learning demonstration and imitation. Similar processes have been identified by Hunecke *et al.* (2017) and Kos *et al.* (2023) as important dimensions of social capital in agricultural innovation adoption. Second, translation ensures that technical information is delivered in local languages, making it accessible to all members. Chikweche *et al.* (2023) similarly emphasised the importance of culturally and linguistically appropriate communication in reaching marginalised populations. Third, practical demonstrations enable farmers to engage directly with new practices rather than relying solely on abstract explanations. Fourth, peer-to-peer interactions facilitate informal knowledge sharing among members and reinforce collective learning processes (Hunecke *et al.*, 2017; Kos *et al.*, 2023). Finally, the group creates a psychologically safe learning environment in which members feel comfortable asking questions and sharing experiences. This emotional safety is particularly important for women and older farmers who may feel

intimidated in formal training settings. Taken together, these mechanisms are widely recognised in existing literature as crucial for enabling low-literate farmers to access innovation ideas and information. This research demonstrates how the group dynamic strengthens them. The group setting fosters an informal yet highly effective learning environment, which is particularly valuable for subsistence farmers who might otherwise be excluded from formal extension settings.

While the social and emotional support provided by farmer groups has previously been documented, particularly in helping women navigate personal and family challenges (e.g., Mudege *et al.*, 2015), the present research demonstrates its significance within agricultural learning environments. The findings show that emotional support, trust, and shared identity are not merely social benefits but also important enablers of knowledge acquisition and innovation adoption.

The group further functions as a platform for social interaction and the exchange of practical information relevant to everyday livelihoods. Mwendwa, a 33-year-old female farmer, explained:

‘Joining this group has helped me learn where to get food at cheaper prices and which shopkeepers extend credit.’

This example illustrates how the group supports daily survival strategies beyond agricultural production. Such interactions strengthen social networks and facilitate the circulation of knowledge that directly contributes to household wellbeing. These findings reinforce the importance of social learning processes grounded in trust, shared experiences, and collective identity. As noted by Dennehy and Dasgupta (2017) and Chatterjee *et al.* (2024), individuals

learn more effectively when they feel understood, supported, and connected to others facing similar circumstances. The farmers' group creates precisely such an environment, enabling members to exchange information, solve problems collectively, and build social capital.

Overall, the farmers' group delivers value that extends far beyond technical training and market access. It provides social, emotional, and relational resources that enhance farmers' capacity to learn, adapt, and participate in agricultural innovation. For women and low-literate farmers in particular, these intangible benefits increase confidence, strengthen social networks, and improve access to information and opportunities. Through these interconnected mechanisms, the group contributes to improved household food security, income generation, and resilience. Figure 4.6 summarises how the farmers' group enhances food security through collective problem-solving, access to markets and productive resources, collective marketing, relational learning, and social support.

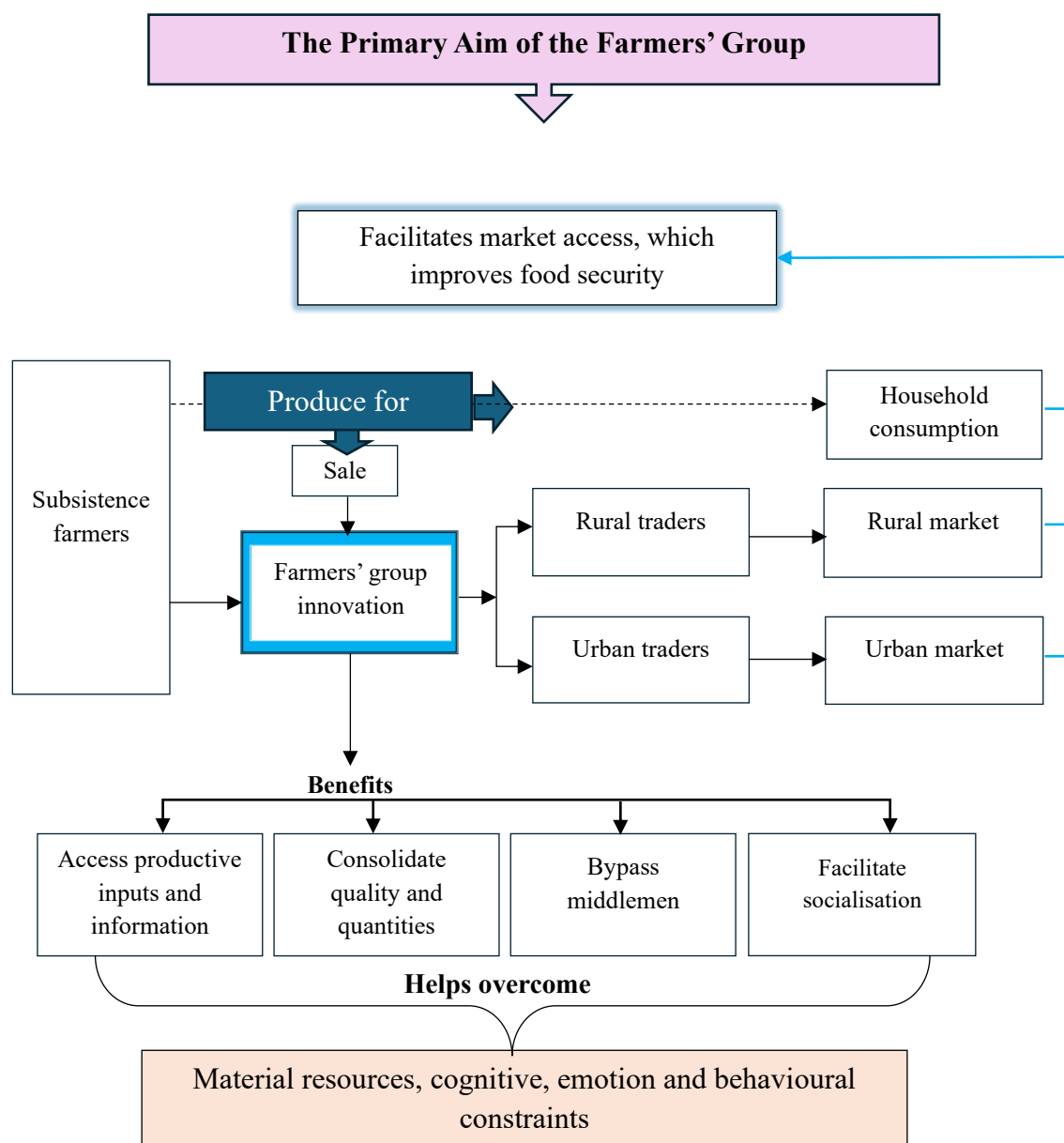


Figure 4.6 Conceptual framework of the farmers' group as a platform to enhance food security

4.2.4 Innovations as Adaptable

Subsistence farmers in this study identified the agricultural innovations, such as improved cassava varieties, *Muguka*, a new crop to their farm, and the farmers' group as innovative due to their adaptability to local environmental conditions and economic challenges farmers face.

A key factor underlying the perceived innovativeness of these crops was their compatibility with existing farming, household, cooking and processing practices, particularly in the case of improved cassava varieties. Such compatibility enhances the appeal of pro-poor agricultural innovations by reducing barriers to adoption, as farmers are not required to make significant changes to established routines and practices. This observation relates to Nakata and Weidner's (2012) proposition that innovations that fit seamlessly into adopters' daily routines and accommodate their constraints are more likely to be adopted and sustained. Farmers' accounts further illustrate how this adaptability shapes perceptions of innovation and influences adoption decisions. The section explores these themes in greater detail.

4.2.4.1 Adaptable to Environmental Changes

Participants identified environmental changes, particularly shifting weather patterns, as a critical factor affecting food security. Subsistence farmers from Mbeere North and Tigania reported significant alterations in rainfall patterns, ranging from prolonged droughts to excessive rainfall, which disrupts agricultural cycles and contributes to the breakdown of local food systems. Given the farmers' reliance on rainfed agriculture, households are highly vulnerable to environmental shocks and often lack viable coping mechanisms when crops fail. Consequently, many farmers experience recurring food shortages and financial instability during seasons of poor crop performance. Similar concerns have been observed by Venugopal and Chakrabarti (2022), who noted that nature-based livelihoods, such as agriculture, face increasing risks from environmental disruptions, threatening the livelihoods of millions of individuals living in subsistence conditions.

In Mbeere North, where crop cultivation and livestock keeping (including cows, goats, and poultry) are the primary livelihood strategies, climate variability and resource constraints to productive inputs have intensified livelihood vulnerability. Florence, a female farmer, explained:

‘There are many times when we have planted our crops, and we do not harvest even a single seed because of rain failure. Other times, we lack planting materials or fertilisers to improve production due to limited finances. We have had to rely on food relief several times to cushion us from hunger.’

Another participant, Njiru, a 67-year-old male farmer, described the implications of recurrent crop failure:

‘Last season we lost all our crops. It was devastating. This has occurred many times. We really cannot plan for our future food needs.’

These accounts illustrate how environmental uncertainty constrains farmers’ ability to plan beyond immediate survival needs. Consistent with Viswanathan and Rosa (2007) and Steinfeld and Holt (2019), the findings suggest that limited resources and recurring livelihood shocks encourage short-term planning horizons among subsistence households. Building on these studies, the present research demonstrates that climate-related uncertainty, compounded by inadequate access to productive inputs, significantly undermines long-term food security planning.

Against this backdrop, farmers increasingly valued innovations that could withstand harsh and unpredictable environmental conditions. During a focus group discussion, Wanjia, a 49-year-old farmer from Mbeere North, highlighted the resilience of improved cassava varieties:

‘The last two years have been particularly tough. Most of our crops failed. The only crop that was unaffected was the improved cassava variety, which is drought resistant.’

Njiru, a 67-year-old male farmer from Mbeere North, confirmed the pattern, adding:

‘The weather has changed so much; we no longer receive rainfall in good time. When it does rain, it is either too little or too much. Last season, we had a reduced harvest of maize and beans, which did not last us until the next season. Cassava survived, but we cannot eat cassava alone. I earned some money from Muguka, which helped me generate income to purchase maize and beans for my family.’

These experiences highlight the vulnerability of staple crops such as maize and beans while highlighting the growing importance of climate-resilient innovations. In response to changing environmental conditions, many farmers have limited options but to adopt drought-resistant crop varieties to survive. In Mbeere North, farmers have adopted improved cassava varieties because of their drought tolerance, higher yields, and shorter maturity periods. Ngari, a 56-year-old farmer, observed:

‘I decided to give the improved cassava variety a try, and it is more drought-and disease-resistant compared to local cassava. It also produces more roots (see Figure 4.8 below). This is a major improvement.’

Mbura, a 42-year-old female farmer, emphasised the importance of early maturity, a characteristic of improved varieties:

‘I like the new variety because it grows quickly. It takes about 6 to 9 months to mature, unlike the local variety, which can take up to a year. With just a little rain, you have your big roots in no time. It also produces more roots (see figure 4.9).’

The sub-county crop director confirmed these advantages:

‘The new cassava variety, the KME grown in Mbeere North, is well-suited for the altered weather patterns. Early maturing varieties allow farmers to adjust planting dates to minimise yield losses in the event of delayed rains. Moreover, the new variety

has reduced cyanogen level, which means the roots do not deteriorate quickly after harvest.'

The KME cassava variety, therefore, offers several advantages over local cassava, including drought and disease resistance, higher yields, early maturity, and lower cyanogenic content. Beyond boosting resilience and productivity, reduced cyanogen levels enhance post-harvest safety and storage potential, an important benefit given the toxicity risks associated with high cyanogen contents, which can pose a risks to humans and livestock (Burns *et al.*, 2010; Parmar *et al.*, 2017). Together, these characteristics have contributed to widespread acceptance of the improved variety, reinforcing its role as an important pro-poor agricultural innovation for climate adaptation.

Field observations corroborated farmers' accounts. Compared with local varieties, improved cassava plants exhibited taller stems, more branching, and broader canopies, characteristics associated with greater photosynthetic capacity. At just four months, improved cassava varieties were approximately 0.6 metres taller than indigenous varieties (see Figure 4.7a and b). Yield differences were equally striking. One plant produced 19 roots (Figure 4.8a), while another yielded a single cassava root measuring about one and a half metres in length (Figure 4.8b). These observations provided tangible evidence of the superior agronomic performance of the improved varieties and suggest they offer a better replacement for the local variety, because of greater utility in production under the prevailing climatic conditions.

Figure 4.7 (a and b) depict the morphological differences between improved and local varieties, while Figure 4.8 (a) shows cassava harvested at eight months, demonstrating its robust yields and Figure 4.8 (b) illustrates a cassava root measuring approximately one and a half metres.



(a) An improved cassava variety, taller with broader leaves.



(b) Indigenous cassava variety, shorter at four months and leaves are thin.

Figure 4.7 The improved cassava variety and the indigenous variety plants were at four months. (a) About 1.6 meters, and (b) About a metre.



(a) Freshly harvested roots, about 19 from the improved variety, at maturity at 9 months.



(b) Cassava root of the improved variety, about 1.5 metres, at maturity at 9 months.

Figure 4.8 Cassava roots from the improved variety

Similar observations were made regarding *Muguka*. Muguka. Muriithi, a 44-year-old farmer, described it as a *'drought-resistant crop that grows quickly,'* while David, a 25-year-old male farmer, noted that *'Muguka is an easy crop to grow and thrives with little rain.'*

In Tigania East, bananas are similarly recognised for their ability to withstand drought-prone conditions. The value of banana production was further enhanced by the farmers' group, which improved market access for producers. As Mugambi, a 52-year-old male farmer, explained,

'With the harsh climate conditions, many crops do not do well in our region. What we have left still flourishing are our bananas. Fortunately, the farmers' group connects us to markets where we can sell our bananas. This allows us to put food on the table.'

Overall, these findings indicate that farmers perceived the KME cassava variety, *Muguka*, and the farmers' group as innovative because they effectively addressed the environmental challenges threatening their livelihoods. While the crops provided drought tolerance, reliable yields, and income-generating opportunities, the farmers' group strengthened market access and enhanced the economic value of climate-resilient production. Their adoption was therefore driven not only by their technical attributes but by their demonstrated ability to improve food security, household income, and resilience under increasingly uncertain climatic conditions. This adaptability to local environmental realities emerged as a key dimension of perceived innovativeness among subsistence farmers.

4.2.4.2 Adapted to Farming Practices

The study found that farmers' decisions to adopt pro-poor agricultural innovations were strongly influenced by the extent to which the innovations aligned with existing farming practices. In Mbeere North, improved cassava varieties were generally incorporated into traditional farming systems rather than cultivated according to the recommendations of government extension agents. Farmers were particularly sceptical of the recommended one-metre spacing, preferring to maintain established intercropping practices. Ireri, a 64-year-old farmer, explained:

'We plant the improved varieties the same way we plant our local varieties. The government officials only stated that we need proper spacing of one metre. But I doubt this can work with the way we intercrop cassava with other crops.'

Similarly, Kagendo a female farmer aged 61, mentioned:

'There was no difference in how I plant the new variety and the way I do with my local varieties. To me, nothing has changed.'

These accounts suggest that adapted the improved cassava varieties to fit existing cultivation systems rather than modifying their farming practices to accommodate the innovation. As a result, adoption occurred with minimal disruption to established planting and crop management routines. This compatibility with existing practices appears to have facilitated acceptance of the improved varieties.

The importance of compatibility is further illustrated by the limited uptake of other pro-poor agricultural innovations, particularly fish farming. According to the Sub-County Crop Director:

'We introduced fish and groundnut farming, hoping farmers in Mbeere can take up new crops and practices to diversify their food sources and cushion them against the effects of drought when other crops such as maize and beans fail.'

Unlike cassava and *Muguka*, which could be integrated into existing rain-fed farming systems, fish farming and groundnut cultivation required substantial changes to established production practices and livelihood arrangements. As such, despite their potential to enhance food security in drought-prone regions, these pro-poor innovations have not been widely adopted. This finding contrasts with Shava and Gunhidzirai's (2017) study of drought-prone communities in Zimbabwe, where fish farming contributed to improved food security. Further, Shava and Gunhidzirai's (2017) study highlighted the importance of external support from a non-governmental organisation, a form of assistance that farmers in Mbeere North did not have.

Among the innovations introduced, fish farming was perceived as particularly incompatible with local environmental and resource conditions. Successful implementation required

significant financial investment, technical knowledge, and reliable access to water—resources that were largely unavailable to most households. Wanja, a 49-year-old farmer, explained:

‘Fish farming requires a significant amount of investment. Firstly, we need a sufficient water supply, which is limited in this dry region of Mbeere North. There is also the need to dig fishponds, which is a new endeavour for us, not to mention the finances needed to purchase fingerlings and cover management costs.’

Florence reinforced this view by comparing conditions in Mbeere North with those in Bungoma, where she was raised:

‘I was raised in Bungoma, a region blessed with abundant water for fisheries. However, Mbeere is too arid for fish farming. The only water available to us comes from the county government of Embu, which we mainly use for domestic purposes. Unfortunately, this water supply is also unreliable. Although we do collect rainwater, it is primarily for household use and lasts only as long as there is rain. Despite my fondness for fish, making fish farming work here is incredibly challenging. One must construct their own fishponds, which is a demanding and costly endeavour.’

These insights reveal the complex trade-offs faced when evaluating new agricultural practices. Although fish farming was recognised as a potentially valuable source of food and income, its adoption would have required substantial changes to existing livelihood systems, alongside investments in water infrastructure, labour, and technical management. For most farmers, these requirements exceeded their available resources and capabilities, rendering the innovation impractical. In contrast, innovations such as improved cassava varieties and *Muguka* were readily incorporated into existing farming systems, demonstrating that compatibility with established practices and local conditions is a critical determinant of perceived innovativeness and adoption among subsistence farmers.

4.2.4.3 Adaptable to Resource, Time, and Labour Constraints

This research established that affordability and familiarity with pro-poor agricultural innovations were important factors shaping perceptions of pro-poor agricultural innovations. During the focus group discussions, Florence, a 62-year-old farmer, emphasised the low-input nature of cassava:

‘Cassava is a familiar crop to us. It is also inexpensive to farm because it does not require costly inputs like fertilisers and herbicides.’

Kagendo, a 61-year-old female farmer, added,

‘Cassava is readily available for us. We do not have to spend money to purchase planting materials or the roots; we share them amongst ourselves.’

These insights highlight that cassava’s low production costs and accessibility through informal seed-sharing networks enhance its acceptability among resource-constrained households. This finding aligns with Nakata and Weidner's (2012) concept of affordability, which suggests that individuals living in poverty are more likely to adopt innovations that do not require resources beyond their means. Kagendo’s remarks also suggest social networks can compensate for financial limitations by facilitating access to planting materials and reducing barriers to adoption. Similar perceptions emerged regarding the *Muguka*, a stimulant crop increasingly cultivated in the region. Muriithi noted:

‘It is a much cheaper crop to grow than maize and beans. Although we cannot feed on Muguka, we can buy food from the income generated from it.’

David likewise described *Muguka* as ‘a good crop to cultivate because it is low maintenance’ while Emily, the local community leader in Mbeere North observed that:

‘Many farmers, especially the young, have turned to Muguka farming as a means of generating income. This is an affordable crop for them, unlike planting maize and beans, which require more inputs.’

Like improved cassava varieties, *Muguka*, represents an incremental innovation that is financially accessible, manageable with limited resources, and capable of generating income. These characteristics support Loevinsohn *et al.* (2012) argument that incremental innovations are particularly valuable for resource-poor farmers because they improve productivity while reducing risk. As a perennial crop requiring relatively low seasonal investment, *Muguka* also provides a continuous source of income that helps households navigate periods of food insecurity.

Beyond affordability, reduced labour requirements emerged as another important factor shaping perceptions of innovativeness. Florence explained

‘Once you plant cassava, you can leave it in the field without the need for weeding. Although it is better to weed, it still thrives with minimal care.’

Similar observations were made by Muriithi, stating,

‘Muguka is an easy crop to manage. It is a bush that doesn’t require constant weeding.’

The low labour demands of these crops are particularly significant in light of the gendered division of agricultural labour. Previous studies have shown that weeding is predominantly undertaken by women (Andersson *et al.*, 2016; Masamha *et al.*, 2018). Thus, crops that require less maintenance reduce women’s workloads and free time for other productive and domestic responsibilities. The adoption of improved cassava varieties and *Muguka*, therefore, reflects

not only economic considerations but also the need to accommodate household labour constraints.

However, while cassava cultivation was widely perceived as affordable and manageable, the processing of cassava roots into flour emerged as a major barrier to full utilisation. Participants expressed strong appreciation for cassava flour, particularly for preparing ugali, yet many were discouraged by the labour-intensive processing involved. Florence explained:

‘People in Mbeere have developed a liking for ugali made with cassava flour, but the issue is that the majority find the process of turning cassava into flour tedious. I always share my cassava flour with my neighbours, but they will not undertake the processing because they find it labour-intensive.’

Similarly, Kagendo, a 61-year-old female farmer, observed:

‘I cultivate improved cassava varieties, but most of what I harvest I sell. I do not process the roots into flour because it is a tiresome task....I buy cassava flour from the local kiosk.’

Waturi echoed these concerns:

‘I am busy all day tending to the farm and taking care of domestic chores. Processing cassava is too laborious; it would overburden me with extra work.’

Muriithi further highlighted the gendered nature of this burden:

‘Processing cassava is not as easy as drying maize and taking it for milling. My wife says it’s too much work for her, and she is quite reluctant to give it a try.’

The findings reveal a disconnect between positive perceptions of a product and willingness to adopt the practices required for its production or implementation. Although participants valued cassava flour, the substantial labour demands associated with processing discouraged widespread uptake. From a Technology Acceptance Model (TAM) perspective (Davis, 1989), this suggests that while the product may score highly on perceived usefulness, low perceived ease of use (or complexity), due to labour-intensive processing, acts as a significant barrier to adoption. While Hasan *et al.*'s (2020) found that user enjoyment of new innovation can positively influence adoption, their study did not account for the effort and learning required to implement and enjoy the innovation, which may act as a significant barrier. The present research suggests that positive affect alone is insufficient to drive adoption when significant structural constraints, including labour availability and gendered responsibilities, remain unresolved.

Nevertheless, some farmers processed cassava roots out of necessity despite the physical demands involved. Makena, a 45-year-old single mother of two young children, shared:

'It is even harder (to process cassava) because I use an ordinary knife, and I get a lot of blisters on my hands. But I do not have an option. I have to feed my children, so I have to put up with the pain.'

Figure 4.9 shows Makena preparing cassava roots for processing into flour.

Florence supported this:

'Processing cassava is not an easy task. I use an ordinary knife, and by the time I am done, I have blisters all over my hands. Perhaps, if we had small machines to ease the process, more women would take up the task.'



Figure 4.9 A participant is preparing cassava roots using an ordinary knife. These are chopped into pieces, dried then taken for milling into flour.

Makena's experience illustrates how poverty and limited alternatives compel some individuals to adopt labour-intensive practices despite the physical hardship involved. Consistent with Kwarazuka and Prain (2019), Viswanathan and Sreekumar (2019), and Locke *et al.* (2017) individuals living in subsistence conditions often endure strenuous and risky activities to meet basic household needs.

Given that participants consistently advocated for mechanised cassava processing, access to appropriate small-scale processing technologies could significantly increase utilisation of cassava products. Previous studies by Kienzle *et al.* (2013) and Mottaleb *et al.* (2017) demonstrate that mechanisation can reduce drudgery and improve efficiency among smallholder farmers. However, as Mottaleb *et al.* (2016) caution, successful technology

adoption requires complementary systems, including improved infrastructure, financing mechanisms, and institutions that enable equitable use of agricultural machinery.

As such, the findings demonstrate that perceptions of innovativeness among subsistence farmers extend beyond technical performance to encompass affordability, labour requirements, and compatibility with everyday livelihood realities. Improved cassava varieties and *Muguka* were widely regarded as innovative because they required few financial inputs, imposed relatively low labour demands, and fit within existing farming systems. In contrast, cassava processing remained constrained by the substantial time and physical effort required, burdens that fell disproportionately on women. The findings therefore suggest that pro-poor agricultural innovations are more likely to be adopted when they align not only with farmers' economic circumstances but also with the labour and time constraints that shape everyday life. Perceived innovativeness is thus rooted in the extent to which innovations reduce, rather than add to, the burdens associated with subsistence livelihoods.

4.2.4.4 Compatibility with Cultural Identity and Food Consumption Habits

Rogers (2003) Diffusion of innovations theory suggests that innovations requiring minimal behavioural change are more likely to be adopted than those that demand significant adjustments to established routines. The present research reinforces this proposition by demonstrating that behavioural and cultural compatibility play a vital role in the adoption of pro-poor agricultural innovations. Participants consistently indicated that innovations associated with unfamiliar foods, such as fish and groundnut, conflicted with existing dietary preferences and cultural norms. Njiru, a 67-year-old farmer, noted,

‘Fish and groundnuts are not a regular part of our diet.’

Resistance was especially pronounced among older participants. Kagendo, a 61-year-old female farmer, rejected the idea outright:

‘There is no way and under no circumstances can I eat fish. It belongs to the people of western Kenya.’

These responses suggest that food preferences are closely intertwined with cultural identity and social belonging. Consequently, innovations that challenge established consumption practices may face resistance regardless of their potential economic or nutritional benefits. This finding supports studies by Nykvist and von Heland (2014) and Curry *et al.* (2021), which identified cultural identity as an important barrier to innovation adoption. Unlike previous studies that have focused primarily on dietary outcomes (e.g., Dillon *et al.*, 2015) or consumption patterns (e.g., Aweke *et al.*, 2021), the present research demonstrates that cultural compatibility is itself a critical determinant of whether food-related innovations are perceived as relevant and adoptable.

In this case, fish farming was not only rejected due to impractical implementation limitations, but also because it is considered culturally unacceptable or undesirable food in Mbeere North. During group discussions, participants expressed strong negative attitudes towards fish consumption. Kagendo, visibly expressed disgust, remarking: ' Fish *smell...ughrrr...I cannot eat it!*' Ireri added, *‘The idea of eating fish is scary because of all the bones.’*

Other participants highlighted a lack of knowledge and skills associated with fish preparation.

Florence explained:

‘Women in Mbeere do not know how to cook fish. In the years I have been married here, I have only seen one other woman cook fish.’

Together, these responses clearly illustrate that negative attitudes, limited preparation skills, and cultural unfamiliarity discouraged farmers from viewing fish farming as a viable or desirable innovation. This finding is consistent with Lowe *et al.*, (2015), who found that negative attitudes toward behaviour, such as water consumption, affected behavioural intentions (reduction of water use). Further, Viswanathan & Sreekumar (2019), argue that unfamiliarity can inhibit innovation adoption.

Importantly, the promotion of fish farming as a food security strategy appeared to overlook local food cultures and knowledge systems. While the innovation addressed production concerns, it failed to account for the cultural, culinary, and social dimensions of food consumption that ultimately shape adoption decisions. This finding suggests that food security interventions often privilege production-oriented objectives while neglecting the broader value chain of preparation, consumption, and cultural acceptance.

A similar pattern emerged in relation to groundnut cultivation. Although a small number of farmers experimented with growing groundnuts, they ultimately abandoned the practice

because they lacked knowledge of how to utilise the harvest and had no access to reliable markets. Njiru shared:

'I did try to grow groundnuts, but after harvesting, we did not know what to do with them. My wife does not know how to prepare them for eating, and there is no market access for raw groundnuts in our local markets. We ended up throwing them away.'

This account highlights the consequence of introducing agricultural innovations without considering post-harvest use, processing knowledge, and market integration. Even where production was successful, the absence of downstream support rendered the innovation ineffective. This demonstrates a narrow focus on the adoption of pro-poor agricultural innovations along the production chain. The finding, therefore, reinforces Viswanathan and Sreekumar's (2019) call for greater attention to innovation adoption across the entire value chain, rather than focusing solely on production.

The study further revealed that sensory preferences influenced adoption decisions regarding improved cassava varieties. Although the improved varieties offered clear agronomic advantages, some farmers rejected them because they differed from local varieties in taste and consumption practices. Florence explained:

'The indigenous cassava roots taste sweet when raw or boiled, unlike the improved varieties, which are bitter when eaten raw but are best suited for processing into flour. It was sad to see many people throw away the improved cassava roots. My brother-in-law was one of them, simply because of the taste.'

Njiru described a similar experience.

‘We were very happy with the harvest from the improved cassava roots. However, since we eat our cassava either raw or boiled, the taste was bitter. We ended up throwing away most of the roots.’

These accounts demonstrate that technical superiority alone does not guarantee adoption. Innovations must also align with established consumption preferences and experiential knowledge. Although the improved cassava varieties produced higher yields and greater resilience, their bitter taste when consumed in customary ways created a mismatch between production benefits and user expectations. As a result, some farmers reverted to traditional varieties despite their lower productivity.

The wastage of groundnuts and improved cassava roots highlights a broader paradox within subsistence contexts: food insecurity can coexist with food waste. Gille (2012) described this phenomenon as a transition from ‘risk to waste’, whereby failed innovations result in the loss of scarce resources, including labour, time, and financial investments. In subsistence settings, such losses can further intensify vulnerability, undermining the very objectives that pro-poor innovations are intended to achieve.

In summary, the findings demonstrate that perceptions of innovativeness are shaped not only by productivity gains or economic benefits but also by compatibility across the entire value chain. Innovations such as improved cassava varieties and *Muguka* were valued because they aligned with local environmental conditions, familiar farming practices, and resource constraints. In contrast, fish farming and groundnut cultivation encountered resistance because they conflicted with established food preferences, preparation skills, market structures, and cultural identities. These findings suggest that successful pro-poor innovations must extend

beyond production considerations to encompass processing, consumption, marketing, and cultural acceptance. Without such alignment, innovations may be technically sound yet socially irrelevant, resulting in rejection, discontinuance, or waste.

4.2.5 Institutions Facilitating Innovation Adoption

The study revealed that innovations perceived as beneficial and with personal relevance to farmers are more likely to be adopted. However, adoption is contingent not only on the perceived value of pro-poor agricultural innovations but also on access to innovative products, ideas, and practices, as well as the necessary support to implement them. Consistent with previous studies (Badstue *et al.*, 2018; Steinfeld & Holt, 2019), resources and knowledge emerge as key enablers of innovation adoption. Farmers' responses further highlighted the critical role of social networks and bridging agents in facilitating access to these resources. Such networks serve as vital channels through which farmers obtain information, material resources, and practical know-how necessary for adopting and sustaining innovations. The following section explores these enabling factors in greater detail.

4.2.5.1 Social Network and Access to Innovative Resources

Farmers in Mbeere North and Tigania East access innovative products and agricultural information through a combination of personal resources and informal social networks. In Mbeere North, many farmers reported obtaining planting materials for cassava and other crops through recycling and exchanges within trusted family and community networks. This pattern emerged consistently across participants' narratives.

Florence, a 62-year-old female farmer, noted:

I replant my plants once I harvest them, or I get them from my brother's wife. Sharing planting materials is a common practice, not limited to cassava. This happens because we trust each other and know where the planting materials come from.'

Similarly, Wanja, a 49-year-old female farmer, highlighted both the economic and social value of resource sharing:

'Sharing planting materials with my family and neighbours helps us save money for other necessities like school uniforms for my children. It also helps us maintain healthy relationships. It is very simple: today, my neighbour shares with me, and if my neighbour doesn't have tomorrow, I will share with them. It's our way of life.'

Muriithi, a 44-year-old male farmer, further illustrated how social networks can compensate for limited financial resources:

'I got my Muguka planting materials from an acquaintance introduced to me by a friend. Although I did not have money, because the initial investment was high, I borrowed money from a trusted friend. I later compensated him with my first harvest.'

These accounts demonstrate how farmers creatively mobilise resources by drawing on familial and social ties to overcome financial and logistical constraints. Resource-sharing within rural farming communities is guided by the principle of reciprocity, whereby individuals provide support with the expectation that assistance will be returned when needed. This embedded system of trust and mutual obligation helps reduce transaction costs, minimises travel burdens, and helps farmers navigate challenges associated with limited resources and geographic remoteness. The role of informal social networks in facilitating innovation diffusion is well established in the literature (Nakata & Weidner, 2012; Hunecke *et al.*, 2017; Kos *et al.*, 2023). Trust, in particular, emerges as a critical enabler of these exchanges. Hunecke *et al.* (2017) argue that trust within both formal and informal networks not only promotes innovation adoption but also fosters a sense of responsibility. This finding of this research extends this

argument by showing how reciprocal practices, such as compensation and mutual assistance, reinforce behaviours that enhance collective well-being, helping farmers create buffers against risk and uncertainty.

The use of personal resources and social networks appeared especially important for female farmers. Women in these communities face unique time constraints due to the dual responsibilities of managing households and engaging in agricultural work. As such, obtaining planting materials through local social networks offers a practical and efficient alternative to seeking external sources. Wanjiru, a 32-year-old farmer, highlighted this convenience:

‘I always recycle my cuttings or borrow them from my mother-in-law. It’s convenient for me because I may not have the time to look for them from external sources.’

Florence similarly noted:

‘There is no shame in sharing because we all face constraints at one time or another. This is particularly helpful for us as women.’

Among female farmers, especially those in participating in organised farmer groups, resource sharing extended beyond agricultural inputs to encompass broader forms of mutual support and collective action. This included assistance with harvesting, marketing, and financial transactions. Kanana, a 28-year-old female farmer, explained,

‘When I am unavailable and buyers come, my neighbours will go to my farm, cut the bananas, and ensure they are delivered to the collection centre. Furthermore, if money is paid and I cannot go collect it, perhaps because I have taken my child to the hospital, my neighbour will ensure I don’t miss out. They will receive the payment and bring it to me. We survive because we support each other.’

These examples illustrate how social networks reduce the physical, temporal, and logistical barriers associated with accessing productive resources and participating in agricultural

markets. For women in particular, such systems are not merely beneficial but often practical and essential for sustaining agricultural livelihoods alongside caregiving responsibilities. Beyond facilitating access to resources, these relationships foster collective efficacy, enabling women to remain active participants in agricultural production and innovation processes. This finding aligns with studies highlighting the role of women-led networks in promoting cooperation, empathy, and communal values (Chatterjee *et al.*, 2024). In turn, these social dynamics create favourable conditions for the adoption, dissemination, and sustained use of agricultural innovations.

4.2.5.2 Role of Bridging Agents in Accessing Productive Resources

Bridging agents, including government institutions, non-governmental organisations, private sector actors and faith-based organisations, play key roles in connecting farmers to innovative products, information and resources (Steinfeld & Holt, 2019). During the focus group discussions, government extension services and church-based initiatives emerged as particularly important sources of pro-poor agricultural innovations. This section focuses on the role of government agents.

(i) The role of Government Agents

Government extension services are widely recognised as the primary source of agricultural innovations and information for the resource-constrained farmers (Kidasi *et al.*, 2021; Nyairo *et al.*, 2022). This was reflected strongly in participants' accounts. Njiru, a 67-year-old farmer, explained:

‘We get most of the new ideas, products, and information from government officials. They don’t come frequently, but we can say they are our main source of novel ideas and information.’

This finding is consistent with previous studies showing that government institutions remain the principal channels through which agricultural innovations are disseminated to smallholder and subsistence farmers (Badstue *et al.*, 2018; Kidasi *et al.*, 2021; Nyairo *et al.*, 2022). Within innovation diffusion literature, extension agents can be understood as opinion leaders who exert considerable influence on farmers’ decisions regarding the adoption of new technologies and practices. As trusted sources of technical expertise, they function as important conduits of knowledge between formal agricultural systems and local farming communities.

Despite this influence, interactions between extension officers and farmers are often characterised by weak ties due to their infrequent and irregular nature (Badstue *et al.*, 2018; Ofoegbu & New, 2021). Nonetheless, subsistence farmers continue to rely heavily on government agents for access to novel agricultural products and practices. Mumbi, a 58-year-old female farmer, noted:

‘Government officials were the first to introduce us to the new cassava varieties. They also brought us improved maize and green gram seed varieties.’

These claims were corroborated by the County Crop Director, Mbeere North, who noted:

‘We bring information about new innovations to farmers. We also provide samples of new products to farmers so that they can familiarise themselves with the products the government recommends for use.’

These accounts illustrate the government's central role in the dissemination of agricultural innovations through a predominantly top-down approach, whereby information and technologies flow from formal institutions to farmers. However, this process is rarely direct or unilateral. Local leaders, including chiefs, frequently act as intermediaries between extension officers and farming communities. Mumbi explained this dynamic:

'The new information about new agricultural products is mainly delivered to us by government officials through our local leaders, such as chiefs.'

While such intermediaries can facilitate communication and improve outreach, they can also create bottlenecks in access to information and resources. In line with Zhang *et al.*'s (2020) concept of social network brokers, individuals occupying positions of strategic connectivity, can either facilitate or constrain information flows. Ngari, a 56-year-old male farmer, described how local leaders sometimes appropriate resources intended for wider distribution:

'The government officials have introduced many varieties of planting materials to us. They bring samples along, which many of us are unable to access, as the local leaders keep them for themselves. The rest of us are directed to buy the new varieties from agro-veterinary shops.'

In such cases, the bureaucratic intermediaries weaken rather than strengthen weak ties (Granovetter, 1983) by introducing inequality in access. This undermines the very purpose of using opinion leaders and local intermediaries to overcome infrastructural challenges in remote areas and deliver innovations as close to the end users as possible. The use of local opinion leaders and intermediaries mirrors Nakata and Weidner's (2012) notion of atomised distribution, where innovations are distributed through decentralised and targeted channels. However, the effectiveness of this approach depends heavily on the accountability and inclusiveness of

intermediaries. Consequently, when intermediaries such as local leaders do not act in the best interests of the community, they may undermine equitable access to resources for the most marginalised, who need the resources the most.

Beyond issues of access, the findings suggest that government-promoted innovations are frequently introduced with limited farmer participation in their design and adaptation. As a result, innovations often fail to reflect local needs, capabilities, and socio-economic realities, including gendered needs and constraints. During a focus group discussion, this disconnect was captured vividly by Mumbi, a 58-year-old female farmer, who remarked: *'They brought us ready-baked cakes,'* metaphorically expressing her scepticism toward externally designed solutions, pre-packaged solutions. Mumbi further posed a question, *'How are we sure the cake is even baked with the cassava flour?'* These remarks reflect farmers' scepticism towards externally designed solutions that are presented as complete packages without adequately involving end-users in their development. Rather than empowering farmers with the knowledge and skills necessary for implementation, innovations are often delivered as prescriptions, creating uncertainty regarding their relevance and practicality. This disconnect was evident in discussions about cassava processing. Njoki (54) explained:

'The government officials stated that we should mix cassava flour with maize or wheat flour, but we do not have the skills to process cassava into flour. Stating do this and that does not help us at all.'

This highlights a persistent gap between information provision and practical capacity building. The findings expose a key limitation of top-down innovation delivery models: innovations may fail not because they lack technical merit, but because farmers are not provided with the necessary skills, resources, or contextual support to implement them effectively. Consequently,

mistrust towards extension services can emerge. As Florence observed, ' *You can never fully trust the government agents.* '

While Nyairo *et al.* (2022) similarly documented mistrust of government extension services among subsistence farmers in Kisumu, the present study sheds light on how such mistrust develops. The present study builds on this by showing how informational shortcomings fuel such mistrust. Specifically, it demonstrates that trust is undermined when farmers' capacities, priorities, and lived realities are ignored. This means innovations may be rejected not because they are ineffective, but because they are inaccessible or poorly understood by the adopters themselves.

This mistrust is further reinforced by institutional constraints within extension systems themselves. The Sub-County Crops Director acknowledged:

'Sometimes, we are unable to provide farmers with everything they need due to limited resources and inadequate staff. With the discontinuation of extension services for farmers, our resources are stretched thin.'

This admission points to broader structural challenges, including underfunding, staffing shortages, and declining extension capacity, which limit the ability of government agents to provide sustained and context-specific support to farmers. Access to extension services was also strongly shaped by gender. Both male and female participants reported that men generally enjoy greater access to government officials and government information, consistent with findings from previous studies (Badstue *et al.*, 2018; Onyalo, 2019; Haug *et al.*, 2021; Adebayo & Worth, 2024). However, the present research offers additional insights into the mechanisms

underlying this disparity. Men's privileged access is rooted in their socially recognised position as household heads and primary decision-makers. Agricultural meetings and training sessions are commonly organised through public barazas, spaces in which men are more likely to participate and be recognised as legitimate recipients of information.

This was reinforced by Muriithi (44), who noted:

'I attend because I am the household head. My wife can only attend if I am unavailable.'

Similarly, Njagi, a 60-year-old male farmer, explained,

'It is my responsibility, not my wife's, to attend such meetings and training.'

This gendered reality was confirmed by the Sub-County Crop Director:

'During such meetings, we expect all farmers to attend, but particularly men, because they are the main decision-makers.'

These findings reveal that the category of 'farmer' remains strongly gendered, often explicitly and implicitly associated with men. Women are often relegated to the role of 'farmers' wives', perceived as subordinates rather than being recognised as farmers in their own right, limiting their direct engagement with innovation networks and extension services. Similar observations have been made in previous studies (e.g., World Bank *et al.*, 2009; Badstue *et al.*, 2018). Consequently, gender norms shape not only access to information but also whose knowledge and participation are valued within agricultural development processes.

Beyond social perceptions, women's exclusion is further reinforced by the unequal distribution of domestic and caregiving responsibilities. Female participants consistently described how household duties, including caregiving and farm work, restricted their ability to attend meetings and training sessions. Murugi (32) explained,

'I have a young child to look after, I have to cook and take care of my other children, there is laundry to do, and goats and chickens to feed as well. Since my husband is not responsible for household chores, he is the best person to attend the meetings organised by extension officers.'

Wanja (49) added,

'Fewer women would be willing to attend the meetings unless it is mandatory because of many household responsibilities.'

Male responses reinforced these expectations, as Muriithi stated:

'If my wife attends such meetings, who will take care of the children and do all the cooking?'

These accounts illustrate how time poverty and mobility restrictions intersect with gendered expectations to limit women's participation in innovation systems. These findings resonate with the concept of the 'mommy track' (Benschop & Doorewaard, 2012), whereby caregiving responsibilities informally marginalise women from opportunities for advancement and participation. Moreover, the expectation of male authority, defining what is acceptable for their wives, and the reinforcement of men as the 'dominant worker' (i.e., full-time and fully available) (Benschop & Doorewaard, 2012) compound women's exclusion from innovation networks.

Importantly, these barriers extend beyond attendance at meetings. The research revealed that information acquired by men is not always shared with women within households, and when it is, it is often incomplete. Wawira (44) explained:

'When I miss attending any of the training meetings, I miss out a lot because my husband does not share all the information he has obtained.'

Similarly, Wanja (49) added,

‘My husband gives me bits and pieces of information that are sometimes difficult to implement.’

This creates significant intra-household information asymmetries that disadvantages women and limits their capacity to engage with pro-poor innovations, particularly those directly relevant to their responsibilities, such as food preparation and other domains they manage. Such findings reinforce critiques of the unitary household model (Doss, 2013; Quisumbing & Doss, 2021), which assumes shared access to resources and knowledge among household members while overlooking internal power dynamics and inequalities.

Interestingly, unmarried women, particularly widows, single women and mothers, reported comparatively better access to extension services. Their positions as household heads enabled them to engage directly with government agents without relying on male intermediaries. For example, Florence, a 62-year-old widow, observed:

‘I attend such meetings because I am the household head. I have no one to attend on my behalf and do not need to ask permission from anyone.’

Similarly, Makena, a 45-year-old unmarried mother of two, remarked:

‘I have to access innovations from the extension officers because I am the sole provider for my children.’

These observations are consistent with those by Badstue *et al.*'s (2018), who noted that single women and widowed women may face fewer social constraints in accessing agricultural services compared to married women. However, the current study adds nuance to this observation by emphasising that it is not simply marital status alone, but household headship that grants women like Florence and Makena the autonomy to engage directly with extension agents.

However, this greater autonomy does not eliminate other constraints. Female-headed households continued to face severe financial, labour, and time pressures, often without the support networks available within two-parent households. Like their married counterparts, they carry the full burden of domestic work, caregiving, and farm management, while also lacking the financial and emotional support a partner might provide. For instance, Makena explained:

‘Most of the time, the biggest challenge is a lack of financial resources to access and implement new ideas. If I were married, I would ask my husband for help. But now I have no one to turn to.’

Similarly, Florence added:

‘Since I lost my husband, I struggle much more due to having fewer resources. I also miss his input. I can say life is a lot harder without him.’

This illustrates the double burden experienced by female household heads: while they may have greater decision-making power, the absence of shared household responsibilities significantly constrains their capacity to implement innovations, as their time, labour, and financial resources are disproportionately stretched across competing domestic, caregiving, and livelihood demands. As a result, autonomy in decision-making did not necessarily translate into greater capacity to adopt innovations.

A critical concern that emerged during follow-up discussions was the social stigma and harassment experienced by single, separated, divorced, or widowed women when participating in predominantly male extension spaces. Makena shared her experience:

‘I get all sorts of funny looks and comments because of my status as a single mother. This includes sexual harassment, which makes it difficult for me to attend meetings where the majority of attendees are men.’

These statements were shared by Mumbi, a divorcee, who noted:

'I get suggestive gestures that are demeaning.'

Florence, on the other hand, indicated,

'I get discriminated against because of my status as a widow.'

Such gender-specific experiences created additional barriers to engage and further restricted their access to innovation-related resources. These findings highlight the need for more gender-sensitive extension approaches that address both structural inequalities and socio-cultural barriers.

(ii) The role of the Church

Responses from participants revealed that the church plays a valuable role in providing access to pro-poor innovations, information and support networks. In Mbeere North, churches are deeply embedded in the local communities and serve as important social institutions. In the focus group discussions, farmers frequently referred to the church as a key source of assistance during times of hardship. As Mumbi, a 58-year-old female farmer, explained:

'The first place we turn to when we face major challenges like lack of food or medical emergencies is the church.'

The relationship between community members and the church extends beyond material support to include strong social and personal connections. Florence highlighted this close relationship:

'We know the church leaders well because they live among us and meet them every Sunday. They also know the congregants; they know what goes on in our villages and our homes. The church is part of our community.'

This finding illustrates the strong social ties between church leaders and their congregations, positioning the church as a trusted intermediary within the community. Steinfield and Holt (2019) highlight the role of churches in collaborating with government agencies to deliver innovation-related knowledge and skills. However, such collaboration appears limited in Mbeere North. Instead, churches largely operate independently in responding to local challenges and facilitating access to information and resources.

Emily, a local community leader, described the church efforts:

‘We organise meetings to address issues affecting our community members, such as food scarcity, health problems, and educational difficulties for children. Whenever we encounter new ideas, we strive to share them with our church members. We also encourage and facilitate the exchange of resources. For example, farmers with surplus planting materials can sell them affordably to others through the church. But poverty in this region limits our capacity, and we receive no government support. Still, we do what we can.’

The finding suggests that, despite operating under significant resource constraints, the church plays an important role in raising awareness of pro-poor innovations and facilitating knowledge exchange. Through its network, community members are able to share information, mobile resources, and support one another in adopting beneficial agricultural practices. This finding supports Mwaura and Nzengya's (2022) observations regarding the church's broader socio-economic contributions in sub-Saharan Africa. It also highlights the value of social networks in subsistence contexts, where formal support systems are often weak or inaccessible. As Emily affirmed:

‘As church leaders, we encourage our congregants to share new products and ideas where possible for the benefit of their households and the entire community.’

However, alongside these positive contributions, participants expressed concerns about the church's declining influence and credibility within the community. Florence expressed a common sentiment shared by several participants:

'The church we have today is not the church of yesteryears. It has changed for the worse.'

When asked to elaborate, she explained:

'We no longer trust our church leaders. They exploit us by collecting money from congregants for their own use.'

Similarly, Mumbi observed:

'Even with relief food, which is provided through the church, sometimes the church leaders keep it for themselves or give it to their families.'

These perceptions of corruption, favouritism, and nepotism undermine trust in church leadership and weaken the church's effectiveness as a channel for innovation dissemination. This finding contrasts with Steinfeld and Holt's (2019) argument that local embedded bridging agents can foster trust and facilitate the adoption of pro-poor innovations. In Mbeere North, declining trust appears to reduce the church's ability to mobilise resources, coordinate collective action, and promote the diffusion of new practices and technologies.

One notable finding concerns the church's accessibility to women compared with formal government extension services. The research revealed a larger proportion of women than men attend churches, reflecting what Wong (2022, p.37) describes as the 'female majority in Christianity.' Female farmers often expressed strong religious identities and regular participation in church activities. For example, Wawira (44 years old) stated:

'I am a born-again Christian, and I attend church every Sunday unless I am unwell. My husband doesn't attend; many men in our community do not see the value in it.'

Both female and male participants confirmed that women form the majority of churchgoers, making them the primary recipients of new ideas and information disseminated through church networks. Emily, the community leader, noted:

‘When we have new ideas to share, we can reach most women in the community because the majority of our congregants are women. We also hold women’s meetings after Sunday services, when they are most.’

The scheduling of women's meetings after church service reflects an understanding of women's competing responsibilities related to farming, childcare, and household management. Consequently, the church provides an important platform for reaching women who are frequently underserved by formal agricultural support systems. However, access to information does not necessarily translate into the ability to implement innovations. Wawira highlighted this challenge:

‘I have more access to new ideas and practices from the church than anywhere else. The challenge is implementing these.’

Emily attributed this difficulty to entrenched gender norms within households:

‘Even when women receive new ideas from the church, they often cannot act without their husband’s approval. This slows the adoption of innovations, regardless of potential benefits.’

These findings suggest that while the church enhances women's access to information, structural barriers continue to limit their capacity to act upon that knowledge. Access and agency, therefore, remain distinct but interconnected dimensions of innovation adoption. Effective dissemination strategies must account not only for how information reaches women but also for the social and cultural constraints that shape their decision-making power.

Overall, the findings highlight the importance of understanding gendered differences in both access to information and the capacity to utilise it. Tailoring delivery mechanisms to the realities of women's lives, particularly those excluded from formal extension systems, may strengthen their ability to adopt pro-poor agricultural innovations and contribute to household and community food security.

More broadly, farmers' willingness and ability to adopt new practices depend not only on access to innovations but also on whether they believe these will improve productivity and address food insecurity. Social networks and bridging agents are critical in this process; however, their effectiveness depends on trust, inclusivity, and contextual relevance. These findings reinforce the principles of the subsistence marketplace framework (Viswanathan et al., 2012), which emphasises the need for deep engagement with communities to understand their everyday realities, values, practices, and constraints. As Nakata and Weidner (2012) and Steinfeld and Holt (2019) argue, innovation initiatives in subsistence contexts must be grounded in local social structures and lived experiences to achieve meaningful and sustainable outcomes. A summary of the discussion is presented in the Table 4.1 below.

Table 4.1 Summary of Conceptualisation of Agricultural Innovations			
How Farmers Perceive Pro-Poor Agricultural Innovations			
New and beneficial			
		Conditions Considered	Importance to subsistence farmers
	○ Innovations as Means of Sustenance	-Contribute to food security and household incomes.	» Clear value propositions. » Availability of agricultural inputs, such as seeds, information, credit, and tools. » Innovations are affordable to farmers. » Are easy to use and implement. » Enhance social networks. » Access to markets. » Must consider women's access and decision-making constraints in households.
	○ Innovations as Value addition	-Extend food shelf life. Improves accessibility and storage. -Enhance food safety.	» Innovations that save time and reduce labour constraints, especially for women. » Training on processing techniques. » Availability of proper storage facilities and materials to preserve processed food. » Access to processing equipment. » Trust in promoters of new pro-poor processing practices.
	○ Innovations as Collective Effort	-Contribute to household food security and incomes.	» Helps bypass intermediaries. » Facilitates market access, especially for women. » Access to production inputs, especially for women, because they are more constrained. » Helps women save time and labour. » Help overcome cognitive constraints for farmers with limited literacy skills.

	○ Innovations as Adaptable	-Environmental changes -Existing farming practices. -Resource, time and labour constraints -Cultural identity and consumption habits	» Helps farmers manage risks posed by environmental disruptions. » Do not require significant behavioural changes. » Must align with seasonal cycles and help reduce labour and time constraints, especially for female farmers. » Maintain the community socio-cultural identities and consumption practices.
Types of innovations adopted by farmers in Mbeere North and Tigania East			
a) Product Innovations			
		Conditions Considered	Importance to subsistence farmers
	Muguka	New product for farmers and their farms.	» Drought and disease-resistant » Low opportunity costs, which help spread the risks.
	Improved agricultural products, such as KME cassava variety	Enhanced functional characteristics over the existing varieties.	
	Processing cassava roots into flour	Adds value to cassava roots.	» Improves the shelf life of farm produce, thus improving the utility of the improved cassava varieties.
b) Process innovations			
	○ Farmers' group	Addresses market challenges that farmers face.	» Helps transport logistics » Help improve the quality and quantity of produce.
Institutions facilitating innovation adoption			
	○ Social network	Facilitates the sharing and exchange of resources.	» Helps farmers reduce costs. » Foster relationship building.
	○ Government Agents	Extension services. Policy support. Subsidies to help reduce barriers.	» Trust in agents » Education, demonstrations, and training to increase farmers' confidence and skills. » Men have better access.
	○ Church leaders	Integrated within the community	» Women have better access.

4.3 Profiles of Pro-poor Agricultural Innovation Adopters

This section presents the findings related to the second research question, which explores the profiles of subsistence farmers who adopt pro-poor agricultural innovations in Mbeere North and Tigania East. These profiles emerged inductively from the data, reflecting the context-specific realities within which subsistence farmers make adoption decisions. The findings reveal that adoption behaviour is shaped by a complex interplay of social, economic, and gendered factors that are often overlooked in existing typologies of subsistence farmers. Previous studies have sought to classify subsistence farmers according to levels of innovativeness or resource endowment. For example, Ayisi *et al.* (2022) proposed a two-tiered classification of subsistence farmers as either high innovative or low innovative, with most farmers falling into the latter category. While Ayisi *et al.*'s framework provides a useful starting point for innovation adoption, but it relies primarily on predetermined socio-economic characteristics such as age, education, and income. Consequently, it risks overlooking the nuanced, context-specific realities that do not neatly align with such classifications, particularly intra-household relations and social dynamics.

Similarly, Sarker *et al.* (2021) developed a typology based on resource endowments and livelihood orientation, identifying four categories of farmers: (1) well-resourced farmers reliant mainly on agriculture; (2) moderately resourced households led by experienced older males with diversified income sources; (3) resource-constrained households dependent on cattle and livestock product sales; and (4) severely resource-constrained households headed by young male farmers dependent largely on off-farm income. While this typology provides valuable insights into variations in resource access and livelihood strategies, it pays limited attention to the social and gendered dimensions that influence innovation adoption. Like Ayisi *et al.*'s (2022)

framework, Sarker *et al.*'s (2021) classification treats the household as relatively homogeneous unit and centres predominantly on male household heads, thereby obscuring gendered inequalities in access to resources, decision-making power, and opportunities for innovation adoption.

Moreover, both Sarker *et al.* (2021) and Ayisi *et al.*'s (2022) classification implicitly assume relatively similar motivations for adopting innovations across farmer categories. However, the present research found that adoption motivations are highly differentiated and strongly influenced by gender roles and responsibilities within the household. Female and male farmers in Mbeere North and Tigania East often adopt pro-poor agricultural innovations for different reasons, reflecting their distinct responsibilities, priorities, and lived experiences. These findings indicate innovativeness among subsistence farmers is multidimensional and cannot be understood through economic resources alone. Instead, it is shaped by the intersection of material conditions, social positioning, gender relations, and contextual constraints.

The profile of adopters developed in this research, therefore, adopts a more holistic and grounded perspective. It is derived from farmers' lived experiences and incorporates motivations, capabilities, gender relations, and contextual constraints as key determinants of adoption behaviour. Rather than imposing fixed categories and mutually exclusive categories, the identified profiles are fluid, overlapping, and interconnected. They reflect the adaptive nature of subsistence farming, where innovation adoption is often driven not only by the desire to improve productivity but also by the need to cope with vulnerability, manage risk, and secure household livelihoods.

Four adopter profiles emerged from the analysis: necessity-driven adopters, those who are left-behind adopters, experienced and knowledgeable adopters. The following sections discuss each profile in detail and explore how their distinctive characteristics shape engagement with pro-poor agricultural innovations.

4.3.1 The Necessity-driven Adopter

The findings found that many farmers in Mbeere North and Tigania East experience declining farmland productivity due to unpredictable environmental conditions and persistent resource constraints. As a result, they face severe food insecurity. This aligns with observations from several studies (e.g., Fan & Rue, 2020; Visser & Wangu, 2021; Yusriadi & Cahaya, 2022), which highlights the widespread food insecurity among subsistence farmers. As a result, farmers are compelled to adopt pro-poor agricultural innovations primarily to meet their basic food needs. Njiru (67), a farmer from Mbeere North, captured this reality:

‘We struggle every day to make ends meet. We have limited resources. You won’t find many cows here, but we have a few goats and chickens. Many of us do not have bank accounts because we have no money to bank. We depend entirely on agriculture for survival. So new innovations are important to us.’

Similarly, Gatwiri, a 45-year-old female farmer from Tigania East, explained:

Every day is a struggle for us. We struggle to feed our children, we struggle to get medical care, we struggle to produce food, but our group gives us hope for better lives.’

These remarks highlight the precarious livelihoods of subsistence farmers, whose limited opportunities beyond agriculture make survival the primary motivation for adopting innovations. As Njiru further explained:

‘We look for solutions to improve our situations and are willing to invest in them. We have adopted drought-resistant varieties such as cassava and maize, which help improve both our food situation and income under the prevailing weather conditions.’

For most households, agricultural production is primarily intended for home consumption, with only surplus sold in local markets to generate income for households (see section 4.2). This finding suggests that the primary objective of farming is not commercial accumulation but household survival and food security. Based on these findings, this research categorises these farmers as ‘necessity-driven adopters,’ because they adopt pro-poor agricultural innovations largely out of necessity. This interpretation aligns with Locke *et al.* (2017) and Steinfeld and Holt (2019), who observed that innovation adoption among subsistence farmers is often driven out of necessity rather than by opportunity or choice.

The findings further indicate that environmental pressures, including climate variability, land degradation, and resource scarcity, significantly restrict the range of livelihood strategies available for farmers. Under such conditions, agricultural innovations become critical mechanisms for maintaining production and meeting basic household needs. These findings are consistent with Agarwal *et al.* (2020), who observe that when environmental pressures undermine subsistence farmers’ ability to secure food needs, the adoption of livelihood-sustaining innovations becomes less a matter of choice and more a matter of necessity. As a result, adoption becomes a compelled response to sustain production and meet basic food needs, rather than a strategic decision among multiple viable alternatives. Moreover, the adoption process in these contexts is deeply shaped by socio-cultural, economic, and agroecological conditions. These factors influence not only whether farmers adopt innovations, but also which innovations are perceived as feasible, accessible and appropriate within their local contexts.

Adoption decisions are therefore embedded within broader livelihood realities rather than being based solely on technical assessments of innovation performance.

This perspective extends Rogers' (2003) conceptualisation of innovation adoption as a process in which individuals evaluate an innovation relative to competing alternatives before making an adoption decision. While subsistence farmers may still consider the relative advantages of innovations, their decisions are made under conditions where viable alternatives are limited or absent. In such contexts, adoption is not simply a matter of selecting the best option from a range of possibilities; it is often a necessary response to environmental and livelihood pressures. The findings therefore suggest that, for subsistence farmers, innovation adoption is shaped not only by perceptions of relative advantage but also by the imperative to secure household survival under conditions of persistent vulnerability.

Farming in both communities is characterised by small landholding and a heavy reliance on family labour. Women play a prominent role, often tending crops while simultaneously caring for young children, see Figure 4.10 and managing other household chores. This reflects the dual burden of production and reproduction identified in previous studies (Onyalo, 2019; Visser & Wangu (2021).



Handheld hoe

Figure 4.10 A woman is planting with her child while carrying planting materials on her back.

The woman holds a handheld hoe, while her child clutches a fabric teddy bear which she plays with as her mother is busy on the farm.

Manual tools such as handheld hoes and machetes are the main farming tools because they are affordable and accessible. Wanja, a 49-year-old female farmer, explained:

*‘Machetes are cheaper to buy, lightweight, and suitable for all household members....
They are easy to use when weeding and planting.’*

However, as Ireri, a 64-year-old farmer, noted:

‘Our farming tools are not efficient to use; we spend days on end tilling and weeding our crops.’

The limited availability of modern agricultural technologies increases labour demands, particularly for women, a finding also reported by Mottaleb *et al.* (2016).

Most farmers cultivate low-value indigenous food crops primarily for subsistence, selling only surplus produce in the local markets where women dominate as vendors (see Figure 4.11). In Tigania East, banana marketing through the *Mlango* farmers group represents a notable

exception, although participation is restricted to group members. Income generated from sales is typically reinvested in household needs and livelihood maintenance.



Figure 4.11 Local Market in Mbeere North, where most of the vendors are women

While much of the agricultural innovation literature focuses on high-value crops like maize (e.g., Gaya *et al.*, 2017; Gebre *et al.*, 2019; Teklewold *et al.*, 2020), this research identified a range of indigenous crops that are central to household food security. These include cassava, cowpeas, sweet potatoes, bananas, pearl millet, sorghum, and traditional vegetables like cowpea leaves and pumpkin leaves, which are critical to household food security. This finding is consistent with Parmar *et al.* (2017), Bokelmann *et al.* (2022) and Aworh (2023), who emphasise the critical role of indigenous crops in strengthening food security across Sub-Saharan Africa.

The cultivation of indigenous crops, including cassava and bananas, is predominantly undertaken by women, reflecting the gendered nature of crop production. These are widely regarded as ‘women’s crops’ because of their importance in household food provision (Andersson *et al.*, 2016; Masamha *et al.*, 2018; Bokelmann *et al.*, 2022). Their affordability, accessibility, and resilience to harsh climatic conditions make them especially valuable to women, who often face greater resource constraints and are disproportionately affected by environmental shocks (discussed in section 4.2.4). By contrast, men tend to prioritise cash crops, with the generated income contributing to household food purchases and other necessities. These patterns help explain the adoption of *Muguka* among men in Mbeere North and the participation of men in the *Mlango* farmers group in Tigania East.

Overall, the findings demonstrate that subsistence farmers in Mbeere North and Tigania East are best understood as a constrained and survival-oriented process, where the imperative to maintain household food security frequently outweighs considerations of profit maximisation or technological superiority. The concept of necessity-driven adopters contributes to diffusion theory by highlighting how vulnerability, rather than opportunity, can serve as a primary driver of innovation adoption in marginalised rural settings. The next section discusses the profile of left-behind adopters.

4.3.2 The Left-behind Adopter

This research found that the adoption of improved cassava varieties, *Muguka*, and farmers’ groups is closely linked to family responsibilities. During focus group discussions, participants repeatedly used expressions such as ‘*feeding my children*,’ ‘*paying fees for my children*,’ and ‘*taking care of our children*,’ when explaining their reasons for adopting pro-poor agricultural

innovations. Nearly all participants were parents, highlighting the central role of household welfare in shaping adoption behaviour.

The demographic profile of participants further illuminates this relationship. The research interviewed 37 farmers, comprising 21 farmers from Mbeere North and 16 from Tigania East. Most participants were over 40 years old. In Mbeere North, only four participants were aged 40 or below, while 17 were above 40 years. In Tigania East, four participants were below 40 years and 12 were above 40 years. Participants ranged in age from 25 to 75 years, with average ages of 46.89 years for women and 52 years for men. According to the Oxford Dictionary (OED, 2015), individuals between 45 and 60 years are categorised as middle-aged, suggesting that most participants fall within this category. Women also constituted the majority of respondents.

These findings broadly align with previous studies of smallholder farming populations. Badstue *et al.* (2018) reported average ages of 42 years for women and 46 years for men across 27 developing countries. Similarly, Ingutia and Sumelius (2022) found an average age of 42 among Kenyan farmers, while Kaliba *et al.* (2020) reported an average age of 47.54 in Tanzania. While the present sample size is not sufficient for national generalisations, it offers valuable insights into how age, gender, and caregiving responsibilities shape the adoption of pro-poor agricultural innovations in subsistence farming contexts.

The demographic profile observed in this research differs from that of developed countries, where farming populations tend to be older. For example, the average age of farmers in the United States was 57.21 years in 2019, while approximately 35 percent of European farmers were over 65 in 2016 (Borda *et al.*, 2023). Africa's comparatively young population (UN,

2025) partly explains this difference. However, both developed and developing contexts face declining youth participation in agriculture. Ayisi *et al.* (2022), observed reduced young involvement in farming in Ghana, while Bokelmann *et al.* (2022) attributed youth migration in Kenya from rural areas to limited livelihood opportunities in agricultural communities.

For subsistence farmers in Mbeere North and Tigania East, the majority of whom are women, productive responsibilities intersect with severe resource constraints to shape adoption behaviour. As discussed in section 4.1.2, many women face systemic challenges in accessing productive resources, such as agricultural inputs and credit, and have limited income-generating opportunities. At the same time, they carry primary responsibility for household management and caregiving. As Njoki, a 45-year-old female farmer from Mbeere North, explained:

‘We produce food for our children with the little resources we have. It is difficult, but we do all we can to feed our families.’

Makena, also a 45-year-old female farmer from Mbeere North, echoed this hardship:

‘There are days I do not have even a shilling in my pocket. Even with nothing, I do all that is possible to ensure my children do not sleep hungry’ [Mbeere North].

Similar sentiments were expressed by Kanana, a 28-year-old female farmer from Tigania East:

‘Poverty notwithstanding, we have to look for solutions to improve farm productivity to feed our children.’

These accounts demonstrate that adoption decisions are embedded within broader responsibilities for household survival and care. Despite severe resource constraints, many women actively seek to adopt pro-poor agricultural innovations to sustain household food

security. This research conceptualises them as ‘left-behind adopters,’ resource-constrained individuals who shoulder the burden of caregiving and food production responsibilities while adopting low-cost innovations that fit within their means. Within this group, women primarily adopt drought-tolerant food crops such as improved cassava varieties and participate in farmers’ groups to enhance household food security. By contrast, men tend to prioritise income-generating crops such as *Muguka*, which indirectly support household food needs through increased earnings.

Younger farmers in this research exhibited a stronger orientation towards profitability than older farmers. Emily, a community leader in Mbeere North, remarked:

‘The majority of farmers who have taken up Muguka farming are young men, because of the allure of making a lot of money.’

Similarly, Muriithi, aged 44, explained that younger farmers allocate more land to *Muguka* than to food crops like cassava, maize, or beans. This observation aligns with Kaliba *et al.*’s (2020) finding that profitability influenced land allocation decisions for improved sorghum among younger adopters in Tanzania, while older farmers tended to be more risk-averse. Brown *et al.* (2019) similarly reported risk aversion among older farmers. However, these studies pay limited attention to the role of gender and caregiving responsibilities in influencing adoption decisions. The findings of the present research revealed that middle-aged farmers in Mbeere North and Tigania East, many of whom are women, adopt pro-poor agricultural practices not because they are less risk-averse but because they carry primary responsibilities for household welfare. As this group is more likely to have dependent children and other family members to support, they tend to prioritise innovations that enhance household food security and livelihood

stability. In contrast, farmers over the age of 65, who are often themselves considered dependents (Kaliba *et al.*, 2020), generally exhibit lower levels of adoption due to declining physical capacity and reduced direct responsibility for household provision.

While limited access to land constrains opportunities for younger farmers and often encourages migration in search of employment, this research revealed that a significant proportion of outmigration involves middle-aged men. These men frequently seek off-farm employment to diversify household income sources, leaving women to manage both agricultural production and domestic responsibilities. Wanjira, a 34-year-old female farmer from Mbeere North, described her situation:

‘We were allocated a very small portion of land to farm by my father-in-law. The farming was not generating enough to feed us and cover our children’s school fees. This prompted my husband to search for alternative employment. He now works in a quarry. Every end of the month, he sends me money to take care of household needs. I am happy that we can keep our children in school.’

Kiende, a 45-year-old female farmer from Tigania East, echoed a similar sentiment:

‘My husband works as a driver.... the money he earns helps us survive.’

These accounts show that off-farm employment serves as an important livelihood diversification strategy for subsistence farmers, supporting findings by Fan and Rue (2020) and Agadjanian and Chae (2023), who identified non-employment as an alternative pathway to address food security concerns in rural communities.

However, male outmigration has resulted in what Haug *et al.* (2021) describe as the feminisation of agriculture. As men seek employment elsewhere, women assume increasing responsibility for both farm management and household care. Wanjira reflected:

‘Although my husband sends me some money, I am left to handle all the farming and household chores. I also feel lonely.’

Kiende added,

‘It would be nice if my husband could help more with the farm work, but there isn’t much to do.’

These experiences illustrate how migration transforms rural households into female-managed units in which women bear the dual burden of agricultural and domestic labour, as left-behind adopters. Despite these constraints, women continue to adopt and utilise pro-poor agricultural innovations to sustain household livelihoods.

The findings further reveal that the effects of migration extend beyond middle-aged women to older generations. In several cases, older women had assumed caregiving responsibilities for grandchildren following the migration of their adult children. Ireri, a 64-year-old male farmer from Mbeere North, observed:

‘My wife, who is 60, now cares for our grandchild. We must support our daughter, who is unmarried and works in Nairobi.’

This dynamic was also evident when Waturi, a 65-year-old female farmer, attended a focus group discussion accompanied by her grandson. She apologised, explaining:

'I apologise, teacher, for bringing my grandson with me. I take care of him while his mother is away working. It is tiring doing farm work, household chores, and childcare at my age, but can I do?'

These stories illustrate how rural migration reshapes household labour arrangements by transferring caregiving and productive responsibilities to older women who might otherwise be easing into retirement. Similar observations were made by Langill *et al.* (2023), who found that male migration increases labour burdens for older rural residents. The present research extends this discussion by showing how elderly women, especially those caring for grandchildren experience multiple forms of disadvantage associated with age, gender and caregiving responsibilities. At the same time, many continue to engage in farming and adopt livelihood-sustaining innovations despite these constraints.

These findings reinforce broader evidence of the feminisation of agriculture across sub-Saharan Africa (Palacios-Lopez *et al.*, 2017; Christiaensen & Demery, 2018; Masamha *et al.*, 2018; FAO, 2020). However, this study extends existing scholarship by identifying left-behind adopters as a distinct category of innovators. Unlike conventional adopters who may adopt innovations to increase productivity or income, left-behind adopters engage with pro-poor agricultural innovations under conditions of structural disadvantage, caregiving responsibility, and livelihood insecurity.

In summary, the findings demonstrate that the adoption of pro-poor agricultural innovations in Mbeere North and Tigania East is shaped by the intersection of age, gender, caregiving responsibilities, and migration. Middle-aged women emerge as key adopters, not because they

are pursuing market opportunities, but because they carry primary responsibility for sustaining household food security and wellbeing. Younger farmers, in contrast, are more strongly motivated by income-generation opportunities and are more likely to adopt commercial crops such as *Muguka* or migrate in search of employment. These migration patterns intensify the responsibilities borne by both middle-aged and elderly women farmers, leaving rural agriculture increasingly sustained by left-behind adopters, who innovate within the constraints of caregiving, limited resources, and persistent livelihood vulnerability.

4.3.3 The Experienced Adopter

The research found that farmers' adoption decisions are strongly influenced by their accumulated farming experience and direct exposure to environmental change, as well as their familiarity with new agricultural innovations. Farmers who had experienced repeated crop failures, food shortages, and changing weather patterns were more likely to adopt agricultural innovations that enhanced household resilience. This study refers to such individuals as experienced adopters because their adoption decisions are informed not only by years of farming but also by accumulated knowledge of local farming systems and lived experiences of environmental stress. This section begins by discussing their experiences with farming practices and environmental changes.

4.3.3.1 Experienced with Farming Practices and Environmental Changes

Experience in farming production refers to the duration a farmer has actively engaged in agriculture since they began making their own production decisions (Ainembabazi & Mugisha, 2014). In the present research, farmers possessed varying levels of experience with agricultural

production and environmental change. These experiences significantly influenced their decisions to adopt improved cassava varieties, cultivate *Muguka*, and participate in farmers' groups. Many farmers recounted instances of crop failure associated with increasingly unpredictable weather conditions. For example, Ireri, a 64-year-old farmer, explained:

'I have watched my crops fail countless times because of the altered weather patterns. I had to switch to improved varieties like cassava that are more resilient, because we don't have water to irrigate our crops.'

Similarly, Njagi, a 60-year-old male farmer, reflected on the lessons learned through hardship: *'Hunger has taught us the hard way,'* he stated. Similar sentiments were shared by other farmers, who stressed that adopting drought-resistant crops had become a necessity for ensuring food security.

These findings demonstrate how direct experiences of crop failure and food insecurity influence farmers' willingness to adopt innovations. Similar findings were reported by Demont's (2022) in India, where farmers who had previously experienced food insecurity were more responsive to concerns about food availability. In both contexts, lived experiences of hunger shaped agricultural decision-making and encouraged the adoption of practices that strengthened food security.

Participants also described how long-term observations of environmental change had altered their farming practices. Kagendo, a 61-year-old female:

'In the past, the weather patterns were predictable; we knew when to plant and when to harvest. This has changed, and we have had to adjust our planting seasons accordingly.'

These narratives highlight how local agricultural knowledge interacts with environmental pressures to shape adoption choices and decisions. Farmers with extensive experience of gradual climatic changes were more likely to adopt innovations that addressed these emerging challenges. Improved cassava varieties, for example, were valued for their drought tolerance, early maturity, and higher yields (see section 4.2.1.1). Farmers assessed these varieties against the declining performance of traditional crops under drought conditions and viewed them as essential for maintaining household food security. Similarly, *Muguka* was perceived as attractive because of its drought tolerance, low management requirements, and income-generating potential (see section 4.2.1.2). Under conditions of climatic uncertainty and limited resources, *Muguka* allowed farmers to diversify household incomes and spread production risks.

A similar pattern emerged in Tigania East, where changing rainfall patterns had prompted farmers to alter both crop choices and marketing strategies. Mugambi (52) explained:

‘The production of our crops has changed significantly with the current weather patterns. Our Khat does produce as much, and we no longer have a good market for it. We have shifted our focus to bananas, which are generating us a good income. However, we have had to adopt improved banana varieties that are more drought-tolerant and high-yielding. To maximise the benefits of our bananas, we joined this group (Mlango) for better market access.’

This response demonstrates how accumulated farming experience enables farmers to recognise when existing livelihood strategies are no longer viable and when new innovations become necessary. Adoption in these contexts is therefore closely linked to adaptation. Faced with declining productivity, uncertain rainfall, and increasing food insecurity, farmers adopt

innovations as practical responses to environmental pressures. While adoption is largely necessity-driven, adoption was particularly evident among left-behind adopters, many of whom are middle-aged women responsible for maintaining household food security under increasingly challenging conditions. Existing studies have shown that farming experience can improve farmers' ability to evaluate the usefulness of agricultural innovations (Mwangi & Kariuki, 2015). However, such studies often treat experience primarily as years spent farming. The present research extends this perspective by demonstrating that experience with climate variability, crop failure, and food insecurity is equally important in shaping adoption decisions. It is not simply the duration of farming that matters, but the cumulative lessons learned through repeated exposure to environmental and livelihood shocks.

The findings also reveal a generational dimension to adoption behaviour. Muriithi, a 44-year-old farmer from Mbeere, explained:

'I have allocated a smaller section of the farm that is less fertile to Muguka, leaving the rest of the farm to grow food crops. However, I see the younger male farmers devote most of their farms to Muguka, leaving a smaller portion for food crops.'

Emily, a community leader, expressed similar concerns:

'The young male farmers who are inexperienced in our farming system and the effects of weather changes on food production are not keen on adopting crops like improved cassava or maize varieties that ensure food supply. They view these crops as less profitable. They opt for crops like Muguka.'

Two important points emerge from these accounts. First, younger farmers appear more willing to experiment with new crops and market opportunities. These findings are consistent with those of Mwangi and Kariuki (2015), Kaliba *et al.* (2020) and Ayisi *et al.* (2022), who argue

that younger farmers are generally less risk-averse and more receptive to innovation. Second, openness to innovation does not necessarily translate into decisions that strengthen long-term household resilience. Limited experience with local farming systems, environmental risks, and food insecurity may encourage a stronger focus on short-term profitability at the expense of food security considerations.

Overall, the findings suggest that adoption decisions are shaped not only by farmers' knowledge of agricultural production but also by their lived experiences of environmental change and food insecurity. Experienced adopters draw upon accumulated knowledge of local farming systems, repeated encounters with climatic shocks, and lessons learned from crop failure to evaluate the relevance of agricultural innovations. This study therefore extends existing understandings of farming experience by demonstrating that adaptation-oriented adoption emerges not simply from years of farming but from sustained engagement with environmental uncertainty and livelihood vulnerability.

4.3.3.2 Prior Experience with new Innovations

The second dimension of experience relates to prior exposure to pro-poor agricultural innovations. Eastwood and Renwick (2020) highlight that prior experience with an innovation significantly influences both its adoption and its integration into existing farming systems. The findings of this research support this view, while also demonstrating that different forms of experience shape adoption in different ways.

For some farmers, prior experience involved direct knowledge of crop production and processing. Florence, for example, possessed extensive experience with cassava cultivation before the introduction of improved cassava varieties in Mbeere North. She explained:

‘The improved variety introduced here is like the one that is mainly grown in the western regions of Kenya, where I grew up. I was happy to see the new varieties in Mbeere North, as these reduced my difficulties in obtaining planting materials.’

Florence’s familiarity with cassava cultivation, processing, and consumption enabled her to evaluate the innovation with greater confidence than many other farmers. Her knowledge extended beyond cultivation practices to include post-harvest processing techniques and potential household uses. This prior experience reduced uncertainty surrounding the innovation and facilitated its integration into her farming system. Other farmers possessed more limited forms of experience. Njiru (67), for instance, recalled how a previous encounter with *ugali* made with the improved cassava varieties during a visit to Bungoma influenced his adoption decision:

‘I tasted ugali made with cassava flour during my visit to Bungoma, and I really liked it.’ I remember that when the planting materials were brought, my wife and I were among the first to plant them.’

Unlike Florence, Njiru’s familiarity with cassava was based primarily on consumption rather than production or processing. Nevertheless, this experience positively shaped his perceptions of the innovation and encouraged early adoption. These findings support Ainembabazi and Mugisha (2014) observation that individuals with prior exposure to an innovation are more likely to adopt it earlier than those without such experience. However, the present research extends this argument by showing that prior experience is not uniform. Production experience,

processing experience, and consumption experience each influence adoption differently and provide varying levels of confidence in evaluating an innovation.

The distinction became particularly evident during the post-harvest stage. While Florence's experience enabled her to adopt both the crop and its associated processing practices, many other farmers lacked confidence in processing cassava into flour. Consequently, adoption of the crop did not necessarily translate into adoption of post-harvest innovations. Florence therefore represents what Rogers' (2003) describes as an early adopter or opinion leader, an individual with superior knowledge of an innovation who can influence the behaviour of others within a social system.

However, Florence also highlighted the limitations of the innovation:

'I do not enjoy processing cassava roots into flour. It is a laborious and time-consuming process.'

This experience proved influential. Rather than encouraging widespread imitation, Florence's negative assessment of cassava processing discouraged many women from adopting the practice. This mirrors Ainembabazi and Mugisha (2014) and Mwangi and Kariuki (2015) observations that peer experiences can both promote and deter adoption, depending on how innovations are perceived in usability. In this case, the substantial labour and time demands associated with cassava processing, particularly for women, who already shoulder disproportionate household responsibilities (discussed in the section 4.2.2.) reduced the attractiveness of the post-harvest innovation.

These findings demonstrate that adoption decisions are shaped not only by pre-adoption expectations but also by experiences gained after adoption. Post-adoption experiences provide critical feedback regarding the usability, practicality, and benefits of an innovation, influencing whether it is sustained, intensified, or abandoned. Negative experiences can result in partial adoption or disadoption, revealing a gap between initial uptake and long-term integration. This observation aligns with Nwachukwu and Vu (2022) and Nguyen *et al.* (2024) who found that user satisfaction has a substantial effect on continued use and loyalty to an innovation. In the agricultural context, this translates to sustained and intensive utilisation of innovations. Similarly, De Oca Munguia *et al.* (2021) argue that continued use and intensity of use provide more meaningful indicators of adoption success than initial adoption rates alone. The findings of the present research support this perspective by demonstrating that experienced farmers, like Florence, are often better positioned to anticipate the practical implications of innovations, enabling them to make more informed adoption decisions and integrate innovations more effectively into their livelihood systems.

Overall, the findings suggest that experience should be understood as a multidimensional concept encompassing prior knowledge, consumption, production, processing, and post-adoption learning. This extends conventional adoption literature, which often treats experience as a static characteristic or measures adoption as a single event. By highlighting how gendered labour demands, post-harvest practices, and user experiences influence long-term innovation use, this research demonstrates the importance of examining adoption across the entire innovation pathway rather than focusing solely on initial uptake. Such an approach is particularly important for understanding the sustainability of pro-poor agricultural innovations in resource-constrained farming contexts.

4.3.4 The Knowledgeable Adopter

This research revealed that most subsistence farmers in Mbeere North rely on indigenous knowledge, accumulated and transmitted across generations, to meet their food security needs. This knowledge is embodied in the values, beliefs, skills and insights developed through long-standing interactions between individuals and their natural environment (Borthakur & Singh, 2020; Kom *et al.*, 2024; Von Maltitz & Bahta, 2024). Deeply integrated into the daily life of farmers, indigenous knowledge forms the foundation of traditional farming practices and remains critical for the community's survival.

Focus group discussions revealed that older farmers had a stronger connection to indigenous knowledge, as they contributed more extensively to this topic than their younger counterparts. The farmers' narratives showed that such knowledge is preserved through practical application, storytelling, cultural rituals and agricultural techniques. Kagendo, a 61-year-old female farmer, explained:

'I learned farming skills from my mother. This has not changed much; I still use the same skills to cultivate most of my crop, including the improved varieties. I even remember the songs our mother taught us while we cultivated land or threshed crops.'

Prompted by the researcher, Kagendo recalled one such song:

Kagendo: *Kavevaga karisaga mbiya mboru kwa Muthoni* (Translated: The one who breathes hardest while digging is lazy, and the reward is a rotten rat sent from the in-laws).

The group joined in singing, laughing as they remembered the tune. When asked about farming-related folktales, Mumbi recounted, *'the story of a beautiful but lazy woman who was eaten by an ogre.'* Other farmers cheered, explaining the virtue of hard work for women to ensure the family's food needs are met. The folktales reflect cultural values that emphasise diligence and

the central role of women in agriculture. Similar observations have been made by Beneria and Sen (1981), who noted that under the pre-colonial African shifting agriculture systems, women were the primary cultivators of subsistence crops, while men cleared land for cultivation. This historical division of labour shows that the centrality of women in agriculture is not a recent phenomenon but a deeply rooted cultural reality that continues to influence food security dynamics today.

Farmers' testimonies also indicated that traditional agricultural values, such as the importance of hard work, are transmitted through lived experience and cultural expressions. This finding aligns with Da Silva *et al.* (2024), who found that indigenous knowledge is often conveyed through folktales, songs, and daily practices. While, Da Silva *et al.* observed that this knowledge is rarely incorporated into rural development initiatives, the present research demonstrates its continued relevance and practical application in everyday farming practices. For instance, Florence, a female farmer, described how she learned farming practices through observations and hands-on experience:

'I watched my mother chop cassava roots to prepare them for processing into flour. At first, it looked difficult, but with practice, I became skilled. My mother insisted I had to learn. I practised until I became good at it. I have passed these lessons on to my daughters.'

When asked why her mother was so insistent, she explained:

'My mother said a good woman knows how to process her cassava into flour; otherwise, her children will sleep hungry and will not get a good husband.'

This testimony illustrates the central role of indigenous crops such as cassava in rural livelihoods and highlights the gendered nature of agricultural knowledge transmission. Cassava

and other indigenous crops, including root and tuber crops, vegetables, and cereals, are often cultivated primarily for household consumption and are closely associated with women's responsibility for family food provision (Reincke *et al.*, 2018; Akinola *et al.*, 2020; Aworh, 2023; Ngigi *et al.*, 2023; Mativavarira *et al.*, 2024; Omuse *et al.*, 2024). Florence's account demonstrates that knowledge of cultivation and processing food crops extends beyond technical competence; it is embedded within cultural expectations of womanhood, caregiving, and household food security. Mastery of subsistence and traditional farming skills is therefore closely linked to women's social identity and their capacity to ensure family well-being.

The findings further illustrate how indigenous crops and the knowledge associated with their cultivation are transmitted across generations through observation, participation and everyday interactions. This mode of learning suggests that indigenous farming practices are accessible to farmers with limited formal education and financial resources, making them particularly suited to the realities of many rural women. Aworh (2023) and Onomu *et al.* (2023) similarly observe that indigenous crops are deeply embedded within local cultural identities and traditional knowledge systems of the rural communities in Africa. This means indigenous crops remain important not only as sources of food security but also as repositories of local knowledge and cultural heritage.

The findings also highlight the prominent role of mothers and grandmothers as custodians of agricultural knowledge. Through socialisation and informal learning, they transfer farming knowledge, skills, and values to younger generations. Similar observations have been reported by Du Toit (2022) and Von Maltitz and Bahta (2024), who noted that informal social learning plays a critical role in sustaining local knowledge systems. While studies by Borthakur and

Singh (2020), Kom *et al.* (2024), and Von Maltitz and Bahta (2024) demonstrate the continued reliance on indigenous knowledge among rural communities in Africa, the systematic review by Gwandure & Lukhele-Olorunju (2023) further highlights the gendered dimensions of this process, showing that women are often the primary custodians and transmitters of knowledge relating to traditional crop cultivation. This suggests that indigenous knowledge, deeply rooted in cultural norms and gendered traditions, provides a critical foundation upon which pro-poor agricultural innovations can be introduced, adapted, and sustained. Rather than representing a barrier to innovation, indigenous knowledge serves as an important resource that enables subsistence farmers to evaluate, adapt, and integrate new agricultural practices into existing livelihood systems. However, this knowledge is often overlooked in the adoption of agricultural innovations. The next section examines how this knowledge is applied in practice by subsistence farmers.

4.3.4.1 The Application of Indigenous Knowledge

This research observed that farmers in Mbeere North and Tigania East do not adopt pro-poor agricultural innovations in isolation. Rather, they integrate new agricultural innovations into existing farming practices through the application of indigenous knowledge accumulated over generations. This integration reflects a dynamic process in which local knowledge and introduced innovations complement one another to address environmental uncertainty and household food security concerns. Key practices identified in this research include the use of organic manure, intercropping and crop rotation, traditional food preservation and storage techniques, weather forecasting using indigenous methods, and the use of local visual cues to interpret and implement pro-poor agricultural innovations.

(i) Use of Animal Manure, Crop Intercropping and Rotation

Farmers in the study areas identified the use of organic manure derived from farm animals and poultry as widely used. Chemical fertilisers were generally viewed as expensive and inaccessible, resulting in their limited use. Farmers instead rely on locally available resources to maintain soil fertility. Crop residues, including stalks from cassava, maize, and beans, are left for livestock to trample and decompose before being mixed with animal manure to produce organic fertiliser. This practice is applied across both traditional and improved crop varieties. Figure 4.12 (a) shows the maize residue used to livestock feed, while (b) is decomposed residues mixed with cow dung that is ready for use as organic fertiliser.



Figure 4.12 Images illustrating fresh and dried stalks used as manure by farmers

Field observations further revealed widespread use of intercropping and crop rotation. Farmers consistently described these practices as knowledge inherited from parents and grandparents

and adapted to contemporary environmental conditions. In Mbeere North, improved cassava varieties are commonly intercropped with maize, beans and other food crops, while in Tigania East, bananas are frequently intercropped with maize or coffee. According to the Sub- County Crop Director, these *‘practices help reduce evapotranspiration during periods of intense heat,’* an important consideration in the semi-arid environments of both study areas. Intercropping also enhances plant canopy cover, suppresses weed growth and improves soil moisture retention (Kom *et al.*, 2024). As farmer Mumbi (58) noted: *‘It saves farmers a lot of weeding.’* This benefit is particularly important for women, who are primarily responsible for weeding activities, as also supported in previous studies (e.g., Andersson *et al.*, 2016; Masamha *et al.*, 2018). By reducing the labour demands, intercropping frees time for other productive and household activities, including trading in local markets and caregiving responsibilities.

Crop rotation also emerged as another important indigenous practice for maintaining productivity and ensuring food security, as explained by Mumbi:

‘You see this section that has beans and maize now? Last season, I planted cassava and finger millet. This helps improve yields.’

All participating farmers reported practising crop rotation and intercropping as strategies for maximising land productivity, maintaining soil fertility, and ensuring access to diverse food crops. Beyond their agronomic benefits, these practices contribute to household dietary diversity and strengthen women’s capacity to fulfil their roles as food providers and caregivers.

Previous studies have highlighted the environmental benefits of intercropping and crop rotation, including improved soil fertility, reduced pest infestations, and greater resilience to climate change (e.g., Kom *et al.*, 2024). However, many of the studies fail to account for the gendered

dimensions of such practices. The present research demonstrates that crop rotation and intercropping are not merely technical farming strategies; they are also gendered livelihood practices. Women draw on extensive local knowledge of farming systems to balance food production, labour demands, environmental risks, and household nutritional needs. Indigenous knowledge, therefore, functions not only as a production resource but also as a mechanism for sustaining household food security.

Informal conversations with female participants revealed how this knowledge also shapes decisions regarding crop diversification and risk management. Several women described tensions within households arising from differing priorities between food security and income generation. Following a successful harvest, men often preferred to reinvest resources in the same crop in pursuit of higher financial returns. Women, however, were generally more cautious because of their responsibility for ensuring household food availability. For example, Wanditi, a 45-year-old female farmer, observed:

'About three years ago, we had a good maize harvest, and we made some good money from the sales. That was great, but the prices the next season were unpredictable, and if the rains failed, the risk was high. The hardest part is convincing my husband to scale down after a good harvest.'

Similarly, Njoki, a 54-year-old female farmer, expressed this concern:

'The temptation to reinvest the limited resources in the same crop after a good harvest is risky. If it fails, food security for the whole family is at stake. Such a situation calls for wisdom.'

Waturi (65) reflected:

'This happens often, and the challenge of having money in the house is poor planning.'

These accounts that women often adopt a broader and longer-term perspective when making agricultural decisions. Rather than focusing solely on immediate financial returns, they weigh environmental uncertainty, household food needs, and future livelihood security. Their preference for crop rotation, intercropping, and diversification reflects a sophisticated form of risk management developed through lived experiences of food shortages, climate variability, and market fluctuations. This finding is consistent with Charoenratana *et al.* (2021), who found that monocropping among subsistence farmers in Thailand frequently resulted in food insecurity, indebtedness, and environmental degradation. The present research extends this literature by demonstrating that indigenous practices such as crop rotation and intercropping are not simply agronomic techniques but also social and livelihood strategies that help households manage uncertainty. In particular, women employ these practices to safeguard household food security while balancing competing pressures for income generation.

Ultimately, the findings suggest that pro-poor agricultural innovations are most effective when they are integrated into existing indigenous knowledge systems rather than replacing them. Farmers act not as passive recipients of innovation but as active knowledge integrators who combine introduced technologies with locally developed practices to enhance resilience. This perspective challenges linear models of innovation adoption by demonstrating that successful adoption depends not only on the characteristics of the innovation itself but also on its compatibility with existing knowledge, gendered labour arrangements, and household food security priorities.

(ii) Use of Local Knowledge to Forecast Weather

Responses from participating farmers revealed the continued importance of indigenous knowledge in forecasting seasonal conditions and guiding agricultural decision-making among farmers in Mbeere North and Tigania East. Through long-term observation of their local environments, farmers have developed traditional ecological knowledge systems that enable them to anticipate climatic conditions and respond to environmental uncertainty. These locally grounded forecasting practices play a critical role in strengthening resilience and informing decisions about crop production and innovation adoption.

Farmers described a range of environmental indicators used to predict weather conditions. Kagendo, a 61-year-old female farmer, explained:

‘Depending on the day’s heat intensity, it is easy to tell if it is going to rain or not.’

She further added,

‘By observing the breeding patterns of butterflies, it is much easier to predict the weather and plan when to start planting.’

Florence, aged 62, described how the behaviour of animals and birds provides important environmental signals:

‘The appearance of rare animals or birds and their chirping indicates an impending natural disaster, such as drought or floods.’

Mumbi (58) identified celestial observations as another source of information:

‘A large ring of light or halo around the moon is associated with surplus harvest, but a halo around the sun indicates looming drought.’

These observations illustrate the depth of farmers' engagement with their local ecosystems and illustrate how environmental cues are interpreted to anticipate future climatic conditions. Similar practices have been documented elsewhere in Africa. For example, Jiri *et al.* (2016) found that the movement of stars from west to east under a clear sky is often interpreted as a sign of impending rainfall. Likewise, Kom *et al.* (2024) reported swarms of dragonflies migrating from the east are commonly viewed as an indication of the approaching rainy season in Southern Africa. While the specific indicators differ across regions, they share a common foundation in systematic observation of environmental and cosmological phenomena. Such knowledge systems remain deeply embedded within local cultural and ecological contexts.

Importantly, the findings demonstrate that indigenous weather forecasting serves a broader purpose than simply predicting rainfall. Farmers use this knowledge to make strategic decisions about agricultural production, risk management, and innovation adoption. Njiru, a 67-year-old male farmer, explained,

'This information helps us gauge the best time to plant our crops, which crops to grow at certain periods, the intensity, the crops that must wait for the next season, and the appropriate time to try out new agricultural innovations based on our predictions.'

This account highlights the role of indigenous knowledge as a decision-support system that shapes both farming practices and innovation choices. Farmers draw on environmental observations to evaluate risks, determine suitable planting periods, select crop varieties, and assess the appropriateness of introducing new agricultural innovations. Indigenous knowledge, therefore, influences not only how farmers respond to environmental change but also how they engage with pro-poor agricultural innovations.

The findings further reveal that farmers do not rely exclusively on indigenous forecasting systems. While most participants expressed confidence in traditional weather indicators, they also acknowledged that climate change has made weather patterns increasingly difficult to predict. As a result, many farmers combine indigenous knowledge with modern meteorological information when making agricultural decisions. Rather than viewing traditional and scientific knowledge as competing systems, farmers integrate them to improve the accuracy of their assessments and reduce uncertainty.

This integration demonstrates that farmers are active knowledge brokers who combine multiple sources of information to manage environmental risks. It also challenges assumptions that agricultural innovation necessarily replaces traditional knowledge systems. Instead, the findings show that indigenous knowledge remains central to agricultural decision-making and continues to shape how innovations are evaluated, adapted, and implemented. By combining local ecological knowledge with scientific weather forecasts, farmers strengthen their adaptive capacity and enhance their ability to maintain food security under increasingly uncertain climatic conditions. As such, indigenous weather forecasting is not merely a cultural practice but a practical resource that supports innovation adoption and climate adaptation. This research, therefore, extends existing research on indigenous knowledge by showing that traditional ecological knowledge functions not only as a mechanism for environmental interpretation but also as an important foundation for agricultural innovation decision-making in resource-constrained farming contexts.

(iii) Leverage Local Skills to understand Text and Numerals

Focus group discussions and informal conversations revealed that most participating farmers had limited formal literacy. While some could read and write basic text, many struggled to interpret technical information presented in Kiswahili or English, Kenya's national and official languages. This limit highlighted the importance of demonstrations, visual cues, and local languages in communicating agricultural innovations. However, rather than preventing adoption, farmers developed alternative ways of understanding and applying new agricultural knowledge. This research, therefore, identifies such farmers as knowledgeable adopters, who, despite limited formal literacy, draw on visual, embodied, and social norms of knowledge to interpret, evaluate, and implement agricultural innovations.

One example came from Kagendo (61):

Researcher: *'You mentioned you struggle with reading and writing. How do you make sense of new innovations and information?'*

Kagendo: *'I use the shape and colour of the letters. I have mastered the shapes of the letters of the products I use. For example, NPK or CAN.'*

Researcher: *'Do you know what NPK and CAN stand for?'*

Kagendo: *'No, but I know I use NPK during planting or a few weeks after planting to help crops grow, and CAN after about two weeks to help the food crops mature well'* [61-year-old female farmer].

Similarly, Florence (62) explained how farmers use environmental associations to interpret colours and symbols:

'I am fortunate my parents took me to school, so I read and write without a challenge. However, many farmers who cannot read and write associate different colours with things around us. For example, they associate green with plants, red with blood, and brown with earth.'

The excerpts demonstrate how farmers rely on visual literacy to understand agricultural products and practices. Rather than focusing on the scientific composition of products, they interpret innovations through colours, shapes, symbols, and familiar environmental references. Similar findings have been reported by Nakata and Weidner (2012) and Hasan *et al.* (2017), who found that visual cues increase both the accessibility and acceptability of innovations among low-literacy populations.

Further evidence emerged from Emily, a community leader in Mbeere North, who described how local organisations intentionally use visual identifiers when distributing agricultural inputs:

'We have a local organisation that works with our community, and I help them deliver fertilisers to farmers. Farmers here know their products by name and colour. For instance, NPK (Nitrogen, Phosphorus, and Potassium) for planting, they know it to be white. CAN (Calcium, Ammonium, Nitrate) for top dressing is black. They also look at the grain sizes. If you give them anything different at each stage, they will notice it, and it can cause confusion, anxiety, and refusal.'

The observations highlight how visual knowledge supports innovation adoption. At the same time, reliance on colours, packaging, and appearance have the potential to create vulnerabilities. As Hasan *et al.* (2017) note, counterfeit products that mimic trusted packaging can easily mislead low-literacy users, emphasising the importance of ethical packaging, quality assurance, and consumer protection mechanisms.

Farmers also overcame literacy barriers through social learning and interpersonal networks. Waturi (65) explained:

'We receive assistance from our children or neighbours to understand information written in Kiswahili or English. The benefit of relying on those around us is that they also demonstrate how to use them, making it easy for us to understand.'

This finding illustrates that innovation knowledge is often socially distributed rather than individually possessed. Family members, neighbours, and community networks act as important intermediaries who translate, demonstrate, and contextualise new information. This is consistent with Viswanathan and Sreekumar (2019) who emphasise the importance of proximate others in helping individuals with low formal literacy capabilities make sense of innovations. Adoption, therefore, emerges not solely from individual knowledge but also from collective learning processes embedded within social relationships.

Participants also described using embodied forms of knowledge to compensate for limited numeracy and the absence of measuring tools. Wathiga (57) explained:

'We are always instructed to use one meter, two meters, or one foot. Since most of us are not proficient with numbers and lack the necessary equipment, we measure using our body parts. For example, we use a stride to approximate a meter. That is what I observed my mother doing, and I do the same.'

Emily confirmed this practice:

'Farmers understand the concept of using strides or spans to measure lengths or distances when sowing. They also use their hands or spoons to gauge the quantity of fertilisers to apply on their farms. While farmers who cannot read and write rely on colours and shapes to identify new agricultural products, they use their fingers to perform basic addition and subtraction.'

These examples demonstrate how knowledge is embedded within everyday practices and bodily experiences. Consistent with Kaaronen *et al.* (2022), body-based measurements provide

affordable, accessible, and easily transferable alternatives to formal measurement systems. Their visibility and simplicity make them particularly effective for peer learning and practical demonstration. These characteristics also align closely with Rogers' (2003) attributes of successful innovations, particularly observability and trialability.

The findings challenge deficit-based assumptions that equate limited formal literacy with limited capacity for innovation adoption. Instead, farmers draw upon sophisticated visual, embodied, and social knowledge systems to interpret and adapt innovations to their local circumstances. Knowledgeable adopters may not possess formal scientific knowledge, yet they demonstrate considerable ingenuity in translating complex agricultural information into forms that are meaningful and usable within their everyday lives.

In summary, the findings support a broader typology of pro-poor agricultural innovation adopters in Mbeere North and Tigania East, comprising necessity-driven adopters, left-behind adopters, experienced adopters, and knowledgeable adopters. These categories are fluid and overlapping rather than mutually exclusive. Across all categories, women emerged as particularly important actors because of their central roles in food production and household caregiving. Their extensive experience with local farming systems, environmental change, and household food provision enables them to combine indigenous knowledge, social networks, and practical problem-solving strategies to navigate resource constraints. The adopter typology presented in Table 4.2, therefore, provides a new way of understanding adoption behaviour among subsistence farmers, moving beyond conventional models that emphasise economic incentives and individual decision-making to highlight the importance of lived experience,

caregiving responsibilities, local knowledge, and social relations in shaping how farmers engage with pro-poor agricultural innovations.

Table 4.2 Summary of the Typology of Adopters in Mbeere North and Tigania East

Typology	Description	Key Characteristics
Necessity-driven adopters	Farmers who adopt pro-poor agricultural innovations to sustain household livelihood and ensure survival.	» Limited resources, including financial, productive inputs, time and labour constraints. » Poor market access. » Lack of institutional support. » Risk aversion.
Left-behind Adopters	Farmers who adopt agricultural innovations, out of necessity, even after other household members migrate for work.	» Predominantly middle-aged (average age, 47 years). » Majority are women with primary caregiving responsibilities. » Resource-constrained with limited support. » Men migrate to urban areas for employment, leaving women and older farmers to manage farms with increased workloads.
Experienced Adopters	Farmers with long-term farming and an in-depth understanding of environmental changes	» Middle-aged and older farmers. » Possess deep local knowledge of farming systems. » Cautious yet practical in adoption decisions. » Familiar with innovations and tend to adopt earlier than other groups
Knowledgeable Adopters	Farmers who integrate years of hands-on experience with both traditional and modern farming methods.	» Draw on local values, beliefs, and skills acquired through community and environmental interaction. » Prefer organic manure to chemical fertilisers. » Use local knowledge to forecast weather. » Employ visual and embodies strategies to interpret text and numerals.

4.1 The Impact of Gender Relations on Innovation Adoptions

This section discusses research question three, which explores how gender relations impact the ability of women and men to adopt pro-poor agricultural innovations. The findings indicate that gender relations among subsistence farming households play a crucial role in shaping the adoption of agricultural innovations intended to meet household consumption needs. Data collected through focus group discussions and interviews revealed three interrelated themes:

gendered perception of innovations, gendered access to and control over innovations, and gendered negotiations surrounding innovation adoption. The themes highlight the ways in which gender dynamics influence decision-making processes, resource allocation, and the uptake of agricultural innovations within households.

4.1.1 Gendered Perceptions of Pro-poor Agricultural Innovations

This section presents findings on how female and male farmers perceive pro-poor agricultural innovations that address their basic needs, specifically, household food security and income generation. Farmers across both sites reported facing significant environmental challenges, most notably unreliable and reduced rainfall, as well as prolonged dry spells. As semi-arid regions without irrigation infrastructure, Mbeere North and Tigania East are particularly vulnerable to such climatic disruptions, which frequently result in crop failures and food shortages (NDMA, 2024). In response, farmers have adopted pro-poor agricultural innovations better suited to these harsh conditions. While drought-tolerant cassava varieties, *Muguka*, and collective efforts such as the *Mlango* farmers' groups were generally perceived as beneficial, the ways in which farmers valued these innovations differed significantly by gender.

As detailed in Section 4.2.1.1, female farmers in Mbeere North prioritise improved cassava varieties because of their contribution to household food provision under conditions of environmental stress. This view was consistently expressed by women participants. Florence (62), remarked that *‘with cassava one cannot sleep hungry’*, while Emily (34) explained that *‘cassava can be harvested and added to the pot, ensuring enough food for everyone in no time.’* Similarly, Mbura (42) noted, *‘I process cassava roots....I make ugali for my children.’* These

accounts demonstrate that women perceive cassava as a dependable source of food that helps sustain households during periods of uncertainty. While previous studies (e.g., Andersson *et al.*, 2016; Parmar *et al.*, 2017; Masamha *et al.*, 2018; Odey & Lee, 2020) identify cassava as a drought-resistant crop commonly cultivated by poor rural women for home consumption, they pay limited attention to how women themselves evaluate its significance. The present findings show that women value cassava primarily for its capacity to ensure that their families, particularly children, have sufficient food.

A similar pattern emerged among female participants of the *Mlango* farmers' group, who identified household food provisioning as their primary motivation for participation. Gacheri (39) explained that *'The income earned from group activities goes toward buying other foodstuffs we do not grow here.'* Maiti, aged 56, valued the group because it enabled *'a variety of diets'* for her family, while Gatwiri (67) noted, *'I joined the group to be able to meet my family's food needs'* (discussed in Section 4.2.3). While previous studies have highlighted the role of farmers' groups in improving women's access to credit (Ingutia & Sumelius, 2022) and enhancing empowerment (Mudege *et al.*, 2015), the findings of the present research demonstrate that female farmers also participate in such groups as a strategy for strengthening household food security.

Women's preference for innovations that contribute directly to household food security reflects their socially constructed roles as mothers and caregivers, as well as food producers responsible for providing and preparing food. As Visser and Wangu (2021) observe, the cultivation of food crops that directly support household food security is largely managed by women. The present research extends this understanding by demonstrating that gender roles influence not only the

crops women cultivate but also the agricultural innovations they choose to adopt. Women, therefore, are more likely to adopt innovations such as drought-tolerant cassava varieties and collective farming and marketing initiatives when these support their responsibility for ensuring household food security.

In contrast, male farmers in Mbeere North expressed a strong preference for adopting *Muguka*, a drought-tolerant cash crop valued for its income-generating potential. As Muriithi (44) explained, *'Muguka helps me generate income,'* while Ngari (56) noted, *'We value innovations that help us bring money home.'* Similarly, David (25) stated, *'I am happy to earn money from Muguka'* (discussed in Section 4.2.1.2). Among male participants in the farmers' group, membership was likewise motivated by the prospect of increasing household income. Mutembei (55) remarked, *'I joined the group...I earn money to take care of my family,'* while Mugambi (52) observed that *'The group helps me manage the economic affairs of my household.'* Kinoti (43) further highlighted the social significance of income, stating that *'With money in my pockets, I can stand among other men with pride'* (Discussed in section 4.2.3.1). These accounts suggest that men evaluate innovations primarily in terms of their ability to generate income and fulfil their responsibilities as household providers.

Similar patterns have been documented elsewhere. Visser and Wangu (2021) found that men farmers tend to prioritise crops that generate income. The present research extends this observation by demonstrating that men's preference for income-generating crops shapes their adoption of pro-poor agricultural innovations that align with socially assigned productive and financial responsibilities. Although these innovations are primarily valued for their capacity to generate income, the proceeds may indirectly contribute to household food security through

the purchase of food and other necessities. This finding is consistent with Locke et al. (2017), who found that men's adoption of fisheries innovations was largely driven by income considerations, although mediated by the gender division of labour.

While closely related, gender roles and the gender division of labour are conceptually distinct. Gender roles refer to socially constructed expectations regarding responsibilities, appropriate behaviours, and contributions associated with being female and male (Stewart *et al.*, 2021; Voola & Voola, 2021). In contrast, the gender division of labour concerns the allocation of productive and reproductive activities within households and communities (Acker, 1990; Benschop & Doorewaard, 2012). In agricultural settings, women often combine food production activities with domestic responsibilities, whereas men's productive activities are more closely associated with income generation. These divisions of labour, in turn, reinforce prevailing gender roles.

As a result, the findings show that gendered preferences for cassava among women and *Muguka* among men are not arbitrary but are deeply rooted in these socially constructed roles and divisions of labour. This contrasts with earlier studies (e.g., Boomgaard & Hart, 2011; Miotto, 2023) that identified gendered crop associations without adequately explaining the underlying causes. The evidence presented here suggests that women's dual responsibility for food production and household care reinforces their preference for innovations that contribute directly to household food security, whereas men's productive role encourages investment in innovations that generate income.

Ultimately, the findings demonstrate that the perceived value of pro-poor agricultural innovations among subsistence farmers in Mbeere North and Tigania East is shaped not only by their practical benefits but also by gendered social roles and responsibilities. Innovation adoption is therefore not simply an individual economic decision but a socially embedded and relational process. However, despite their central role in household food production and provisioning, women's ability to adopt and benefit from innovations is often constrained by limited control over productive resources, inability to make decisions, as well as time and mobility constraints. By contrast, men's headship roles privilege their access to productive assets, social networks, and institutional support that facilitate adoption. The implications of these unequal patterns of access and control for innovation adoption are explored in the following section.

4.1.2 Gendered Access and Control of Innovations

The findings reveal that subsistence farmers in Mbeere North and Tigania East operate under severe resource constraints, including limited income, land and agricultural inputs (discussed in section 4.2.1). Although poverty affects most households in these regions, women are particularly disadvantaged because their access to productive resources is often mediated through men. As primary food producers, women remain heavily dependent on husbands for access to land, income, and farming inputs. Gatwiri, a 45-year-old female farmer from Tigania East, explained:

'I depend on my husband wholly. There is nothing I own; no money, no land, nothing.'

This lack of control over resources was echoed across all-female focus groups. Waturi (65) observed:

‘The land we own is inherited from my father-in-law, and ownership is registered in my husband’s name. He controls everything that happens here.’

Wathiga (57) from Mbeere North, further explained,

‘When my husband allocates me space to cultivate, he also supports me with resources, such as money to buy seeds or fertilisers’

Mwendwa (33, Tigania East) reinforced this dependency:

‘I do not have any money of my own. Therefore, I cannot undertake any activities without the necessary inputs. I engage my husband to obtain his input and support.’

These accounts illustrate how women’s access to productive resources is embedded within broader gendered power relations. Consistent with Doss' (2018) observation that ‘many poor women are farmers and many poor farmers are women’ (p.36), the findings reveal how structural inequalities continue to shape women’s agricultural livelihoods. In rural Kenya, land is predominantly acquired through inheritance (Ndiritu *et al.*, 2014), yet customary norms favour male heirs on the assumption that daughters will access land through marriage. However, the findings revealed that upon marriage, women typically move to their husband’s land, usually inherited from his family, which limits their ownership and control. Consequently, women often experience exclusion from both natal and marital land ownership. A reflective memo from an all-female focus group in Tigania East (December 2023) illustrates the emotional weight of these realities:

‘Many described feelings like ‘internally displaced people in our own homes,’ owning nothing beyond personal belongings. Widows feared disinheritance, recounting incidents of women being evicted from marital homes and facing rejection in their natal homes, where they are seen as ‘burden’ or ‘spoilers’ who no longer deserve a share of family land.’

This exclusion has important implications for innovation adoption. Because access to land and productive resources is fundamental to implementing agricultural innovations, women's dependence on husbands constrains both their autonomy and their ability to act on new opportunities. As Karega (43, Tigania East) explained,

'I can use the farm to cultivate crops, but only after consulting my husband and getting his approval.'

Similarly, Waturi (65, Mbeere North) lamented:

'Sometimes I want to move quickly with a good idea, but I am completely unable to do so.'

These findings reinforce earlier studies demonstrating how unequal access to land and productive resources limits women's adoption of agricultural innovations (Doss & Morris, 2000; Njuki *et al.*, 2014; Beuchelt, 2016; Doss, 2018).

Resource dependency was closely linked to women's limited decision-making power. Haug *et al.* (2021) defined decision-making power as the ability to select a course of action from among available alternatives. However, the study revealed that decision-making authority often remained concentrated in the hands of male household heads. Kanana, aged 28, a female farmer from Tigania East, recounted:

'When the group began, I was interested in joining, but I would not make the decision alone. I communicated my interest to my husband. Although he was hesitant at first, he later agreed, and we are both happy with the group.'

Likewise, Gacheri (39) from Tigania East, explained:

'Even when I have new ideas that I know can help improve the food situation, it is a challenge to implement, because my husband controls everything. So, I must ask him.'

These experiences demonstrate that women's adoption of pro-poor agricultural innovations frequently involves negotiation rather than independent decision-making.

By contrast, male participants described themselves as autonomous decision-makers. Kinoti (43, Tigania East) asserted, *'I am the main decision-maker in my house....the final decision is mine, and I expect my wife to support it'* while Muriithi, a 44-year-old male farmer from Mbeere North, argued that *'As the man of the house, your authority should be felt.'* Such accounts reveal how household authority remains strongly gendered, granting men greater control over both resources and innovation-related decisions. These gendered power dynamics place women in a subordinate position and limit their agency. However, unlike earlier studies that treat gender relations as a dichotomous binary, where either gender adopts or does not (Ndiritu *et al.*, 2014; Aduwo *et al.*, 2019; Gebre *et al.*, 2019), the findings reveal a more nuanced reality in which women actively negotiate access to resources and opportunities while seeking to maintain household harmony.

Furthermore, the research found that women's access to agricultural extension services and innovation networks was similarly shaped by gender roles and expectations. Heavy domestic workloads, childcare responsibilities, and social norms restricting women's mobility often limited participation in training programmes and farmers' groups. In many cases, men acted as gatekeepers. For example, Kanana explained:

'Initially, my husband was against me joining the group.....Eventually, when he heard it was helping farmers sell bananas, he agreed.'

Similarly, Mwendwa, 33 year 33-year-old female farmer from Tigania East noted:

‘My husband had to accompany me to the first meeting to make sure it wasn’t a gathering of women rebelling against men.’

These findings indicate that women’s access to pro-poor agricultural innovations is often mediated by male approval, contingent on the perceived value, outcomes or social acceptability of the activity. Such control stems from gender norms that discourage women from independent public engagement, consistent with earlier findings from studies by Mudege *et al.* (2015) and Badstue *et al.* (2018). However, the present research extends this literature by demonstrating how social norms not only limit women’s direct access to extension agents but also reinforce men’s active gatekeeping roles, significantly constraining women’s exposure to innovative knowledge and practices.

At the same time, spousal support emerged as an important enabling factor in the adoption of innovations. Nkirote, (35, Tigania East) explained:

‘It is impossible to be a member of this group without my husband’s support..... Sometimes, he agrees to stay home to take care of the children and feed the goats. Other times, he does not help, so I carry the youngest child to the meeting and leave our eldest with the neighbour. I also complete most household tasks before I leave, so he doesn’t say I neglected my household duties.’

This finding suggests that spousal support to adopt pro-poor innovations does not necessarily mean a shift in household responsibilities or challenge the gender division of labour. Rather, female farmers remained primarily responsible for domestic work and had to manage household-related tasks as well as innovation-related activities.

For many women, support also helped reduce the risks associated with innovation adoption, as noted by Gatwiri (45, Tigania East):

‘Having my husband’s support helps deal with uncertainties if the new ventures fail,’

Similarly, Wanja (49, Mbeere North) emphasised the role of joint decision-making in reducing household tensions:

‘When we make decisions together, it means my husband supports my idea, which also helps reduce any tensions that might arise within the household.’

These findings suggest that while cooperation can facilitate access to innovations, it also reinforces gender hierarchies. Women’s efforts to maintain what Wanja (49) described as *‘harmony and unity in all we do’* reflect how innovation adoption is embedded within broader social relationships and expectations surrounding marriage and family life. Good social relations, as identified by Alcamo *et al.* (2003), are fundamental for human well-being, even when shaped by unequal power dynamics. Such dynamics are rooted in structural gender inequalities that position men as household heads and primary decision-makers, as also noted in previous studies (Badstue *et al.*, 2018; Kwarazuka & Prain, 2019; Stewart *et al.*, 2021). The present study also illustrates how women internalise and accept these social roles and expected behaviours as wives, using them both to maintain social order and to create pathways for innovation adoption.

Women in female-headed households reported greater autonomy over land use and agricultural decision-making. Florence (61, Mbeere North), a widow, inherited her late husband’s land and manages it independently. Mumbi (58, from Mbeere North), a divorcee, received land as a gift from her grandfather, while Makena (45), a single mother of two, was fortunate to have received a share of land inherited from her parents. Although customary laws in Kenya have

historically prohibited women from owning or inheriting land, Makena benefited from the Matrimonial Property Act of 2013, which grants women the legal right to purchase, register, and inherit property from their parents (Government of Kenya, 2022). This legal shift has marginally improved land security for women in Kenya.

Unlike married women, widowed, divorced, separated, and single women were generally able to decide independently how to use their land and whether to adopt innovations. Nevertheless, this autonomy was frequently accompanied by reduced access to financial, labour, and emotional support. As Mumbi reflected, *'I make decisions more quickly now than when I was married,'* she also recognised the loss of resources previously provided by her former husband. Similarly, Florence (61, Mbeere North) lamented Florence lamented:

'I miss the support my late husband provided. Now, I have no one to share my ideas with or help make sense of the new information.'

While Makena added:

'Being unmarried offers some freedom, but I struggle with low income and lack of farm inputs.'

These findings align with previous studies (e.g., Ndiritu *et al.*, 2014; Beuchelt, 2016; Badstue *et al.*, 2018) showing that women's access to pro-poor innovations is constrained by limited financial and physical resources, regardless of marital status. However, the findings of this research emphasise that women in female-headed households are more disadvantaged compared to their married counterparts. This disparity arises because married women often gain access to resources and innovative products through their husbands, whereas women without spousal support lack these indirect channels, leaving them more dependent on their own, often limited means.

Poor health further compounded these challenges. Farmers described illness as both a consequence and a driver of poverty, reducing their capacity to engage in agricultural activities and limiting their ability to invest in innovations. Wanja (49) recalled:

‘Last time I fell sick, I couldn’t work for over a week and had no money for treatment. My neighbours contributed money and took me to the hospital.’

Njagi, a 60-year-old male farmer, starkly summarised the cumulative vulnerabilities:

‘We die of hunger, we die of sickness, we die poor.’

These accounts reflect a deep sense of despair and systemic marginalisation experienced by subsistence farmers. Consistent with studies by Nakata and Weidner (2012) and Steinfield and Holt (2019), this research finds that poor health, especially when compounded by poverty, undermines the ability of subsistence farmers to adopt and sustain pro-poor innovations. This challenge is particularly acute for female farmers, who often shoulder the dual role of productive and reproductive work. As Wanja explained:

‘When a woman is sick, everything comes to a standstill. Worst, they are expected to pull themselves up, be strong, and continue taking care of the family. It gets overwhelming most of the time.’

While this finding resonates with previous studies from both developed and developing countries (Bastos *et al.*, 2009; Visser & Wangu, 2021; Samtleben & Müller, 2022) that highlight the disproportionate health burden borne by women, the present research emphasises that this burden is not simply individual hardship. Instead, it reflects entrenched structural poverty, chronic food insecurity, and inadequate access to health and economic resources.

Overall, the findings demonstrate that access to and control over productive resources are deeply gendered and significantly shape the adoption of pro-poor agricultural innovations. Women's ability to engage with innovations is often constrained by limited land ownership, restricted decision-making authority, unequal access to extension services, and the demands of unpaid care work. While negotiation and spousal support can create pathways for adoption, these mechanisms frequently operate within and reinforce existing gender hierarchies. The findings therefore suggest that innovation adoption is not solely a matter of technical suitability or economic benefit but is fundamentally shaped by broader structures of gendered power and inequality. The next section explores these gender power relations and their implications on pro-poor agricultural innovations.

These results suggest that for pro-poor agricultural innovations to be truly effective, they must extend beyond technical utility, such as yield improvement and tangible benefits like food security. They should also address deeply rooted systems of inequality, gendered power relations, and neglect that limit the participation and resilience of subsistence women farmers. Next, results related to gender power relations in pro-poor agricultural innovations are presented.

4.1.3 Gender Power Relations Around Innovations

In both Mbeere North and Tigania East, social norms emphasise the value of wives and husbands working together to meet their household needs. Women's contributions to food production and caregiving complement men's productive activities, reflecting the interdependent nature of rural livelihoods. However, this interdependence is embedded within structured and gendered social arrangements that position men as household heads and women

as subordinate partners (Benschop & Doorewaard, 2012; Stewart *et al.*, 2021). As a result, women's adoption of pro-poor agricultural innovations is rarely a straightforward and individual decision; rather, it is mediated by household power relations and negotiation processes.

Although women have long played a central role in African agriculture (Beneria & Sen, 1981; Boserup, 1989; Farhall & Rickards, 2021), the present research confirms that persistent gender inequality continues to constrain their ability to adopt pro-poor agricultural innovations intended to improve household food security. While previous studies document these constraints (Beuchelt, 2016; FAO, 2020; Farhall & Rickards, 2021; Visser & Wangu, 2021), less attention has been paid to the everyday strategies women use to navigate them. The findings show that women engage in strategic negotiations to gain spousal approval, which functions as a prerequisite for adopting new agricultural practices, echoing observations by Locke *et al.* (2017) and Kwarazuka and Prain (2019).

For instance, Wanditi (45, female farmer) indicated:

'When I come across new and beneficial ideas, I cannot implement them without consulting my husband. I request his permission. His input is very important.'

Similarly, Wawira, aged 38 from Mbeere North, described her experience after receiving sunflower seeds from a church training session:

'I remember we got training from our church on how we can diversify our incomes through sunflower farming. We also got sample seeds to try out. But when I came home, I would not plant them without my husband's approval.'

When asked to explain what happened to the seeds, this is what she had to say:

Researcher: *‘What did you do with the seeds?’*

Wawira: *‘I informed him about the church training and the samples given. But since he was not too keen on the idea, I shelved it.*

Researcher: *Does your husband always oppose your ideas and suggestions?*

Wawira: *There are instances when he supports, and other times, he dismisses them. There is always a lot of haggling, no matter how good the idea is. In my opinion, men want to be in charge to the point of being the originators of all ideas, so I must request politely, if it is beneficial for the family.’*

Female participants in Tigania East expressed similar experiences regarding the need for approval to adopt pro-poor agricultural innovations. Mukubu, aged 45, noted:

‘I must involve my husband in most farm ideas. I cannot pick innovative ideas alone. I seek his approval, but he does not require the same from me; he just informs me of his decisions.’

Gacheri (45) remarked, *‘I must ask, that is not negotiable.’*

These experiences indicate that pro-poor innovation adoption is often hinged not on the utility, personal relevance or value of pro-poor agricultural innovations but on the household power relations. For these women, even well-informed ideas require permission to act upon, as independent action may be interpreted as a challenge to male authority. The need to seek approval, therefore, reflects not a lack of competence or knowledge but the social expectation that male authority must be recognised and maintained. This finding complicates and extends existing accounts by Boomgaard and Hart (2011) and Farhall and Rickards (2021), which frame women’s ideas as inherently undervalued. Evidence from the present research suggests women’s ideas may be recognised as valid, yet their enactment is constrained by gender power relations that regulate who is authorised to act. As such, women often conform to normative

expectations of subservience (Badstue *et al.*, 2018; Kwarazuka & Prain, 2019) not because they internalise inferiority, but as a strategic accommodation to navigate these constraints and enable innovation adoption.

This pattern of negotiation reflects what Benschop and Doorewaard (2012) call the ‘legitimacy of inequality’, a socially accepted form of subordination that appears natural within the social structures. Consequently, men are viewed and view themselves as the primary decision-makers and initiators of new ideas, despite evidence suggesting that women are equally or even more proactive in seeking solutions to meet household needs. Negotiation, therefore, becomes a mechanism through which women avoid conflict and confrontation, helping minimise threats to male authority. Njiru, a 67-year-old male farmer from Mbeere North, expressed his disdain for women who ‘*Kwiamba*’ (try to be men), while Mumbi, a 58-year-old female farmer, affirmed:

‘Men strongly want to be recognised as the household heads. They oppose their wives’ taking actions without their approval, as this threatens their authority.’

Thus, spousal approval functions less as an objective evaluation of innovation adoption but more as a performance practice that sustains social order and gender hierarchy. While household decision-making is widely recognised as a bargaining process (e.g., Doss, 2013; Shibata *et al.*, 2020), these findings demonstrate that women often bargain from structurally weaker positions, relying on accommodation rather than direct challenge. This means that women’s innovations remain hidden and shaped by internal negotiations rather than visible decision-making. These dynamics highlight critical aspects of social gender relations, including power dynamics and hierarchical structures within societal institutions like

households and marketplaces (Stewart *et al.*, 2021), which significantly influence the adoption of innovations but are often overlooked in innovation studies.

Gendered power relations also influence access to innovation-related information. As discussed in the section 4.1.2, men benefit from greater mobility and fewer domestic obligations, which enables them to engage more readily with extension services that disseminate and train farmers on pro-poor agricultural innovations. Moreover, their position as household heads further positions them as the primary recipients of agricultural training and development interventions, a pattern observed in previous studies (Mudege *et al.*, 2015; Badstue *et al.*, 2018; Nyairo *et al.*, 2022). However, information acquired by men does not always reach women, even when women are primarily responsible for implementing the associated practices. Participants reported that men sometimes withhold, forget, or dismiss information that could be useful to their wives. Njiru (67) admitted:

‘Sometimes, I don’t share with my wife all the information I have because I may not remember everything I learned.’

Similarly, Mutembi, a 55-year-old, stated:

‘It’s hard to tell why, but I may not share information with my wife if I think it is not useful to her.’

As a result, women frequently receive incomplete or fragmented information. Wawira (44) explained:

‘Sometimes, I get incomplete information from my husband, which I cannot use.’

The information gaps reinforce women’s marginalisation in the innovation process and reflect what Acker (1990) terms ‘gendered organisations,’ whereby advantages and disadvantages are

systematically produced through socially constructed distinctions between feminine and masculine roles' (p. 146).

Gendered power relations also shape how the benefits of innovation are defined and distributed. Women consistently framed successful innovation in terms of household well-being and food security. As Waturi (65, Mbeere North) explained

'There is nothing as fulfilling as having sufficient food for the family. I sleep with no worries.'

Kiende (45, Tigania East) similarly described *'food for the family'* as *'the ultimate prize.'* In contrast, men often associated innovation with income generation, social status, and public recognition. Muriithi's (44, Mbeere North) commented: *'When I make money from my crop, I go out to celebrate with my friends,'* while Mugambi (52, Tigania East) added: *'Good harvests bringing good money call for celebration with friends.'*

This contrast reflects broader gender norms that associate women with the private sphere of family care and men with the public sphere of social recognition and economic authority (Stewart *et al.*, 2021; Voola & Voola, 2021). These norms also help explain why women's successful innovations may become subject to male control. Several female participants reported that once an agricultural enterprise became profitable, their husbands assumed control over it. Gacheri (45, Tigania East) explained:

'When the bananas became profitable for us, my husband hijacked the project, making it his, although I do most of the work.'

Similarly, Makubu (45) noted:

'My husband controls everything after he realised bananas are making good money.'

These findings complicate existing arguments that successful women-led initiatives necessarily enhance women's status and empowerment (Locke *et al.*, 2017; Badstue *et al.*, 2018; Kwarazuka & Prain, 2019). Instead, they demonstrate that success can trigger the appropriation of women's labour and men eclipsing their efforts, thereby reinforcing rather than transforming existing gender hierarchies. When asked how they navigate this situation, Gacheri (45) reflected:

'I have limited options. I still sell my bananas through the group and receive the benefits of membership. Although my husband controls all the sales, at least I get the trickle-down benefits rather than not being a member of the group, which would be worse.'

This finding indicates the constrained and unequal bargaining position in which women operate, where continued participation reflects not empowerment in a transformative sense, but a pragmatic negotiation within restrictive gender norms.

The findings, therefore, reveal how gendered power relations shape not only the adoption of pro-poor agricultural innovations but also the distribution of information, decision-making authority, and benefits arising from innovation. As a result, innovations designed to improve the livelihoods of vulnerable populations may disproportionately benefit male household members while leaving women in more marginalised positions. Such dynamics are often obscured in quantitative studies that use mathematical modelling to predict adoption rates or measure innovation outcomes (e.g., Ndiritu *et al.*, 2014; Gebre *et al.*, 2019). This highlights the merit of a social relational approach that makes these hidden processes visible by demonstrating how gender roles, institutional arrangements, and power relations influence who

adopts innovations, how decisions are negotiated, and who ultimately benefits from innovations.

4.2 Chapter Summary

This chapter has presented findings indicating that subsistence farmers in Mbeere North and Tigania East perceive improved cassava varieties (KME), *Muguka* cultivation, and participation in farmers' groups as valuable pro-poor agricultural innovations. These innovations are valued for their contribution to household sustenance, income generation, value addition, collective action, and their adaptability or compatibility with local environmental, agroecological, and subsistence farming conditions. However, successful adoption depends not only on the availability of innovations but also on the support systems that facilitate access to information, resources, and implementation. Social networks emerged as the primary channels through which farmers accessed new agricultural knowledge and opportunities, with bridging agents such as government extension officers and religious institutions playing a critical role in connecting farmers to innovations. Access to these networks, however, is gendered. Male farmers are more likely to benefit from government extension services, while female farmers rely more heavily on church-based networks and relationships.

In addressing the second research question, the chapter identified four adopter profiles among subsistence farmers. These include necessity-driven, left-behind, experienced, and knowledgeable adopters. While not mutually exclusive, these profiles capture distinct yet overlapping characteristics and shared experiences, offering a more grounded understanding of adoption behaviours within subsistence farming contexts. These groups emphasise varied contextual motivations, capabilities and constraints that shape adoption behaviour. The profiles

demonstrate that adoption is not a uniform process but is influenced by farmers' lived experiences, resource endowments, social positions, and responses to changing livelihood circumstances. By moving beyond conventional adopter categories, these profiles provide a more nuanced understanding of how subsistence farmers engage with pro-poor agricultural innovations.

In response to the third research question, the findings demonstrate that gender relations significantly shape both access to and adoption of pro-poor agricultural innovations. Women and men experience innovation processes differently because of socially prescribed gender roles and unequal power relations within households. While women play a critical role in food production and household food security, they face greater structural constraints, as men's role as household heads grants them more direct access to and control over productive resources, including land, information, and decision-making authority. As a result, women often must negotiate access to these resources in order to adopt new pro-poor agricultural innovations. Their adoption pathways are therefore shaped not only by material constraints but also by interpersonal power dynamics and broader social norms that privilege male authority. These findings illustrate that innovation adoption is fundamentally embedded within social relations. Without attention to the gendered structures and power dynamics that govern access to resources and decision-making, pro-poor agricultural interventions risk reproducing existing inequalities rather than advancing equitable and inclusive development outcomes.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter discusses the findings in the context of the extant literature and begins with a recap of the research questions, study objectives, results, and the study's contribution, as shown in Table 5.1 below.

Table 5.1 Summary of Research Aims, Findings and Contributions			
Aims	Research Questions	Findings	Contributions
To understand how adopters of agricultural innovations view innovations and the value they attach to them.	How do farmers perceive agricultural innovations?	➤ Farmers perceive innovations as beneficial because they contribute to food security, improve household incomes and are adaptable to existing environmental conditions and adopters' lifestyles.	❖ The study contributes to the literature on innovation adoption by highlighting the gendered and collective dimensions of pro-poor innovations, shaped by perceived relevance to everyday life and community-based decision-making.
To understand the contextual situations that influence adoption behaviours.	What are the profiles of farmers who adopt pro-poor agricultural innovations?	➤ Necessity-driven farmers who adopt pro-poor agricultural innovations out of necessity. ➤ Left-behind farmers, who bear the primary responsibility of providing food for their families and have to stay in rural areas as their spouses migrate. ➤ Experienced with farming systems, environmental changes, as well as innovations. ➤ Knowledgeable farmers who rely on indigenous knowledge and hands-on experience to implement new innovations.	❖ The study enriches the understanding of innovativeness by considering the diverse motivations, structural contexts, as well as the capacities and capabilities of adopters.

To explore how women and men perceive innovations	How do gender relations affect the process of innovation adoption?	➤ Women perceive innovations through the lens of food benefits, reflecting their roles in providing and preparing food for their families. In contrast, men often view innovations in terms of income gains, aligned with roles as household providers. ➤ Socially constructed roles of women as wives and socio-cultural norms limit women's access to and control over productive resources compared to men, thereby affecting their ability to adopt innovations. ➤ Due to unequal power dynamics that arise from the different positions of women and men, women typically negotiate to access productive resources and innovate, implying that their innovation processes are not straightforward but rather complex and dynamic.	❖ The study shifts the understanding of innovations from individual barriers to structural and relational constraints that are shaped by gendered roles, unequal access to resources, and intra-household power dynamics within households.
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5.2 Insights into the Gendered Perception of Agricultural Innovations

The findings of this research revealed that both women and men in Mbeere North and Tigania East adopt pro-poor agricultural innovations such as improved cassava varieties, *Muguka* cultivation, and participation in farmers' groups, to secure food and generate income for their households. These findings highlight the value that subsistence farmers attach to innovations that support their livelihoods and address everyday needs. While previous studies have demonstrated the contribution of agricultural innovations to food security and income generation in sub-Saharan Africa (e.g., Meijer *et al.*, 2015; Nyairo *et al.*, 2022), they have paid

limited attention to how women and men perceive and engage with these innovations differently. In a different context, Chatterjee *et al.* (2024) found that women's participation in social enterprises improved financial access and saved time in accessing welfare programs for both women and men users in India. However, the study did not explore how gender shapes the perceptions of such innovations, thereby overlooking the relational dynamics that influence adoption processes in subsistence contexts.

By foregrounding farmers' lived experiences, the present research demonstrates that the adoption of pro-poor agricultural innovations is shaped less by individual psychological characteristics, such as openness to new ideas (Rogers, 2003; Ayisi *et al.*, 2022), and more by the social and relational contexts in which farmers are embedded. In this respect, the findings partially align with the Technology Acceptance Model (TAM) (Davis, 1989), which suggests that innovations perceived as useful are more likely to be adopted. However, the present research expands on the model, showing that perceptions of innovation usefulness or benefit are not gender neutral. Rather, they are shaped by socially constructed roles, responsibilities, and expectations that influence how women and men evaluate, access, and utilise innovations.

While both women and men attach different values to pro-poor agricultural innovations, women face structural constraints, such as limited access to productive resources, restricted decision-making authority, and gendered norms that significantly shape their capacity to adopt pro-poor agricultural innovations on equal terms with men. Rather than accessing innovations directly, women often engage in ongoing negotiations to secure access to land, inputs, information, and approval for adoption. Such negotiations illustrate that adoption is not a linear process but one that is mediated by power relations within households and communities.

Importantly, these findings challenge portrayals of women as passive recipients of innovation. Despite operating within unequal social structures, women actively navigate and negotiate these constraints to access innovation opportunities. In doing so, they challenge and, at times, reshape entrenched social norms that position men as the primary controllers of agricultural input resources. This creates opportunities for innovation adoption that would otherwise remain inaccessible. Their experiences demonstrate that innovation adoption involves not only technical and economic considerations but also continuous engagement with formal and informal power structures.

The findings in this research validate the social construction approach adopted to explain how gender relations influence pro-poor agricultural innovations. The findings show that gender is not simply a demographic characteristic that influences adoption outcomes but a socially constructed and continually negotiated process that shapes access to resources, decision-making authority, and innovation opportunities. By making visible the structural and intra-household dynamics that shape innovation adoption, the research highlights the importance of understanding innovation as a socially embedded phenomenon. The following section discusses these dynamics in greater depth by examining how socially constructed gender roles influence the adoption of pro-poor agricultural innovations.

5.2.1 Influence of Gender Roles on Innovation Adoption

Farmers in both study locations actively engage in food production and adopt pro-poor agricultural innovations. However, gendered priorities shape how women and men perceive and use these innovations. In Mbeere North, female farmers prioritised improved cassava varieties because of their contributions to food for home consumption, whereas men

emphasised the economic value of *Muguka* as a cash crop. Similarly, in Tigania East, female farmers valued participation in the *Mlango* farmers' group primarily for its role in improving food access through collective marketing and market linkages, while men focused on its income-generating potential. While the sale of surplus food or cash crops among subsistence farmers in sustaining livelihoods has been highlighted in several studies (Nyabaro *et al.*, 2019; Kaliba *et al.*, 2020; Ume, 2023), the present findings reveal that the primary driver is not profit maximisation but the need to meet basic household needs. Importantly, these needs are gendered. Socially constructed roles and responsibilities underpin how women and men evaluate innovations, with women prioritising pro-poor agricultural innovations that support food provision, and men favouring those that strengthen their role as household providers through income generation.

These gendered priorities influence not only perceptions of innovation value but also assessments of relative advantage. Women viewed improved cassava varieties as advantageous because their drought tolerance, pest resistance, and high yields directly enhance household food availability. Men, by contrast, regarded *Muguka* as advantageous because of its low production costs, climate resilience, and good market return. Participation in farmers' groups was also perceived as beneficial by both women and men, although for different reasons. Women found it easier to market the bananas through the group because of time and mobility constraints linked to domestic responsibilities. Group participation was also better than working as hired labour, which offers low pay and requires long hours away from home. For men, the primary advantage lay in the convenience of earning income through the group without negotiating with middlemen. These findings reveal that perceptions of relative advantage are shaped by gendered responsibilities and livelihood priorities.

These insights extend established innovation adoption models, including the Diffusion of Innovations (DOI) (Rogers, 2003), the Technology Acceptance Model (TAM) (Davis, 1989), and the Contextualised Bottom of the Pyramid model (CBOP) (Nakata & Weidner, 2012). While these frameworks conceptualise relative advantage and usefulness primarily as individual cognitive evaluations, the findings demonstrate that such assessments are socially embedded and influenced by gendered divisions of labour within households. Similar patterns have been observed by Khoza *et al.* (2021), who found that female household heads preferred climate-smart technologies that reduced climate risk, whereas male household heads prioritised productivity and yields. However, by relying on household headship as a proxy for gender, that study obscures the intra-household dynamics through which gender roles influence perceptions of innovation benefits. The present research advances the concept of relative advantage by showing that the value attached to an innovation is mediated by socially constructed responsibilities and expectations rather than solely by its technical attributes.

The findings further indicate that female farmers overlapping productive and reproductive responsibilities intensify the importance of labour- and time-saving innovations. Women simultaneously manage agricultural production, childcare, food preparation, and household maintenance, resulting in significant time and labour constraints. Consequently, innovations are valued not only for their contribution to food security or income generation but also for their capacity to reduce drudgery. In this context, drudgery refers to the physical and time-intensive demands associated with adopting and using innovations. This differs from the notion of ‘ease of use’ in TAM (Davis, 1989) and ‘complexity’ in DOI (Rogers, 2003), which primarily focus on cognitive effort. For female farmers, low-drudgery innovations, such as improved cassava, low-maintenance *Muguka*, and group membership, which reduces reliance on casual

wage labour, are particularly valuable because they enable the simultaneous fulfilment of productive and caregiving responsibilities.

While the study by Khoza *et al.* (2021) attribute female farmers' preference for low-effort agricultural technologies to their role as primary agricultural labourers, the present findings suggest a broader explanation. Women's reproductive responsibilities substantially increase their overall labour burden, making labour- and time-saving innovations essential not only for agricultural productivity but also for sustaining household livelihoods. This finding highlights the importance of recognising domestic and care work when examining innovation adoption among subsistence farmers.

The findings also illustrate that gender norms shape access to the productive resources and opportunities required for innovation adoption. Even within formally inclusive spaces such as the *Mlango* farmers' group, women's participation, particularly that of married women, remains mediated by household power relations that privilege male authority. This reflects a form of informal exclusion in which women are positioned primarily as caregivers and supporters rather than autonomous economic actors. Although unmarried women face fewer household-level gender constraints, they remain disadvantaged by broader structural inequalities, including limited access to land, credit, agricultural inputs, and agricultural extension services, consistent with previous studies (Badstue *et al.*, 2018; Gebre *et al.*, 2019). In some instances, women also reported experiencing overt forms of gender discrimination that further restricted their engagement with innovation opportunities.

These patterns of exclusion align with Acker's (2006) concept of 'inequality regimes' whereby organisational and social structures reproduce and normalise unequal distribution of power and resources. The patterns also resonate with Benschop and Doorewaard's (2012) concept of hegemonic power structures, which operate both explicitly through direct control over women's access to innovation and implicitly through internalised gender norms that render such control legitimate and unquestioned. By adopting a social construction perspective, this research reveals how gender roles and relations are neither fixed nor biologically determined, as implied in some agricultural adoption studies (e.g., Ndiritu *et al.*, 2014; Beuchelt, 2016; Gebre *et al.*, 2019). Rather, they are socially produced, negotiated and maintained, with significant consequences for women's ability to adopt pro-poor agricultural innovations.

Overall, findings demonstrate that gender roles and power relations mediate how pro-poor agricultural innovations are perceived, valued, and adopted. Existing adoption models, such as DOI (Rogers, 2003), (TAM) (Davis, 1989), TAM2 (Venkatesh & Davis, 2000), UTAUT (Venkatesh *et al.*, 2003) and CBOP (Nakata & Weidner, 2012), often treat gender as a demographic variable or assume a gender-neutral adopter. In doing so, they overlook how gendered responsibilities, household power relations and differential access to resources shape key adoption constructs such as relative advantage, usefulness, and ease of use. In subsistence farming contexts, these constructs are not merely individual cognitive evaluations, but relational assessments embedded within everyday survival strategies. Consequently, innovations that may appear equally beneficial from a technical perspective may generate markedly different adoption outcomes depending on how they align with the adopter's gendered responsibilities, constraints, and access to resources.

5.2.2 The importance of Food Products for Female Farmers' Well-being

The analysis of the findings indicates that subsistence farmers in Mbeere North and Tigania East face interconnected livelihood challenges in which food production serves not only as a means of meeting basic food and nutritional needs but also as a foundation for broader household well-being. Within these systems, women occupy a central and strategic position because of their socially assigned responsibilities for food preparation, consumption, childcare, and family welfare. These responsibilities place women at the centre of household food systems and make them key actors in decisions relating to food production and consumption. At the same time, they anchor women within the productive sphere, where their contributions are frequently undervalued despite their significance for household survival. This finding is consistent with extensive literature highlighting women's critical role in agriculture and food security across developing countries (Christiaensen & Demery, 2018; Voola *et al.*, 2018; Beegle & Christiaensen, 2019; Fan & Rue, 2020; Visser & Wangu, 2021; FAO, 2023).

The findings further suggest that when women and men have equitable opportunities to access and adopt pro-poor agricultural innovations, the benefits extend beyond increased production to improvements in household nutrition, food security, income generation, and overall well-being. However, the influence of socially constructed gender roles means that innovations are not perceived, valued, or utilised in the same way by women and men. Instead, their meaning and usefulness are shaped by gendered responsibilities and priorities, resulting in distinct adoption pathways and outcomes.

This dynamic is particularly evident within the context of environmental uncertainty. In both study locations, subsistence agriculture functions as a critical coping strategy in response to increasingly unpredictable rainfall patterns and climate variability. As rain-fed agriculture remains the dominant production system, households are highly exposed to environmental shocks, a challenge widely documented in previous studies (Venugopal & Chakrabarti, 2022; FAO *et al.*, 2023). Yet vulnerability to these shocks is not experienced equally. Women, as the primary managers of household food systems, often bear a disproportionate share of the burden. This vulnerability stems not from inherent fragility but from the intersection of poverty, unequal access to productive resources, and entrenched sociocultural norms that constrain their ability to adopt and benefit from agricultural innovations. While similar patterns have been identified elsewhere (e.g., Masikati *et al.*, 2019; Allen *et al.*, 2021; Antriandarti *et al.*, 2024), the present research demonstrates that women's reproductive responsibilities further intensify these challenges by competing for time, labour, and resources, particularly during periods of environmental stress.

The research revealed how structural disadvantages, including lower incomes, time and labour constraints, limited literacy and numeracy skills, and restricted access to agricultural information, magnify the impact of crop failures, impacting women's ability to secure food for their families. Crop failure, for example, has consequences that extend beyond lost production, undermining women's ability to fulfil their responsibilities for household food provision. During shortages, women often prioritise the needs of other family members above their own (Visser & Wangu, 2021; CARE, 2020a). Moreover, water scarcity increases their labour burden as they walk longer distances to collect water (Camey *et al.*, 2020; Allen *et al.*, 2021). These pressures often reduce opportunities for participation in training, innovation adoption, and income-generating activities. The pressures of domestic work and caregiving may result in

women drawing girls from school to assist in household and caregiving duties, perpetuating intergenerational cycles of poverty and disadvantage.

Against this backdrop, innovations such as improved cassava varieties, *Muguka* cultivation, and participation in farmers' groups emerge as important adaptive strategies. Their significance lies not only in their contribution to food production and income generation but also in their compatibility with the realities of subsistence livelihoods. These innovations are relatively affordable, accessible, and less demanding in terms of labour, capital, and technical expertise. Such characteristics are particularly important for women, who often have limited control over financial resources, productive assets, and mobility. As Badstue *et al.* (2018) argue that affordability and accessibility are important for resource-constrained farmers generally; however, the present findings suggest that they are especially critical for women because they mediate access to innovation opportunities in contexts of gender inequality.

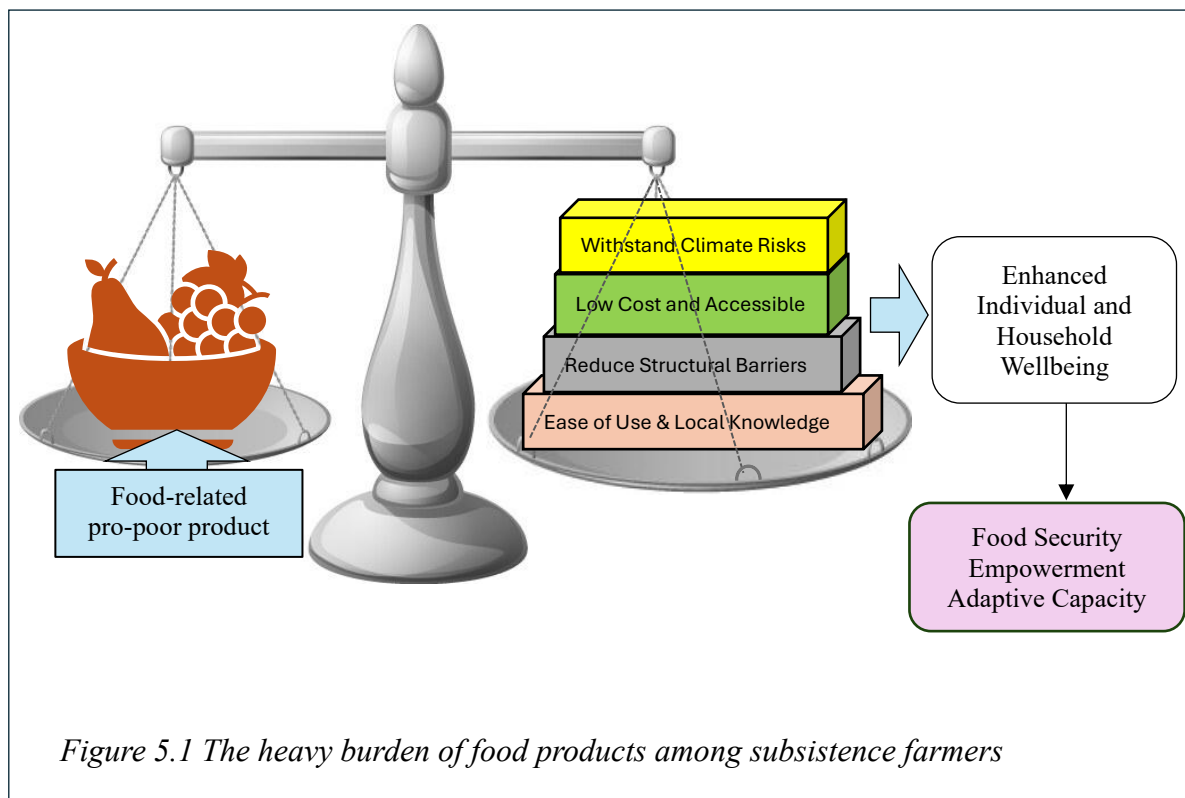
The findings also contribute to debates on literacy, knowledge and innovation adoption. While previous studies have documented lower literacy levels in rural areas and persistent gender disparities in educational attainment (World Bank Group, 2016; FAO, 2018; Beegle & Christiaensen, 2019; Fan & Rue, 2020; World Bank, 2022; Chikweche *et al.*, 2023), relatively little attention is paid to how women with limited literacy adopt innovations successfully. This present research demonstrates that innovations requiring minimal technical expertise and building upon existing local knowledge systems are more likely to be adopted by women. Such innovations not only improve food security but also create more inclusive pathways for participation among marginalised groups.

A further contribution of the findings lies in highlighting the importance of social capital and local knowledge. The innovations explored in this research are deeply embedded within existing social networks and everyday livelihood practices. Women's involvement in food production, caregiving, and community relationships positions them within valuable networks through which information, resources, and support circulate. These networks facilitate adaptation to local conditions while creating opportunities for women to exercise agency within existing structural constraints. Moreover, the labour-saving nature of these innovations reduces some of the pressures associated with women's multiple responsibilities and can lessen the extent of negotiation required to mobilise labour and resources for adoption. While Badstue *et al.* (2020) argue that women's demand for labour-saving technologies stems from gendered divisions of labour that intensify time poverty, the present findings demonstrate how innovations such as improved cassava varieties, *Muguka*, and participation in farmers' groups directly address these constraints by reducing labour demands and creating greater flexibility in livelihood management.

Viewed through a gender perspective, the adoption of pro-poor agricultural innovations explored in this research is closely linked to food security, empowerment, and household well-being. This supports Ramani *et al.*'s (2012) conceptualisation of pro-poor innovations as an approach that improves productivity and incomes, but the current research goes further to illustrate that pro-poor innovations can address the structural disadvantages experienced by marginalised groups. For women living in subsistence conditions, the value of innovation extends beyond the technical benefits commonly emphasised in innovation adoption theories, such as Rogers' (2003) concept of relative advantage or Davis' (1989) notion of usefulness. Its significance also lies in its personal relevance: the capacity to reduce drudgery, accommodate multiple responsibilities, strengthen adaptive capacity, and support everyday problem-solving.

From this perspective, pro-poor agricultural innovations that enhance food production become inseparable from broader livelihood strategies aimed at sustaining household stability under conditions of uncertainty.

These findings establish a clear gendered link between food-system responsibilities and adoption of pro-poor agricultural innovations. This connection reframes the concept of innovation adoption from a gendered perspective by demonstrating that women's engagement with pro-poor agricultural innovations is not only shaped by strategic roles in maintaining household food systems but also by their ability to address resource constraints and access barriers. In so doing, this research extends the prevailing understanding of pro-poor innovations beyond the questions of technical suitability and economic performance emphasised in the DOI Rogers (2003) and TAM (Davis, 1989) to encompass its role in resilience, adaptation, and empowerment. As illustrated in Figure 5.1 pro-poor agricultural innovations that enhance food production carry the 'heavy lifting' within subsistence households by supporting food security, generating income, reducing structural inequalities, and enhancing well-being. These insights provide a more nuanced and novel gendered perspective on agricultural innovations, underlining the central role of pro-poor food products in shaping adaptive strategies and transforming the lives of the rural poor.



To this end, the findings deepen understanding of how subsistence farmers perceive and adopt food-related innovations by demonstrating that adoption is driven by the extent to which innovations address both practical livelihood needs and personally meaningful priorities.

This perspective highlights two interrelated dimensions of pro-poor agricultural innovation adoption. The first concerns the incremental benefits derived from an innovation's features and performance, consistent with Rogers' (2003) concept of relative advantage or Davis (1989) notion of usefulness. The second relates to innovation-value fit, the extent to which innovations align with the adopter's personal motivations and contextual realities (Mulvey & Gengler, 2013), as well as facilitating conditions such as resources and infrastructure (Venkatesh *et al.*, 2003). The findings suggest that subsistence farmers do not evaluate innovations solely on their technical merits; they also assess whether innovations support the goals and obligations that

matter most in their daily lives, such as securing food, generating income, reducing labour burdens, and maintaining household well-being. Viewed through a value maximisation perspective (Kim *et al.*, 2007), therefore, adoption emerges as the outcome of an interaction between innovation attributes, perceived benefits, and the personal benefits to adopters. This perspective extends conventional adoption models by showing that perceptions of pro-innovation value are not determined solely by product characteristics but are also shaped by the lived realities of resource-constrained households. As such, adoption decisions reflect not only what an innovation can do, but also how well it fits the social, economic, and gendered circumstances of those expected to use it. This integrated understanding helps explain not only which innovations subsistence farmers adopt, but why they choose them, highlighting the importance of designing and promoting innovations that align with the everyday realities and priorities of marginalised populations.

5.3 Insights into the Profile of Adopters of Pro-poor Agricultural Innovations

The analysis of innovation opportunities revealed that farmers' needs, roles, and lived experiences are central to understanding adoption and innovativeness in subsistence contexts. Farmers in Mbeere North and Tigania East do not constitute a homogeneous group; rather, their adoption behaviours are shaped by diverse livelihood realities, environmental pressures, resource constraints, and gendered responsibilities. The finding supports Hermans *et al.*'s (2021) observation that 'farmers' adoption decisions are dynamic, multi-dimensional and contextual' (p. 1809). Accordingly, rather than viewing farmers through a fixed adopter category, this research conceptualises them through a set of fluid, overlapping, and interconnected adopter profiles.

This perspective differs significantly from existing typologies. Ayisi *et al.* (2022), for example, classify subsistence farmers in binary terms as either high or low innovators, based primarily on age and income, while assigning limited importance to gender and education. The present findings challenge this view by showing that female farmers actively engage in pro-poor agricultural innovations, driven by their gendered responsibilities in food production and caregiving, despite having limited access to resources. As such, Ayisi *et al.* (2022) framework risks misclassifying women as low innovators solely because they are often poorer and more resource-constrained than their male counterparts. Ayisi *et al.* (2022) approach also inadvertently reinforces the stereotype that women are less innovative, rather than recognising the structural barriers that shape their adoption capacity.

Similarly, Sarker *et al.* (2021) categorise farmers according to resource endowments and livelihood orientation, classifying farmers into four categories: well-resourced farmers reliant mainly on agriculture; moderately resourced households led by experienced older males with mixed income sources; resource-constrained households dependent on cattle and livestock product sales; and severely resource-constrained households headed by young male farmers relying on off-farm income. While both Sarker *et al.* (2021) and Ayisi *et al.* (2022) approaches recognise heterogeneity among farmers, they pay limited attention to how gendered roles, household power relations, environmental uncertainty, and lived experiences shape adoption behaviour. As a result, they risk portraying innovativeness as an individual attribute rather than a socially embedded process. The present findings challenge this view by demonstrating that innovation adoption is shaped not only by access to resources but also by the intersection of gender, livelihood vulnerability, social relations, local knowledge, and environmental conditions.

To capture this complexity, the research identifies four interconnected adopter profiles: necessity-driven adopters, left-behind adopters, experienced adopters, and knowledgeable adopters. These profiles are not mutually exclusive categories, but recurring patterns of motivations, capabilities, and constraints observed among subsistence farmers. Individual farmers may move between profiles as livelihood circumstances, household conditions, and environmental pressures change.

The first profile, the necessity-driven adopters engage with innovations primarily to secure food, income, and livelihood continuity rather than to maximise productivity or gain a competitive advantage. Although the profile resonates with Vandecasteele and Geuens' (2010) notion of functional innovativeness and with Rogers' (2003) emphasis on relative advantage, the findings extend these perspectives by demonstrating that adoption is often motivated by survival imperatives rather than performance enhancement. Improved cassava varieties, *Muguka* cultivation, and participation in farmer groups were adopted because they helped households maintain food security and cope with worsening environmental conditions. For subsistence farmers in Mbeere North and Tigania East, farming remains the primary source of food and income, with few viable livelihood alternatives available to households.

The farmers here are comparable to what Steinfeld and Holt (2019) describe as mimetic users, individuals who adopt innovations not for novelty, experimentation, or competitive advantage, but as a means of ensuring survival. In this context, farmers are not necessarily choosing between viable alternatives; rather, they are responding to circumstances in which non-adoption threatens household food security and livelihood sustainability. This pattern contrasts with Rogers' (2003) framework of innovation adoption as a decision-making process involving

the evaluation of competing alternatives. For these farmers, adoption is mainly driven by the necessity to meet household food needs and is constrained by choice. Similar patterns were observed by Locke *et al.* (2017), who found that fisheries innovations in Southeast Asia and the Pacific were adopted primarily to meet basic food needs. Adoption, therefore, becomes a strategy for survival and an adaptive response to livelihood vulnerability rather than a conventional adoption decision based primarily on perceived benefits. The necessity-driven profile reframes uptake of innovation as an adaptive behaviour under constraint, driven by survival and resilience.

Necessity-driven adoption is thus inseparable from the functioning of the local food system, which spans production, processing, distribution, preparation, and consumption (Fanzo & Davis, 2021). Within this system, women are the pivotal necessity-driven adopters. Their roles in caregiving, food provisioning, and social reproduction mean that innovation adoption is both a livelihood necessity and a means of fulfilling gendered household obligations. As such, necessity-driven adoption is often collective, gendered, and embedded in food systems. This perspective deepens the understanding of who innovates, why, and under what conditions, expanding the scope of innovation adoption research to include the realities of those operating at the margins, where innovation is less about novelty and more about necessity.

The second profile, left-behind adopters, consists predominantly of women who adopt innovations under conditions of severe social and resource constraints. These women often assume responsibility for both agricultural production and household reproduction, even after the migration of male household members. Their limited access to productive resources, such as land, financial, labour and agricultural information, reflects structural inequalities rooted in

household power relations and broader gender norms. Moreover, they shoulder the bulk of household responsibilities. Their motivations are rooted in necessity, caregiving, and resilience, showing that adoption can occur even under extreme constraints. This cumulative labour burden, often shouldered alone and sometimes without adequate resources, illustrates how migration increases their vulnerability and deepens their marginalisation, reinforcing their left-behind status. Such constraints are systemic rather than individual shortcomings, highlighting the limitations of more individualistic adoption models such as TAM (Davis, 1989) and DOI by Rogers (2003).

Despite these constraints, left-behind women continue to adopt innovations to sustain household livelihoods. Their experiences align with studies highlighting the vulnerabilities associated with social and economic disadvantage (Wang & Tang, 2020; Connor *et al.*, 2024), describing how women in similar circumstances face livelihood fragility in isolation. However, the findings of this research revealed women's considerable agency and resilience under conditions of disadvantage. By foregrounding this group, the research contributes to the literature on innovation adoption by bringing visibility to structural inequalities and context-specific challenges often overlooked in frameworks that prioritise speed (Rogers, 2003), scale (Ayisi *et al.*, 2022) or market-oriented measures of success (Kaliba *et al.*, 2020; Ruzzante *et al.*, 2021). This perspective shifts attention away from questions of why some farmers do not adopt innovations toward an examination of the structural barriers that make adoption more difficult, costly, and risky.

The third group of adopters identified in this research, as experienced adopters, are characterised by extensive farming experience and accumulated exposure to environmental change. As subsistence farmers in Mbeere North and Tigania East rely heavily on natural resources, particularly agriculture, for their livelihoods, climate-related disruptions increasingly threaten the viability of these nature-dependent activities. In the absence of viable alternative livelihoods, such disruptions directly undermine farmers' ability to meet even their basic food security needs. This experience, therefore, contributes to a cautious and risk-aware approach to adopting new pro-poor agricultural innovations, particularly in the face of environmental uncertainties. These farmers adopted drought-tolerant innovations such as improved cassava varieties, *Muguka*, and participated in collective marketing arrangements because they enhanced resilience under increasingly uncertain climatic conditions.

These examples illustrate the incremental benefits of such innovations in line with Rogers' (2003) concept of innovation relative advantage over existing alternatives. They also demonstrate how subsistence livelihoods intersect with environmental uncertainty (as discussed in section 5.2.2) as a driver of agricultural innovation adoption, an observation consistent with Venugopal and Viswanathan (2017).

Therefore, what might appear as late adoption in Rogers' (2003) diffusion of innovation framework, in this research, is understood as strategic adoption under conditions of scarcity and risk. Most importantly, the decision to adopt pro-poor agricultural innovations cannot be reduced to individual rational choices based solely on perceived benefits such as relative advantages or compatibility. Instead, these decisions are deeply embedded in farmers' lived

experiences of food shortages, climate shocks, and their ongoing efforts to safeguard household well-being.

Moreover, farmers with prior experience of innovations are not only more likely to adopt new pro-poor agricultural practices, but also to do so more strategically. Their accumulated knowledge enables them to better anticipate the usability, potential benefits, and risks associated with innovations, as also observed by Ainembabazi and Mugisha (2014), allowing them to make informed choices under conditions of uncertainty. In the context of subsistence farming, this foresight is especially valuable, as it reduces the likelihood of costly failures and fosters more resilient livelihood strategies. These experienced adopters also serve as important role models within their communities. Their visible success with certain innovations builds credibility and trust, influencing the perceptions and decisions of less experienced farmers. In environments where scepticism and risk aversion are common, particularly following past failures, these peer examples can carry more persuasive weight than formal extension messages. Experienced adopters not only draw on their own histories to make decisions but also become conduits through which trust, knowledge, and confidence in innovations are transmitted to others. This approach extends the notion of atomised distribution of innovations by Nakata and Weidner (2012), illustrating how relational processes shaped by experience, trust and adoption enhance innovation adoption.

A critical insight from this research concerns the role of trust in shaping adoption behaviour, particularly trust in innovation providers, such as extension agents. The findings reveal a stark contrast between Mbeere North and Tigania East regarding how trust moderates the effectiveness of extension services. In Mbeere North, trust was thin or eroded due to negative

past experiences, such as failed innovations, mismatches between offered technologies and local practices (e.g., fish and groundnut farming), and inadequate implementation support (e.g., for cassava processing). These experiences weakened farmers' willingness to engage with extension agents.

Conversely, in Tigania East, trust was stronger, largely because of farmers' involvement in collective groups (discussed in Section 4.2.3). The collective effort not only enhances farmers' technical capacity but also helps overcome psychological and social barriers, including perceived risks, scepticism, emotional anxiety, and low motivation when engaging with extension services, as also noted by Chindasombatcharoen *et al.* (2024). While such barriers are often attributed to the innovations themselves, this research shows that the quality of interaction with innovation providers and trust built through it can significantly moderate these challenges.

However, the quality of subsistence farmers' relationships with extension agents is an overlooked dimension in adoption studies. While the Theory of Planned Behaviour (TPB) proposed by Fishbein & Ajzen (1975) recognises the role of subjective norms in shaping adoption intentions, it often assumes that these social influences are uniformly positive or reliable. In contrast, the present research shows that external influence from extension agents in Mbeere North was neither consistent nor inherently supportive. A key contribution of this profile is its emphasis on trust in extension agents. The findings show that trust in extension services, innovation providers, and peer farmers significantly shapes adoption decisions. In environments where previous interventions have failed, trust becomes a critical mechanism through which farmers evaluate uncertainty and manage risk.

Echoing critiques by Lee and Gambiza (2022) and Chindasombatcharoen *et al.* (2024), this research challenges the marginalisation of relational factors within adoption literature, where trust and farmer-extension agent relationships are frequently treated as peripheral concerns. Instead, this research demonstrates that trust is a dynamic, context-dependent, and shaped by past interactions, collective experiences, and the perceived quality of support provided. In this way, trust functions not merely as an enhancer of adopters' experiences but as a significant determinant of whether innovations are ultimately adopted. These results highlight the need to reposition relational dynamics, particularly trust, as the centre of innovation adoption frameworks, rather than treating them as secondary to cognitive evaluations or technical attributes. Further, these findings challenge the linear models that assume innovation adoption is driven by straightforward cost-benefit analysis. The profile of experienced adopters brings the complexity of real-world decision-making into focus, highlighting the importance of experiential knowledge and contextual realities in shaping whether, when, and why innovations are adopted.

Lastly, the knowledgeable adopter profile highlights the importance of indigenous knowledge, socio-ecological memory, and social learning in shaping innovation adoption. These farmers possess deep ecological understanding and evaluate innovations in relation to existing livelihood systems rather than in isolation. This adds a valuable yet often underexplored dimension to innovation adoption studies. These farmers do not adopt new practices indiscriminately; instead, they make informed, context-sensitive decisions that reflect both local knowledge systems and their ability to assess innovations within complex and dynamic environments. Contrary to assumptions that innovativeness is primarily associated with formal education, youth, or early adoption (Rogers, 2003), the present research demonstrates that innovations also emerge from accumulated local and experiential learning. Drawing on socio-

ecological memory (Nykvist & Von Heland, 2014), knowledgeable adopters integrate new practices into established systems in ways that maintain stability while enabling adaptation.

In contexts where traditional livelihood systems form the foundation for adaptation and innovation, these practices may be viewed as ‘unorthodox’ and from Rogers (2003) perspective, be misinterpreted as scepticism toward new innovations. However, Venugopal and Chakrabarti (2022) found that while subsistence farmers employ diverse strategies to mitigate and adapt to weather variability, they retain a ‘strong allegiance to traditional livelihood systems as their cornerstone for maintaining consumption adequacy’ (p. 301). This embedded knowledge allows subsistence farmers to adopt innovations in ways that are sustainable and locally relevant.

The use of indigenous knowledge systems also challenges the assumption that low literacy or formal education inhibits innovation. The results indicate that local knowledge systems enhance the ability of farmers to adopt pro-poor innovations, overcoming the limitation of a lack of formal literacy and numeracy skills. As argued by Ayisi *et al.* (2022) innovativeness can be rooted in alternative ways of knowing. For example, knowledgeable adopters often rely on visual and participatory learning tools, such as images, demonstrations, and videos, to evaluate and adopt new pro-poor agricultural technologies (Ayisi *et al.*, 2022). These approaches meet their educational needs while respecting their lived experiences. This evidence demonstrates that the adoption of new pro-poor agricultural innovations is not solely explained by rational decision-making and information flows through formal communication channels, as proposed by Rogers (2003). Instead, it is a participative process which blends indigenous knowledge and social learning, which facilitates the adoption of innovations.

The research revealed that the knowledgeable adopters are often community influencers, respected elders or middle-aged individuals whose adoption choices shape broader community behaviours. Their role as sources of local knowledge systems and early adopters of innovations highlights the social and participatory nature of adoption in rural subsistence contexts. In this regard, the profile of knowledgeable adopters reframes innovativeness beyond formal education and young individuals, recognising the value of indigenous knowledge, lived experience and adaptive creativity. This perspective enriches innovation adoption studies by offering a more contextually grounded, socially embedded, and ecologically sensitive understanding of how pro-poor agricultural innovations are evaluated and used. The findings show that farmers are not resistant to change; rather, their innovativeness reflects alternative adoption pathways rooted in local knowledge, risk awareness, and community leadership. By recognising the importance of knowledgeable adopters, the present research emphasises the need for innovative design and dissemination strategies that engage with farmers' local experiences and knowledge systems to enhance adoption outcomes.

In summary, the adopter profiles developed in this research demonstrate that innovation adoption in subsistence contexts is fluid, socially embedded, and highly context dependent. Motivations and situational factors, including livelihood pressures, seasonal variations, and prior experiences, play a crucial role in shaping how and when farmers engage with new practices. These dynamic adoption behaviours challenge the fixed adopter classifications, such as those proposed by Rogers (2003), Sarker *et al.* (2021) and Ayisi *et al.* (2022) which tend to treat innovativeness as a stable characteristic of individuals or households.

The typology developed here highlights the importance of sustainable livelihoods, gendered divisions of labour, environmental uncertainty, trust, and local knowledge systems in shaping adoption processes. By foregrounding these factors, the research offers a more nuanced understanding of who adopts innovations, why they adopt them, and under what conditions adoption occurs. Innovation adoption is revealed not as a linear process driven solely by perceived benefits but as a dynamic response to livelihood needs, structural constraints, social relationships, and adaptive strategies. Recognising this complexity provides a foundation for more inclusive and contextually responsive innovation policies that better reflect the realities of marginalised farming communities.

5.4 Gender Dynamics of Innovation Adoption within the Contextualised Bottom-of-the-Pyramid Framework

This section discusses the findings of research question three: how gender relations influence the adoption of pro-poor agricultural innovations among farmers in Mbeere North and Tignia East. The findings demonstrate that gender relations arising from interactions between female and male farmers play a significant role in shaping the innovation adoption process. Unlike quantitative modelling approaches that reduce gender to binary variables of 0 or 1 (e.g., Ndiritu *et al.*, 2014; Gaya *et al.*, 2017; Gebre *et al.*, 2019; Shibata *et al.*, 2020), this research contends that such representations do not sufficiently capture the complex, relational, and context-specific nature of gender within households adopting pro-poor agricultural innovations.

Gender emerges as a critical factor due to unequal power relations within adopting units, particularly households, which create disparities in access and decision-making processes. These inequalities are rooted in structural arrangements that define who holds leadership roles,

whose voices are heard and listened to, and whose needs and priorities receive attention (Alsos *et al.*, 2013; Stewart *et al.*, 2021). Despite their importance, these dimensions are often underrepresented in studies of agricultural innovation. As Locke *et al.* (2017), Badstue *et al.* (2018), and Kwarazuka and Prain (2019) observe, gender norms and relational dynamics are frequently overlooked in the analyses of agricultural innovation adoption.

Drawing on a social construction perspective on gender relations, this research uncovers the structures of marginalisation, exclusion, and power imbalances that influence the uptake of pro-poor agricultural innovations. Grounded in the lived experiences of farmers, this approach recognises both women and men as active agents while revealing the tensions, negotiations, and trade-offs involved in decisions about whether and how innovations are adopted (Locke *et al.*, 2017; Kwarazuka & Prain, 2019). In so doing, the research addresses an important gap in the literature and advances understanding of innovation adoption within subsistence marketplaces.

The Contextualised Bottom-of-the-Pyramid (CBOP) model by Nakata and Weidner (2012) offers valuable insights into the adoption decisions of subsistence consumers or adopters. However, since the model is conceptual, it pays limited attention to adopters' own perspectives and lived experiences. Consequently, the framework renders gender dynamics and intra-household power relations largely invisible. The findings of this research demonstrate that innovation adoption among subsistence farmers cannot be adequately understood without taking into account the relational nature of gender and intra-household power dynamics that shape access to resources, decision-making, and the adoption process. To address this limitation, the present research proposes the 'Gender and Subsistence Farmers in an Integrated Framework

(GSFIF) (outlined in Figure 5.2), which synthesises the empirical findings and offers a conceptual model for analysing innovations through a gender-responsive lens. Building on the CBOP model, the GSFIF extends the subsistence marketplace scholarship by explicitly incorporating gender as a dynamic, relational and socially constructed process that shapes innovation adoption. By integrating gender into the analysis, the GSFIF provides a nuanced and contextually grounded understanding of innovation adoption among subsistence farmers. The framework recognises that adoption decisions are shaped not only by innovation characteristics, market conditions, and social contexts, but also by gendered relations that determine who has access to information, resources, mobility, decision-making authority, and the capacity to act on innovation opportunities.

The discussion that follows begins by examining the poverty dimension within the CBOP framework and their implication on gender relations and innovation adoption.

5.4.1 Gendered Dimensions of Poverty

The CBOP framework identifies multiple dimensions of poverty, including economic, physical, psychosocial, and knowledge deprivations that characterise individuals living in subsistence contexts (Nakata & Weidner, 2012). The findings of this research confirm the relevance of these dimensions among subsistence farmers in Mbeere North and Tigania East while demonstrating that they are experienced differently by female and male farmers.

Economic deprivation was evident through low incomes and limited access to productive resources. However, women experienced these constraints more acutely than men, a finding

consistent with previous studies showing that rural women often have reduced access to resources necessary for food production (Ndiritu *et al.*, 2014; Beuchelt, 2016; Aduwo *et al.*, 2019; Gebre *et al.*, 2019). The findings reveal that access to and control over resources are mediated by gender relations, suggesting that economic deprivation is not experienced uniformly within subsistence households. As a result, the affordability of innovations, a key construct within the CBOP model's innovation attribute dimension, varies according to gendered power relations and resource ownership patterns.

As a result, women frequently negotiate with male household heads to gain access to innovative resources required for food production. This finding mirrors observations by Locke *et al.* (2017), who found that women actively negotiate to overcome structural barriers. The present research extends this insight by showing that women's position as economically marginalised food producers compel them to navigate patriarchal systems in order to secure access to pro-poor agricultural innovations. Such negotiations highlight women's agency while simultaneously revealing the structural constraints within which adoption decisions occur. The findings, therefore, illustrate how innovation adoption is shaped by the interaction between individual agency and gendered institutional arrangements.

Knowledge deprivation, another key poverty dimension within the CBOP framework, was also evident among subsistence farmers. Women generally reported lower levels of educational attainment than men. This mirrors findings from previous studies (World Bank Group, 2016; FAO, 2018; World Bank, 2022; Chikweche *et al.*, 2023), which show that rural women in subsistence contexts often have fewer educational opportunities. Lower literacy and numeracy levels limit women's ability to access, interpret, and utilise technical information, creating

additional barriers to innovation adoption. This implies that knowledge deprivation is distinctly gendered. To overcome formal knowledge limitations, women farmers relied heavily on pictorial materials, visual demonstrations, and experiential learning approaches. Similar strategies have been identified by Nakata and Weidner (2012) and Hasan *et al.* (2017) as effective for enhancing innovation understanding in subsistence contexts. However, these studies do not explain how these vary by gender.

The findings further reveal the importance of social relationships in overcoming knowledge constraints. Female farmers frequently depended on spouses, relatives, and other members of their social networks to interpret technical or abstract information. This supports the work of Viswanathan and Sreekumar (2019), who emphasise the central role of social interactions in knowledge acquisition among low-literate populations. However, the present research shows that these relational practices are not merely supplementary; they are essential mechanisms through which women compensate for structural educational disadvantages. These practices extend the CBOP model by showing how visual learning and social networks can compensate for knowledge deprivations. Through these strategies, female farmers enhance their capacity to understand, adopt, and implement innovations despite facing more pronounced literacy and numeracy constraints than men. In this way, social and visual learning function as critical adaptive resources, enabling women to navigate information-intensive agricultural innovations within contexts of persistent gendered educational inequality.

The research also revealed a strong relationship between economic deprivation and poor physical health, creating a mutually reinforcing cycle of vulnerability. Low incomes constrained farmers' ability to access healthcare and maintain productive livelihoods, while

poor health reduced their capacity to engage effectively in agricultural activities. These effects were particularly pronounced among women, who often carried substantial productive and reproductive responsibilities. In turn, health-related vulnerabilities increased anxiety and uncertainty surrounding the adoption of pro-poor agricultural innovations, echoing findings by Steinfeld and Holt (2019).

These findings, therefore, demonstrate that the poverty dimensions identified in the CBOP framework are deeply intertwined and mediated through gender relations. Economic, knowledge, physical, psychosocial, and knowledge deprivations do not operate independently; rather, they intersect to shape farmers' opportunities, constraints, and innovation adoption decisions. By applying a social relational perspective, this research reinterprets the CBOP frameworks through a gendered lens, revealing how gender relations influence the experience and consequences of poverty within subsistence households. This reinterpretation provides the theoretical justification for incorporating gender as a core component in the proposed 'Gender and Subsistence Farmers in an Integrated Framework' (GSFIF), thereby extending the explanatory power of the CBOP model in understanding pro-poor agricultural innovation adoption.

5.4.2 Gendered Dimension of Innovation Attributes

The CBOP framework identifies five innovation attributes that influence adoption, including affordability, visual comprehensibility, adaptability, relative advantage, and compatibility (Nakata & Weidner, 2012). The findings of this research demonstrate that female and male farmers evaluate these attributes differently because of their socially constructed roles and responsibilities within households. Consequently, perceptions of innovation value are shaped

not only by the characteristics of the innovation itself but also by gender relations that influence how benefits are experienced and prioritised.

Female farmers primarily valued pro-poor agricultural innovations for their contributions to household food security, whereas male farmers placed greater emphasis on income generation. These differing priorities reflect socially assigned household responsibilities, discussed in Section 5.2. The perceived benefits associated with improved cassava varieties, *Muguka*, and participation in farmers' group support Kim *et al.*'s (2007) value maximisation perspective, which suggests that the perceived usefulness of an innovation is mediated by the value it delivers for users. In this research, usefulness reflects tangible benefits of using pro-poor agricultural innovations, such as food security and increased income. While these benefits also contributed to the relative advantage of innovations over existing alternatives, such as drought resilience and reduced production effort, the findings show that perceptions of usefulness and advantage are mediated by gender. Female and male farmers interact with innovations from different social positions and therefore evaluate their benefits and relative advantage differently. This finding extends the CBOP framework by introducing usefulness as a new and distinct innovation attribute, while retaining the relative advantage attribute. The new innovation attribute highlights the importance of adopter-centred evaluations in subsistence contexts, addressing a gap in its original formulation, as the CBOP is conceptualised and limited in empirical qualitative grounding.

Ease of use also emerged as a critical determinant of adoption, particularly among female farmers who faced significant time and labour constraints arising from their dual responsibilities in food production and domestic chores. These findings highlight how

gendered divisions of labour systematically shape innovation preferences and adoption decisions. Women generally preferred low-maintenance crops, such as improved cassava and *Muguka*, because these required less labour and were easier to integrate into existing daily routines. Conversely, innovations demanding time and labour effort, such as processing cassava roots into flour, generated resistance because women typically performed these tasks with limited support from men. Similarly, in Tigania East, a locally organised farmers group, *Mlango*, was perceived as more accessible because it accommodated women's restricted mobility and extensive domestic responsibilities.

These findings extend Rogers' (2003) concept of complexity and Davis' (1989) ease of use by demonstrating that ease of use is not solely a technical characteristic of an innovation. Rather, it is shaped by the social realities within which potential adopters operate. For female farmers in particular, ease of use reflects the extent to which an innovation can be integrated into existing responsibilities and constraints. This observation supports Viswanathan and Sreekumar (2019) argument that innovation adoption is embedded within broader social and structural contexts. The findings, therefore, introduce ease of use as an additional innovation attribute within the CBOP framework and demonstrate the value of incorporating adopter perspectives into the analyses of innovation adoption.

The findings further reveal that the social and cultural norms strongly shape innovation compatibility. Improved cassava varieties and *Muguka* were readily adopted because they aligned with existing farming systems, while cassava was also consistent with local dietary preferences. In contrast, innovations requiring substantial changes to established food practices, such as groundnuts and fish products, were met with greater resistance. These adoption patterns

are closely linked to women's roles as primary managers of household food preparation. As a result, decisions about food-related innovations extend beyond production considerations to include taste preferences, dietary norms, cooking practices, and broader cultural expectations. Such considerations form part of the social identities and everyday practices through which food choices are negotiated and adopted within households.

These findings challenge assumptions that poor consumers of innovations possess limited agency in food-related decision-making (Voola *et al.*, 2018). Instead, farmers actively assess innovations for their cultural appropriateness and compatibility with existing lifestyles. The findings, therefore, reinforce the argument that compatibility is not merely a technical attribute but also a socio-cultural one. In the context of this research, adoption decisions are shaped by farmers' lived experiences and the extent to which innovations fit within established practices and identities. This is particularly important in subsistence settings, where adopting unfamiliar foods often requires learning new preparation methods and modifying deeply embedded routines, which are more difficult.

The role of gender is further evident in the adoption of the farmers' group. Women frequently perceived these groups as compatible with values of mutual support, cooperation, and collective problem-solving, characteristics associated with communal orientations identified in previous studies (Hmieleski & Sheppard, 2019; Chatterjee *et al.*, 2024). This finding further demonstrates that compatibility extends beyond technical fit to encompass social relationships and culturally embedded ways of organising livelihoods. Moreover, the findings highlight the centrality of gender in understanding innovation compatibility.

To this end, this research extends the CBOP framework by introducing two additional innovation attributes, usefulness and ease of use, and by demonstrating that perceptions of all innovation attributes are mediated by gender relations. Gender emerges not merely as a demographic characteristic but as a relational and socially constructed factor that shapes how female and male farmers evaluate usefulness, ease of use, affordability, visual comprehensibility, adaptability, relative advantage, and compatibility. Incorporating gender into the analysis of innovation characteristics, therefore, enhances understanding of innovation adoption in subsistence contexts and strengthens the explanatory power of the proposed Gender and Subsistence Farmers Integrated Framework (GSFIF). The framework captures the contextual realities and lived experiences of subsistence farmers more effectively than existing models by recognising gender as a central mechanism through which innovation attributes are perceived, interpreted, and acted upon.

5.4.3 Gendered Dimensions of Dissemination of Pro-poor Innovations

The dissemination of agricultural innovations is intricately linked to the marketing environment component of the CBOP framework proposed by Nakata and Weidner (2012). Among subsistence farmers, government extension services constitute the primary channel through which innovations and agricultural knowledge are communicated. Acting as intermediaries between farmers and technical experts, extension agents facilitate the flow of information and resources that support innovation adoption. This relationship functions as a bridging tie through which innovations are promoted and transmitted, a process conceptualised in this research as bridging promotion. Consistent with the findings of Adebayo and Worth (2022, 2024) and Ejem *et al.* (2023), bridging promotion plays an important role in facilitating the adoption and diffusion of pro-poor agricultural innovations aimed at enhancing household

food security and livelihoods. Moreover, as extension services are typically delivered close to farmers' homes, they embody Nakata and Weidner's (2012) notion of atomised distribution by reducing barriers associated with travel costs, distance and time.

However, the findings reveal that access to extension services is far from gender neutral. Men generally enjoy greater access, due to structural arrangements and socially constructed household roles that position them as heads of households and primary farmers. In contrast, women's participation is constrained by multiple, intersecting factors. Domestic responsibilities limit their mobility, cultural norms often discourage interactions with male extension agents, and male authority frequently influences decisions regarding participation in training activities. These findings echo observations by Mudege *et al.* (2015) and Badstue *et al.* (2018), who similarly identified gendered barriers to agricultural knowledge dissemination.

These challenges are further compounded by the predominance of male extension agents, a pattern also reported by Badstue *et al.* (2018), Adebayo and Worth (2022) and Nyairo *et al.* (2022). The underrepresentation of women within extension systems reinforces perceptions of farming as a predominantly masculine activity and contributes to the marginalisation of women within agricultural economies. Consequently, the interaction of gender norms, male-dominated extension services, and unequal access to information reproduces structural inequalities that constrain women's capacity to engage with innovations and benefit from agricultural development initiatives.

While these inequalities were evident in both study sites, the farmer group model in Tigania East provided a partial mechanism for overcoming them. Membership in farmers' group

created socially acceptable opportunities for women to attend training sessions and engage with extension agents, consistent with findings reported by Mudege *et al.* (2015). Participation was legitimised through the formal activities of the group, thereby reducing concerns about violating prevailing social expectations. Nevertheless, even within this more inclusive arrangement, underlying gender relations continued to influence participation and access to benefits, often favouring men (Badstue *et al.*, 2018; Nyairo *et al.*, 2022). These findings highlight that the pro-poor agricultural innovation dissemination process is neither gender neutral nor purely technical; rather, it is deeply embedded in power relations, cultural norms, and household dynamics. Within the proposed ‘Gender and Subsistence Farmers in an Integrated Framework’ (GSFIF), dissemination therefore emerges as a socially mediated process in which gender acts as a key moderating factor influencing access to information and innovation opportunities.

While extension services aim to support sustainable agriculture by building farmers’ capacity to address production challenges such as poor yields, pests, and droughts (Ndlela & Worth, 2021; Adebayo & Worth, 2022), the findings of this research indicate that adoption decisions are also influenced by socio-cultural, agro-ecological, and environmental considerations (Curry *et al.*, 2021; Hölsgens, 2022). Innovations may be rejected or abandoned when they conflict with local livelihood strategies, food preferences or cultural practices, as illustrated by the limited uptake of fish and groundnut farming in the study sites (see Section 4.2.4). Such outcomes may stem from exclusionary, top-down dissemination approaches that prioritise technical solutions while neglecting farmers’ socio-cultural realities, economic capacities, resource constraints, and practical skills. When innovations fail to align with local contexts, trust between farmers and extension agents can be weakened, reducing the effectiveness of dissemination efforts. These findings therefore highlight the need for dissemination approaches

that integrate agro-ecological, social, and cultural considerations alongside technical objectives. This principle is embedded within the GSFIF, which places farmers' lived realities at the centre of innovation dissemination and adoption.

Flexible payment arrangements, another key element of the marketing environment, identified by Nakata and Weidner (2012), also emerged as an important mechanism for promoting inclusion and reducing barriers to adoption. The findings demonstrate that flexible payment arrangements are not simple financial instruments but operate as socially mediated practices shaped by gendered access to resources and networks. Women and men benefit from flexible payment options in different ways, with women's participation often depending less on individual financial capacity and more on access to supportive social networks and collective structures.

The findings reveal that subsistence farmers frequently rely on social networks to access innovative products and practices through mechanisms of reciprocity and mutual support. Financially constrained farmers, particularly women with limited independent income, often obtained zero-interest loans and flexible repayment arrangements through local networks and women's groups. These informal arrangements helped overcome resource constraints and facilitated innovation adoption, reflecting patterns identified by Nakata and Weidner (2012), Viswanathan and Sreekumar (2019) and Hasan *et al.* (2020). Within the GSFIF framework, such social networks represent an informal dissemination pathway that complements formal extension systems and compensates for gender-based inequalities in access to information and resources.

In Tigania East, flexibility also extended beyond payment arrangements to include the organisation of phased training sessions and adaptable meeting schedules designed to accommodate women's caregiving responsibilities. This approach reflects the concept of equity work proposed by Raghubanshi *et al.* (2021), whereby social arrangements are intentionally structured to promote inclusion and equitable participation. For women, whose availability is often shaped by domestic and productive responsibilities, these flexible routines function as important enablers of innovation adoption. Such adaptations were made possible through the farmer group approach, which integrated extension activities into trusted community structures and ongoing collective practices. These findings broaden the understanding of flexibility within the CBOP framework. Rather than viewing flexibility solely as a financial mechanism, the research demonstrates that it also encompasses adaptive participation structures that respond to the realities of different social groups. Flexible payment arrangements and flexible participation practices are both sustained through interpersonal relationships, trust, and group-based social capital. Consequently, flexibility should be understood as a socially embedded and gender-responsive attribute that supports inclusive innovation adoption.

In this regard, the findings extend the marketing environment component of the CBOP framework by demonstrating that dissemination and access are fundamentally shaped by social relations and gender dynamics. The proposed GSFIF framework integrates four interrelated dimensions: bridging promotion, atomised distribution, agro-ecological and socio-cultural contextualisation, and participation approaches as important in the dissemination of innovation among subsistence farmers. Supported by interpersonal networks and collective social structures, these dimensions work together to reduce structural barriers, address gender inequalities, and promote more inclusive innovation adoption among subsistence farmers. In

doing so, the framework shifts attention from dissemination as a purely technical process to dissemination as a socially negotiated and contextually embedded practice.

5.4.4 Gendered Dimension of the Social Context

The social context within CBOP (Nakata & Weidner, 2012) position social capital, collective need, and assimilationist culture as important factors influencing innovation adoption. In Mbeere North and Tigania East, subsistence farming is inherently a social activity, meaning that adoption decisions are embedded in a complex social environment. Previous studies (Hunecke *et al.*, 2017; De Oca Munguia *et al.*, 2021; Kos *et al.*, 2023) have made similar observations, noting that the adoption of agricultural innovations is not an independent individual decision, but a socially mediated process involving diverse adopters. This finding emphasises the role of social capital, understood as the networks, norms, and trust that connect farmers (Nakata & Weidner, 2012; Barrios & Blocker, 2015; Hunecke *et al.*, 2017).

Social networks in this research took three main forms, namely: familial ties, relational (peer-to-peer) networks, and group-based associations. Familial ties represent the most immediate and close-knit networks, involving dyadic relationships, specifically between a man and his wife, who are the primary decision-makers within a household. However, these ties are governed by gendered social norms that delineate acceptable roles and behaviours for men and women, often subordinating women. As a result, the hierarchical household dynamics significantly inhibit women's capacity to adopt pro-poor agricultural innovations. This observation aligns with existing literature on social capital, which emphasises that hierarchical social norms not only limit agency, especially for those in subordination, but also shape

preferences and perceived options (e.g., Hunecke *et al.*, 2017). Importantly, such constraints persist in both male and female-headed households, owing to pervasive structural inequalities that continue to privilege male authority in resource control and decision-making. Thus, while close-knit household networks are central to subsistence farming, they can simultaneously act as barriers to equitable pro-poor agricultural innovations, a critical insight for the Gender and Subsistence Farmers in an Integrated Framework (GSFIF).

Beyond the household, peer-to-peer and group-based networks facilitate resource sharing and reciprocity. As noted by Nakata and Weidner (2012) and Viswanathan and Sreekumar (2019), these reciprocal exchanges are deeply embedded in the subsistence marketplace and constitute essential strategies for both survival and innovation adoption. However, these wider networks are also shaped and stratified by gender, which functions as a central organising principle in social interactions (Holstein & Gubrium, 2005; Benschop & Verloo, 2015), a dimension that is often overlooked in innovation adoption studies. This gendered structuring shapes access to resources, participation in decision-making, and the flow of innovation-related knowledge, meaning that the effectiveness of such networks in supporting adoption is directly contingent on the extent to which they address or reproduce gender-based inequalities.

The CBOP framework conceptualises collective need as a shared motivation that drives innovation adoption among subsistence consumers (Nakata & Weidner, 2012). While the findings of this research support the notion that increasing food production constitutes a common concern among subsistence farmers, they also demonstrate that collective need is not a gender-neutral construct. Rather, it is interpreted and prioritised differently by women and men according to their socially constructed roles and responsibilities within households. Across

both study sites, female farmers tended to prioritise innovations that enhanced household food security and ensured food availability, whereas male farmers were more likely to emphasise innovations that generated income. Although similar patterns have been observed by Visser and Wangu (2021), the present research extends this understanding by showing how these differing priorities are rooted in gender relations and the social expectations attached to women's and men's household roles. Women's responsibilities for food provision and preparation shape their preference for innovations that contribute directly to household consumption, while men's roles as household providers encourage a stronger focus on income-generating opportunities.

These findings suggest that collective need is not simply a shared community objective, but a socially negotiated construct shaped by gendered experiences, responsibilities, and power relations. Consequently, what appears to be a common goal, improving food production, is understood and pursued differently by women and men. This insight extends the CBOP framework by demonstrating that collective need is mediated by gender and cannot be assumed to be homogeneous within subsistence communities. Within the proposed Gender and Subsistence Farmers Integrated Framework (GSFIF), gender therefore emerges as a key factor shaping how collective needs are defined, prioritised, and translated into innovation adoption decisions.

In contrast to the assimilationist culture dimension within the CBOP framework (Nakata & Weidner, 2012), which links innovation adoption to aspirations for higher social status and identity transformation, this research found no evidence that subsistence farmers adopted pro-poor agricultural innovations for status-seeking purposes. Instead, adoption was primarily

driven by necessity and shaped by realities of resource scarcity, livelihood insecurity, and the need to secure household food supplies (discussed in sections 4.2.1 and 4.3.1). These findings suggest that the assimilationist assumptions embedded within the CBOP framework have limited explanatory value in the context of subsistence farming communities. Consequently, the proposed GSFIF omits the assimilationist culture dimension and instead reconceptualises social context around necessity-driven adoption, gender relations, and the structural constraints that shape farmers' decision-making processes.

In summary, familial ties, peer-to-peer relationships, and group-based forms of social capital are central to the adoption of pro-poor agricultural innovations aimed at addressing food insecurity and livelihood challenges. However, access to and benefits derived from these networks are mediated by gendered power relations that often disadvantage women. Unlike the largely gender-neutral treatment of social context within the CBOP framework, this research demonstrates that social context is inherently gendered and fundamentally shapes the adoption process within subsistence farming communities. The findings further reveal that social context cannot be understood as an isolated dimension operating independently of other adoption factors. Rather, it is deeply interconnected with poverty conditions, innovation attributes, adopter characteristics, and dissemination systems. Gender relations influence how farmers experience poverty, evaluate innovation attributes, access information, mobilise social networks, and participate in adoption processes. As a result, social context permeates all dimensions of the proposed GSFIF, highlighting the importance of understanding innovation adoption as a socially embedded and relational process rather than a purely individual or technical decision. The next section explores the profile of adopters and why they are included in the new GSFIF framework.

5.4.5 Adopter Profiles of Pro-poor Agricultural Innovation

This research focused on understanding how subsistence farmers experience the adoption of pro-poor agricultural innovations. Drawing on a subsistence and gender-relational perspective, the research profiled the adopters in ways that reflect their lived realities and demonstrates how these realities shape adoption decisions. The findings confirm that adopters themselves are critical informants in understanding innovation uptake, positioning them as an important component of the Gender and Subsistence Farmers in an Integrated Framework (GSFIF). The inclusion of adopters' perspectives aligns with Lowe and Alpert's (2015) argument that 'adopters (consumers) themselves are the only proper informants regarding how they perceive innovations and in what ways these innovations are new to them' (p. 8). In this view, innovativeness is not defined by producers, policymakers or researchers, but by farmers themselves. By centring on the farmers' voice, this research reinforces a subsistence-oriented approach (Venugopal & Viswanathan, 2017) that privileges the realities of farming households rather than relying solely on top-down theorisation.

The perspective is particularly important because it helps reconceptualise the CBOP framework. Whereas the CBOP framework (Nakata & Weidner, 2012) hypothesises adopter behaviour, the GSFIF grounds adoption processes in empirical evidence derived directly from subsistence farmers. Food security emerged as the primary driver for adopting pro-poor agricultural innovations, highlighting both a significant societal challenge and a micromarketing concern (Venugopal & Chakrabarti, 2022). Consequently, the focus shifts from how organisations design innovations for the poor to understanding why and how subsistence farmers adopt them. Based on these findings, the GSFIF identifies four adopter typologies - necessity-driven, left-

behind, experienced, and knowledgeable adopters, which collectively illustrate how poverty, gender relations and lived experience shape adoption behaviour.

The first typology, the necessity-driven adopters, embodies innovation adoption at the intersection of poverty, environmental uncertainty, and the need for survival. Subsistence farmers favour innovations that are affordable, accessible, and low risk, valuing them primarily for their immediate contribution to food security and livelihood stability. This pattern mirrors the success of other pro-poor innovations in comparable contexts. For example, mobile money services like M-Pesa in Kenya (Suri & Jack, 2016; Hove & Dubus, 2019), bKash in Bangladesh (Hasan *et al.*, 2020), and information entrepreneurship initiatives (Chatterjee *et al.*, 2024), all of which succeeded because they provided practical, affordable, and accessible solutions to everyday challenges. In the GSFIF, necessity-driven adopters exemplify how adoption is fundamentally rooted in immediate utility and survival needs.

The second typology, left-behind adopters, consists primarily of women who simultaneously manage household caregiving and agricultural production. These farmers experience multiple forms of deprivation, including limited access to productive resources, lower educational attainment, and restricted decision-making power. Their vulnerabilities are often intensified by the migration of male household members, as also noted in Wang and Tang (2020) and Gosselin-Pali (2025), which weakens household support systems. Despite their central role in food production, left-behind adopters remain underserved by formal dissemination and extension systems. However, the findings reveal that they are not passive recipients of innovation. Rather, they actively engage with innovations through peer learning, visual communication tools, and culturally embedded knowledge-sharing practices. This typology,

therefore, highlights both the effects of gendered inequalities and the agency through which women navigate structural constraints.

The third typology, experienced adopters, comprises farmers with extensive practical knowledge of local farming systems, as also noted by Ainembabazi and Mugisha (2014). This present research extends this to include years of coping with environmental variability, resource shortages, and production risks, forcing these farmers to develop adaptive capacities that shape their adoption decisions. Their evaluations of innovation attributes, such as relative advantage, compatibility, and complexity, are grounded in lived experience rather than abstract assessments. Innovations are not simply adopted; they are evaluated, adapted, and shared through local social networks and informal learning processes. This finding contrasts with studies that portray adoption as largely driven by external mandates or donor interventions (Khoza *et al.*, 2021). Within the GSFIF, experienced adopters demonstrate the importance of adaptive learning, social influence, and locally embedded knowledge in sustaining innovation adoption and diffusion.

The fourth typology, knowledgeable adopters, demonstrates how deep local knowledge can compensate for structural deprivation. The knowledgeable farmers possess a deep understanding of their agro-ecological environment and draw on experiential learning, observation, and experimentation to adapt and diffuse innovations. Their adoption capacity is therefore shaped not only by resources but also by accumulated knowledge and practical capabilities. Similar patterns are evident in studies highlighting indigenous innovation and problem-solving under resource constraints (Onwuegbuzie *et al.*, 2024). Knowledgeable adopters assess innovations according to their compatibility with local farming systems,

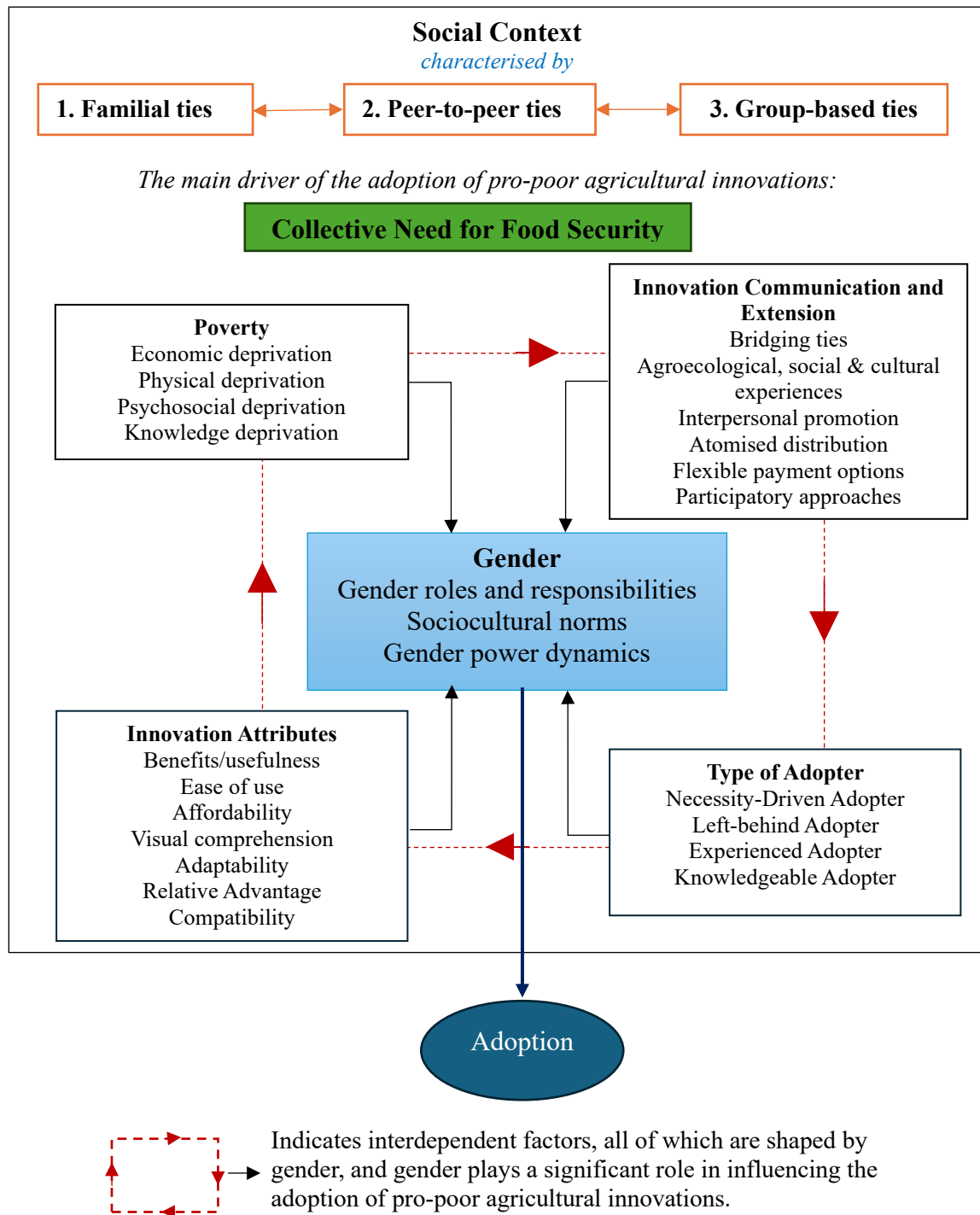
cultural practices, labour requirements, and food needs. They also reduce perceived complexity by using visual demonstrations, storytelling, and symbolic communication that facilitate both understanding and peer learning. Inspired by Sen's (1999) capability approach, his typology demonstrates how subsistence farmers exercise agency and expand their opportunities despite structural constraints.

Collectively, these typologies should not be viewed as mutually exclusive categories but as analytical profiles that capture different dimensions of subsistence farmers' adoption experiences. A single farmer may exhibit characteristics associated with multiple typologies. Together, they reveal that innovation adoption is shaped not only by the attributes of innovations themselves but also by the interaction of poverty, gender relations, social networks, experience, and local knowledge. Building on these insights, the 'Gender and Subsistence Farmers in an Integrated Framework (GSFIF)' extends the Contextualised Bottom-of-the-Pyramid (CBOP) framework by Nakata and Weidner (2012) by explicitly integrating gender relations into the analysis of innovation adoption. While retaining the CBOP dimensions of poverty, innovation attributes, dissemination and marketing environment, and social context, the GSFIF reinterprets these dimensions through the lived experiences of subsistence farmers. Rather than operating independently, these dimensions are interconnected and mutually reinforcing, with gender relations mediating access to resources, labour allocation, information flows, social participation, and household decision-making.

Accordingly, innovation adoption is conceptualised as a socially embedded process driven by efforts to secure household and community food security under conditions of resource constraint and uncertainty. Familial ties, peer-to-peer relationships, and group-based social

capital provide the social infrastructure through which information, resources, and support circulate. The principal contribution of the GSFIF lies in recognising gender as a cross-cutting and relational mechanism that shapes every dimension of the adoption process. Unlike the CBOP framework (Nakata & Weidner, 2012), where gender remains largely implicit, the GSFIF demonstrates how gender relations influence the experience of poverty, the evaluation of innovation attributes, access to dissemination systems, participation in social networks, and the definition of collective needs.

The resulting framework, the ‘Gender and Subsistence Farmers in an Integrated Framework’, is presented in Figure 5.2. It is developed in response to the limitations of the CBOP framework (Nakata & Weidner, 2012), which, because of its conceptual orientation and limited attention to adopters’ lived experiences, does not adequately account for gender relations in innovation adoption. This GSFIF, therefore, integrates the CBOP framework with Benschop & Verloo’s (2015) social construction theory of gender. By synthesising the empirical findings of this research, the framework provides a more relational and socially grounded model for understanding how gender relations shape access to resources, decision-making power, and the capacity of subsistence farmers to act on innovation opportunities. Grounded in detailed empirical insights, the framework captures how pro-poor agricultural innovations are perceived, negotiated, and adopted within subsistence farming communities. By placing farmers’ voices at the centre of analysis, the framework reflects the strengths of this ethnographic approach, demonstrating how in-depth engagement with participants’ lived experiences enables a more nuanced understanding of gendered aspects of innovation adoption in subsistence marketplace settings.



*Figure 5.2 Integrated Conceptual Framework: The **Gender and Subsistence Farmers in an Integrated Framework** synthesises empirical findings and provides a conceptual model for analysing the gendered dimension of innovation adoption.*

Table 5.2 presents a comparison between the Contextualised Bottom of the Pyramid (CBOP) framework developed by Nakata and Weidner (2012) and the Gender and Subsistence Farmers in an Integrated Framework (GSFIF). The comparison demonstrates how GSFIF builds upon and extends the CBOP framework to provide a more contextually grounded and gender-responsive understanding of innovation adoption among subsistence farmers. While CBOP offers valuable insights into how poverty-related constraints shape consumer behaviour at the bottom of the pyramid, GSFIF adapts and expands these insights by explicitly incorporating gender relations, intra-household dynamics, food-system realities, and livelihood vulnerabilities that characterise subsistence farming contexts. Furthermore, the GSFIF reconceptualises innovation adoption as a socially embedded process shaped by the interaction of poverty, gender, social networks, dissemination systems, and innovation attributes. In doing so, GSFIF shifts the analytical focus from individual consumption behaviour to the complex social, economic, and institutional processes that influence how innovations are perceived, negotiated, adopted, and utilised within farming households and communities. The comparison, therefore, highlights the key theoretical advancements of the GSFIF and demonstrates its greater capacity to explain innovation adoption in subsistence farming settings.

Table 5.2 CBOP and GSFIF Comparative Table			
Dimensions	Contextualised Bottom of the Pyramid (Nakata & Weidner, 2012)	Gender and Subsistence Farmers in an Integrated Framework	Elements Added/Modified
Poverty	-Economic deprivation -Physical deprivation -Psychosocial deprivation -Knowledge deprivation	-Economic deprivation -Physical deprivation -Psychosocial deprivation -Knowledge deprivation	No change
New Product Attributes	-Affordability -Visual comprehensibility -Adaptability -Relative advantage -Compatibility	*Benefits/usefulness *Ease of use -Affordability -Visual comprehension -Adaptability -Relative advantage -Compatibility	New to GSFIF and absent in CBOP <i>*Benefits/usefulness</i> <i>*Ease of use</i>
Social Context	Social Capital Assimilationist Culture Collective Need	*Familial ties *Peer-to-peer ties *Group-based ties	New to GSFIF and absent in CBOP <i>*Familial ties</i> <i>*Peer-to-peer ties</i> <i>*Group-based ties</i> -Assimilationist culture removed in GSFIF -GSFIF recognises that social context underlies innovation adoption, as it's embedded in everyday social relations.
Marketing Environment	-Interpersonal Promotions -Atomised Distribution -Flexible Payment Forms	*Bridging ties *Agroecological, social & cultural experiences -Interpersonal promotion -Atomised distribution -Flexible payment options *Participatory approaches	Marketing Environment reframed to Innovation Communication and Extension in GSFIF. New elements added in GSFIF. <i>*Bridging ties</i> <i>*Agroecological, social & cultural experiences</i> <i>*Participatory approaches</i>
Type of Adopter	-	*Necessity-Driven Adopter *Left-behind Adopter *Experienced Adopter *Knowledgeable Adopter	Entirely New to GSFIF, highlighting the heterogeneity of subsistence farmers.
Gender	-	*Gender roles and responsibilities *Sociocultural norms *Gender power dynamics	New to GSFIF. Shapes and mediates all other elements

5.5 Chapter Summary

This chapter has discussed the findings of this research in relation to the existing literature. The discussion revealed that gender-specific priorities rooted in socially constructed roles for women and men greatly influence the perception and adoption of pro-poor agricultural innovations among subsistence farmers in Mbeere North and Tigania East. Consequently, the perceived value of these innovations differs between women and men farmers. In doing so, this research makes a novel contribution by advancing a gendered understanding of how subsistence farmers perceive and engage with pro-poor agricultural innovations.

The discussion further highlighted that the adoption of pro-poor agricultural innovations that have a direct food benefit carries a considerable burden for subsistence farmers, given that food production is central to households' well-being. Beyond ensuring immediate food needs, food production also provides the primary source of income for many farming households. As such, pro-poor agricultural innovations must do more than demonstrate relative advantage and practical value. They must also remain accessible and affordable in order to address the realities of resource-constrained farmers. Moreover, for adoption to be sustainable, these innovations need to be resilient to environmental risks such as drought, erratic rainfall, and soil degradation, which frequently threaten agricultural livelihoods. In this way, pro-poor innovations that provide the benefit of food security are not only products and practices for improving productivity but are deeply tied to the overall well-being of farmers and their households.

Furthermore, the discussions challenged the tendency to treat subsistence farmers as a homogeneous group, echoing critiques such as those advanced by Ayisi *et al.* (2022). Instead, the discussion explored the four adopter profiles: These included: (1) necessity-driven adopters,

motivated by survival; (2) left-behind adopters, predominantly women, who bear disproportionate caregiving and food production responsibilities; and (3) experienced and (4) knowledgeable adopters, who draw on indigenous knowledge, experiential learning, and social networks to adapt and diffuse innovations. Taken together, these differentiated profiles provide a more nuanced and socially embedded perspective on adoption behaviours. They demonstrated that subsistence farmers' innovation behaviours are shaped by survival needs, gendered responsibilities, accumulated experience, and indigenous knowledge.

At the same time, the discussion revealed persistent gendered power dynamics that constrain female farmers' access to productive resources such as finances, agricultural inputs, extension services, and decision-making. These constraints do not arise solely from their identities as women, but from structural and institutional inequalities that marginalise women's participation in innovation processes. In response to the insights, this research has developed a new adoption framework, the 'Gender and Subsistence Farmers in an Integrated Framework (GSFIF),' which enhances the Contextualised Bottom-of-the-Pyramid (CBOP) model (Nakata & Weidner, 2012). By incorporating a gender perspective, the GSFIF captures the complex interplay between poverty, innovation attributes, farmer characteristics, and social context in shaping adoption. In doing so, it foregrounds the farmers' perspectives, highlighting the differentiated adoption pathways shaped by gender, and reframes pro-poor agricultural innovation adoption as a participatory and socially embedded process.

CHAPTER SIX

CONCLUSION

6.1 Introduction

This chapter aims to conclude the dissertation by summarising the key findings, discussing their theoretical and practical implications, acknowledging the study's limitations, and identifying opportunities for future research. The chapter begins by restating the research aim, objectives, and research question that guided the study before reflecting on the contributions made to knowledge and practice.

6.2 Research Aim and Objective of the Research

The overarching aim of this study was to explore how gender relations influence the adoption of pro-poor agricultural innovations among subsistence farmers in Kenya. To achieve this aim, the research addressed three questions: How do farmers perceive agricultural innovations? What are the profiles of farmers who adopt pro-poor agricultural innovations? How do gender relations affect the adoption of pro-poor agricultural innovations? An interpretive ethnographic approach was adopted to gain an in-depth understanding of farmers' perspectives, experiences, and the meanings they attach to pro-poor agricultural innovations. Particular attention was paid to the ways in which social interactions shaped by gender norms and roles influence innovation adoption processes.

To develop a more nuanced understanding of adoption in subsistence contexts, the research integrated the social construction theory of gender (Benschop & Verloo, 2015) with the

contextualised bottom-of-the-pyramid model (Nakata & Weidner, 2012). This theoretical synthesis informed the development of a new innovation adoption framework, the ‘Gender and Subsistence Farmers in an Integrated Framework (GSFIF).’ This framework is the first model of its kind to conceptualise innovation adoption explicitly through a gendered lens. It thus extends existing subsistence marketplace scholarship by demonstrating how social structures, power relations, and contextual realities shape farmers’ engagement with pro-poor agricultural innovations.

Methodologically, the research relied on focus group discussions, participant observations, and in-depth formal and informal discussions, and Key Informant interviews. These methods enabled a prolonged engagement with subsistence farmers in Mbeere North and Tigania East and provided rich insights into their everyday realities. This approach offered insights that are often absent from quantitative studies, where gender is frequently treated as a demographic variable rather than a social and relational construct. Grounded in a constructionist interpretive epistemology, the study foregrounded how gendered roles, power dynamics, and relational interactions shape both perceptions of and engagement with pro-poor agricultural innovations.

By drawing on and integrating insights from the innovation adoption, subsistence marketplace and gender studies literatures, this research advances a more nuanced understanding of the social dynamics influencing the uptake of pro-poor agricultural innovations among subsistence farmers in Kenya. The following section summarises the key findings of this research.

6.3 Summary of Research Findings

This first research question explored how subsistence farmers perceive pro-poor agricultural innovations. The findings reveal that these perceptions are strongly shaped by gendered roles and responsibilities within households. Female farmers generally valued pro-poor agricultural innovations that enhanced household food production and food security, whereas men tended to prioritise innovations that expand opportunities for income generation. These differing perceptions reflect socially constructed gender norms that position women as primarily responsible for reproductive work, such as childcare, food preparation, and household maintenance, while men are commonly viewed as household heads and principal income earners. Although earlier studies (e.g., (Andersson *et al.*, 2016; Visser & Wangu, 2021; FAO, 2023; Antriandarti *et al.*, 2024) have documented gendered divisions of labour, which reinforce gender roles, the present research extends existing knowledge by demonstrating how these roles directly influence the perceived value and adoption of pro-poor agricultural innovations.

The findings further show that innovation adoption cannot be adequately understood by treating gender as a simple demographic variable. Widely used adoption models, such as Rogers' (2003) Diffusion of Innovation (DOI) theory and Davis' (1989) Technology Acceptance Model (TAM), typically represent gender as a binary variable of 0/1, where either a woman or a man adopts. This approach may overlook the social roles, responsibilities, and power relations associated with women and men. By contrast, this research demonstrates that farmers evaluate innovations according to their relevance to gender-specific needs, responsibilities, and livelihood priorities. In doing so, it contributes to debates on the legitimacy of pro-poor innovations (Hölsgens, 2022) by showing that innovations acquire legitimacy when

farmers themselves perceive them as meaningful and valuable within their everyday lives. More broadly, the findings advance understanding of innovation adoption in subsistence marketplaces by foregrounding gender as a socially constructed and context-dependent rather than a static demographic variable.

The second research question explored the profiles of subsistence farmers who adopt pro-poor agricultural innovations. Four adopter profiles emerged from the findings: necessity-driven, left-behind, experienced and knowledgeable adopters. These profiles capture the diverse motivations, constraints, and capabilities that shape adoption behaviour in subsistence farming contexts. The necessity-driven are motivated primarily by the need to secure household food supplies and livelihoods. Their adoption decisions are driven by immediate practical needs rather than commercial objectives, distinguishing them from farmers whose primary motivation is profit maximisation (e.g., Kaliba *et al.*, 2020). Left-behind adopters are predominantly women who combine agricultural production with caregiving responsibilities while often facing significant resource constraints and limited institutional support. In many cases, these women assume responsibility for both farming and household management following the migration of male household members in search of employment opportunities.

The experienced adopters are seasoned farmers whose practical knowledge enables them to recognise the limitations of traditional farming practices in the face of environmental and climatic changes. While generally cautious about risk, they are willing to adopt innovations that address food production challenges and frequently serve as informal role models within their communities. Knowledgeable adopters possess extensive experiential and indigenous knowledge that enables them to adapt innovations to local conditions and needs. Despite having

limited formal education, they draw upon practical expertise and deep understanding of local agro-ecological systems to evaluate, modify, and diffuse innovations within their communities.

Together, these findings reinforce arguments that farmers are not a homogeneous group (e.g., Ayisi *et al.*, 2022). More importantly, they demonstrate that adopter profiles are fluid, overlapping, and shaped by local realities rather than fixed categories. By identifying these profiles, the research provides a more nuanced and contextually grounded understanding of innovation adoption and highlights the importance of gender-sensitive and locally embedded approaches to agricultural development.

The third research question explored how gender relations influence the adoption of pro-poor agricultural innovations. The findings reveal that gender relations are dynamic and continuously reproduced through both structural arrangements and everyday social interactions. Access to resources, information, extension services, and decision-making opportunities is shaped by unequal power relations that often privilege men while constraining women's participation. Women, who often bear responsibility for both agricultural production and domestic work, often negotiate access to innovations, agricultural inputs, and extension services within patriarchal household structures. These negotiations illustrate the ways in which women navigate structural constraints while exercising agency to secure resources that support household food security and resilience. The findings therefore demonstrate that gender relations both constrain and enable innovation adoption. They shape how innovations are perceived, accessed, negotiated, adopted, and diffused within farming households and communities.

By highlighting the interplay between structural inequities and individual agency, this research contributes to the literature on innovation adoption by showing that adoption is not merely an individual decision-making process but a socially embedded and gendered phenomenon. The findings reveal how gendered roles, norms, and power relations continue to marginalise women despite their central contribution to agricultural production. At the same time, they demonstrate the strategies through which women actively engage with and shape innovation processes. Collectively, these insights underscore the importance of integrating gender relations into analyses of innovation adoption and provide the empirical foundation for the proposed Gender and Subsistence Farmers Integrated Framework (GSFIF).

6.4 Implications for Theory

This research makes significant theoretical contributions to the literature on innovation adoption in subsistence marketplaces, particularly within the agricultural contexts. First, the findings support the conceptual merit of Nakata and Weidner's (2012) Contextualised Bottom of the Pyramid (CBOP) framework as a useful lens for understanding innovation adoption under conditions of poverty. However, the research also demonstrates important limitations of the framework. While the CBOP framework acknowledges the influence of contextual factors in subsistence contexts, it lacks empirical grounding in the lived experiences of adopters and renders gender dynamics that profoundly shape adoption processes invisible.

A major theoretical contribution of this research is therefore the reconceptualisation and extension of the CBOP framework through the development of the Gender and Subsistence Farmers Integrated Framework (GSFIF). By integrating the social construction theory of gender with subsistence marketplace theory, the GSFIF provides a more contextually grounded

explanation of innovation adoption among subsistence farmers. Unlike the CBOP framework, which primarily focuses on contextual constraints, the GSFIF places adopters at the centre of the innovation process and recognises their lived experiences, capabilities, motivations, and constraints as critical influences on adoption decisions. The framework, therefore, offers a more inclusive and empirically informed understanding of how pro-poor agricultural innovations are adopted within subsistence farming communities.

A second contribution lies in demonstrating that gender functions as a cross-cutting and relational mechanism that shapes every dimension of the adoption process. The findings show that women and men occupy different social positions within households and communities, have unequal access to productive resources, and exercise different levels of decision-making authority. These differences influence how innovations are perceived, accessed, evaluated, and utilised. Rather than treating gender as a demographic characteristic, as is common in many adoption studies, this research conceptualises gender as a socially constructed and dynamic influence that mediates the relationship between poverty, innovation attributes, dissemination systems, social context, and adoption outcomes. This perspective extends existing innovation adoption theory by revealing how gender relations shape both opportunities and constraints within subsistence farming systems.

A third contribution is the introduction of adopter profiles that reflect the diversity and complexity of innovation adoption in subsistence contexts. The four profiles identified, necessity-driven, left-behind, experienced and knowledgeable adopters, provide a more nuanced understanding of adoption behaviour than traditional models that assume relatively homogeneous adopters or rely on rigid adopter categories. These profiles highlight how

adoption decisions emerge from the interaction of poverty, gender relations, local knowledge, environmental uncertainty, and social networks. In doing so, they offer a more context-sensitive understanding of innovation adoption and diffusion within subsistence marketplaces.

The research also contributed to subsistence marketplace scholarship by demonstrating the central role of food security in shaping adoption decisions. For subsistence farmers, pro-poor agricultural innovations are valued not only for their economic benefits but also for their contribution to household food security, livelihood stability, and resilience. Adoption therefore occurs within broader social, environmental, and market systems rather than as an isolated decision-making process. This finding reinforces calls for greater attention to the interconnected realities of subsistence livelihoods and highlights the importance of understanding innovation adoption within wider food-system contexts (Venugopal & Chakrabarti, 2022).

Another important contribution concerns the role of power relations and social norms in shaping adoption outcomes. The findings reveal how women's access to agricultural innovations, extension services, and productive resources is often constrained by gendered expectations, unequal decision-making power, and institutional arrangements that privilege men. At the same time, women actively negotiate these constraints and develop strategies to participate in innovation processes. By highlighting the interaction between structural inequalities and individual agency, the research advances understanding of how adoption unfolds within contexts characterised by unequal power relations.

Finally, the research questions the adequacy of mainstream innovation adoption models such as Rogers's (2003) DOI, Davis' (1989) TAM, Venkatesh and Davis' (2000) TAM2, Venkatesh *et al.*'s (2003) UTAUT Ajzen's (1991) TPB, and Nakata and Weidner's (2012) CBOP in explaining innovation adoption in subsistence farming contexts. These models largely assume individual decision-making assumptions, which are aggregated to represent the adopting unit. In so doing, they are likely to reproduce a male-oriented innovation perspective that overlooks the complex household dynamics and gendered realities that shape adoption in rural settings. In contrast, the GSFIF conceptualises adoption as a socially embedded process influenced by gender relations, household power dynamics, social networks, and contextual constraints. By explicitly integrating these dimensions, the framework provides a more comprehensive explanation of who adopts innovations, how adoption decisions are negotiated, and how the benefits of innovation are distributed within subsistence farming communities.

Taken together, these contributions advance both innovation adoption theory and subsistence marketplace scholarship by providing a gender-sensitive, empirically grounded, and contextually informed framework for understanding the adoption of pro-poor agricultural innovations.

6.4.1 Practical implications

The findings of this research have important implications for policymakers, agricultural development practitioners, extension services, non-governmental organisations, and organisations involved in the design and dissemination of pro-poor agricultural innovations. By demonstrating that innovation adoption is shaped by gender relations, household power dynamics, and the lived realities of subsistence farmers, the study highlights the need for more

inclusive, context-sensitive, and gender-responsive approaches to agricultural innovation. The following recommendations emerge from the findings.

First, innovation evaluation frameworks should move beyond gender-disaggregated adoption statistics and incorporate measures that capture gender-specific outcomes and benefits. Female and male farmers often perceive the value of innovations differently because of their distinct household roles, responsibilities, and livelihood priorities. Evaluation systems should reflect how women's roles, constraints, and experiences influence adoption, factors often neglected in innovation adoption models.

Second, local communities, especially female farmers, should be actively involved in the design, testing and development of pro-poor agricultural innovations. Participatory and co-design approaches can help ensure that innovations are socially acceptable, ecologically appropriate, and aligned with local needs, values, and farming practices. Such approaches are likely to enhance both the relevance and legitimacy of innovations within subsistence farming communities.

Third, the successful adoption of food-related innovations may require complementary programs that familiarise farmers with new food products, tastes, and preparation methods, and nutritional benefits. Exposure activities, demonstrations, and community-based learning initiatives can help reduce cultural resistance and facilitate the integration of new foods into existing dietary practices.

Fourth, agricultural extension services should be redesigned to better reflect the diverse roles that women perform across agricultural production systems. Women are involved not only in crop production but also in food processing, preservation, marketing, and value chain activities. Extension programmes that recognise these multiple roles and provide tailored information and support are more likely to improve women's participation and adoption outcomes.

Fifth, innovative delivery mechanisms are required to reduce barriers associated with time constraints, distance, and restricted mobility, particularly among rural women. Mobile extension services, similar to mobile health outreach programs (Rabiou *et al.*, 2024) offer a promising approach by bringing agricultural information, training, and technical support directly to farming communities. Such services can improve access to innovations while reducing the costs associated with participation.

Sixth, persistent inequalities in access to productive resources and decision-making authority highlight the need for gender-transformative interventions that engage both women and men. Awareness programs should aim to shift attitudes around gender roles, power dynamics, and gender stereotypes that constrain women's participation in agricultural innovation processes. As argued by Mudege *et al.* (2015) interventions that encourage collaboration and shared decision-making are more likely to create supportive environments for women's empowerment while minimising perceptions of threat to men's social identities.

Finally, policymakers and development practitioners should recognise that subsistence farmers are not a homogeneous group. The adopter profiles identified in this research, necessity-driven, left-behind, experienced, and knowledgeable adopters, demonstrate the diversity of

motivations, constraints, and capabilities that shape innovation adoption. Innovation design, dissemination, and scaling strategies should therefore be tailored to the needs of different adopter groups, taking account of factors such as gender, experience, knowledge, and resource availability.

6.4.2 Policy Implications

This research highlights the range of factors that policymakers and development practitioners should consider when promoting the adoption of pro-poor agricultural innovations among subsistence farmers in Kenya. The findings demonstrate that farmers prioritise innovations that address food security needs, fit local socio-cultural and agroecological conditions, and remain resilient under conditions of environmental uncertainty. Given the central role of food production in subsistence livelihoods, the study offers several important policy implications.

First, practitioners and policymakers should move beyond measuring adoption rates as the primary indicator of success (e.g., Ruzzante *et al.*, 2021) and instead assess how effectively innovations address the needs of different groups of farmers. The findings reveal that women and men adopt innovations for different reasons and derive different forms of value from them. Consequently, agricultural policies and programs should adopt gender-responsive approaches that recognise these differences. This may include targeted input subsidies, differentiated extension support, and innovation incentives that respond to the distinct priorities of female and male farmers.

Second, agricultural innovations should be designed and disseminated in ways that are compatible with local agroecological, social, and cultural realities. The findings demonstrate that innovations are more likely to be adopted when they align with existing farming practices, household food needs, cultural preferences, and local livelihood strategies. Policymakers should therefore encourage participatory innovation processes that involve local communities in the design, testing, and adaptation of innovations. As highlighted by Nykvist and Von Heland (2014) and Curry *et al.* (2015), consideration of food preferences, cultural practices, and consumption patterns is essential if innovations are to gain local acceptance and achieve sustainable adoption.

Third, reducing gender inequality in access to agricultural information and resources should become a policy priority. The findings show that women frequently face barriers in accessing extension services, productive inputs, and innovation-related information, often relying on male household members as intermediaries. Agricultural extension systems should therefore be redesigned to better reach marginalised women, particularly those responsible for food production. Increasing the recruitment and deployment of female extension officers may improve communication, trust, and participation among women farmers while helping to address gender-based barriers to innovation adoption.

Fourth, policymakers should recognise that innovation adoption is embedded within household and community power relations. Adoption decisions are often negotiated within existing social structures rather than made independently by individuals. The findings reveal that women frequently navigate and negotiate gender norms to gain access to innovations and productive resources. Policy interventions should therefore avoid approaches that directly challenge local

social arrangements without community engagement. Instead, programmes should promote collaborative and gender-transformative strategies that encourage joint decision-making and shared responsibility among women and men. Such approaches can support women's empowerment while maintaining social cohesion and reducing resistance to change (Dery, 2024). In doing so, they can contribute to broader development objectives, including the achievement of Sustainable Development Goal 5 on gender equality.

Finally, agricultural policy should place greater emphasis on attracting and retaining young people in farming. The findings suggest that younger farmers are often motivated by profitability, efficiency, and labour-saving technologies. Policies that support mechanisation across agricultural value chains, from production and processing to storage and marketing, can enhance productivity, reduce post-harvest losses, create employment opportunities, and improve the attractiveness of agriculture as a livelihood. Encouraging youth participation in agriculture is critical not only for addressing food insecurity but also for promoting rural economic development and reducing the pressures associated with rural–urban migration.

6.5 Study Limitations and Suggestions for Future Research

The primary aim of this research has been to understand how gender, as a social construct, influences the adoption of pro-poor agricultural innovations among subsistence farmers. The ethnographic approach, grounded in prolonged engagement, participant observations, and immersion within farming communities, enabled an in-depth exploration of farmers' lived experiences and the social processes underpinning innovation adoption. Given the limited research exploring the influence of gender relations on the adoption of pro-poor agricultural

innovations in Kenya, this approach was particularly valuable in generating rich, context-specific insights. However, the findings should be interpreted in light of several limitations.

First, the research was conducted within two agricultural regions in Kenya and focused specifically on subsistence farmers. While focusing on a single country (Kenya) and a specific group of subsistence farmers may constrain the generalisability of the findings, the context-specific insights generated here provide a strong foundation for advancing knowledge in other contexts. These findings can be further validated and replicated in other contexts (Stremersch *et al.*, 2023).

Despite this limitation, the research makes an important theoretical contribution through the development of the ‘Gender and Subsistence Farmers in an Integrated Framework (GSFIF).’ The findings demonstrate that gender is a central influence on innovation adoption, shaping how farmers perceive, evaluate, and engage with pro-poor agricultural innovations. Women’s adoption decisions were largely motivated by household food security, whereas men were more likely to prioritise income-generating opportunities. Women’s adoption decisions were largely motivated by household food security, whereas men were more likely to prioritise income-generating opportunities. Future research could examine whether similar gendered motivations exist in other subsistence settings and explore how these motivations vary across cultural, economic, and agricultural contexts. Further research could also evaluate the applicability and explanatory power of the GSFIF in different developing-country contexts and compare similarities and differences in adoption processes across settings.

A second area for future research concerns the structural disadvantages experienced by rural women. The findings reveal that women face multiple and intersecting forms of disadvantage, including poverty (World Bank Group, 2016; Beegle & Christiaensen, 2019; Onyalo, 2019), lower levels of formal education (Chikweche *et al.*, 2023), limited access to productive resources and credit (Beuchelt, 2016; Ingutia & Sumelius, 2022) , and restricted access to extension services (Mudege *et al.*, 2015; Badstue *et al.*, 2018). These constraints are further compounded by women's reproductive and caregiving responsibilities, which reduce the time and labour available for innovation-related activities. The findings suggest that innovation adoption is not merely a technological process but one that is shaped by broader institutional arrangements and power structures. Future research could investigate how gendered relations influence the adoption of innovations beyond agriculture, for example, financial services, healthcare technologies, among others, across both rural and urban settings.

The study also identified religion as an important but underexplored factor influencing access to agricultural information and innovations. Women were more likely than men to receive information through church networks, reflecting broader patterns of female participation in religious institutions (Wong, 2022). However, existing literature also suggests that religious institutions can reproduce patriarchal norms and gender inequalities (Schnabel, 2016; Okoli & Okwuosa, 2020). Future research should therefore explore the intersection of gender, religion, and innovation adoption to better understand how faith-based networks can influence access and adoption of innovations within agriculture and other sectors within subsistence communities.

Another area warranting further investigation concerns the effects of male migration on women's innovation adoption. While migration may contribute to household resilience by diversifying income sources (Fan & Rue, 2020; Agadjanian & Chae, 2023), it may simultaneously increase women's agricultural responsibilities and decision-making burdens. Although this research did not explicitly examine the relationship between migration and innovativeness, the findings suggest that male migration may have important implications for women's access to resources, labour allocation, and adoption decisions. Future studies could therefore investigate how male out-migration influences the innovativeness, agency, and adaptive capacity of female subsistence farmers.

Methodologically, this research demonstrates the value of qualitative and ethnographic approaches for understanding innovation adoption in subsistence contexts. By prioritising depth of understanding over broad generalisation, the research supports arguments by Kwarazuka and Prain (2019) and De Oca Munguia *et al.* (2021) that innovation adoption is fundamentally a relational process involving interactions among farmers, households, communities, and institutions. Such processes are often difficult to capture through conventional quantitative approaches. Future research should continue to refine methodologies for studying hard-to-reach and marginalised populations, particularly approaches that capture the complexity of social relationships, power dynamics, and lived experiences within subsistence marketplaces.

In conclusion, this research has answered three key questions: (1) How do farmers perceive pro-poor agricultural innovations? (2) What are the profiles of farmers who adopt pro-poor agricultural innovations? (3) How do gender relations affect the adoption of agricultural

innovations? By answering these questions, the study advances understanding of innovation adoption in subsistence marketplaces and demonstrates the importance of integrating gender relations into analyses of agricultural innovation. The proposed Gender and Subsistence Farmers Integrated Framework (GSFIF) provide a foundation for future research and offers a more contextually grounded understanding of how innovation adoption unfolds within subsistence farming communities.

REFERENCES

- Abebe, G. K., Bijman, J. and Royer, A. (2016), 'Are middlemen facilitators or barriers to improve smallholders' welfare in rural economies? Empirical evidence from Ethiopia', *Journal of Rural Studies*, 43, pp. 203–213. Available at: <https://doi.org/10.1016/j.jrurstud.2015.12.004>.
- Acker, J. (1990), 'Hierarchies, Jobs, Bodies: A Theory of Gendered Organizations', *Gender & Society*, 4(2), pp. 139–158. Available at: <https://doi.org/10.1177/089124390004002002>.
- Acker, J. (2006), 'Inequality Regimes: Gender, Class, and Race in Organizations', *Gender & Society*, 20(4), pp. 441–464. Available at: <https://doi.org/10.1177/0891243206289499>.
- Adebayo, J. A. and Worth, S. H. (2022), 'Women as extension advisors', *Research in Globalization*, 5, p. 100100. Available at: <https://doi.org/10.1016/j.resglo.2022.100100>.
- Adebayo, J.A. and Worth, S.H. (2024) 'Profile of women in African agriculture and access to extension services', *Social Sciences & Humanities Open*, 9, p. 100790. Available at: <https://doi.org/10.1016/j.ssaho.2023.100790>.
- Adeyeye, S. A. O. (2017), 'The role of food processing and appropriate storage technologies in ensuring food security and food availability in Africa', *Nutrition & Food Science*, 47(1), pp. 122–139. Available at: <https://doi.org/10.1108/NFS-03-2016-0037>.
- Adler, P. A. and Adler, P. (2003), 'The Promise and Pitfalls of Going into the Field', *Contexts*, 2(2), pp. 41–47. Available at: <https://doi.org/10.1525/ctx.2003.2.2.41>.
- Aduwo, O. E. *et al.* (2019), 'Gender differences in agricultural technology adoption in developing countries: a systematic review', *Acta Horticulturae*, (1238), pp. 227–238. Available at: <https://doi.org/10.17660/ActaHortic.2019.1238.24>.
- Agadjanian, V. and Chae, S. (2023), 'Long-term Consequences of Men's Migration for Women's Well-being in a Rural African Setting', *Sociological Perspectives*, 66(6), pp. 1084–1102. Available at: <https://doi.org/10.1177/07311214231180557>.
- Agarwal, N. *et al.* (2020), 'Managing dilemmas of resource mobilization through *jugaad*: A MULTI-METHOD study of social enterprises in Indian healthcare', *Strategic Entrepreneurship Journal*, 14(3), pp. 419–443. Available at: <https://doi.org/10.1002/sej.1362>.
- Alsos, A. G., Ljunggren, E. and Hytti, U. (2013), 'Gender and innovation: state of the art and a research agenda', *International Journal of Gender and Entrepreneurship*. Edited by D. Gry Agnete Alsos, Professor Ulla Hy, 5(3), pp. 236–256. Available at: <https://doi.org/10.1108/IJGE-06-2013-0049>.
- Ahmed, A. U., Hernandez, R. and Naher, F. (2016), 'Adoption of Stress-Tolerant Rice Varieties in Bangladesh', in F.W. Gatzweiler and J. Von Braun (eds) *Technological and Institutional Innovations for Marginalized Smallholders in Agricultural Development*. Cham: Springer International Publishing, pp. 241–255. Available at: https://doi.org/10.1007/978-3-319-25718-1_15.

Ahmed, S. M. (2008), 'Taking Healthcare where the community is: The story of the Shasthya Sebikas of BRAC in Bangladesh', *BRAC University Journal*, V(1), pp. 39–45.

Ainembabazi, J. H. and Mugisha, J. (2014), 'The Role of Farming Experience on the Adoption of Agricultural Technologies: Evidence from Smallholder Farmers in Uganda', *The Journal of Development Studies*, 50(5), pp. 666–679. Available at: <https://doi.org/10.1080/00220388.2013.874556>.

Ajzen, I. (1991), 'The Theory of Planned Behavior.', *Organizational Behaviour and Human Decision Processes*, 50(2), pp. 170–211.

Akinola, R. *et al.* (2020), 'A Review of Indigenous Food Crops in Africa and the Implications for more Sustainable and Healthy Food Systems', *Sustainability*, 12(8), p. 3493. Available at: <https://doi.org/10.3390/su12083493>.

Aku, A. *et al.* (2018), 'Effect of market access provided by farmer organizations on smallholder vegetable farmer's income in Tanzania', *Cogent Food & Agriculture*. Edited by F. Yildiz, 4(1), p. 1560596. Available at: <https://doi.org/10.1080/23311932.2018.1560596>.

Akwalu, J. N., and Muchai, S. N. (2020), 'Constituency Development Fund (CDF) and its effects on community welfare in Tigania East Constituency, Mery County Kenya', *Journal of Poverty, Investment and Development (JPID)*, 5(2), pp. 12–35.

Allen, E. M., Munala, L. and Henderson, J. R. (2021) 'Kenyan Women Bearing the Cost of Climate Change', *International Journal of Environmental Research and Public Health*, 18(23), p. 12697. Available at: <https://doi.org/10.3390/ijerph182312697>.

Amis, J. M. and Silk, M. L. (2008), 'The Philosophy and Politics of Quality in Qualitative Organizational Research', *Organizational Research Methods*, 11(3), pp. 456–480. Available at: <https://doi.org/10.1177/1094428107300341>.

Andersson, K., Lodin, J. B., and Chiwona-Karlton (2016), 'Gender dynamics in cassava leaves value chains: The case of Tanzania', *Journal of Gender, Agriculture and Food Security*, 1(2), pp. 84–109.

Anditi, C. *et al.* (2022), 'Addressing gender dimensions in energy innovations: A gender analysis framework for informal urban settlements in Africa', *Energy Research & Social Science*, 88, p. 102476. Available at: <https://doi.org/10.1016/j.erss.2021.102476>.

Anjum, G. and Aziz, M. (2025), 'Climate change and gendered vulnerability: A systematic review of women's health', *Women's Health*, 21, p. 17455057251323645. Available at: <https://doi.org/10.1177/17455057251323645>.

Antriyandarti, E. *et al.* (2024), 'The dual role of women in food security and agriculture in responding to climate change: Empirical evidence from Rural Java', *Environmental Challenges*, 14, p. 100852. Available at: <https://doi.org/10.1016/j.envc.2024.100852>.

Apata, T. G. (2019), 'Analysis of cassava value chain in Nigeria: pro-poor approach and gender perspective', *International Journal of Value Chain Management*, 10(3), p. 219. Available at: <https://doi.org/10.1504/IJVC.2019.10022069>.

- Arts, J. W. C., Frambach, R. T. and Bijmolt, T. H. A. (2011), 'Generalizations on consumer innovation adoption: A meta-analysis on drivers of intention and behavior', *International Journal of Research in Marketing*, 28(2), pp. 134–144. Available at: <https://doi.org/10.1016/j.ijresmar.2010.11.002>.
- Aweke, C. S. *et al.* (2021), 'Impact assessment of agricultural technologies on household food consumption and dietary diversity in eastern Ethiopia', *Journal of Agriculture and Food Research*, 4, p. 100141. Available at: <https://doi.org/10.1016/j.jafr.2021.100141>.
- Aworh, O. C. (2023), 'African traditional foods and sustainable food security', *Food Control*, 145, p. 109393. Available at: <https://doi.org/10.1016/j.foodcont.2022.109393>.
- Ayisi, D. N., Kozári, J. and Krisztina, T. (2022), 'Do smallholder farmers belong to the same adopter category? An assessment of smallholder farmers innovation adopter categories in Ghana', *Heliyon*, 8(8), p. e10421. Available at: <https://doi.org/10.1016/j.heliyon.2022.e10421>.
- Badstue, L. *et al.* (2018), 'What drives capacity to innovate? Insights from women and men small-scale farmers in Africa, Asia, and Latin America'. Available at: <https://doi.org/10.22004/AG.ECON.293588>.
- Badstue, L. *et al.* (2020), 'How local gender norms and intra-household dynamics shape women's demand for laborsaving technologies: insights from maize-based livelihoods in Ethiopia and Kenya', *Gender, Technology and Development*, 24(3), pp. 341–361. Available at: <https://doi.org/10.1080/09718524.2020.1830339>.
- Barrios, A. and Blocker, C. P. (2015), 'The Contextual Value of Social Capital for Subsistence Entrepreneur Mobility', *Journal of Public Policy & Marketing*, 34(2), pp. 272–286. Available at: <https://doi.org/10.1509/jppm.14.167>.
- Iza, B. C. L. *et al.* (2019), 'The Role of Farmers' Entrepreneurial Orientation on Agricultural Innovations in Ugandan Multi-Stakeholder Platform', in T.S. Rosenstock, A. Nowak, and E. Girvetz (eds) *The Climate-Smart Agriculture Papers*. Cham: Springer International Publishing, pp. 201–213. Available at: https://doi.org/10.1007/978-3-319-92798-5_17.
- Bastos, A. *et al.* (2009), 'Women and poverty: A gender-sensitive approach', *The Journal of Socio-Economics*, 38(5), pp. 764–778. Available at: <https://doi.org/10.1016/j.socec.2009.03.008>.
- Beegle, K. and Christiaensen, L. (2019), *Accelerating Poverty Reduction in Africa*. Washington, DC: World Bank. Available at: <https://doi.org/10.1596/978-1-4648-1232-3>.
- Behfar, K. and Okhuysen, G. A. (2018), 'Perspective—Discovery Within Validation Logic: Deliberately Surfacing, Complementing, and Substituting Abductive Reasoning in Hypothetico-Deductive Inquiry', *Organization Science*, 29(2), pp. 323–340. Available at: <https://doi.org/10.1287/orsc.2017.1193>.
- Benschop, Y. and Doorewaard, H. (2012), 'Gender subtext revisited', *Equality, Diversity and Inclusion: An International Journal*. Edited by S. Sayce, 31(3), pp. 225–235. Available at: <https://doi.org/10.1108/02610151211209081>.

Berihu B. A. (2015), 'Effect of Khat (*Catha edulis* Forsk) on Neurobehavioral Functions: Systematic review and Meta analysis.', pp. 1369–77.

Bernasek, A. (2003), 'Banking on Social Change: Grameen Bank Lending to Women', 16(3), pp. 369–385.

Beuchelt, T. D. (2016) 'Gender, Social Equity and Innovations in Smallholder Farming Systems: Pitfalls and Pathways', in F.W. Gatzweiler and J. von Braun (eds) *Technological and Institutional Innovations for Marginalized Smallholders in Agricultural Development*. Cham: Springer International Publishing, pp. 181–198. Available at: https://doi.org/10.1007/978-3-319-25718-1_11.

Bilal, M. and Jaghdani, T. J. (2024), 'Barriers to the adoption of multiple agricultural innovations: insights from Bt cotton, wheat seeds, herbicides and no-tillage in Pakistan', *International Journal of Agricultural Sustainability*, 22(1), p. 2318934. Available at: <https://doi.org/10.1080/14735903.2024.2318934>.

Birt, L. *et al.* (2016), 'Member Checking: A Tool to Enhance Trustworthiness or Merely a Nod to Validation?', *Qualitative Health Research*, 26(13), pp. 1802–1811. Available at: <https://doi.org/10.1177/1049732316654870>.

Bluhm, D. J. *et al.* (2011), 'Qualitative Research in Management: A Decade of Progress', *Journal of Management Studies*, 48(8), pp. 1866–1891. Available at: <https://doi.org/10.1111/j.1467-6486.2010.00972.x>.

Boddy, C. (2005), 'A rose by any other name may smell as sweet but “group discussion” is not another name for a “focus group” nor should it be', *Qualitative Market Research: An International Journal*, 8(3), pp. 248–255. Available at: <https://doi.org/10.1108/13522750510603325>.

Bokelmann, W. *et al.* (2022), 'The Role of Indigenous Vegetables to Improve Food and Nutrition Security: Experiences From the Project HORTINLEA in Kenya (2014–2018)', *Frontiers in Sustainable Food Systems*, 6, p. 806420. Available at: <https://doi.org/10.3389/fsufs.2022.806420>.

Boomgaard, P. and Hart, M. (2011), 'Globalization, Environmental Change, and Social History: An Introduction', in P. Boomgaard and M. 'T Hart (eds) *Globalization, Environmental Change, and Social History*. 1st edn. Cambridge University Press, pp. 1–26. Available at: <https://doi.org/10.1017/CBO9780511920677.001>.

Borda, Á. J., Sárvári, B. and Balogh, J. M. (2023), 'Generation Change in Agriculture: A Systematic Review of the Literature', *Economies*, 11(5), p. 129. Available at: <https://doi.org/10.3390/economies11050129>.

Borthakur, A. and Singh, P. (2020), 'Indigenous knowledge systems in sustainable water conservation and management', *Water Conservation and Wastewater Treatment in BRICS Nations*. Elsevier, pp. 321–328. Available at: <https://doi.org/10.1016/B978-0-12-818339-7.00016-3>.

Boserup, E. (1989), *Woman's role in economic development*. New edition. London: Earthscan.

- Bourgoin, A. and Harvey, J. F. (2018), 'Professional image under threat: Dealing with learning–credibility tension', *Human Relations*, 71(12), pp. 1611–1639. Available at: <https://doi.org/10.1177/0018726718756168>.
- Brown, P., Daigneault, A. and Dawson, J. (2019), 'Age, values, farming objectives, past management decisions, and future intentions in New Zealand agriculture', *Journal of Environmental Management*, 231, pp. 110–120. Available at: <https://doi.org/10.1016/j.jenvman.2018.10.018>.
- Bull, S. *et al.* (eds) (2024), *Research Ethics in Epidemics and Pandemics: A Casebook*. Cham: Springer International Publishing (Public Health Ethics Analysis). Available at: <https://doi.org/10.1007/978-3-031-41804-4>.
- Burns, A. *et al.* (2010), 'Cassava: The Drought, War and Famine Crop in a Changing World', *Sustainability*, 2(11), pp. 3572–3607. Available at: <https://doi.org/10.3390/su2113572>.
- Burns, E. *et al.* (2012), 'Reflexivity in midwifery research: The insider/outsider debate', *Midwifery*, 28(1), pp. 52–60. Available at: <https://doi.org/10.1016/j.midw.2010.10.018>.
- Câmara, F.S. and Madruga, M. S. (2001), 'Cyanic acid, Phytic acid, total tannin and aflatoxin contents of a Brazilian (Natal) multimistura preparation', *Revista de Nutrição*, 14(1), pp. 33–36. Available at: <https://doi.org/10.1590/S1415-52732001000100005>.
- Camey, I. *et al.* (2020), 'Gender-based violence and environment linkages. In The Violence of Inequality'. Wen, J., Ed.; IUCN: Gland, Switzerland. Available at: <https://portals.iucn.org/library/sites/library/files/documents/2020-002-En.pdf>.
- CARE (2021), 'Enabling Inclusive Food Systems. Food and Water Systems Annual Report.' CARE, Atlanta.
- CARE (2020a), 'Left Out and Left Behind: Ignoring Women Will Prevent Us from Solving the Hunger Crisis. In: Policy Report.' CARE, London. Available at: www.care.org/food.
- Carter, N. *et al.* (2014), 'The Use of Triangulation in Qualitative Research', *Oncology Nursing Forum*, 41(5), pp. 545–547. Available at: <https://doi.org/10.1188/14.ONF.545-547>.
- Central Bank of Kenya (2024), *Agriculture Sector Survey*. Central Bank of Kenya, Nairobi, Kenya.
- Charoenratana, S., Anukul, C. and Rosset, P. M. (2021), 'Food Sovereignty and Food Security: Livelihood Strategies Pursued by Farmers during the Maize Monoculture Boom in Northern Thailand', *Sustainability*, 13(17), p. 9821. Available at: <https://doi.org/10.3390/su13179821>.
- Chatterjee, A., Chauradia, A. J. and Pedada, K. (2024), 'Rural women microentrepreneurs, consumer acquisition, and value delivery: Evidence from a quasi-experiment in rural India', *Journal of the Academy of Marketing Science* [Preprint]. Available at: <https://doi.org/10.1007/s11747-024-01053-6>.
- Chikweche, T., Lappeman, J. and Egan, P. (2023), 'Researching the marginalised bottom of the pyramid in Africa: Lessons and prospects for inclusive, relevant practices', *International*

Journal of Market Research, 65(5), pp. 597–621. Available at:
<https://doi.org/10.1177/14707853221147190>.

Chindasombatcharoen, N. *et al.* (2024), ‘Navigating psychological barriers in agricultural innovation adoption: A multi-stakeholder perspective’, *Journal of Cleaner Production*, 475, p. 143695. Available at: <https://doi.org/10.1016/j.jclepro.2024.143695>.

Christiaensen, L. and Demery, L. (2018), *Agriculture in Africa: Telling Myths from Facts*. Washington, DC: World Bank. Available at: <https://doi.org/10.1596/978-1-4648-1134-0>.

Chua, P., Bhavnani, K.-K. and Foran, J. (2000), ‘Women, culture, development: a new paradigm for development studies?’, *Ethnic and Racial Studies*, 23(5), pp. 820–841. Available at: <https://doi.org/10.1080/01419870050110913>.

Claridge, T. (2020), ‘Social capital at different levels and dimensions: a typology of social capital’. Available at: <https://doi.org/10.5281/ZENODO.8016096>.

Cloutier, C. (2024), ‘Strategies for Generating Deliberately Emergent Qualitative Research Designs’, *The Journal of Applied Behavioral Science*, 60(2), pp. 358–380. Available at: <https://doi.org/10.1177/00218863241235417>.

Cloutier, C. and Ravasi, D. (2021), ‘Using tables to enhance trustworthiness in qualitative research’, *Strategic Organization*, 19(1), pp. 113–133. Available at: <https://doi.org/10.1177/1476127020979329>.

Connor, D.S. *et al.* (2024), ‘Who gets left behind by left behind places?’, *Cambridge Journal of Regions, Economy and Society*, 17(1), pp. 37–58. Available at: <https://doi.org/10.1093/cjres/rsad031>.

County Government of Meru (2023), ‘Meru County Integrated Development Plan 2023 - 2027’.

Crotty, M. (2003), *The Foundation of Social Research: Meaning and Perspectives in the Research Process*. London: Sage Publications.

Crudeli, L. *et al.* (2022), ‘Beyond individualistic behaviour: Social norms and innovation adoption in rural Mozambique’, *World Development*, 157, p. 105928. Available at: <https://doi.org/10.1016/j.worlddev.2022.105928>.

Curry, G.N. *et al.* (2015), ‘A bridge too far? The influence of socio-cultural values on the adaptation responses of smallholders to a devastating pest outbreak in cocoa’, *Global Environmental Change*, 35, pp. 1–11. Available at: <https://doi.org/10.1016/j.gloenvcha.2015.07.012>.

Curry, G.N. *et al.* (2021), ‘Disruptive innovation in agriculture: Socio-cultural factors in technology adoption in the developing world’, *Journal of Rural Studies*, 88, pp. 422–431. Available at: <https://doi.org/10.1016/j.jrurstud.2021.07.022>.

Da Silva, C., Pereira, F. and Amorim, J. P. (2024), ‘The integration of indigenous knowledge in school: a systematic review’, *Compare: A Journal of Comparative and International Education*, 54(7), pp. 1210–1228. Available at: <https://doi.org/10.1080/03057925.2023.2184200>.

Dahal, N. *et al.* (2024), 'Participant selection procedures in qualitative research: experiences and some points for consideration', *Frontiers in Research Metrics and Analytics*, 9, p. 1512747. Available at: <https://doi.org/10.3389/frma.2024.1512747>.

Dahana, W. D., Kobayashi, T. and Ebisuya, A. (2018), 'Empirical Study of Heterogeneous Behavior at the Base of the Pyramid: The Influence of Demographic and Psychographic Factors', *Journal of International Consumer Marketing*, 30(3), pp. 173–191. Available at: <https://doi.org/10.1080/08961530.2017.1399308>.

Davis, B., Di Giuseppe, S. and Zezza, A. (2017), 'Are African households (not) leaving agriculture? Patterns of households' income sources in rural Sub-Saharan Africa', *Food Policy*, 67, pp. 153–174. Available at: <https://doi.org/10.1016/j.foodpol.2016.09.018>.

Davis, F. (1989), 'Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology', *MIS Quarterly*, 13(3), pp. 319–340.

Demont, T. (2022) 'Coping with shocks: How Self-Help Groups impact food security and seasonal migration', *World Development*, 155, p. 105892. Available at: <https://doi.org/10.1016/j.worlddev.2022.105892>.

Dennehy, T. C. and Dasgupta, N. (2017), 'Female peer mentors early in college increase women's positive academic experiences and retention in engineering', *Proceedings of the National Academy of Sciences*, 114(23), pp. 5964–5969. Available at: <https://doi.org/10.1073/pnas.1613117114>.

Denzin, N. K., and Lincoln, Y. S. (2018), *The SAGE handbook of qualitative research*. 5th edn. Sage Publications.

Dery, I. (2024), 'Re-imagining gender equality discourse through an Africa(n)-centred feminist perspective', *Journal of Gender Studies*, pp. 1–12. Available at: <https://doi.org/10.1080/09589236.2024.2428416>.

Deterding, N. M. and Waters, M. C. (2021), 'Flexible Coding of In-depth Interviews: A Twenty-first-century Approach', *Sociological Methods & Research*, 50(2), pp. 708–739. Available at: <https://doi.org/10.1177/0049124118799377>.

Dillon, A., McGee, K. and Oseni, G. (2015), 'Agricultural Production, Dietary Diversity and Climate Variability', *The Journal of Development Studies*, 51(8), pp. 976–995. Available at: <https://doi.org/10.1080/00220388.2015.1018902>.

Doss, C. (2013), 'Intrahousehold Bargaining and Resource Allocation in Developing Countries', *The World Bank Research Observer*, 28(1), pp. 52–78. Available at: <https://doi.org/10.1093/wbro/lkt001>.

Doss, C.R. (2018), 'Women and agricultural productivity: Reframing the Issues', *Development Policy Review*, 36(1), pp. 35–50. Available at: <https://doi.org/10.1111/dpr.12243>.

Doss, C. R. and Morris, M. L. (2000), 'How does gender affect the adoption of agricultural innovations?: The case of improved maize technology in Ghana', *Agricultural Economics*, 25(1), pp. 27–39. Available at: <https://doi.org/10.1111/j.1574-0862.2001.tb00233.x>.

Du Toit, C. D. (2022), 'A realistic reading as a feminist tool: The Prodigal Son as a case study', *HTS Teologiese Studies / Theological Studies*, 78(4). Available at: <https://doi.org/10.4102/hts.v78i4.7413>.

Dumont, G. (2023), 'Immersion in Organizational Ethnography: Four Methodological Requirements to Immerse Oneself in the Field', *Organizational Research Methods*, 26(3), pp. 441–458. Available at: <https://doi.org/10.1177/10944281221075365>.

Duncombe, R. A. (2014), 'Understanding the Impact of Mobile Phones on Livelihoods in Developing Countries', *Development Policy Review*, 32(5), pp. 567–588. Available at: <https://doi.org/10.1111/dpr.12073>.

Eastwood, C. R. and Renwick, A. (2020), 'Innovation Uncertainty Impacts the Adoption of Smarter Farming Approaches', *Frontiers in Sustainable Food Systems*, 4, p. 24. Available at: <https://doi.org/10.3389/fsufs.2020.00024>.

Ejem, A. A. *et al.* (2023), 'Perspectives on communicating 21st-Century agricultural innovations to Nigerian rural farmers', *Journal of Agriculture and Food Research*, 11, p. 100511. Available at: <https://doi.org/10.1016/j.jafr.2023.100511>.

Elevina Pérez *et al.* (2017), 'Cassava flour as an alternative to produce gluten-free baked goods and pastas', *Handbook on Cassava: Production, Potential Uses and Recent Advances*.

Embu County Government (2019), 'County Integrated Development Plan 2018-2022: A Vibrant and Prosperous County'. Embu County Government. Available at: <https://repository.kippira.or.ke/bitstream/handle/123456789/573/2018-2022%20Embu%20County%20CIDP.pdf?sequence=1&isAllowed=y>.

Fan, S. and Rue, C. (2020), 'The Role of Smallholder Farms in a Changing World', in S. Gomez y Paloma, L. Riesgo, and K. Louhichi (eds) *The Role of Smallholder Farms in Food and Nutrition Security*. Cham: Springer International Publishing, pp. 13–28. Available at: https://doi.org/10.1007/978-3-030-42148-9_2.

Fanzo, J. and Davis, C. (2021), *Global Food Systems, Diets, and Nutrition: Linking Science, Economics, and Policy*. Cham: Springer International Publishing (Palgrave Studies in Agricultural Economics and Food Policy). Available at: <https://doi.org/10.1007/978-3-030-72763-5>.

FAO (2012), 'Enduring Farms: climate change, smallholders and traditional farming communities.' FAO. Available at: <http://www.fao.org/docrep/018/ar588e/ar588e.pdf>.

FAO (2013), 'FAO Policy on Gender Equality: Attaining Food Security Goals in Agriculture and Rural Development.' FAO, Rome.

FAO (2015), 'The State of Food Insecurity in the World 2015: Meeting the 2015 international hunger targets: taking stock of uneven progress.' Rome. Available at: <https://www.fao.org/3/i4646e/i4646e.pdf>.

FAO (2016), 'Women Hold the Key to Building a World Free from Hunger and Poverty.'

FAO (2018), 'Scaling Up Agroecology Initiative: Transforming Food and Agricultural Systems in Support of the SDGs. A proposal prepared for the International Symposium on Agroecology.' Food and Agriculture Organization (FAO), Rome.

FAO (2018), 'Sustainable Food Systems: Concept and Framework.' Food and Agriculture Organisation, Rome. Available at: <http://www.fao.org/3/ca2079en/CA2079EN.pdf>.

FAO (2020), 'FAO Policy on Gender Equality 2020-2030'. FAO, Rome. Available at: <http://www.fao.org/3/cb1583en/cb1583en.pdf>.

FAO (2023) *FAO Science and Innovation Forum 2023: Science and innovation for climate action*. FAO. Available at: <https://doi.org/10.4060/cc9164en>.

FAO et al. (2023), *The State of Food Security and Nutrition in the World 2023: Building Resilience for Peace and Food Security*. FAO; IFAD; UNICEF; WFP; WHO; Available at: <https://doi.org/10.4060/cc3017en>.

FAO (2023), *The status of women in agrifood systems*. FAO. Available at: <https://doi.org/10.4060/cc5343en>.

FAO and IFAD (2019), 'United Nations Decade of Family Farming 2019-2028. Global Action Plan.' United Nations, Rome.

Farhall, K. and Rickards, L. (2021), 'The "Gender Agenda" in Agriculture for Development and Its (Lack of) Alignment With Feminist Scholarship', *Frontiers in Sustainable Food Systems*, 5, p. 573424. Available at: <https://doi.org/10.3389/fsufs.2021.573424>.

Farrell, J. R. and Hill, R. P. (2018), 'Poverty Research and Measurement: Making the Case for Consumption Adequacy', *Journal of Consumer Affairs*, 52(3), pp. 770–791. Available at: <https://doi.org/10.1111/joca.12183>.

Feleke, S. et al. (2016), 'Assessing the impacts of cassava technology on poverty reduction in Africa', *Studies in Agricultural Economics*, 118(2), pp. 101–111. Available at: <https://doi.org/10.7896/j.1612>.

Femdal, I. and Solbjør, M. (2018), 'Equality and differences: group interaction in mixed focus groups of users and professionals discussing power', *Society, Health & Vulnerability*, 9(1), p. 1447193. Available at: <https://doi.org/10.1080/20021518.2018.1447193>.

Fielding, N.G. (2012), 'Triangulation and Mixed Methods Designs: Data Integration With New Research Technologies', *Journal of Mixed Methods Research*, 6(2), pp. 124–136. Available at: <https://doi.org/10.1177/1558689812437101>.

Figg, C. et al. (2009), 'Implications and Benefits of a Long-Term Peer Debriefing Experience on Teacher Researchers', *Brock Education Journal*, 19(1). Available at: <https://doi.org/10.26522/brocked.v19i1.118>.

Fishbein, M and Ajzen, I., (1975), *Belief, attitude, intention and behaviour: An introduction to theory and research*.

Fletcher, D. E. (2006), 'Entrepreneurial processes and the social construction of opportunity', *Entrepreneurship & Regional Development*, 18(5), pp. 421–440. Available at: <https://doi.org/10.1080/08985620600861105>.

Forsyth, D. R. (2013), *Group dynamics*. Australia: Wadsworth Cengage learning.

Fujishin, R. (2013), *Creating Effective Groups: The Art of Small Group Communication*. New York: Rowman & Littlefield Publishers.

Garcia, R. and Calantone, R. (2002), 'A critical look at technological innovation typology and innovativeness terminology: a literature review', *Journal of Product Innovation Management*, 19(2), pp. 110–132. Available at: <https://doi.org/10.1111/1540-5885.1920110>.

Gaya, H. I. *et al.* (2017), 'Gender Differentials and Adoption of Drought Tolerant Maize Varieties among Famers in Northern Nigeria.', *European Journal of Business and Management*, 9(5), pp. 81–87.

Ge, Y. *et al.* (2023), 'Gender differences in smallholder farmers' adoption of crop diversification: Evidence from Shaanxi Plain, China', *Climate Risk Management*, 39, p. 100482. Available at: <https://doi.org/10.1016/j.crm.2023.100482>.

Gebre, G.G. *et al.* (2019), 'Gender differences in the adoption of agricultural technology: The case of improved maize varieties in southern Ethiopia', *Women's Studies International Forum*, 76, p. 102264. Available at: <https://doi.org/10.1016/j.wsif.2019.102264>.

Germann, F. *et al.* (2024), 'Frontiers: Breaking the Glass Ceiling: Empowering Female Entrepreneurs Through Female Mentors', *Marketing Science*, 43(2), pp. 244–253. Available at: <https://doi.org/10.1287/mksc.2023.0108>.

Gille, Z. (2012), 'From Risk to Waste: Global Food Waste Regimes', *The Sociological Review*, 60(2_suppl), pp. 27–46. Available at: <https://doi.org/10.1111/1467-954X.12036>.

Giller, K. E. *et al.* (2021), 'Small farms and development in sub-Saharan Africa: Farming for food, for income or for lack of better options?', *Food Security*, 13(6), pp. 1431–1454. Available at: <https://doi.org/10.1007/s12571-021-01209-0>.

Gioia, D. (2021), 'A Systematic Methodology for Doing Qualitative Research', *The Journal of Applied Behavioral Science*, 57(1), pp. 20–29. Available at: <https://doi.org/10.1177/0021886320982715>.

Gioia, D. A., Corley, K.G. and Hamilton, A.L. (2013), 'Seeking Qualitative Rigor in Inductive Research: Notes on the Gioia Methodology', *Organizational Research Methods*, 16(1), pp. 15–31. Available at: <https://doi.org/10.1177/1094428112452151>.

Githunguri, C., Gatheru, M., and Ragwa, S. (2017), 'Cassava production and utilization in coastal, eastern and western regions of Kenya.', *Handbook on Cassava Production, Potential USes and Recent Advances*. Nova Science Publishers, Inc, pp. 42–54.

Glaser, B. G. and Strauss, A. L. (2017), *The Discovery of Grounded Theory: Strategies for Qualitative Research*. 1st edn. Routledge. Available at: <https://doi.org/10.4324/9780203793206>.

Gosselin-Pali, A. (2025), 'Migration and nutrition of the left behind: Evidence from Ghana', *World Development*, 188, p. 106853. Available at: <https://doi.org/10.1016/j.worlddev.2024.106853>.

Government of Kenya (2022), 'The Matrimonial Property Act: Chapter 152: Revised Edition'. National Council for Law.

Granovetter, M. (1983), 'The Strength of Weak Ties: A Network Theory Revisited', *Sociological Theory*, 1, p. 201. Available at: <https://doi.org/10.2307/202051>.

Guest, G., Namey, E. and Chen, M. (2020), 'A simple method to assess and report thematic saturation in qualitative research', *PLOS ONE*. Edited by A. Soundy, 15(5), p. e0232076. Available at: <https://doi.org/10.1371/journal.pone.0232076>.

Guest, G., Namey, E. and McKenna, K. (2017), 'How Many Focus Groups Are Enough? Building an Evidence Base for Nonprobability Sample Sizes', *Field Methods*, 29(1), pp. 3–22. Available at: <https://doi.org/10.1177/1525822X16639015>.

Gwandure, C. and Lukhele-Olorunju, P. (2023), 'Women's use of indigenous knowledge in Africa', *Social Sciences & Humanities Open*, 8(1), p. 100741. Available at: <https://doi.org/10.1016/j.ssaho.2023.100741>.

Habtemariam, L.T., Abate Kassa, G. and Gandorfer, M. (2017), 'Impact of climate change on farms in smallholder farming systems: Yield impacts, economic implications and distributional effects', *Agricultural Systems*, 152, pp. 58–66. Available at: <https://doi.org/10.1016/j.agsy.2016.12.006>.

Hammersley, M. (2018), 'Values in Social Research', in R. Iphofen and M. Tolich, *The SAGE Handbook of Qualitative Research Ethics*. 1 Oliver's Yard, 55 City Road London EC1Y 1SP: SAGE Publications Ltd, pp. 23–34. Available at: <https://doi.org/10.4135/9781526435446.n2>.

Hammersley, M. (2018), 'What is ethnography? Can it survive? Should it?', *Ethnography and Education*, 13(1), pp. 1–17. Available at: <https://doi.org/10.1080/17457823.2017.1298458>.

Hammersley, M. and Atkinson, P. (2007), *Ethnography*. Routledge. Available at: <https://doi.org/10.4324/9780203944769>.

Harley, B. and Cornelissen, J. (2022), 'Rigor With or Without Templates? The Pursuit of Methodological Rigor in Qualitative Research', *Organizational Research Methods*, 25(2), pp. 239–261. Available at: <https://doi.org/10.1177/1094428120937786>.

Hasan, M. R., Lowe, B. and Rahman, M. (2017), 'Visual cues and innovation adoption among bottom of the pyramid consumers', *Qualitative Market Research: An International Journal*, 20(2), pp. 147–157. Available at: <https://doi.org/10.1108/QMR-04-2015-0032>.

Hasan, R., Lowe, B. and Petrovici, D. (2019), 'An Empirical Comparison of Consumer Innovation Adoption Models: Implications for Subsistence Marketplaces', *Journal of Public Policy & Marketing*, 38(1), pp. 61–80. Available at: <https://doi.org/10.1177/0743915618813348>.

- Hasan, R., Lowe, B. and Petrovici, D. (2020), 'Consumer adoption of pro-poor service innovations in subsistence marketplaces', *Journal of Business Research*, 121, pp. 461–475. Available at: <https://doi.org/10.1016/j.jbusres.2018.12.075>.
- Haug, R. *et al.* (2021), 'Feminization of African Agriculture and the Meaning of Decision-Making for Empowerment and Sustainability', *Sustainability*, 13(16), p. 8993. Available at: <https://doi.org/10.3390/su13168993>.
- Hendriks, S. L. *et al.* (2021), 'The Role of Science, Technology, and Innovation for Transforming Food Systems in Africa: Food Systems Summit Brief Prepared by Research Partners of the Scientific Group for the Food Systems Summit April 2021', p. 22 pages. Available at: <https://doi.org/10.48565/SCFSS2021-A948>.
- Hermans, T. D. G. *et al.* (2021), 'Why we should rethink “adoption” in agricultural innovation: Empirical insights from Malawi', *Land Degradation & Development*, 32(4), pp. 1809–1820. Available at: <https://doi.org/10.1002/ldr.3833>.
- Hmieleski, K. M. and Sheppard, L. D. (2019), 'The Yin and Yang of entrepreneurship: Gender differences in the importance of communal and agentic characteristics for entrepreneurs' subjective well-being and performance', *Journal of Business Venturing*, 34(4), pp. 709–730. Available at: <https://doi.org/10.1016/j.jbusvent.2018.06.006>.
- Holmelin, N. B. (2021), 'National specialization policy versus farmers' priorities: Balancing subsistence farming and cash cropping in Nepal', *Journal of Rural Studies*, 83, pp. 71–80. Available at: <https://doi.org/10.1016/j.jrurstud.2021.02.009>.
- Hölsgens, R. (2022), 'Introducing the adopter perspective in social innovation research', *Innovation: The European Journal of Social Science Research*, 35(2), pp. 245–264. Available at: <https://doi.org/10.1080/13511610.2021.1964351>.
- Holstein, J.A and Gubrium, J. F (2005), 'Interpretive practice and social action', *The Sage Handbook of Qualitative Research*, 3, pp. 483–505.
- Hove, L. and Dubus, A. (2019), 'M-PESA and Financial Inclusion in Kenya: Of Paying Comes Saving?', *Sustainability*, 11(3), p. 568. Available at: <https://doi.org/10.3390/su11030568>.
- Hulme, David (2008), *The Story of the Grameen Bank: From Subsidised Microcredit to Market-based Microfinance*. Manchester: Brooks World Poverty Institute, University of Manchester.
- Hunecke, C. *et al.* (2017), 'Understanding the role of social capital in adoption decisions: An application to irrigation technology', *Agricultural Systems*, 153, pp. 221–231. Available at: <https://doi.org/10.1016/j.agsy.2017.02.002>.
- IFAD (2019), *Republic of Kenya: Country Strategic Opportunities Programme 2020-2025*. Rome.
- Ingutia, R. and Sumelius, J. (2022), 'Do farmer groups improve the situation of women in agriculture in rural Kenya?', *International Food and Agribusiness Management Review*, 25(1), pp. 135–156. Available at: <https://doi.org/10.22434/IFAMR2020.0142>.

Intergovernmental Panel On Climate Change (IPCC) (2023), *Climate Change 2021 – The Physical Science Basis: Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. 1st edn. Cambridge University Press. Available at: <https://doi.org/10.1017/9781009157896>.

Järventie-Thesleff, R. *et al.* (2016), 'Roles and identity work in "at-home" ethnography', *Journal of Organizational Ethnography*, 5(3), pp. 235–257. Available at: <https://doi.org/10.1108/JOE-07-2016-0015>.

Jarzabkowski, P., Bednarek, R. and Lê, J. K. (2014), 'Producing persuasive findings: Demystifying ethnographic textwork in strategy and organization research', *Strategic Organization*, 12(4), pp. 274–287. Available at: <https://doi.org/10.1177/1476127014554575>.

Jenkins, K., Narayanaswamy, L. and Sweetman, C. (2019), 'Introduction: Feminist values in research', *Gender & Development*, 27(3), pp. 415–425. Available at: <https://doi.org/10.1080/13552074.2019.1682311>.

Jerolmack, C. and Khan, S. (2014), 'Talk Is Cheap: Ethnography and the Attitudinal Fallacy', *Sociological Methods & Research*, 43(2), pp. 178–209. Available at: <https://doi.org/10.1177/0049124114523396>.

Jiri, O. *et al.* (2016), 'Seasonal Climate Prediction and Adaptation Using Indigenous Knowledge Systems in Agriculture Systems in Southern Africa: A Review', *Journal of Agricultural Science*, 8(5), p. 156. Available at: <https://doi.org/10.5539/jas.v8n5p156>.

Joseph Alcamo and *et al.* (2003), *Ecosystems and Human well-being: A framework for assessment /Millennium Ecosystem Assessment*. World Resource Institute. Available at: http://pdf.wri.org/ecosystems_human_wellbeing.pdf.

Kaaronen, R. O., Manninen, M. A. and Eronen, J. T. (2022), 'Body-based units of measure in cultural evolution'. Available at: <https://doi.org/10.31219/osf.io/tjde7>.

Kalejaiye, P. O., Abosede, A. J. and Adisa, I. (2021), 'Informal Sector, Middlemen, and Poverty Among Rural Farmers in Nigeria', in R. Baikady *et al.* (eds) *The Palgrave Handbook of Global Social Problems*. Cham: Springer International Publishing, pp. 1–11. Available at: https://doi.org/10.1007/978-3-030-68127-2_170-1.

Kaliba, A. R. *et al.* (2020), 'A typology of adopters and nonadopters of improved sorghum seeds in Tanzania: A deep learning neural network approach', *World Development*, 127, p. 104839. Available at: <https://doi.org/10.1016/j.worlddev.2019.104839>.

Kawarazuka, N. and Prain, G. (2019), 'Gendered processes of agricultural innovation in the Northern uplands of Vietnam', *International Journal of Gender and Entrepreneurship*, 11(3), pp. 210–226. Available at: <https://doi.org/10.1108/IJGE-04-2019-0087>.

Kenya Agricultural Productivity Programme, Republic of Kenya and World Bank Group (No date) 'Climate Risk Profile, Meru County'. Kenya County Climate Risks Profile Series.

Kenya National Bureau of Statistics (KNBS) (2022), *2019 Kenya Population and Housing Census: Counting Our People for Sustainable Development and Devolution of Services. Analytical Report on Household and Family Dynamics*. Kenya National Bureau of Statistics.

Khandelwal, M. *et al.* (2017), 'Why Have Improved Cook-Stove Initiatives in India Failed?', *World Development*, 92, pp. 13–27. Available at: <https://doi.org/10.1016/j.worlddev.2016.11.006>.

Khoza, S. *et al.* (2021), 'A gender-differentiated analysis of climate-smart agriculture adoption by smallholder farmers: application of the extended technology acceptance model', *Gender, Technology and Development*, 25(1), pp. 1–21. Available at: <https://doi.org/10.1080/09718524.2020.1830338>.

Khoza, S., Van Niekerk, D. and Nemaconde, L.D. (2019), 'Understanding gender dimensions of climate-smart agriculture adoption in disaster-prone smallholder farming communities in Malawi and Zambia', *Disaster Prevention and Management: An International Journal*, 28(5), pp. 530–547. Available at: <https://doi.org/10.1108/DPM-10-2018-0347>.

Kidasi, P.C. *et al.* (2021), 'Farmers' Sources and Varieties of Cassava Planting Materials in Coastal Kenya', *Frontiers in Sustainable Food Systems*, 5, p. 611089. Available at: <https://doi.org/10.3389/fsufs.2021.611089>.

Kienzle, J., Ashburner, J. and Sim, B.G. (eds) (2013), 'Mechanization for Rural Development: A review of patterns and progress from around the world.'

Kilic, T., Winters, P. and Carletto, C. (2015), 'Gender and agriculture in sub-Saharan Africa: introduction to the special issue', *Agricultural Economics*, 46(3), pp. 281–284. Available at: <https://doi.org/10.1111/agec.12165>.

Kim, H. W., Chan, H. C. and Gupta, S. (2007), 'Value-based Adoption of Mobile Internet: An empirical investigation', *Decision Support Systems*, 43(1), pp. 111–126. Available at: <https://doi.org/10.1016/j.dss.2005.05.009>.

Kiprop, E., Matsui, K. and Maundu, N. (2019), 'The Role of Household Consumers in Adopting Renewable Energy Technologies in Kenya', *Environments*, 6(8), p. 95. Available at: <https://doi.org/10.3390/environments6080095>.

Kirsty Williamson (2006), 'Research in Constructivist Frameworks Using Ehtnographic Techniques', *Library Trends*, 55(1).

Klein, C. (ed.) (2017), *Handbook on cassava: production, potential uses and recent advances*. New York: Nova Publishers (Plant science research and practices).

Klein, G. (2013), 'The Structure of Legitimization: Establishing Organizational Legitimacy While Applying Decision Making Rules', *SSRN Electronic Journal* [Preprint]. Available at: <https://doi.org/10.2139/ssrn.2700173>.

Klerkx, L., Aarts, N. and Leeuwis, C. (2010), 'Adaptive management in agricultural innovation systems: The interactions between innovation networks and their environment', *Agricultural Systems*, 103(6), pp. 390–400. Available at: <https://doi.org/10.1016/j.agsy.2010.03.012>.

KNBS (2024), *National Agriculture Production Report: 2023-2024*. Kenya National Bureau of Statistics, Nairobi. Kenya.

- Knorr, D., Augustin, M. A. and Tiwari, B. (2020), 'Advancing the Role of Food Processing for Improved Integration in Sustainable Food Chains', *Frontiers in Nutrition*, 7, p. 34. Available at: <https://doi.org/10.3389/fnut.2020.00034>.
- Kochetkov, D. M. (2023), 'Innovation: A state-of-the-art review and typology', *International Journal of Innovation Studies*, 7(4), pp. 263–272. Available at: <https://doi.org/10.1016/j.ijis.2023.05.004>.
- Kom, Z., Nicolau, M. D. and Nenwiini, S. C. (2024), 'The Use of Indigenous Knowledge Systems Practices to Enhance Food Security in Vhembe District, South Africa', *Agricultural Research* [Preprint]. Available at: <https://doi.org/10.1007/s40003-024-00716-8>.
- Kos, D., Lensink, R. and Meuwissen, M. (2023), 'The role of social capital in adoption of risky versus less risky subsidized input supplies: An empirical study of cocoa farmers in Ghana', *Journal of Rural Studies*, 97, pp. 140–152. Available at: <https://doi.org/10.1016/j.jrurstud.2022.10.027>.
- Krueger, R. A. and Casey, M. A. (2000), *Focus Groups. A Practical Guide for Applied Research*. 3rd edn. Sage Publications. (3rd Edition).
- Krueger, R. A. and Casey, M. A. (2014), *Focus Groups: A practical Guide for Applied Research*. Fifth. Los Angeles: Sage College Publishing.
- Laichena, J. *et al.* (2022), 'Kenya agricultural policy profile.' Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Initiative on Diversification in East and Southern Africa.
- Langill, J. C. *et al.* (2023), 'Gendered effects of migration on social organization and smallholder production in Oubritenga Province, Burkina Faso', *Journal of Rural Studies*, 98, pp. 19–33. Available at: <https://doi.org/10.1016/j.jrurstud.2023.01.021>.
- Langley, A. and Klag, M. (2019), 'Being Where? Navigating the Involvement Paradox in Qualitative Research Accounts', *Organizational Research Methods*, 22(2), pp. 515–538. Available at: <https://doi.org/10.1177/1094428117741967>.
- Lanka, E. *et al.* (2021), 'Why We Need Qualitative Research in Management Studies', *Revista de Administração Contemporânea*, 25(2), p. e200297. Available at: <https://doi.org/10.1590/1982-7849rac2021200297.en>.
- Lee, M. and Gambiza, J. (2022), 'The adoption of conservation agriculture by smallholder farmers in southern Africa: A scoping review of barriers and enablers', *Journal of Rural Studies*, 92, pp. 214–225. Available at: <https://doi.org/10.1016/j.jrurstud.2022.03.031>.
- Lee, Y. and Colarelli O'Connor, G. (2003), 'The Impact of Communication Strategy on Launching New Products: The Moderating Role of Product Innovativeness', *Journal of Product Innovation Management*, 20(1), pp. 4–21. Available at: <https://doi.org/10.1111/1540-5885.t01-1-201002>.
- Li, Z., Dohan, D. and Abramson, C. M. (2021), 'Qualitative Coding in the Computational Era: A Hybrid Approach to Improve Reliability and Reduce Effort for Coding Ethnographic Interviews', *Socius: Sociological Research for a Dynamic World*, 7, p. 237802312110623. Available at: <https://doi.org/10.1177/23780231211062345>.

Lincoln, Y. S., Lynham, S. A. and Guba, E. G (2018), *Paradigmatic controversies, contradictions, and emerging confluences, revisited*. 5th edn. Edited by N. K. Denzin and . S. Lincoln. Thousand Oaks, CA: Sage: he Sage handbook of qualitative research.

Lindheim, T. (2022), 'Participant Validation: A Strategy to Strengthen the Trustworthiness of Your Study and Address Ethical Concerns', in G. Espedal et al. (eds) *Researching Values*. Cham: Springer International Publishing, pp. 225–239. Available at: https://doi.org/10.1007/978-3-030-90769-3_13.

Locke, C. *et al.* (2017), 'Innovation and gendered negotiations: Insights from six small-scale fishing communities', *Fish and Fisheries*, 18(5), pp. 943–957. Available at: <https://doi.org/10.1111/faf.12216>.

Locke, K., Feldman, M. and Golden-Biddle, K. (2022), 'Coding Practices and Iterativity: Beyond Templates for Analyzing Qualitative Data', *Organizational Research Methods*, 25(2), pp. 262–284. Available at: <https://doi.org/10.1177/1094428120948600>.

Loevinsohn M, Sumberg J, and Diagne A (2012), 'Under what circumstances and conditions does adoption of technology result in increased agricultural productivity?' Protocol. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.

Löhr, K., Weinhardt, M. and Sieber, S. (2020), 'The "World Café" as a Participatory Method for Collecting Qualitative Data', *International Journal of Qualitative Methods*, 19, p. 160940692091697. Available at: <https://doi.org/10.1177/1609406920916976>.

Lokot, M. (2021), 'Whose Voices? Whose Knowledge? A Feminist Analysis of the Value of Key Informant Interviews', *International Journal of Qualitative Methods*, 20, p. 1609406920948775. Available at: <https://doi.org/10.1177/1609406920948775>.

Louhichi, K., Riesgo, L. and Gomez y Paloma, S. (2020), 'Introduction', in S. Gomez y Paloma, L. Riesgo, and K. Louhichi (eds) *The Role of Smallholder Farms in Food and Nutrition Security*. Cham: Springer International Publishing, pp. 1–10. Available at: https://doi.org/10.1007/978-3-030-42148-9_1.

Lourdes Beneria and Gita Sen (1981), 'Accumulation, Reproduction and Women's Role in Economic Development: Boserup Revisted.', 7(2), pp. 279–298. Available at: <https://doi.org/3173878>.

Lowe, B. and Alpert, F. (2015), 'Forecasting consumer perception of innovativeness', *Technovation*, 45–46, pp. 1–14. Available at: <https://doi.org/10.1016/j.technovation.2015.02.001>.

Lowe, B., Lynch, D. and Lowe, J. (2015), 'Reducing household water consumption: a social marketing approach', *Journal of Marketing Management*, 31(3–4), pp. 378–408. Available at: <https://doi.org/10.1080/0267257X.2014.971044>.

Magnani, G. and Gioia, D. (2023), 'Using the Gioia Methodology in international business and entrepreneurship research', *International Business Review*, 32(2), p. 102097. Available at: <https://doi.org/10.1016/j.ibusrev.2022.102097>.

- Makini, F. W; *et al.* (2016), 'Status of Agricultural Innovations, Innovation Platforms, and Innovations Investment. 2015 PARI project country report: Republic of Kenya.' Forum for Agricultural Research in Africa (FARA), Accra Ghana.
- Manggat, I., Zain, R. and Jamaluddin, Z. (2018), 'The Impact of Infrastructure Development on Rural Communities: A Literature Review', *International Journal of Academic Research in Business and Social Sciences*, 8(1), p. Pages 647-658. Available at: <https://doi.org/10.6007/IJARBSS/v8-i1/3837>.
- Martin, K. D. and Paul Hill, R. (2012), 'Life Satisfaction, Self-Determination, and Consumption Adequacy at the Bottom of the Pyramid', *Journal of Consumer Research*, 38(6), pp. 1155–1168. Available at: <https://doi.org/10.1086/661528>.
- Martin, P. Y. (2004), 'Gender As Social Institution', *Social Forces*, 82(4), pp. 1249–1273. Available at: <https://doi.org/10.1353/sof.2004.0081>.
- Martin, P. Y. (2006), 'Practising Gender at Work: Further Thoughts on Reflexivity', *Gender, Work and Organization*, 13(3), pp. 254–276. Available at: <https://doi.org/10.1111/j.1468-0432.2006.00307.x>.
- Martínez-García, C.G. *et al.* (2018), 'Using a Socio-psychological model to identify and understand factors influencing the use and adoption of a successful innovation by small-scale dairy farmers of Central Mexico.', *Experimental Agriculture*, 54(1), pp. 142–159. Available at: <https://doi.org/10.1017/S0014479716000703>.
- Masamha, B., Thebe, V. and Uzokwe, V. N. E. (2018), 'Mapping cassava food value chains in Tanzania's smallholder farming sector: The implications of intra-household gender dynamics', *Journal of Rural Studies*, 58, pp. 82–92. Available at: <https://doi.org/10.1016/j.jrurstud.2017.12.011>.
- Masikati, P., Descheemaeker, K. and Crespo, O. (2019), 'Understanding the Role of Soils and Management on Crops in the Face of Climate Uncertainty in Zimbabwe: A Sensitivity Analysis', *The Climate-Smart Agriculture Papers*. Cham: Springer International Publishing, pp. 49–64. Available at: https://doi.org/10.1007/978-3-319-92798-5_5.
- Masters, A. (2008), 'Unpleasant middlemen', *Journal of Economic Behavior & Organization*, 68(1), pp. 73–86. Available at: <https://doi.org/10.1016/j.jebo.2008.03.003>.
- Mativavarira, M. *et al.* (2024), 'Opportunities for African indigenous vegetables (AIVs): regulations in the vegetable seed sector in sub Saharan Africa', *CABI Agriculture and Bioscience*, p. 93. Available at: <https://doi.org/10.1186/s43170-024-00295-2>.
- Maurya, P. K. *et al.* (2020), 'An introduction to environmental degradation: Causes, consequence and mitigation', *Environmental Degradation: Causes and Remediation Strategies*. Agro Environ Media - Agriculture and Ennvironmental Science Academy, Haridwar, India, pp. 1–20. Available at: <https://doi.org/10.26832/aesa-2020-edcrs-01>.
- Mbiti, I. M. (2016), 'The Need for Accountability in Education in Developing Countries', *Journal of Economic Perspectives*, 30(3), pp. 109–132. Available at: <https://doi.org/10.1257/jep.30.3.109>.

- Mburu, S.W. *et al.* (2016), 'Agrobiodiversity conservation enhances food security in subsistence-based farming systems of Eastern Kenya', *Agriculture & Food Security*, 5(1), p. 19. Available at: <https://doi.org/10.1186/s40066-016-0068-2>.
- McLeod, S. (2024), 'Peer Debriefing In Qualitative Research'. Available at: <https://doi.org/10.13140/RG.2.2.33017.17761>.
- Meijer, S. S. *et al.* (2015), 'The role of knowledge, attitudes and perceptions in the uptake of agricultural and agroforestry innovations among smallholder farmers in sub-Saharan Africa', *International Journal of Agricultural Sustainability*, 13(1), pp. 40–54. Available at: <https://doi.org/10.1080/14735903.2014.912493>.
- Micheels, E.T. and Nolan, J.F. (2016), 'Examining the effects of absorptive capacity and social capital on the adoption of agricultural innovations: A Canadian Prairie case study', *Agricultural Systems*, 145, pp. 127–138. Available at: <https://doi.org/10.1016/j.agsy.2016.03.010>.
- Midgley, J. (2006), 'Gendered economies: Transferring private gender roles into the public realm through rural community development', *Journal of Rural Studies*, 22(2), pp. 217–231. Available at: <https://doi.org/10.1016/j.jrurstud.2005.08.014>.
- Miotto, M. (2023), *Colonialism, cash crops and women in Africa*. Prague: Charles University, Center for Economic Research and Graduate Education.
- Montes De Oca Munguia, O., Pannell, D. J. and Llewellyn, R. (2021), 'Understanding the Adoption of Innovations in Agriculture: A Review of Selected Conceptual Models', *Agronomy*, 11(1), p. 139. Available at: <https://doi.org/10.3390/agronomy11010139>.
- Moser, A. and Korstjens, I. (2018), 'Series: Practical guidance to qualitative research. Part 3: Sampling, data collection and analysis', *European Journal of General Practice*, 24(1), pp. 9–18. Available at: <https://doi.org/10.1080/13814788.2017.1375091>.
- Motsi, H., Molapo, M. and Phiri, E. E. (2022), 'A review of the adaptive capacity of sweet sorghum to improve food security and poverty alleviation in sub-Saharan Africa', *South African Journal of Botany*, 150, pp. 323–329. Available at: <https://doi.org/10.1016/j.sajb.2022.07.040>.
- Mottaleb, K. A. *et al.* (2017), 'Enhancing Smallholder Access to Agricultural Machinery Services: Lessons from Bangladesh', *The Journal of Development Studies*, 53(9), pp. 1502–1517. Available at: <https://doi.org/10.1080/00220388.2016.1257116>.
- Mottaleb, K. A., Krupnik, T. J. and Erenstein, O. (2016), 'Factors associated with small-scale agricultural machinery adoption in Bangladesh: Census findings', *Journal of Rural Studies*, 46, pp. 155–168. Available at: <https://doi.org/10.1016/j.jrurstud.2016.06.012>.
- Mudege, N. N. *et al.* (2015), 'Understanding collective action and women's empowerment in potato farmer groups in Ntcheu and Dedza in Malawi', *Journal of Rural Studies*, 42, pp. 91–101. Available at: <https://doi.org/10.1016/j.jrurstud.2015.09.002>.
- Mukeshimana, M. C. *et al.* (2021), 'Analysis on barriers to biogas dissemination in Rwanda: AHP approach', *Renewable Energy*, 163, pp. 1127–1137. Available at: <https://doi.org/10.1016/j.renene.2020.09.051>.

Mulvey, M. S. and Gengler, C. E. (2013), 'Understanding Innovation - Values Fit from the Consumer Perspective: A New Mixed-Model Approach', *NMIMS Management Review*, 23(2), pp. 18–46. Available at: <https://doi.org/10.1177/0971102320130203>.

Murray, U. *et al.* (2016), 'Smallholder Farmers and Climate Smart Agriculture: Technology and Labor-productivity Constraints amongst Women Smallholders in Malawi', *Gender, Technology and Development*, 20(2), pp. 117–148. Available at: <https://doi.org/10.1177/0971852416640639>.

Mwangi, M and Kariuki, S. (2015), 'Factors Determining Adoption of New Agricultural Technology by Smallholder Farmers in Developing Countries', *Journal of Economics and Sustainable Development*, 6(5), pp. 208–217.

Mwaura, P. K and Nzungu, D. M., (2022), 'Examining the Role of the Church in Socio-Economic Development of the Rural Poor in the Sub-Saharan Region; Insights from Previous Research and Future Research Directions', *African Multidisciplinary Journal of Research (AMJR)*, (Special Issue II), pp. 147–158.

Mwiti, F. and Goulding, C. (2018), 'Strategies for community improvement to tackle poverty and gender issues: An ethnography of community-based organisations ("Chamas") and women's interventions in the Nairobi slums', *European Journal of Operational Research*, 268(3), pp. 875–886. Available at: <https://doi.org/10.1016/j.ejor.2017.12.009>.

Mwongera, C. *et al.* (2019), 'Climate-Smart Agricultural Value Chains: Risks and Perspectives', in T.S. Rosenstock, A. Nowak, and E. Girvetz (eds) *The Climate-Smart Agriculture Papers*. Cham: Springer International Publishing, pp. 235–245. Available at: https://doi.org/10.1007/978-3-319-92798-5_20.

Naeem, M. *et al.* (2023), 'A Step-by-Step Process of Thematic Analysis to Develop a Conceptual Model in Qualitative Research', *International Journal of Qualitative Methods*, 22, p. 16094069231205789. Available at: <https://doi.org/10.1177/16094069231205789>.

Nakata, C. and Weidner, K. (2012), 'Enhancing New Product Adoption at the Base of the Pyramid: A Contextualized Model: New Product Adoption at the BOP', *Journal of Product Innovation Management*, 29(1), pp. 21–32. Available at: <https://doi.org/10.1111/j.1540-5885.2011.00876.x>.

National Drought Management Authority (2024), *Update on Drought Situation in ASAL Counties*. Nairobi, Kenya. Available at: <https://ndma.go.ke/update-on-drought-situation-in-asal-counties/>.

National Information Platform for Food Security and Nutrition (NIPFN) and Kenya Institute of Public Policy Research and Analysis (KIPPRA) (2021), 'Review of Policies on Food Security and Nutrition and the use of Evidence in Improving Human Nutrition in Kenya'. Kenya Institute of Public Policy Research and Analysis (KIPPRA).

Ndiritu, S.W., Kassie, M. and Shiferaw, B. (2014), 'Are there systematic gender differences in the adoption of sustainable agricultural intensification practices? Evidence from Kenya', *Food Policy*, 49, pp. 117–127. Available at: <https://doi.org/10.1016/j.foodpol.2014.06.010>.

Ndlela, S. and Worth, S. (2021), 'Creating self-reliance and sustainable livelihoods amongst small-scale sugarcane farmers', *The Journal of Agricultural Education and Extension*, 27(3), pp. 325–339. Available at: <https://doi.org/10.1080/1389224X.2020.1851268>.

Ndungu, L. (2019), 'Economic Activities in Mbeere North.' African Economic Review.

Ngigi, P. B. *et al.* (2023), 'Mainstreaming traditional fruits, vegetables and pulses for nutrition, income, and sustainability in sub-Saharan Africa: the case for Kenya and Ethiopia', *Frontiers in Nutrition*, 10, p. 1197703. Available at: <https://doi.org/10.3389/fnut.2023.1197703>.

Nguyen, H. M., Ho, T. K. T. and Ngo, T. T. (2024), 'The impact of service innovation on customer satisfaction and customer loyalty: a case in Vietnamese retail banks', *Future Business Journal*, 10(1), p. 61. Available at: <https://doi.org/10.1186/s43093-024-00354-0>.

Njuki, J. *et al.* (2014), 'A Qualitative Assessment of Gender and Irrigation Technology in Kenya and Tanzania', *Gender, Technology and Development*, 18(3), pp. 303–340. Available at: <https://doi.org/10.1177/0971852414544010>.

Njuki, J. *et al.* (2022), 'A review of evidence on gender equality, women's empowerment, and food systems', *Global Food Security*, 33, p. 100622. Available at: <https://doi.org/10.1016/j.gfs.2022.100622>.

Nwachukwu, C. and Vu, H. M. (2022), 'Service Innovation, Marketing Innovation and Customer Satisfaction: Moderating Role of Competitive Intensity', *Sage Open*, 12(2), p. 21582440221082146. Available at: <https://doi.org/10.1177/21582440221082146>.

Nyabaro, V., Mburu, J. and Hutchinson, M. (2019), 'Factors enabling the participation of women in income sharing among banana (*musa* spp.) producing households in South Imenti, Meru County, Kenya', *Gender, Technology and Development*, 23(3), pp. 277–292. Available at: <https://doi.org/10.1080/09718524.2019.1669104>.

Nyairo, N.M. *et al.* (2022), 'Farmers' attitudes and perceptions of adoption of agricultural innovations in Kenya: a mixed methods analysis'. Available at: <https://doi.org/10.17170/KOBRA-202204216055>.

Nykqvist, B. and Von Heland, J. (2014), 'Social-ecological memory as a source of general and specified resilience', *Ecology and Society*, 19(2), p. art47. Available at: <https://doi.org/10.5751/ES-06167-190247>.

Odey, G.N. and Lee, W.Y. (2020), 'Evaluation of the quality characteristics of flour and pasta from fermented cassava roots', *International Journal of Food Science & Technology*, 55(2), pp. 813–822. Available at: <https://doi.org/10.1111/ijfs.14364>.

Odhambo, A. C. (2018), 'Business Models for Linking Smallholder Farmers to Markets: The Case of Banana Producers in Meru County, Kenya.' Egerton University.

OECD (2013), *Agricultural Innovation Systems: A Framework for Analysing the Role of the Government*. OECD. Available at: <https://doi.org/10.1787/9789264200593-en>.

Ofoegbu, C. and New, M. (2021), 'Collaboration Relations in Climate Information Production and Dissemination to Subsistence Farmers in Namibia', *Environmental Management*, 67(1), pp. 133–145. Available at: <https://doi.org/10.1007/s00267-020-01383-5>.

O'Kane, P., Smith, A. and Lerman, M. P. (2021), 'Building Transparency and Trustworthiness in Inductive Research Through Computer-Aided Qualitative Data Analysis Software', *Organizational Research Methods*, 24(1), pp. 104–139. Available at: <https://doi.org/10.1177/1094428119865016>.

Okoli, A. B. and Okwuosa, L. (2020), 'The role of Christianity in gender issues and development in Nigeria', *HTS Teologiese Studies / Theological Studies*, 76(4). Available at: <https://doi.org/10.4102/hts.v76i4.6007>.

Olmos-Vega, F.M. *et al.* (2023), 'A practical guide to reflexivity in qualitative research: AMEE Guide No. 149', *Medical Teacher*, 45(3), pp. 241–251. Available at: <https://doi.org/10.1080/0142159X.2022.2057287>.

Omuse, E. R. *et al.* (2024), 'The global atlas of edible insects: analysis of diversity and commonality contributing to food systems and sustainability', *Scientific Reports*, 14(1), p. 5045. Available at: <https://doi.org/10.1038/s41598-024-55603-7>.

Onomu, A.R., Taruvinga, A. and Chinyamurindi, W. T. (2023), 'Potential and Transformation of Indigenous Floral Foods in Africa: What Research Tells Over the Past Two Decades (2000–2022)', *Advances in Agriculture*. Edited by O. Merah, 2023, pp. 1–21. Available at: <https://doi.org/10.1155/2023/8877953>.

Onwuegbuzie, H. N., Mafimisebi, O. P. and Orighoyegha, E. (2024), 'Indigenous Knowledge and Entrepreneurship as a Strategy for Sustainable Development in Africa', *FIIB Business Review*, p. 23197145241288403. Available at: <https://doi.org/10.1177/23197145241288403>.

Onyalo, P. O (2019), 'Women and Agriculture in Rural Kenya: Role in Agricultural Production.', *Centre for Research and Technology Development (RESTECH-Centre), Kenya*, 4(4), pp. 1–10.

O.Nyumba, T. *et al.* (2018) 'The use of focus group discussion methodology: Insights from two decades of application in conservation', *Methods in Ecology and Evolution*. Edited by D. Geneletti, 9(1), pp. 20–32. Available at: <https://doi.org/10.1111/2041-210X.12860>.

O'Reilly, M. and Parker, N. (2013), 'Unsatisfactory Saturation': a critical exploration of the notion of saturated sample sizes in qualitative research', *Qualitative Research*, 13(2), pp. 190–197. Available at: <https://doi.org/10.1177/1468794112446106>.

Osewe Maurice, Liu Aijun, and Han Jiqing (2021), 'Variety Traits and Sustainable Food Security: The Role of Improved Cassava Varieties in Kenya', *Chemical Engineering Transactions*, 89, pp. 355–360. Available at: <https://doi.org/10.3303/CET2189060>.

Oxford English Dictionary (2015), *Oxford English Dictionary*. Oxford University Press. Available at: <https://www.oed.com/>.

Oyeinkorikiye, I., Akpotu, C. and Dickson, R. (2017), 'Ontological and Epistemological Philosophies Underlying Theory Building in Social Sciences.', *Researchjournal's Journal of Management*, 5(9).

Palacios-Lopez, A., Christiaensen, L. and Kilic, T. (2017) 'How much of the labor in African agriculture is provided by women?', *Food Policy*, 67, pp. 52–63. Available at: <https://doi.org/10.1016/j.foodpol.2016.09.017>.

Pan, Y., Smith, S. C. and Sulaiman, M. (2018), 'Agricultural Extension and Technology Adoption for Food Security: Evidence from Uganda', *American Journal of Agricultural Economics*, 100(4), pp. 1012–1031. Available at: <https://doi.org/10.1093/ajae/aay012>.

Pannell, D. J. *et al.* (2006), 'Understanding and promoting adoption of conservation practices by rural landholders', *Australian Journal of Experimental Agriculture*, 46(11), p. 1407. Available at: <https://doi.org/10.1071/EA05037>.

Parker, M. L. *et al.* (2019), 'Climate Change and Seed Systems of Roots, Tubers and Bananas: The Cases of Potato in Kenya and Sweetpotato in Mozambique', in T.S. Rosenstock, A. Nowak, and E. Girvetz (eds) *The Climate-Smart Agriculture Papers*. Cham: Springer International Publishing, pp. 99–111. Available at: https://doi.org/10.1007/978-3-319-92798-5_9.

Parmar, A., Sturm, B. and Hensel, O. (2017), 'Crops that feed the world: Production and improvement of cassava for food, feed, and industrial uses', *Food Security*, 9(5), pp. 907–927. Available at: <https://doi.org/10.1007/s12571-017-0717-8>.

Pecis, L. (2016), 'Doing and undoing gender in innovation: Femininities and masculinities in innovation processes', *Human Relations*, 69(11), pp. 2117–2140. Available at: <https://doi.org/10.1177/0018726716634445>.

Pecis, L. and Berglund, K. (2021), 'Hidden in the limelight: A feminist engagement with innovation studies', *Organization*, 28(6), pp. 993–1017. Available at: <https://doi.org/10.1177/13505084211015380>.

Pink, S. (2007), *Doing Visual Ethnography*. 1 Oliver's Yard, 55 City Road, London England EC1Y 1SP United Kingdom: SAGE Publications, Ltd. Available at: <https://doi.org/10.4135/9780857025029>.

Prahalad, C. K. and Hart, S. L. (2010), 'The fortune at the bottom of the pyramid', *Revista Eletrônica de Estratégia & Negócios*, 1(2), p. 1. Available at: <https://doi.org/10.19177/reen.v1e220081-23>.

Pratt, M. G., Sonenshein, S. and Feldman, M. S. (2022), 'Moving Beyond Templates: A Bricolage Approach to Conducting Trustworthy Qualitative Research', *Organizational Research Methods*, 25(2), pp. 211–238. Available at: <https://doi.org/10.1177/1094428120927466>.

Quisumbing, A. R. and Doss, C. R. (2021), 'Gender in agriculture and food systems', *Handbook of Agricultural Economics*. Elsevier, pp. 4481–4549. Available at: <https://doi.org/10.1016/bs.hesagr.2021.10.009>.

Rabiou, L. M. *et al.* (2024), 'Mobile outreach clinics for improving health care services accessibility in vulnerable populations of the Diffa Region in Niger: a descriptive study', *International Journal for Equity in Health*, 23(1), p. 235. Available at: <https://doi.org/10.1186/s12939-024-02322-0>.

- Raghubanshi, G., Venugopal, S. and Saini, G. K. (2021), 'Fostering inclusive social innovation in subsistence marketplaces through community-level alliances: An institutional work perspective', *Industrial Marketing Management*, 97, pp. 21–34. Available at: <https://doi.org/10.1016/j.indmarman.2021.06.009>.
- Ramani, S.V., SadreGhazi, S. and Duysters, G. (2012), 'On the diffusion of toilets as bottom of the pyramid innovation: Lessons from sanitation entrepreneurs', *Technological Forecasting and Social Change*, 79(4), pp. 676–687. Available at: <https://doi.org/10.1016/j.techfore.2011.06.007>.
- Rankoana, S. (2017), 'Subsistence Food Production Practices: An Approach to Food Security and Good Health', *International Journal of Environmental Research and Public Health*, 14(10), p. 1184. Available at: <https://doi.org/10.3390/ijerph14101184>.
- Reincke, K. *et al.* (2018), 'Key factors influencing food security of smallholder farmers in Tanzania and the role of cassava as a strategic crop', *Food Security*, 10(4), pp. 911–924. Available at: <https://doi.org/10.1007/s12571-018-0814-3>.
- Robinson, O. C. (2014), 'Sampling in Interview-Based Qualitative Research: A Theoretical and Practical Guide', *Qualitative Research in Psychology*, 11(1), pp. 25–41. Available at: <https://doi.org/10.1080/14780887.2013.801543>.
- Rogers, E. M. (1983) *Diffusion of Innovation*. New York: Free Press.
- Rogers, E. M. (2003) *Diffusion of innovations*. 5th edn. New York: Free Press.
- Rojas, M., Méndez, A. and Watkins-Fassler, K. (2023), 'The hierarchy of needs empirical examination of Maslow's theory and lessons for development', *World Development*, 165, p. 106185. Available at: <https://doi.org/10.1016/j.worlddev.2023.106185>.
- Rossetto, K.R. (2014), 'Qualitative research interviews: Assessing the therapeutic value and challenges', *Journal of Social and Personal Relationships*, 31(4), pp. 482–489. Available at: <https://doi.org/10.1177/0265407514522892>.
- Ruzzante, S., Labarta, R. and Bilton, A. (2021), 'Adoption of agricultural technology in the developing world: A meta-analysis of the empirical literature', *World Development*, 146, p. 105599. Available at: <https://doi.org/10.1016/j.worlddev.2021.105599>.
- Sætre, A.S. and Van De Ven, A. (2021), 'Generating Theory by Abduction', *Academy of Management Review*, 46(4), pp. 684–701. Available at: <https://doi.org/10.5465/amr.2019.0233>.
- Samtleben, C. and Müller, K.U. (2022), 'Care and careers: Gender (in)equality in unpaid care, housework and employment', *Research in Social Stratification and Mobility*, 77, p. 100659. Available at: <https://doi.org/10.1016/j.rssm.2021.100659>.
- Sarker, M.R. *et al.* (2021), 'A farming system typology for the adoption of new technology in Bangladesh', *Food and Energy Security*, 10(3), p. e287. Available at: <https://doi.org/10.1002/fes3.287>.
- Sarma, H. *et al.* (2020), 'Performance of volunteer community health workers in implementing home-fortification interventions in Bangladesh: A qualitative investigation',

PLOS ONE. Edited by J.K. Das, 15(4), p. e0230709. Available at: <https://doi.org/10.1371/journal.pone.0230709>.

Schnabel, L. (2016), 'Religion and Gender Equality Worldwide: A Country-Level Analysis', *Social Indicators Research*, 129(2), pp. 893–907. Available at: <https://doi.org/10.1007/s11205-015-1147-7>.

Sen Amartya (1999), *Development of freedom*. New York, Random House.

Shava, E. and Gunhidzirai, C. (2017), 'Fish farming as an innovative strategy for promoting food security in drought risk regions of Zimbabwe', *Jàmbá: Journal of Disaster Risk Studies*, 9(1). Available at: <https://doi.org/10.4102/jamba.v9i1.491>.

Shibata, R., Cardey, S. and Dorward, P. (2020), 'Gendered Intra-Household Decision-Making Dynamics in Agricultural Innovation Processes: Assets, Norms and Bargaining Power', *Journal of International Development*, 32(7), pp. 1101–1125. Available at: <https://doi.org/10.1002/jid.3497>.

Shohel, T. A., Niner, S. and Gunawardana, S. (2021), 'How the persistence of patriarchy undermines the financial empowerment of women microfinance borrowers? Evidence from a southern sub-district of Bangladesh', *PLOS ONE*. Edited by A. Hussain, 16(4), p. e0250000. Available at: <https://doi.org/10.1371/journal.pone.0250000>.

Shohel, T. A., Niner, S. and Gunawardana, S.J. (2023), 'Even Though I Get a Loan, My Husband Controls It': Rhetoric Versus Reality of Empowering Bangladeshi Women Through Microfinance Programs', *The European Journal of Development Research*, 35(4), pp. 794–819. Available at: <https://doi.org/10.1057/s41287-022-00539-9>.

Singh-Peterson, L. and Iranacolaivalu, M. (2018), 'Barriers to market for subsistence farmers in Fiji – A gendered perspective', *Journal of Rural Studies*, 60, pp. 11–20. Available at: <https://doi.org/10.1016/j.jrurstud.2018.03.001>.

Slettebø, T. (2021), 'Participant validation: Exploring a contested tool in qualitative research', *Qualitative Social Work*, 20(5), pp. 1223–1238. Available at: <https://doi.org/10.1177/1473325020968189>.

Snyder, H. (2019), 'Literature review as a research methodology: An overview and guidelines', *Journal of Business Research*, 104, pp. 333–339. Available at: <https://doi.org/10.1016/j.jbusres.2019.07.039>.

Sorescu, A. B., Chandy, R. K. and Prabhu, J. C. (2003), 'Sources and Financial Consequences of Radical Innovation: Insights from Pharmaceuticals', *Journal of Marketing*, 67(4), pp. 82–102. Available at: <https://doi.org/10.1509/jmkg.67.4.82.18687>.

Steger, T. M. (2000), 'Economic growth with subsistence consumption', *Journal of Development Economics*, 62(2), pp. 343–361. Available at: [https://doi.org/10.1016/S0304-3878\(00\)00088-2](https://doi.org/10.1016/S0304-3878(00)00088-2).

Steinfeld, L. and Holt, D. (2019), 'Toward A Theory on the Reproduction of Social Innovations in Subsistence Marketplaces', *Journal of Product Innovation Management*, 36(6), pp. 764–799. Available at: <https://doi.org/10.1111/jpim.12510>.

Stewart, R. *et al.* (2021), ‘Gendered stereotypes and norms: A systematic review of interventions designed to shift attitudes and behaviour’, *Heliyon*, 7(4), p. e06660. Available at: <https://doi.org/10.1016/j.heliyon.2021.e06660>.

Storm-Mathisen, A. (2018), ‘Visual Methods in Ethnographic Fieldwork – On Learning from Participants Through their Video-accounts’, *Forum for Development Studies*, 45(2), pp. 261–286. Available at: <https://doi.org/10.1080/08039410.2018.1450287>.

Stremersch, S. *et al.* (2023), ‘The value of context-specific studies for marketing’, *Journal of the Academy of Marketing Science*, 51(1), pp. 50–65. Available at: <https://doi.org/10.1007/s11747-022-00872-9>.

Stringer, L.C. *et al.* (2020), ‘Adaptation and development pathways for different types of farmers’, *Environmental Science & Policy*, 104, pp. 174–189. Available at: <https://doi.org/10.1016/j.envsci.2019.10.007>.

Summers, K. (2020), ‘For the greater good? Ethical reflections on interviewing the “rich” and “poor” in qualitative research’, *International Journal of Social Research Methodology*, 23(5), pp. 593–602. Available at: <https://doi.org/10.1080/13645579.2020.1766772>.

Suri, T. and Jack, W. (2016), ‘The long-run poverty and gender impacts of mobile money’, *Science*, 354(6317), pp. 1288–1292. Available at: <https://doi.org/10.1126/science.aah5309>.

Swain, J. and King, B. (2022), ‘Using Informal Conversations in Qualitative Research’, *International Journal of Qualitative Methods*, 21, p. 16094069221085056. Available at: <https://doi.org/10.1177/16094069221085056>.

Syed A. Rahim (1961), ‘The diffusion and adoption of agricultural practices: A study in a viallage in East Pakistan.’ Comilla: East Pakistan Academy of Village Development.

Teklewold, H., Adam, R.I. and Marenja, P. (2020), ‘What explains the gender differences in the adoption of multiple maize varieties? Empirical evidence from Uganda and Tanzania’, *World Development Perspectives*, 18, p. 100206. Available at: <https://doi.org/10.1016/j.wdp.2020.100206>.

Temple, B. and Young, A. (2004), ‘Qualitative Research and Translation Dilemmas’, *Qualitative Research*, 4(2), pp. 161–178. Available at: <https://doi.org/10.1177/1468794104044430>.

Thomas, D. R. (2006), ‘A General Inductive Approach for Analyzing Qualitative Evaluation Data’, *American Journal of Evaluation*, 27(2), pp. 237–246. Available at: <https://doi.org/10.1177/1098214005283748>.

Ume, C. (2023), ‘The role of improved market access for small-scale organic farming transition: Implications for food security’, *Journal of Cleaner Production*, 387, p. 135889. Available at: <https://doi.org/10.1016/j.jclepro.2023.135889>.

Ume, C., Nuppenau, E. A. and Domptail, S. E. (2022), ‘A feminist economics perspective on the agroecology-food and nutrition security nexus’, *Environmental and Sustainability Indicators*, 16, p. 100212. Available at: <https://doi.org/10.1016/j.indic.2022.100212>.

UN (1995), 'Report of the Fourth World Conference on Women: Beijing, 4-15 September 1995'. United Nations, New York.

UN (2020), 'Sustainable Development Outlook 2020: Achieving SDGs in the wake of COVID-19: Scenarios for policymakers'. Department of Economic and Social Affairs.

UN Women (2015), 'The Cost of the Gender Gap in Agricultural Productivity in Malawi, Tanzania, and Uganda.' New York, NY: UN Women.

UN Women (2021), 'Women and the Sustainable Development Goals (SDGs)'. Available at: <https://www.unwomen.org/en/news/in-focus/women-and-the-sdgs>.

United Nations (UN) (2015), 'Transforming our World: The 2030 Agenda for Sustainable Development'. United Nations (UN). Available at: <https://undocs.org/en/A/RES/70/1>.

United Nations (UN) (2025), *Advancing the implementation of the African continental free trade area: Proposing transformative strategic actions*. Ethiopia: United Nations Economic Commission for Africa.

USAID (2020), 'Gender Equality and Female Empowerment Fact Sheet'. USAID.

Van Hulst, F. J. and Posthumus, H. (2016), 'Understanding (non-) adoption of Conservation Agriculture in Kenya using the Reasoned Action Approach', *Land Use Policy*, 56, pp. 303–314. Available at: <https://doi.org/10.1016/j.landusepol.2016.03.002>.

Vandecasteele, B. and Geuens, M. (2010), 'Motivated Consumer Innovativeness: Concept, measurement, and validation', *International Journal of Research in Marketing*, 27(4), pp. 308–318. Available at: <https://doi.org/10.1016/j.ijresmar.2010.08.004>.

Venkatesh, V. *et al.* (2003), 'User Acceptance of Information Technology: Toward a Unified View', *Management Information Systems Research Center, University of Minnesota*, 27(3), pp. 425–478.

Venkatesh, V. and Davis, F. D. (2000), 'A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies', *Management Science*, 46(2), pp. 186–204. Available at: <https://doi.org/10.1287/mnsc.46.2.186.11926>.

Venugopal, S. and Chakrabarti, R. (2022), 'How Subsistence Communities Reconfigure Livelihood Systems in Response to Climate Change: A Coupled-Systems Perspective', *Journal of Macromarketing*, 42(2), pp. 292–307. Available at: <https://doi.org/10.1177/02761467211070985>.

Venugopal, S. and Viswanathan, M. (2017), 'The subsistence marketplaces approach to poverty: Implications for marketing theory', *Marketing Theory*, 17(3), pp. 341–356. Available at: <https://doi.org/10.1177/1470593117704282>.

Venugopal, S. and Viswanathan, M. (2021), 'Negotiated Agency in the Face of Consumption Constraints: A Study of Women Entrepreneurs in Subsistence Contexts', *Journal of Public Policy & Marketing*, 40(3), pp. 336–353. Available at: <https://doi.org/10.1177/0743915620953821>.

Vera, H. (2016), 'Rebuilding a Classic: *The Social Construction of Reality* at 50', *Cultural Sociology*, 10(1), pp. 3–20. Available at: <https://doi.org/10.1177/1749975515617489>.

Visser, J. and Wangu, J. (2021), 'Women's dual centrality in food security solutions: The need for a stronger gender lens in food systems' transformation', *Current Research in Environmental Sustainability*, 3, p. 100094. Available at: <https://doi.org/10.1016/j.crsust.2021.100094>.

Viswanathan, M. *et al.* (2012), 'Marketing Interactions in Subsistence Marketplaces: A Bottom-Up Approach to Designing Public Policy', *Journal of Public Policy & Marketing*, 31(2), pp. 159–177. Available at: <https://doi.org/10.1509/jppm.11.049>.

Viswanathan, M. *et al.* (2014), 'Subsistence Entrepreneurship, Value Creation, and Community Exchange Systems: A Social Capital Explanation', *Journal of Macromarketing*, 34(2), pp. 213–226. Available at: <https://doi.org/10.1177/0276146714521635>.

Viswanathan, M. (2017), 'What the subsistence marketplaces stream is really about: Beginning with micro-level understanding and being bottom-up', *Journal of Marketing Management*, 33(17–18), pp. 1570–1584. Available at: <https://doi.org/10.1080/0267257X.2017.1318940>.

Viswanathan, M. and Sreekumar, A. (2019), 'Consumers and technology in a changing world: the perspective from subsistence marketplaces', *European Journal of Marketing*, 53(6), pp. 1254–1274. Available at: <https://doi.org/10.1108/EJM-11-2017-0826>.

Von Maltitz, L. and Bahta, Y. T. (2024), 'The impact of indigenous practices to promote women's empowerment in agriculture in South Africa', *Frontiers in Public Health*, 12, p. 1393582. Available at: <https://doi.org/10.3389/fpubh.2024.1393582>.

Voola, A. and Voola, R. (2021), 'Exploring Subsistence Marketplaces Through a Feminist Perspective', *Australasian Marketing Journal*, 29(1), pp. 87–94. Available at: <https://doi.org/10.1177/1839334921998554>.

Voola, A.P. *et al.* (2018), 'Families and food: exploring food well-being in poverty', *European Journal of Marketing*, 52(12), pp. 2423–2448. Available at: <https://doi.org/10.1108/EJM-10-2017-0763>.

Wandia, E. (2024), 'Factors Affecting Socio-Economic Status of the Residents of Mbeere North; Embu County Kenya', *Journal of Public Policy & Governance*, 8(1), pp. 45–52. Available at: <https://doi.org/10.53819/81018102t4283>.

Wang, C. and Tang, J. (2020), 'Ritualized Law and Livelihood Fragility of Left-Behind Women in Rural China', *International Journal of Environmental Research and Public Health*, 17(12), p. 4323. Available at: <https://doi.org/10.3390/ijerph17124323>.

Watson, T. J. (2011), 'Ethnography, Reality, and Truth: The Vital Need for Studies of "How Things Work" in Organizations and Management: Ethnography, Reality, and Truth', *Journal of Management Studies*, 48(1), pp. 202–217. Available at: <https://doi.org/10.1111/j.1467-6486.2010.00979.x>.

WFP (2021), 'Evidence Pathways to Gender Equality and Food Systems Transformation'.

Wong, W. Y. C. (2022), 'Women Worldwide: Interplay between Church and Society and the Gender Paradox', *International Bulletin of Mission Research*, 46(1), pp. 35–43. Available at: <https://doi.org/10.1177/23969393211053436>.

World Bank (2009), *Handbook on Poverty and Inequality*. The World Bank. Available at: <https://doi.org/10.1596/978-0-8213-7613-3>.

World Bank (2022), *Poverty and Shared Prosperity 2022: Correcting Course*. The World Bank. Available at: <https://doi.org/10.1596/978-1-4648-1893-6>.

World Bank, Food and Agriculture Organization, and International Fund for Agricultural Development (2009), *Gender in Agriculture Sourcebook*. The World Bank. Available at: <https://doi.org/10.1596/978-0-8213-7587-7>.

World Bank Group (2016), *Poverty and Shared Prosperity 2016: Taking on Inequality*. Washington, DC: World Bank. Available at: <https://doi.org/10.1596/978-1-4648-0958-3>.

World Bank Group (2019), *Kenya Economic Update, April 2019, No. 19*. World Bank, Nairobi. Available at: <https://doi.org/10.1596/31515>.

Yun, C. (2020), 'Early Innovation Adoption: Effects of Performance-Based Motivation and Organizational Characteristics', *Public Performance & Management Review*, 43(4), pp. 790–817. Available at: <https://doi.org/10.1080/15309576.2019.1666725>.

Yusriadi, Y. and Cahaya, A. (2022), 'Food security systems in rural communities: A qualitative study', *Frontiers in Sustainable Food Systems*, 6, p. 987853. Available at: <https://doi.org/10.3389/fsufs.2022.987853>.

Benschop, Y. and Verloo, M. (2015), 'Feminist Organization Theories: Island of Treasure.', *The Routledge Companion to Philosophy in Organization Studies*. Routledge, Taylor & Francis Group, pp. 100–112.

Zeweld, W. *et al.* (2017), 'Smallholder farmers' behavioural intentions towards sustainable agricultural practices', *Journal of Environmental Management*, 187, pp. 71–81. Available at: <https://doi.org/10.1016/j.jenvman.2016.11.014>.

Zhang, A. J., Matous, P. and Tan, D. K. Y. (2020), 'Forget opinion leaders: the role of social network brokers in the adoption of innovative farming practices in North-western Cambodia', *International Journal of Agricultural Sustainability*, 18(4), pp. 266–284. Available at: <https://doi.org/10.1080/14735903.2020.1769808>.

APPENDICES

Appendix 1: Sample of Ethics Form

Dear Student/Staff Member, The following checklist should be completed in line with the instructions contained on the KBS Ethics Moodle page. Student Applications Once the student has completed the checklist (Sections I, II, IV, Va, Vb, Vc and VI) it should be returned to your project supervisor (Principal Investigator). The Principal Investigator (PI) must then complete sections III and VII and send an electronic copy of the completed and signed form in Word format to the KBS REAG Chair via kbsethics@kent.ac.uk. Staff Applications Please complete all sections excluding Section II and send an electronic copy of the completed and signed form in Word format to the KBS REAG Chair via kbsethics@kent.ac.uk. Data collection can begin once a letter/email of approval has been received directly from the REAG Chair. PLEASE NOTE if any questions in Section Va, Vb and Vc are answered ‘yes’, you will need to complete the full ethical review application form that can be found on the KBS Ethics Moodle page. Additionally, if any responses in Section Vb are answered ‘yes’ then in addition to a full ethical review form, the applicant must also complete a University of Kent, Data Protection Impact Assessment (DPIA) Screening Checklist questionnaire with their Principal Investigator (supervisor) and send to dataprotection@kent.ac.uk for approval prior to submitting a full Review application. If the outcome of the DPIA Screening Checklist is that a full DPIA assessment is required, please complete a University of Kent Data Protection Impact Assessment template and send to dataprotection@kent.ac.uk for approval. Unapproved DPIA forms will not be accepted. The relevant Data Protection Impact Assessment forms can be found under Stage 4 on the KBS Ethics Moodle. If the question in Section Vc is answered as ‘yes’, the supervisor/staff member must contact the University Research & Governance Officer, Tegan Coleman, T.Coleman-581@kent.ac.uk to understand if the project requires external review via the NHS. Any significant change in the question, design or conduct over the course of the research should be notified to the REAG Chair and may require a new application for ethics approval.		
Section I: Project details		
Project title:	A Gendered Perspective of Pro-poor Innovation Adoption among Subsistence Farmers in Kenya.	
Proposed data collection start date:	26/12/2023	NB: The data collection start date must be at least 10 working days from when a correctly completed form is submitted. Ethical approval cannot be granted retrospectively.
Planned data collection end date	30/12/2023	
Section II: Student details		
Student name:	Lucy Muthoni Mbwiria	

University of Kent e-mail	Lm825@kent.ac.uk			
Programme title Module:	PhD Marketing			
Module Code: (taught programmes only)	N/A			
Module Convenor:	N/A			
Student Declaration				
I am satisfied that all ethical issues have been identified and that satisfactory procedures are in place to deal with those issues in this research project. If any significant changes are made to the design of the research, I will notify the KBS REAG and understand that further review may be required before I can proceed to implement the change(s) I confirm that I will follow appropriate risk assessment procedures for projects involving fieldwork, lone working and/or data collection outside the UK. I will abide by the procedures described in this form.				
Student signature	Please Tick ☐	By ticking this box, I acknowledge I am electronically signing this application. Failure to tick this box will be considered an unsigned application and will be returned.	Date	
Section III: Principal Investigator Declaration				
Principal Investigator name:	Dr. Frida Mwititi (First Supervisor)			
Principal Investigator email:	f.g.mwititi@kent.ac.uk			
Principal Investigator signature:	Please Tick ☐	By ticking this box, I acknowledge I am electronically signing this application. Failure to tick this box will be considered an unsigned application and will be returned	Date	9/11/2023

Appendix 2: Sample of Participant Consent Form

Title of project: A Gendered Perspective of Innovation Adoption among Subsistence Farmers in Kenya		
Name of investigator: LUCY MUTHONI MBWIRIA		
Participant Identification Number for this project:		
1. I confirm I have read and understand the information sheet dated...for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. 2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason. Lucy Mbwiria -lm825@kent.ac.uk Dr. Mwiti Fredah F.G.Mwiti@kent.ac.uk Professor Ben Lowe B.Lowe@kent.ac.uk 3. I understand that my responses will be anonymised before analysis. I give permission for members of the research team to have access to my anonymised responses. 4. I agree to take part in the above research project. 5. I agree to have my interview recorded.	☐ ☐ ☐ ☐ ☐	
Name of participant	Date:	Signature:
Name of person taking consent (if different from lead researcher)	Date:	Signature:
To be signed and dated in the presence of the participant		
Lead researcher	Date:	Signature:
You are being invited to participate in a research study about your experience in adoption of climate smart value chains. The purpose of the study is to understand the intersection of consumers with technology thought out the value chain using the example of cassava production. I will be the personally conducting this study as part of my PhD which I am pursuing at University of Kent, United Kingdom. I would like to state to you that before travelling for this exercise, I sought ethical approvals from the University of Kent which is a prerequisite before any data collection involving human beings is conducted. This entailed filling out Kent Business School (KBS) Ethics Review Checklist for research with Human participants form v18. Approval was granted by the KBS Research Ethics Advisory Group (REAG) chair making it possible for me to here today. This research has been funded by the Research Training Support Grant (RTSG) through KBS, and I am grateful for their support.		

The nature of this study requires me to observe your farm activities and how you engage in acquisition and consumption of innovations throughout the value chain. The observations will take place for at most four hours each day for the next ten days. This will require me to follow you around as you undertake your daily activities. I will also take notes and take some photographs and record the proceedings with an audio recorder to enable me to remember what transpires. If, however, you are uncomfortable with me using any of these devices please do not hesitate to inform me. I may also seek to have a follow-up interview with you after the meetings, and should I need to do so, I will call you in advance to arrange for such a meeting. Such an interview will take at most one and half hours and will also be audio recorded. The audio recorder will be encrypted to protect the information you give me from any unauthorised access.

During interviews and observation sessions, all covid-19 protocols will be strictly adhered to in accordance with the government directives. Wearing of masks will be mandatory, social distancing will be enhanced, and frequent washing of hands will be required.

Further, I want to assure you that I will do my best to ensure that by participating in this study you will not be put in any risk whatsoever, and that complete anonymity will be pursued in the preparation of the final report. I may use your quotes verbatim, but I will ensure that you are not identified by name. In addition, measures will be taken to ensure that any photographs taken do not reveal your identity. Should the data be published, no personal information will be disclosed. The information you provide will be used for academic purposes and though it may not benefit you directly, the information learned in this study should provide more general benefits. There are no costs to you for participating as well, but should you incur any transport costs from the follow up meeting I am willing to reimburse you. Please note that your participation in this study is voluntary. You are free to withdraw or decline to answer any particular question you do not wish to answer for any reason. If you have any further questions about the study, please contact me or my supervisors in the UK on the numbers attached on your consent form. I would like to most sincerely thank every one of you for your participation.

Appendix 3: Participant Reimbursement Form

Research Participants Reimbursement Form

Prepared by Muthoni Mbwiria

I _____ confirm that I have received Ksh.
_____ as compensation for time away from gainful activities.

Appendix 4: Focus Group Interview Guides

General warm-up questions

1. Introduce yourself and let me know a little about yourself and your family?

- i). How long have you been a farmer? Do you farm with your wife/husband/partner?
- ii). Do you have other sources of income or just farming?
- iii) What kind of produce do you farm here?
- iv) Do you consume it all at home or sell some of it and where?

2. How do subsistence consumers interact with agricultural innovations?

- i) Have you recently acquired new ideas and practices in relation to farming?
- ii) Can you name or give me examples of some of these new products, ideas or practices?
- iii) Why do you term them as new?
- iv) What motivates you to produce or acquire these new products/ideas?
- v) In what ways do you use these new ideas and practices?
- vi) How did you learn about these new ideas?
- vii) What are the benefits and challenges faced in acquiring and using these new ideas?
- viii) Would you reuse the new product/ideas?
- ix) Would you recommend it to your neighbours? Why or why not?
- x) Have you ever rejected new agricultural ideas? Why or why not?

2. How does gender impact adoption of innovation?

- i) Describe where and how you acquire the innovations you use?
- ii) Is there a difference between you and men in terms of how you acquire or use innovations?
- iii) Tell me about these differences? Are these unique to you or do other women or men in the community experience the same?
- iv) Why do you think this is the case?
- v) What challenges do you face as a woman/man when acquiring new products and ideas?
- vi) How do you navigate these challenges to ensure you can acquire and use new ideas or products that benefit you and your family?

3. How do the contextualised cultural and social settings characterised by resource constraints influence the adoption of innovation?

- i) Tell me about your culture? How do you relate with other members of the community? In relation to your culture and social set-up, what is your role and how important is this to you and the society?
- ii) How does your culture influence how you acquire and utilise new agricultural ideas and practices?
- iii) Tell me about your assets? How do they help you acquire innovation?

Appendix 5: In-depth Interview Guides

[A] Mbeere North

1. General warm up questions

- i) What is your name and age?
- ii) How long have you been a farmer?

2. What subsistence farmers consider to be innovations

- i) Do you grow the improved cassava varieties?
- ii) Why do you consider these as a new crop in your farm?
- iii) What circumstances or situations motivated you to accept these new crops?
- iv) Explain to me how you cultivate cassava.
- v) Do you sell cassava in the market once harvested?
- vii) Do you process cassava? If yes, why? If not, why not?
 - Explain to me how this is done.
 - What other people are involved in the process?
 - How do you relate with them?
 - What do you do with the processed products?

3. Who, in your opinion, is the most influential person or group when it comes to accepting or using new products?

- i) Tell me about the role of leaders, such as chiefs, in identifying, learning, and adoption of new products.
- ii) Are there other people who are important to you in the process of learning and using new products like the improved cassava variety?

4. Can you describe to me how you receive and implement something new as a woman.

5. What challenges do you face as a woman when acquiring or implementing new products or ideas?

6. How do you navigate these challenges to ensure you can acquire and use new products?

[B] Tigania East

1. General warm up questions

- i) What is your name and age?
- ii) How long have you been a farmer?

2. How farmers interact with agricultural innovations.

i) Tell me of anything new you have bought or used in relation to farming.

ii) What circumstances or situations motivate you to buy or use the new products, ideas or practices?

iii) Are you a member of Mlango CBO?

iv) Why is it important to you?

v) Explain to me how you joined the group?

-Was it easy to join the group?

-Did you encounter any challenges joining and being in the group as a woman? What are these?

vi) How do you navigate these challenges to ensure you benefit from the group?

vi) How has the group benefitted you?

3. Who, in your opinion, is the most influential person or group when it comes to accepting or using new products?

i) Tell me about the role of leaders, such as chiefs, in identifying, learning, and adoption of new products.

ii) Are there other people who are important to you in the process of learning and using new products?

Appendix 6: Key Informant Interview Guides

1. What types of innovations are adopted by farmers in Mbeere?
2. What triggers the adoption of these innovations?
3. How do you create awareness and diffuse innovations? What is your role in this process?
4. What criteria do farmers use to evaluate innovations?
5. How do you ensure that these criteria are taken into consideration during the development or dissemination of innovations? What challenges have you encountered during this process?
6. Are there any significant differences between men and women in terms of innovation adoption?
7. If there are differences, how do you propose addressing them?

Appendix 7: Example of Interview Transcript (Mbeere North sub-county)

- Researcher:** What drives you and the people in this community to take up new agricultural ideas or practices?
- Florence:** One reason is hunger. People are motivated to embrace new ideas because they want to address the issue of drought in this area, which affects food production. We also seek to earn an income and improve our lives.
- Mumbi:** (Interjecting) That is true. Hunger is our biggest challenge, along with poverty. We take up new agricultural ideas to help produce food to feed our children.
- Researcher:** Can you give me examples of the new ideas or practices you have embraced?
- Kagendo:** For me, it is the new cassava variety.
- Researcher:** Why do you consider the new cassava varieties to be new?
- Informant:** This is because the new cassava varieties are drought- and disease-resistant, produce more roots, and are easy to grow.
- Makena:** For me, I would say it is the process of converting cassava into flour. It is a new practice that allows me to make flour from cassava roots, which I use to bake cakes that I sell in the market. The money I earn helps me feed my children.
- Muriithi:** I recently started growing *Muguka* as well. This is a new cash crop in this region, and it is doing quite well. I realised that *Muguka* can bring me money, especially when other food crops such as maize and beans fail. *Muguka* is easy to grow, as it does not require many inputs like fertilisers, so I planted it on about a quarter of my farm. This way, even if other crops fail, I will still have money to buy food for my family.
- Researcher:** What are people embrace more, new cassava varieties or *Muguka*?
- Muriithi:** I think cassava, because it is a food crop and, given the challenge of food scarcity, it is evident that more people want to ensure they have food, hoping that any surplus can be sold to generate income.
- Mumbi:** (Interjecting) Many people are opposed to *Muguka* because it is causing problems in homes.
- Researcher:** What do you mean by this?
- Mumbi:** The income generated from *Muguka* is mainly controlled by men. When they receive the money from the sale of *Muguka* twigs, they often diverted it for personal use like indulging in alcohol, leaving their families worse off if there were not enough food crops grown (*disquiet in the group*).

Appendix 8: Example of Interview Transcript (Tigania East sub-County)

Researcher: What drives you and the people in this community to take up new agricultural ideas or practices?

Mugambi: I would say the ability of new ideas or practices to help us produce food for our families. Our region is very dry, and we have been experiencing erratic rainfall. For this reason, our priority here is to put food on the table. In addition, we also hope to generate income to pay school fees for our children.

Researcher: Is this the perspective of the people in this community?

Participants: (*Unanimously*) Oh yes! That is the main reason. Food, then money.

Researcher: What are some of the ideas or practices you have recently embraced on your farm you consider new?

Maiti: Joining the *Mlango* community-based farmers group is a new practice for me.

Researcher: Why do you consider the *Mlango* farmers group to be new to you?

Maiti: It has improved the way I sell my bananas. I am happy because now I can provide for my family with the money I earn from selling my bananas.

Mugambi: Selling our bananas has been the biggest challenge in our area for years. We often encountered unscrupulous buyers who purchased our bananas at extremely low prices and disrespected us. This group has alleviated that problem for us.

Researcher: What other benefits do you gain from being a member of the *Mlango* group?

Norah: I faced difficulties in providing for my family singlehandedly after my husband fell sick because I had limited time to work on other people's farms to earn an income. However, after joining the farmers' group, I can now sell my bananas at better prices, so I do not need to work on other people's farms.

Kanana: Not having to travel long distances to purchase inputs and acquire information saves me time and money.

Mwendwa: (*Interjecting*) The fact that we no longer have to travel far for inputs is a huge relief for us. These are delivered close to our homes, which allows me to focus on other tasks and even take a rest.

Curubi: Attending the group meetings is easy because most people here know me, and we share similar experiences. I do not feel small or ignored, even though I cannot read or write. The group members help me make sense of what the extension officers are saying.

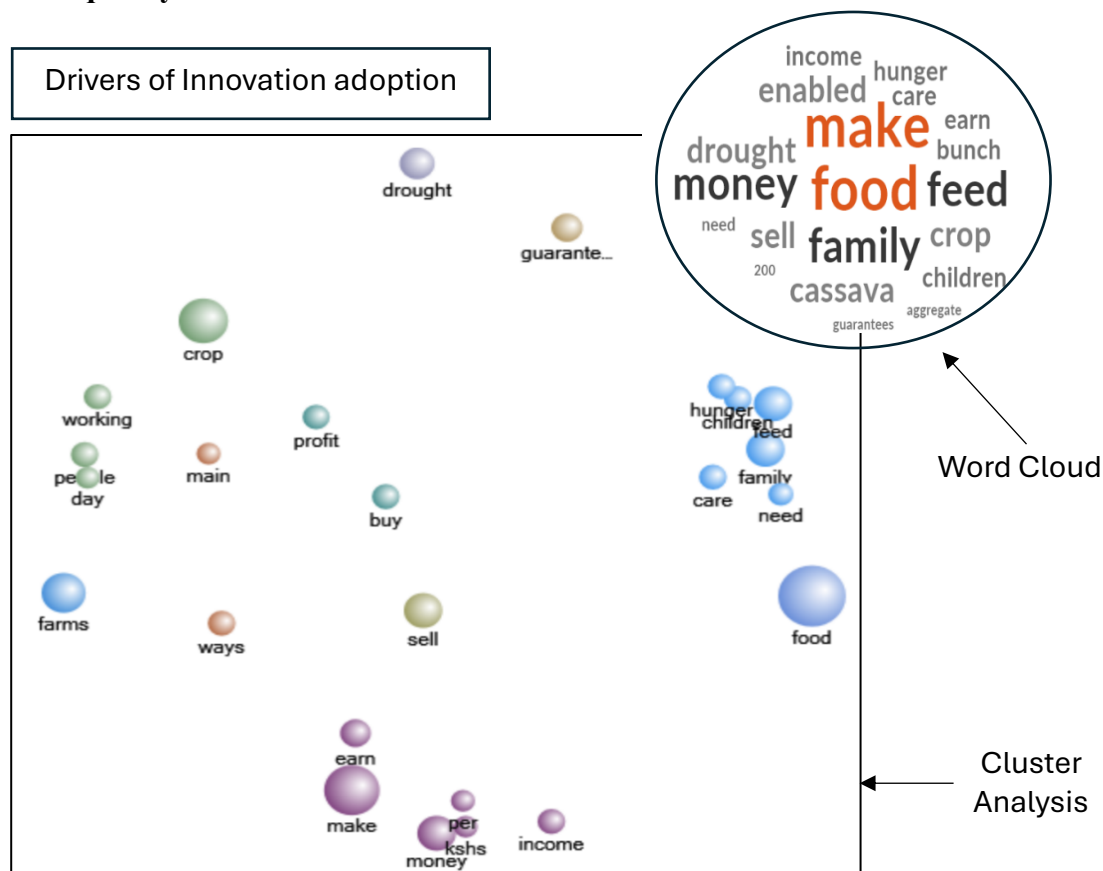
Appendix 9: Example of Analytical Codes

The screenshot displays the NVIVO software interface. On the left is a dark blue sidebar with navigation options: Quick Access, IMPORT, Data (with sub-items: Files, Literature Review, Primary Data, File Classifications, Focus Group Discussions, Key Informant Interview, Externals), ORGANIZE, Coding (with sub-items: Codes, Sentiment, Relationships, Relationship Types), Cases (with sub-items: Cases, Case Classifications, Participants demographics), and Notes. The main window has a light grey top menu bar with tabs: File, Home, Import, Create, Explore, Share, and Modules. Below the menu bar is a toolbar with icons for Clipboard, Item, Organize, Query, Visualize, Code, Autocode, Range, Uncode, Case Classification, File Classification, and Workspace. The central area is titled 'Codes' and contains a table with a search bar 'Search Project'. The table has columns: Name, Files, References, Created on, Created by, Modified on, and Modified by. The data rows are as follows:

Name	Files	References	Created on	Created by	Modified on	Modified by
Actors in adoption of new products, ideas an	0	0	18/04/2024 13:	MM	18/04/2024 16:	MM
Adoption of agriculture innovations	1	2	03/03/2024 01:	MM	03/03/2024 02:	MM
Barriers for women's adoption	1	21	03/03/2024 01:	MM	18/04/2024 13:	MM
Barriers to Agricultural innovation	1	1	03/03/2024 02:	MM	18/04/2024 13:	MM
Drivers of new adoption of new products, ide	0	0	18/04/2024 13:	MM	17/05/2024 14:	MM
Factors influencing adoption decisions	0	0	18/04/2024 12:	MM	22/05/2024 22:	MM
Gender binaries	1	2	03/03/2024 01:	MM	03/03/2024 01:	MM
How farmers learn about New innovation	2	10	19/04/2024 13:	MM	22/05/2024 18:	MM
Impact of Gender Relations of Innovation Ad	2	6	19/04/2024 13:	MM	19/04/2024 16:	MM
Mathematical Modelling	1	2	03/03/2024 01:	MM	03/03/2024 02:	MM
Process Innovation	0	0	22/05/2024 22:	MM	22/05/2024 22:	MM
Product Innovation	0	0	22/05/2024 22:	MM	22/05/2024 22:	MM
Reasons for non-adoption	1	3	03/03/2024 02:	MM	03/03/2024 02:	MM

At the bottom of the main window, it shows 'MM 67 Items'. The Windows taskbar at the very bottom shows the date as 06/02/2025 and time as 13:30.

Appendix 10: Example of Word Cloud and Cluster Analysis generated from Word Frequency Search in NVivo



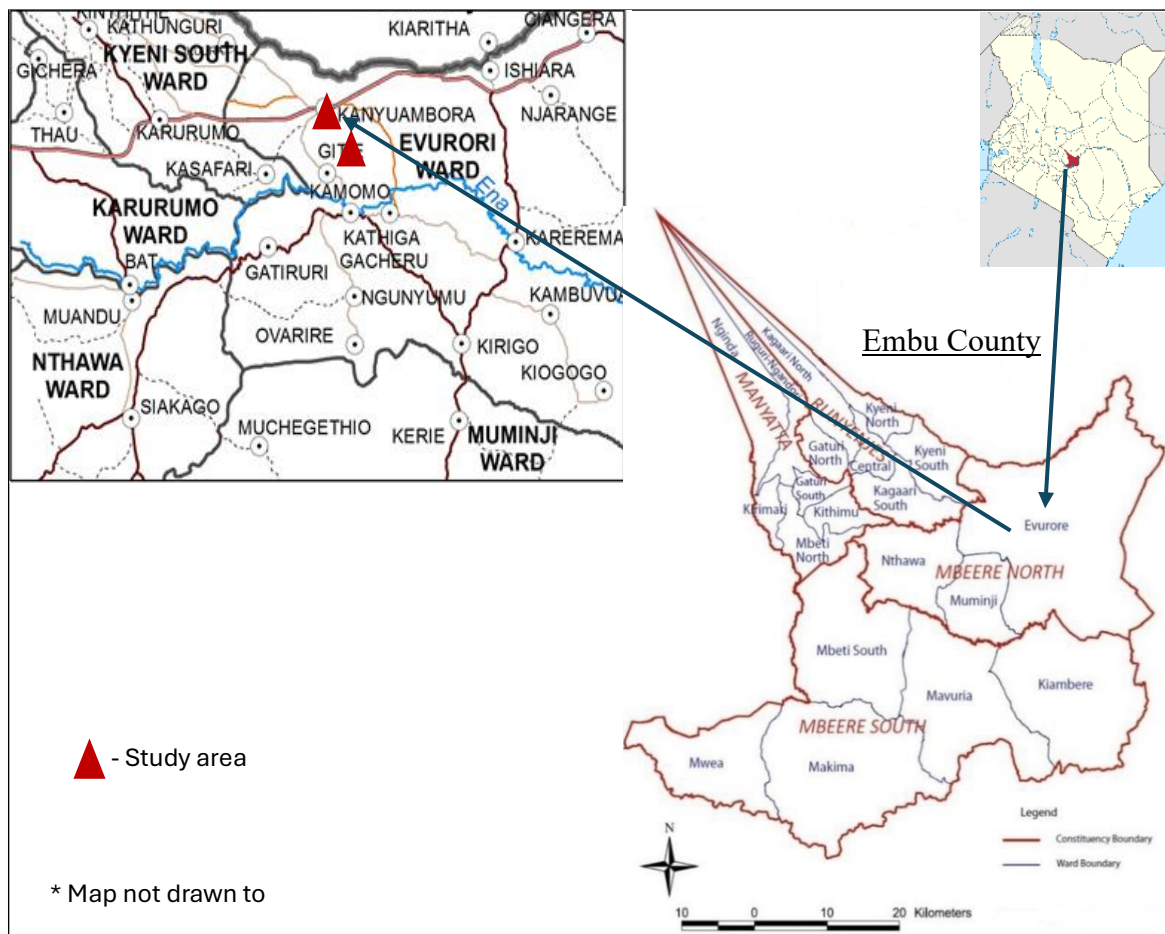
indicated
widows household thus adopters
ownership **women** education
making **decision** small
married **men** productive
zambia **assets** csa fgds sites
hhhs findings **land** owned
makers adoption husband
farming adoption primary
study female

Women's decision-making within households is viewed through the lens of their relationship with their spouses.

Adoption of cassava and the enjoyment of eating ugali made with cassava flour are notable. Main challenges, include a lack of training on processing cassava into flour and a lack of market access.

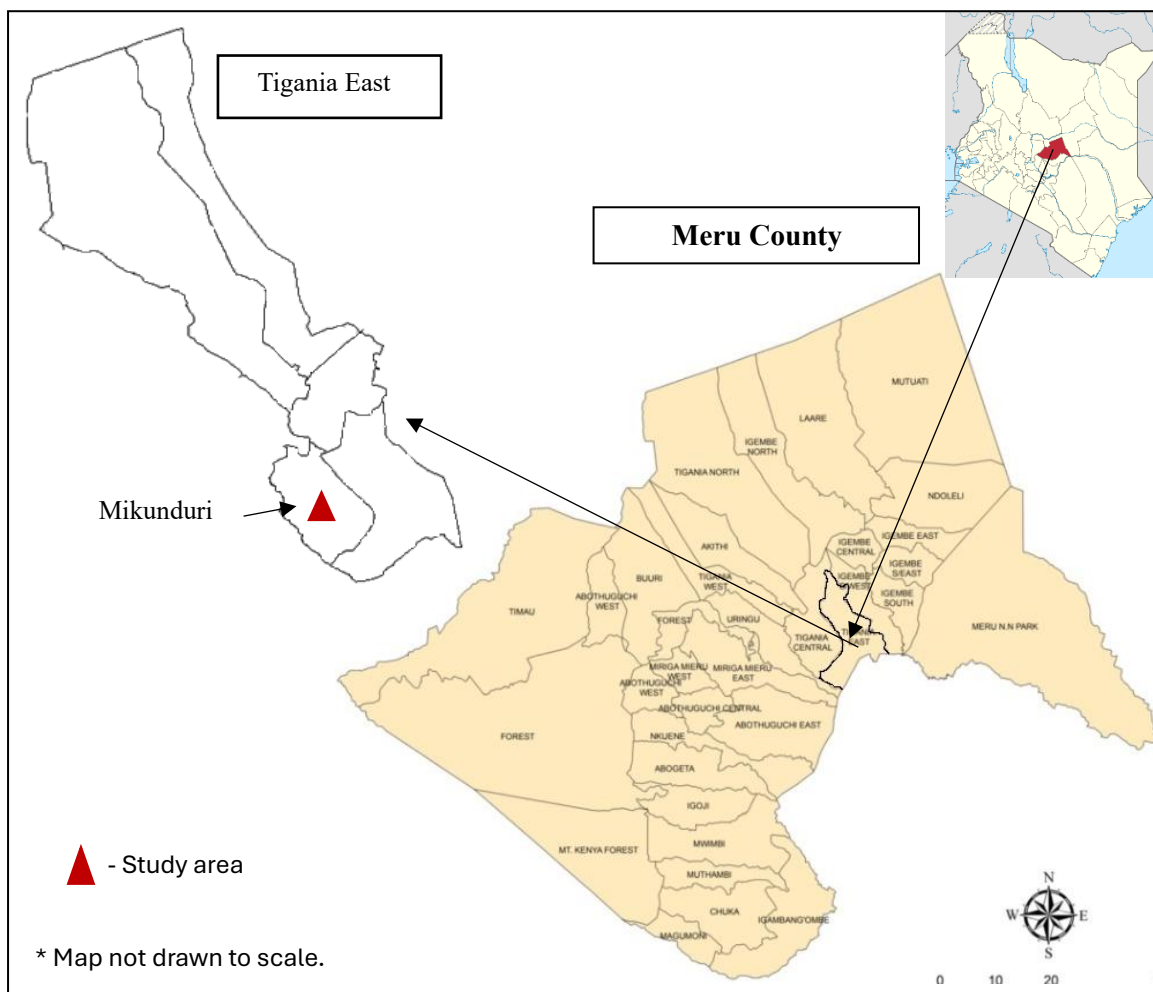
something purchase like
market eating
good ideas **make** enjoy joined
manage well **cassava** new produce
area people **work** crop money
try know **training** also benefits
yielded mother government

Appendix 11: Map of the Study Area – Mbeere North sub-County



Adopted from Embu County Integrated Development Plan 2018-2022).

Appendix 12: Map Study Area – Tigania East sub-County



Adopted from from Meru County Integrated Development Plan 2018-2022.

Appendix 13: Gioia Data Structure for Institutional Support

First-order concepts	Second-order Themes	Aggregate Dimensions
‘We get new ideas, products and information from government officials’ [Farmer]. ‘We bring information and new innovations to farmers’ [Government officials]. ‘New information about agricultural products is delivered to us by extension officials through local leaders’ [Farmer]. ‘When our church gets new ideas, we communicate these to congregants’ [Community leader]. ‘I have more access to ideas from the church than government officials’ [Female farmer]. ‘The extension officials stated that we mix cassava with flour, but we do not have the skills to process cassava into flour’ [Farmer]. ‘We are unable to provide farmers with everything they need because of a lack of resources’ [Government official].	Extension services as conduits of innovative knowledge The church, as the alternative community-based knowledge network Gaps between information provision and practical implementation	Institutional pathways for innovation diffusion
‘I attend training because I am the household head’ [Male farmer]. ‘It is my responsibility to attend meetings, not my wife’ [Male farmer]. ‘We expect farmers, particularly men, to attend because they are the decision makers’ [Government officials]. ‘I have a young child to look after... I do not have time to attend meetings’ [Female farmer].	Male authority in innovation engagement	Gendered access to innovation systems

‘When I miss extension training, my husband does not share all the information’ [Female farmer]. ‘My husband gives me bits and pieces of information’ [Female farmer]. ‘Since I am the household head, I attend extension meetings’ [Widowed female farmer].	Women's indirect and constrained access to innovation knowledge. Female headship as an avenue for direct innovation access.	Gendered access to innovation systems
‘The biggest challenge as a single parent is the lack of resources’ [Female farmer]. ‘Since I lost my husband, I struggle much more due to having fewer resources’ [Female farmer]. ‘As an unmarried woman, I get suggestive gestures that are demeaning’ [Female farmer]	Resource constraints limiting innovation uptake. Gendered social barriers and exclusion	Gendered capacities for innovation adoption
‘Women cannot act without their husband's approval’ [Female farmer]. ‘Women who access ideas from the church cannot act without their husband's approval’ [Community leader].	Male control over innovation-related decision-making	