Gendered Pathways in Bio-Based Production

Exploring Women's Sustainable Practices and Institutional Conditions in Kenya

Maja Otterstedt

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Maja Otterstedt

Supervisor:	Gwendolyn Varley, Swedish University of Agricultural Sciences, Department of Urban and Rural Development
Assistant supervisor:	Jamila Ahmed, Stockholm Environment institute Africa
Examiner:	Patrik Oskarsson, Swedish University of Agricultural Sciences, Department of Urban and Rural Development

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Swedish University of Agricultural Sciences
Faculty of Natural Resources and Agricultural Sciences
Department of Urban and Rural Development
Division of Rural Development

Abstract

This study looks at how women running bio-based enterprises in Kenya work with sustainability in practice, and why that work so rarely translates into the recognition, resources or economic mobility it deserves. Kenya's bioeconomy is gaining policy attention as a route to inclusive and sustainable development, and is described as being at a defining moment. How women actually experience and navigate this transition remains largely unexplored, especially in African contexts.

The research uses a qualitative, comparative approach drawing on 22 interviews conducted across nine counties, individual conversations with women entrepreneurs, group discussions with 53 participants, and interviews with key informants from government, research and the private sector. Women work across four bio-based clusters: value addition to primary produce and circular food systems, bio-based agricultural inputs, bio-based industrial development and sustainable bioenergy.

Three questions structure the findings: how women's environmental knowledge, built through daily work with land and resources, not through training, is recognised and supported by institutions; how gender norms shape experiences simultaneously across institutions, households and self-perception, producing coping strategies rather than structural change; and how institutional barriers around land, credit, infrastructure, markets and policy lock into each other, compounding exclusion.

The central argument, developed through feminist political ecology, Haraway's situated knowledges and Fraser's misrecognition and maldistribution, is that these are not isolated problems but a system, producing a gap between what women already know and practise and what the institutions around them are built to support. Collective organisation helps, but cannot substitute for financial instruments adapted to small-scale production, support designed around women's actual conditions, or structural shifts in who captures value in markets.

The study contributes grounded evidence to debates on gender and the bioeconomy in African contexts, and points toward what financial instruments, support programmes and market structures would need to look like to actually reach the women doing the work.

Keywords: Women's entrepreneurship, feminist political ecology, bioeconomy, Kenya, gender and institutions, situated knowledge, value chains, collective organisation, care work, sustainable production, recognition, informal economy

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Figure 1. CLD showing reinforcing relationships identified across themes in section 7. Source: Author’s own illustration, created in Boardmix 47

Abbreviations

Abbreviation	Description
ABDK	Advancing Bioeconomy Development in Kenya
AGRA	Alliance for a Green Revolution in Africa
CLD	Causal Loop Diagram
FPE	Feminist Political Ecology
GDP	Gross Domestic Product
KEBS	Kenya Bureau of Standards
SEI	Stockholm Environment Institute

1. Introduction and Background

1.1 Context and research focus

Kenya, a country of approximately 50 million people, combines modern industries with widespread small-scale farming and informal enterprise (KNBS, 2024; 2025). Agriculture is central to livelihoods and the largest contributor to export earnings (Mathenge et al, 2024), yet is increasingly constrained by climate change, soil degradation and resource depletion (FAO, 2023).

National strategies including Vision 2030 and the Green Economy Strategy and Implementation Plan have responded by placing growing emphasis on sustainable development (National Treasury and GGGI, 2023). Within this context, the bioeconomy – economic activity based on producing and using biological resources – is increasingly presented as a pathway toward sustainable and inclusive development, even as agriculture, forestry and fishing already account for over 30 percent of GDP and approximately 65 percent of export earnings (Virgin et al., 2024; SEI, 2025b).

Questions of inclusion are especially pressing in this context. Kenya continues to face persistent gender inequalities in economic participation and opportunity, while a significant share of employment comes from entrepreneurship and small businesses, particularly in the informal sector (Kagume, 2022). Women represent a substantial proportion of the agricultural and informal workforce (FAO, 2023) and are already active across all four enterprise clusters identified by the Advancing Bioeconomy Development in Kenya (ABDK) project. Yet how much women contribute is rarely reflected in what gets counted. Women in Kenya spent more than five times as many hours on unpaid domestic and care work as men in 2021, with the total economic value of this work estimated at 23.1 percent of GDP, none of which appears in formal economic systems (KNBS, 2025). Women also face a substantial and well-documented financing gap that limits their ability to grow and formalise their enterprises (AfDB, 2017). The conditions under which women participate in bio-based sectors remain similarly uneven and insufficiently understood.

This study examines women-led enterprises working with biological resources in Kenya, recognising that women enter bio-based production from varied starting points. Some practices existed long before bioeconomy became a policy concept, rooted in local livelihoods, environmental knowledge and everyday resource use. Others have developed more recently through sustainability initiatives, market opportunities or targeted support programmes. Rather than assuming a single path, this research examines how women construct enterprises around biological resources under different conditions and with different forms of support.

A qualitative, comparative multi-case approach is used to examine experiences across sectors and value chains, capturing patterns and differences. The study focuses on three interconnected dimensions: how women describe their sustainability practices; how gender norms shape entrepreneurship and leadership; and how institutional conditions create opportunities or barriers. In doing so, it generates evidence on how women already engage in bio-based production in Kenya – and what determines whether that engagement leads anywhere.

Kenya's bioeconomy has been described as being at a "defining moment," with foundations in place but a need for a more coordinated and inclusive national approach, one in which equitable participation is central (Virgin et al., 2024). Women are active participants across all four enterprise clusters identified by the ABDK project, spanning value addition to primary produce and circular food systems, bio-based agricultural inputs, bio-based industrial development and sustainable bioenergy, yet bioeconomy research focuses on technological innovation and formal policies, potentially marginalising the more localised and grounded forms of production and knowledge through which many women operate (Leach, 2015; SEI, 2025a). This raises a direct and unresolved question: whether a growing bioeconomy sector in Kenya creates genuine opportunities for women entrepreneurs, or whether these transitions reproduce existing inequalities in new forms.

1.2 Sustainability and the emergence of the bioeconomy

The global economy's dependence on intensive resource extraction and fossil fuel-based growth has generated economic growth at the cost of environmental degradation, resource depletion and unequal exposure to ecological harm (Springett and Redclift, 2015). It was partly in response to these tensions that the concept of sustainable development came, defined by the Brundtland Report as meeting present needs without compromising future generations' ability to meet their own, and crucially, asking how resources, costs and benefits are distributed (WCED, 1987).

The bioeconomy has emerged as one response to this challenge, gaining attention both in research and policy as a pathway towards more sustainable forms of production and development (Pfau et al., 2014). It is broadly understood as economic activity based on producing and using biological resources (Vivien et al., 2019). In this sense, the bioeconomy is a transformation process rather than one sector, involving production systems, technologies, value chains, markets and the people who work within them.

What counts as sustainable within the bioeconomy is contested, with ongoing debate about whether it reflects a stronger or weaker form of sustainability (Diaconașu et al., 2022). Policy documents frequently connect it to circular production systems, the Sustainable Development Goals and the African Union's Agenda 2063 (Virgin et al., 2022). Yet Scoones, Newell and Leach (2015) argue that such framings have tended toward technical fixes rather than addressing the structures that produced unsustainability.

This prioritisation of formal expertise over local knowledge is not gender-neutral. Women's labour and knowledge have frequently been central to sustainable resource management while remaining structurally underrecognised within policies (Rocheleau, 1991). Gendered inequalities in access to land, finance and formal markets may therefore shape who is able to participate in and benefit from bioeconomy development (Doss, 2013; Hackfort and Saave, 2024). These dynamics play out concretely in Kenya, where momentum around bio-based alternatives is growing alongside persistent structural barriers.

1.3 The Bioeconomy in Eastern Africa and Kenya

Kenya's 2017 ban on single-use plastics opened space for bio-based alternatives, and the Bioenergy Strategy (2020–2027) points to opportunities in cleaner cooking fuels, biomass briquettes and improved supply chains (Virgin et al., 2022). MSMEs are increasingly recognised for their role in agro-processing, circular innovation and waste valorisation. Yet persistent barriers remain: fragmented policies, weak financing and infrastructure gaps continue to limit progress, and Kenya does not currently have a unified national bioeconomy strategy, with development instead governed across sectoral policies in agriculture, energy, environment and innovation (SEI, 2025b).
Around 66 percent of women in sub-Saharan Africa work in agrifood systems, yet remain marginalised in work conditions and outcomes compared to men (FAO, 2023).

2. Literature review

This review draws on three interconnected bodies of literature to contextualise the study's focus on women-led enterprises in Kenya's emerging bioeconomy. The first examines gendered roles and constraints in agriculture and natural-resource-based sectors, establishing the structural conditions within which women work and the knowledge they develop through that work. The second reviews gender and bioeconomy research, examining how the field has approached questions of sustainability, labour, participation and leadership. The third body of literature addresses women's entrepreneurship, institutions and value chain participation, documenting the specific barriers women face in translating labour and knowledge into economic mobility. Together, these bodies of literature provide the conceptual and empirical context for understanding women's participation in the bioeconomy.

2.1 Gendered roles and constraints in agriculture and natural-resource-based sectors

Gender inequalities in agriculture and natural-resource-based sectors have long been documented, with women consistently disadvantaged in access to land, inputs, finance, technology and decision-making despite playing central roles in production systems (Doss, 2013; Agarwal, 2010).

The FAO (2011) showed that these structural inequalities affect not only women's own productivity but also wider social, economic and environmental outcomes, a pattern James (1996) identified earlier in women's limited integration into government agricultural programmes. In the Kenyan context specifically, these patterns persist across both formal and informal sectors, where regulatory and institutional support is often weak or uneven (Kagume, 2022).

Within natural resource systems specifically, there is a gap between who carries the weight of environmental work and who controls decisions about it. Agarwal (2010) shows that rural women know local forests in detail, from daily

labour such as firewood and fodder collection, but remain largely absent from formal decision-making about them. She argues this is not incidental: women's knowledge is shaped by the work they do, the assets they lack, and the institutions that exclude them. Addressing that exclusion is therefore a precondition for both equitable and effective governing of resources.

When farming becomes more commercially valuable, the same dynamic plays out in markets: women’s contributions are retained while control over revenues shifts away from them. Fischer and Qaim (2012) document this in Kenya through banana farming, where women managed daily labour and income but lost decision-making power as organised market groups raised the crop’s commercial value. Overall household income rose through commercialisation, but revenues shifted toward men while women retained the labour burden, reflecting how access to markets and producer networks is often structured in ways that favour men.

Crucially, this gap between those who do the work and those who set the rules is built into governance structures rather than being incidental to them. Nightingale (2006) shows in community forestry in Nepal that women and lower castes performed the most demanding daily resource work and held the most grounded knowledge of it, yet decision-making remained with men from higher castes. Adams, Juran and Ajibade (2018) find a parallel pattern in water governance in Malawi, where a combination of men dominating in decision-making spaces, socio-cultural norms limiting women's authority, and a low confidence in institutions among women, produced systematic exclusion. They conclude that gender inclusion must go beyond formal participation to incorporate women's voices, leadership roles and targeted representation.

Together, these studies show patterns of gendered constraint in agricultural production, resource governance and market participation. The following section examines how these patterns have been addressed within bioeconomy research.

2.2 Gender and bioeconomy research

Bioeconomy research has largely been framed around questions of technological innovation, commercialisation, resource efficiency and sustainability transitions, with gender receiving comparatively little attention. Bugge, Hansen and Klitkou (2016) capture this in their three dominant visions of the bioeconomy: biotechnology, bio-resource and bio-ecology, each oriented around technical and economic transformation rather than social relations.

As Hackfort and Saave (2024) argue, this reflects a deeper structural divide in economic thinking between productive and reproductive work. Reproductive activities such as unpaid care work, ecological restoration, subsistence labour, are treated as naturally existing rather than as work requiring time, effort and knowledge. As a result, they fall outside what the bioeconomy recognises as valuable, shaping whose labour and whose knowledge count.

Pfau et al. (2014) and Wolfram and Kienesberger (2023) both find gender and social dimensions consistently marginalised, whether in bioeconomy research or across a decade of sustainability-transition literature. Diaconasu et al. (2022) point to what fills that space instead: European bioeconomy research tends to focus on knowledge systems, innovation capacity and intellectual property, while gender

equality and women's roles receive far less attention, which helps explain why gendered participation, power and everyday sustainability practice remain comparatively underdeveloped within the field.

A smaller body of research has begun to engage gender more directly. Diaz-Chavez (2025) argues that gender equality and working conditions must be treated as central elements of sustainable bioeconomy transitions, while Roos et al. (2021) and Sanz-Hernandez et al. (2025) suggest that women's leadership can shape organisational approaches to sustainability. Palm et al. (2024), in a review of gender and circular economy research, find that women are often overrepresented in lower-status roles while men dominate leadership and expert positions. They also note that gender research in this space has been confined to consumer behaviour without examining power structures and institutional conditions.

These studies show that gender is entering bioeconomy and sustainability research, but often through broad or policy-oriented framings – instead of looking at power, institutions and everyday practice. The following sections draw on literature in women's entrepreneurship, institutions and value chain participation to build this analytical ground.

2.3 Women’s entrepreneurship, institutions and participation in value-chains

Women's entrepreneurship is often presented as important for inclusive development and innovation, yet research consistently shows that entrepreneurial opportunities are shaped by institutional conditions. Brush et al.'s gender-aware 5M framework, as discussed by Lock and Lawton Smith (2016), emphasises that women's entrepreneurship must be understood in relation not only to markets and money, but also to management, motherhood and the wider institutional environment.

In sub-Saharan Africa, women entrepreneurs face structural constraints linked to land ownership, collateral requirements, infrastructure, networks and regulation. Women often own fewer assets, have less legal recognition, face restrictions on movement and are expected to prioritise household responsibilities, all of which make it harder to register, expand or invest in a business (Ogundana, 2022; Aterido, Beck and Iacovone, 2013). In Kenya, where many enterprises operate across the formal and informal (Kagume, 2022), women are pushed into the most vulnerable segments of the informal economy, without contracts or as unpaid family contributors (Chen, 2012; Adom, 2017). This is not incidental but institutionally produced, shaped by social norms governing women's mobility and market structures that consistently favour formal actors.

Women-led enterprises in Kenya often respond by relying on savings groups, SACCOs, table banking and other community-based systems to access capital and organise production – arrangements that sit outside neat formal or informal categories (Kinyanjui, 2014; Johnson et al., 2010). Agarwal (2010) explains the logic: women tend to invest more in localised cooperation networks than men partly because they have fewer productive assets and options to exit, which makes the everyday social capital a livelihood strategy and a foundation for collective action.

Within value chains, women participate extensively in production but are concentrated in lower-value segments such as primary production and small-scale processing. More profitable roles such as aggregation, certification, management, export, are dominated by actors with greater access to capital, land and market networks (Malhotra et al., 2024; Barrientos, Dolan and Tallontire, 2003; FAO, 2011). Increased participation may raise women's income without shifting decision-making power, and in global production networks women are frequently confined to these lower-paid and labour-intensive roles, while men dominate within coordination and upgrading work.

Finance is one of the most frequently documented constraints. Women entrepreneurs across sub-Saharan Africa face significant barriers to formal credit such as limited collateral, weaker credit histories and unequal land ownership, and often rely on savings or informal sources instead (World Bank, 2019; Ogundana, 2022). The African Development Bank estimates a substantial financing gap for women-led enterprises, reflecting structural biases in financial systems (AfDB, 2017). These barriers are often compounded by unreliable infrastructure, weak transport systems, low digital access and uneven support services (Ogundana, 2022).

Access to credit alone is insufficient if the terms do not match women's realities. Namayengo et al. (2023) found that standard microfinance repayment schedules in Uganda forced women borrowers to redirect loans away from farming or sell livestock to meet deadlines, as loan terms were misaligned with agricultural income cycles. Similar mismatches between institutional design and women's actual conditions appear in research on digital entrepreneurship and entrepreneurial ecosystems, where exclusion comes from institutional inequalities rather than lack of capacity (UNCTAD, 2025; World Bank, 2019).

Taken together, this literature documents patterns of gendered constraint in entrepreneurship, informal markets and value chain participation, that are institutional rather than individual. The following section identifies where these patterns intersect with bioeconomy research and where empirical gaps remain.

2.4 Research gap and contribution

Despite growing research across agriculture, entrepreneurship and bioeconomy studies, gender remains weakly integrated into bioeconomy scholarship.

Sanz-Hernandez et al. (2022) show not only that gender is marginal in bioeconomy research, but that the field has not seriously engaged with feminist theory, including ecofeminism, intersectionality and grassroots approaches. This reflects an underlying problem in how the field conceptualises whose knowledge and labour count as contributions to the bioeconomy in the first place. Mölders (2019) connects this pattern to a tendency in dominant economic thinking to treat reproductive and subsistence labour as economically invisible, even though economic systems depend on it.

This critique also applies to how the bioeconomy is commonly framed. Hackfort and Saave (2024) show how farming systems that rely on digital tools, data and technical knowledge can delegitimise local knowledge and exclude non-expert producers from decision-making, particularly in contexts where local experience is central to these practices.

A further gap concerns geographical focus and research design. Existing gender-and-bioeconomy research is concentrated in Europe and the Global North, while qualitative studies from African contexts remain scarce (Sanz-Hernandez et al., 2022; Ramcilovic-Suominen, Kroger and Dressler, 2022). In relation to entrepreneurship research, Ojong, Simba and Dana (2021) find that studies on female entrepreneurship in Africa often reproduce similar findings across countries without sufficiently examining women's own strategies or potential for growth.

In Kenya specifically, research and policy attention have largely focused on sector performance, technological innovation and market development (Virgin et al., 2024), leaving the everyday realities of women running bio-based enterprises less visible. Hackfort et al. (2024) similarly find that the political economy of how women retain or lose control over commercialising bio-based products, such as African indigenous vegetables, is underexplored. Meanwhile, assumptions that women's lower adoption of sustainable practices reflects lack of knowledge consistently overlook the structural barriers that actually explain it (Bwalya, 2026). Practitioners promoting inclusive bioeconomy development therefore have limited evidence on how women currently organise production, what obstacles they face and what support they actually prioritise.

This study addresses these gaps by giving context-specific qualitative research on how women-led enterprises in Kenya practise sustainability and navigate the institutional and market conditions that shape their participation in the bioeconomy.

3. Research aim and research questions

The aim of this study is to examine how women-led enterprises in Kenya practise bio-based and sustainable production in their everyday work, and how gendered norms and institutional conditions shape whether that practice translates into recognition, resources and economic mobility. This is captured in the following overall research question:

How do women entrepreneurs in Kenya's bioeconomy practise sustainability and navigate their enterprises, and how do gendered norms and institutional conditions shape whether that practice translates into recognition, resources and economic mobility?

To answer this, an underlying three research questions will be answered:

1. How do women entrepreneurs describe their motivations, environmental knowledge and sustainability practices in their enterprises?
2. How do gender norms influence how women navigate entrepreneurship and leadership within these sectors?
3. What institutional conditions enable and constrain women’s participation in bio-based value chains?

Together, these questions treat women-led enterprises not just as participants in an emerging policy category, but as actors navigating the gap between the

knowledge and sustainability practice they bring and the recognition and economic mobility they are able to access.

4. Theoretical Framework

This study is grounded in feminist political ecology (FPE), examining how gender, power and environmental relations are produced together through everyday labour, resource use and institutional arrangements. Building on the foundational work of Rocheleau, Thomas-Slayter and Wangari (1996) and Elmhirst (2011), FPE provides the primary analytical lens through which this study examines how women in Kenya's bioeconomy practise sustainability and navigate the conditions shaping their enterprises.

Within this framework, the analysis focuses on three interconnected concepts: institutions, both the formal structures of finance, regulation and markets, and the informal norms that shape how women are treated within them; agency and recognition, meaning what women are actually able to do within those conditions, and whether their knowledge and work are recognised and valued; and care, meaning how unpaid domestic responsibilities shape the time and resources available for enterprise and economic mobility.

Together, these concepts allow the study to hold two things simultaneously: the structural constraints that limit women's participation, and the knowledge, strategies and agency that women bring to their work despite those constraints. The framework is therefore not only a lens for analysing constraints, but a tool for taking women's work serious, and asking why it receives little recognition and few resources.

4.1 Feminist Political Ecology (FPE)

Feminist political ecology emerged as a field concerned with bringing gender into political ecology's analysis of power relations and natural resources – specifically, how gender shapes environmental knowledge, resource access and participation in decisions about resource use (Rocheleau, Thomas-Slayter and Wangari, 1996).

Elmhirst (2011) revisits this framework through three connected themes: gendered environmental knowledges, rights and responsibilities, and politics, arguing that gender must be examined alongside race, class, ethnicity, caste and cultural context, as these conditions together shape how people pursue livelihoods, access resources and experience environmental change. More recently, Agostino et al. (2023) show how FPE has drawn on ecofeminism, postcolonial and decolonial theory, and feminist science studies to move beyond resource access toward broader concerns with colonialism, care, justice and knowledge production. For this study, this trajectory matters because it positions FPE as a framework for examining not only who can access bio-based resources, but whose knowledge and practices are recognised within sustainability transitions.

Gender, as used here, refers not to biological difference but to the socially constructed roles, expectations and hierarchies that shape how women and men

are positioned in society, affecting access to land, labour, resources, authority and economic opportunity (Detraz, 2017). These relations are part of wider power structures that determine whose work is seen, valued and rewarded. This is particularly important in sustainability transitions, which are often assumed to be neutral: Scoones, Newell and Leach (2015) argue that green transformations consist of competing pathways shaped by power, institutions and knowledge, meaning transitions may privilege some actors and forms of expertise while marginalising others.

A central but often overlooked dimension of FPE concerns how women develop environmental knowledge through daily labour. Rocheleau (1991) showed how women in Machakos District, Kenya, developed expertise about their local environments through everyday responsibilities rather than formal training, yet agricultural institutions consistently failed to recognise this, designing projects without consulting women and delivering extension services that overlooked their priorities. This was not a knowledge gap on women's part but a recognition gap within institutions. Because women and men collect different resources in different places and at different times, women's environmental knowledge is not simply an overlooked version of men's but a distinct form of expertise in its own right (Nightingale, 2006).

This recognition gap has epistemological dimensions. Haraway (1988) argues that decisions about whose knowledge counts as legitimate are political rather than neutral, introducing situated knowledge to reframe partiality not as a limitation but as what makes knowledge more accountable and reliable. Applied here, women's local and experiential observations constitute a form of expertise that deserves recognition on its own terms, with direct implications for how bioeconomy research and policy treat women's environmental knowledge.

FPE also critically looks at how development and sustainability programmes operate in practice. Even apparently inclusive programmes can reproduce inequality if underlying power relations remain unchanged. Women may be incorporated as environmental actors while remaining excluded from resources, decision-making and the concrete benefits of their work (Agostino et al., 2023). Nightingale (2006) argues that gender and environment are co-produced, where social relationships shape environmental conditions, and environmental practices in turn shape how gender relations are formed and experienced. For a study of women's participation in bio-based production, where resource use, environmental knowledge and gendered labour are inseparable, this co-production framing is the analytical starting point.

This is visible in how sustainability discourse positions women. Arora-Jonsson (2011) identifies a double positioning: women are framed simultaneously as victims of environmental harm and as naturally more conservation-oriented, yet remain excluded from resources and decision-making, what she calls the feminisation of responsibility, where policy increases women's environmental duties without providing corresponding resources or addressing the underlying power relations.

Following Elmhirst (2011) and Mollett and Faria (2013), this study treats gender relations as shaped by geographic, historical and social location, recognising that the conditions women face are context-specific and not interchangeable across communities.

As the enterprises at the centre of this research are organised around biological resource use, environmental knowledge and gendered labour, FPE provides the analytical lens for capturing dimensions that entrepreneurship frameworks alone cannot reach. It situates women-led enterprises within the wider social and institutional relations that shape their opportunities and constraints, and responds to calls within the bioeconomy literature for feminist approaches that foreground power rather than treating gender as a descriptive variable (Sanz-Hernandez et al., 2022).

4.2 Institutions through an FPE lens

FPE is concerned with how institutions shape women's access to resources, recognition and decision-making in environmental and production systems. North (1990) defines institutions as the formal and informal rules that structure human interaction, a distinction Helmke and Levitsky (2004) develop further: formal institutions are codified in laws and official rules, while informal institutions are unwritten norms and shared expectations that shape behaviour without legal enforcement. From a feminist perspective, institutions do not simply enforce rules. They embed and reproduce gendered hierarchies even when equality is an explicit policy goal (Waylen, 2014).

In the context of the bioeconomy, access to land, finance, regulation, support programmes and markets is therefore shaped not only by official policy but also by social norms, gendered expectations and unequal recognition, a dynamic particularly important in Kenya, where many enterprises operate across both formal and informal systems (Kagume, 2022).

Torre (2021) shows that gender increasingly appears in institutional language but rarely changes practice, reduced to indicators and reporting rather than a questioning of power relations. Brodkin (2012) adds that even well-designed policies rarely reach people as intended: when implementation is unclear, frontline workers fill the gaps through their own judgement, producing a systematic distance between policy intention and what people actually receive. Together, these accounts help explain why the gap between policy and practice in this study reflects how institutions are structured rather than being incidental.

4.3 Agency, recognition and care through an FPE lens

FPE and the institutional perspective explain the structural conditions women face. Understanding how women navigate those conditions requires attention to agency, recognition and care as developed within feminist scholarship: what women are actually able to do, whether their knowledge and work are valued, and how care responsibilities shape their capacity to act.

Leach (1992) argues that when women's environmental roles are recognised at all, they tend to be framed as a natural response to resource decline rather than as expertise, increasing responsibilities without delivering corresponding resources or recognition. Since these roles are socially produced rather than natural, they are shaped by power relations that determine who carries responsibilities, who holds knowledge and who has the right to make decisions.

Kabeer (1999) defines agency as both action and the meaning, motivation and purpose behind it, what she calls the power within. Agency can take many forms: negotiating, resisting, manipulating or simply reflecting on one's situation. Crucially, resources, agency and achievements cannot be assessed separately. Access to a resource only matters if a person has the agency to use it, and agency only counts if it connects to choices that genuinely matter. Cornwall (2016) extends this, arguing that lasting change requires working at both individual and structural levels simultaneously, supporting women's collective organisation while tackling the norms and institutional conditions that determine what their agency can actually produce.

Understanding why women's sustainability practices are inseparable from their livelihood strategies requires a further conceptual move. Bebbington's (1999) framework understands rural livelihoods through combinations of capital, natural, human, social, produced and financial, that people draw on to build viable lives. These capitals are interdependent: deficits in financial or physical capital directly limit how far environmental knowledge or social networks can sustain livelihoods. With fewer productive assets and limited exit options, women invest heavily in social capital through collective cooperation, a livelihood strategy and foundation for action that formal institutions rarely recognise as economically significant (Agarwal, 2010). Without access to assets, knowledge and motivation alone cannot translate into sustainable livelihoods.

These material constraints are compounded by how women's work and knowledge are valued. Fraser (1995) identifies two distinct forms of injustice: socioeconomic, rooted in unequal distribution of resources; and cultural, arising from misrepresentation, nonrecognition or disrespect by formal institutions. These are not separate: when activities are coded as feminine, this is embedded in labour markets that suppress women's wages, and when groups are delegitimised, their access to resources and benefits is cut off. Misrecognition is therefore institutionalised, shaping people's ability to participate as full members of society.

Care work is a further structural dimension. Hackfort and Saave (2024) show how reproductive and care activities are treated as naturally existing rather than as labour requiring time and knowledge, leaving them outside what bioeconomy frameworks recognise as economically important. In most low- and middle-income countries, formal care services are limited, meaning care falls largely on women within the household and constrains the time and energy available for economic activity (Razavi, 2007). Agostino et al. (2023) connect this directly to participation: care responsibilities place an invisible constraint on women's capacity to engage even when they are formally included as environmental actors.

Together, these frameworks refuse to explain women's position through individual deficits. Instead, they examine the institutional and normative conditions that determine whose contributions are recognised, whose access to resources is enabled, and whose economic mobility the bioeconomy ultimately supports, which is the central problem the empirical chapters examine.

5. Methodology

5.1 Research design

This study uses a comparative, multi-case qualitative approach to explore the experiences of women-led enterprises across different parts of Kenya's bioeconomy. Cases were selected across different sectors and counties to capture variation in women's opportunities rather than depth within a single enterprise type, and include participants from two positions: individual women entrepreneurs running established businesses, and women participating as members of collective groups – farming, weaving or processing within bioeconomy value chains. Both are included because they hold different positions within the same systems, and together they reveal how gendered conditions operate across the bioeconomy rather than in one corner of it. Their experiences are treated as complementary rather than equivalent.

The design combines semi-structured interviews, group discussions, key informant interviews and field observations, capturing how women describe and make decisions about their enterprises, the everyday practices through which sustainability is organised, and how gendered institutional conditions are experienced and negotiated across different subsectors and contexts.

What women say about their enterprises, practices and constraints is treated as situated and meaningful knowledge, consistent with the constructionist, interpretivist position and Haraway's (1988) concept of situated knowledge introduced in the theoretical framework. Key concepts used throughout the study, including gender, bioeconomy, sustainability and women-led enterprise, are defined in Appendix 3.

5.2 Case selection

Cases were selected in collaboration with SEI Africa using purposive sampling, with participants selected for their relevance to bio-based enterprise activities (Palys, 2008). Initial contact was made through the ABDK project database, which included enterprises with a woman listed as leader, or a woman and man jointly, with the woman as the primary figure.

During the first weeks of fieldwork, I used snowball sampling to expand the dataset (Morgan, 2008). Through the entrepreneurs, I was referred to women's groups they worked with and to other entrepreneurs they thought might be interested in participating. Because referrals came through existing contacts, recommended participants were generally already open to being interviewed. The study covers enterprises across the four ABDK clusters, capturing variation in production types, formalisation levels and market relationships.

In some cases, enterprises were jointly owned or managed with a spouse. These were included where women held an active and recognised leadership role in daily operations and decision-making, and where both the woman and her spouse recognised her as the initiator and leader of the enterprise. This is acknowledged as a limitation of the study.

5.3 Data collection

Data was collected across nine counties and sub-locations in Kenya: Nairobi, Kiambu, Murang'a, Kirinyaga, Makueni, Kilifi, Laikipia, Meru and Tharaka-Nithi. This geographical spread includes coastal, highland, peri-urban and semi-arid settings, enabling comparison of how women's experiences differ across ecological and institutional contexts.

Semi-structured interviews were conducted with women entrepreneurs, women farmers and group members. These interviews gathered information on sustainability practices, value addition, financial access, market relations, environmental knowledge and support needs. Participants included women running enterprises in agroecological production, circular and waste-based processing, bioenergy and ecosystem-based production. Interviews were typically between 60 and 120 minutes long and were audio-recorded with participants' consent. In-person interviews were preferred wherever possible, while a small number were conducted online, primarily with entrepreneurs and key informants based in Nairobi who had limited availability.

Most interviews were conducted in English, which is widely spoken in Kenya. However, a number were held in local languages, for which a local translator was present. In these cases, questions were asked in English, translated into the local language, and responses translated back into English. As translation carries the risk that meanings and nuances are lost or changed, the translator was treated as an active contributor to the process. Where possible, translated transcripts were reviewed with the translator to clarify interpretation (Temple and Young, 2004). Where participants had limited literacy, this was not possible, and the study relied on the translator's attentiveness during the interview itself. This is acknowledged as a limitation.

Group discussions were conducted with women working collectively as producers within bio-based value chains, including women's groups, cooperatives and community-based organisations. These discussions explored everyday work, production routines, division of labour, shared understandings of sustainability and the challenges of collective organisation. They were particularly valuable for capturing patterns that individual interviews could not reach, including how decisions are made collectively, how responsibilities are distributed within groups and how members experience institutional support and exclusion.

Key informant interviews were conducted with representatives from government, research institutions, regional innovation programmes, NGOs, industry associations and national regulatory and policy bodies. These provided a broader institutional and policy perspective on the conditions shaping women-led enterprises and helped contextualise the patterns described by entrepreneurs and groups. Their accounts were used to support or add context to enterprise-level findings, and were therefore treated as supporting sources rather than as the main focus of analysis.

Field observations accompanied in-person interviews and group discussions, documenting production environments, tools, technologies, workflows, physical conditions and interactions between participants. Observations helped contextualise interview findings and capture practices, such as manual processing

methods, workspace constraints or circular resource use, that participants did not always describe explicitly in conversation.

Additional documents were used where available and relevant, such as national policy documents related to the bioeconomy, gender and enterprise support, providing background context for the institutional conditions described by participants.

In total, the study draws on 22 interviews: 11 individual interviews with women entrepreneurs, 6 group discussions involving 53 participants, and 5 key informant interviews. The sample spans four bioeconomy clusters identified in the ABDK framework: value addition to primary produce, bio-based agricultural inputs, bio-based industrial development, and sustainable bioenergy. Statements were compared within and across sources, with variations and contradictions treated as reflecting different positions rather than inaccuracies.

5.4 Data analysis and coding approach

This study combines deductive and inductive approaches to analysis. The research questions and theoretical framework gave an initial direction, while themes also took shape through engagement with participants' descriptions and experiences (Saldaña, 2011, pp. 84-86). Analytical notes were kept throughout the coding process to track emerging ideas, connections and patterns across the data, a practice referred to as memoing (Benaquisto, 2008).

All interviews and group discussions were transcribed and organised into structured tables of analysis. Each table includes (1) verbatim quotes from the transcripts, (2) the name of the interviewee or group, and (3) one to three descriptive codes assigned to each quote (Saldaña, 2011). This structure maintained a clear link between the raw data, codes and the themes that developed throughout the analysis. An example of the coding table will be provided in Appendix 2.

The interview guide was initially structured around five thematic areas: environmental motivations, gender roles, institutional conditions, value chain position and entrepreneurs' own experiences. These were broader than the three research questions, designed to capture different dimensions of women's experiences while keeping interviews open and conversational. They served as entry points for coding, with more specific patterns developing through engagement with the material.

Following Braun and Clarke (2006), the coding process was conducted in several stages. First, an initial round of open coding was carried out across the interview material. Each quote was read closely and assigned one to three short descriptive codes capturing key ideas expressed by participants. Codes were generated inductively from the data while also guided deductively by the research questions to ensure key dimensions were consistently captured across cases (Braun and Clarke, 2006, p. 83).

Second, codes were reviewed and refined across interviews. Similar codes were merged, clarified or split where necessary to ensure consistency across the dataset (Braun and Clarke, 2006).

Third, the coding process resulted in a set of themes organised under the three research questions, developed by comparing patterns across interviews, group discussions and field contexts. Table 1 provides an overview of the final thematic structure.

Fourth, representative quotes were selected for each theme based on their clarity, relevance and ability to illustrate patterns observed across multiple interviews and group discussions. Quotes were selected when they illustrated a recurring pattern, a contrasting experience or an important exception, with an effort made to preserve participants' original wording and maintain a clear link to the interviewee or group from which they came.

Throughout, the analysis maintains a comparative approach, identifying shared patterns and variation across enterprise types, subsectors, organisational forms and geographic contexts (Mills, 2008), and examining how gendered institutional structures shape opportunities, constraints and decision-making across scales, from everyday production practices and household responsibilities to wider market structures, regulatory frameworks and political-economic conditions (Elmhirst, 2011).

5.5 Overview of themes organised by research question

Table 1. Theme overview.

Research Question	Themes
RQ1: Sustainability practices and environmental knowledge	Sustainability meanings and environmental values; motivations relating to values, health and livelihood; environmental knowledge and sustainability practices; structural limits on sustainable practice
RQ2: Gendered experiences of entrepreneurship and leadership	Gendered institutions and leadership norms; gendered labour, domestic roles and household dynamics; gendered financial dynamics and risk perceptions; gendered strategies and negotiation; recognition and collective organisation
RQ3: Institutional conditions shaping participation in bio-based value chains	Finance and capital constraints; infrastructure and resource constraints; markets and value chain dynamics; institutional support, knowledge systems and the regulatory and policy environment

5.6 Scope and delimitations

The study focuses on women-led enterprises within selected subsectors of Kenya's bioeconomy, covering both formal and informal enterprise contexts but without aiming to provide a complete mapping.

Geographically, the research is limited to counties where access was feasible due to safety and time constraints. The study does not seek to measure environmental impact or economic performance quantitatively, and findings are

intended to provide analytically rich and context-specific insights rather than statistically representative results.

As the dataset spans individual entrepreneurs and collective group members who differ in socioeconomic starting point, findings are treated with care when drawing conclusions about women in Kenya's bioeconomy as a whole. The barriers and strategies described operate differently depending on which position women occupy, and this variation is acknowledged.

5.7 Ethics and positionality

The study follows the ethical principles of qualitative research as established by the home institution. Research clearance has been obtained through the Kenya National Commission for Science, Technology and Innovation (NACOSTI). Participants received clear information about the purpose of the study, how the data would be used, and their right to decline or withdraw at any time. No directly identifying sensitive personal data was collected, and care was taken when discussing potentially sensitive topics such as income, household roles and institutional barriers.

Beyond formal ethical approval, ethical practice in qualitative research continues throughout the research process (Saldaña, 2011, pp. 28-29). During fieldwork, unexpected situations and the personal nature of participants' accounts sometimes raised considerations that could not be fully anticipated in advance. I therefore stayed attentive during interviews, adjusting the conversation where needed to avoid causing discomfort or distress.

Reflexivity and positionality are central to this study (Dodgson, 2019). As a white European researcher working with Kenyan women, my positionality as an outsider shaped the research in ways that require explicit acknowledgement. To attend to this, I maintained ongoing reflexivity throughout fieldwork and analysis, remaining aware that my positionality and theoretical framework may have shaped what I saw in the data and how I made sense of it. The study sought to minimise extractive practices through transparency, sensitivity to participants' time and contexts, and accessible sharing of findings with participating enterprises after the research.

6. Results

The findings are organised around the study's three research questions: sustainability motivations and environmental knowledge, gender norms and entrepreneurship, and the institutional conditions shaping participation in bio-based value chains.

6.1 RQ1 Sustainability motivations

I identified four main themes emerging from the data. Women's views on sustainability, their motivations, and the environmental knowledge they use in practice develop together through their everyday work. Together, the four themes show that women's sustainable practices are grounded in real knowledge and

motivation, but that this practice does not consistently translate into resources or economic mobility because the material conditions needed to act on that knowledge are often absent.

6.1.1 Sustainability as a whole-system and mutually beneficial, integrating economic, social and environmental aspects

When asked what sustainability meant to them, women across the dataset did not describe it through policy language or sustainability buzzwords. Instead, they described it through the practical conditions that make their life, business and care for the environment possible over time. For several entrepreneurs, sustainability was a matter of keeping their enterprises running, about the life of their communities and the generations coming after them.

A herbs and oils entrepreneur (urban Kenya) put this in a simple way: "If you start today, you're able to keep it going tomorrow and the day after and for years to come." For a honey processing entrepreneur (urban Kenya) sustainability meant: "Having what the business needs to keep running like raw materials, workers, profitability, both now and into the future." In these examples, sustainability was described from the daily reality of keeping a business alive. It was not framed as a separate environmental goal, but through what is needed for the business to continue operating.

Other women described sustainability in more explicit relation to people and the environment. For example, a circular economy entrepreneur (urban Kenya) connected her understanding directly to the planet and future generations: "When I hear sustainability, I think of using what is available without harming the planet, and considering the generation that comes after me – will they find that I helped destroy the earth or helped people reverse and take care of it?" A food processing entrepreneur (central Kenya) described sustainability in terms of national food security, for example by "using drought-tolerant, local crops like cassava to make our country food secure, so we're not waiting for relief food, while at the same time providing preventative nutrition that reduces lifestyle diseases."

While these answers may appear different, they do not point to separate understandings of sustainability. Rather, they reflect different ways of describing the same underlying concern: how to sustain both the enterprise and the conditions it depends on. For some women, this is expressed through the immediate need to keep the business running. For others, it is described in relation to environmental care, food security and future generations.

6.1.2 Values, health and livelihood as the overlapping motivations for women's engagement

While Theme 1 showed how women understand sustainability, this theme focuses on what motivates them to engage in bio-based and sustainable production. Across the interviews, three connected motivations appeared repeatedly: personal values around organic production, concern for personal health, and the need to earn a living. These motivations usually worked together rather than separately.

For some entrepreneurs, organic production was something that reflected values they already held before starting their businesses. A moringa entrepreneur

(urban Kenya) described avoiding pesticides as a basic principle, explaining that food should be "grown without any pesticides or herbicides so that it can actually function the way it should in your body." An agro-processing entrepreneur (Makueni) said she wanted to work "organically and sustainably" from the beginning and gradually built her agricultural knowledge over time. For a biochar entrepreneur (coastal Kenya), the motivation came from observing environmental change directly: "I saw the weather… started to change, and I came to realise it because of deforestation. So I used to ask myself, what can I do to change… maybe somewhere else, where maybe other ladies can follow."

Health ran through both the entrepreneur and group interviews as a second, strong thread. A biofertiliser entrepreneur (central Kenya) linked farming without using chemicals to improved human health, explaining that "when you eat healthy crops, even you are born healthy. When you eat food which has no chemicals, you reduce diseases." The moringa farmers (eastern Kenya, group 1) described health benefits as central to how they promote the crop, especially because the "older people are improving their health… they are seeing a big difference." A skincare entrepreneur (peri-urban Kenya) framed this health motivation as a way to protect her customers: "our line targets health conscious customers… our line comes to promote their health… that's why we use natural skincare products that are also healing, nourishing on the skin."

Alongside these value-based motivations came economic necessity. A circular economy entrepreneur (urban Kenya) described it as wanting to turn waste into something useful, at the same time as: "That is what I use to pay my house rent. That is what I use to pay school fees for my son."

Across the interviews, motivations were rarely separate forces that simply happened to coincide. In several cases, one motivation was the entry point into bio-based production, while others developed through the work itself. The biofertiliser entrepreneur (central Kenya) began from a livelihood problem of her mother's shrinking yields and rising fertiliser costs, but the solution she developed also addressed soil health and chemical exposure. The coconut farmers group (coastal Kenya) started their business as a practical response to waiting for komaza trees to mature, but this later developed into a system where nothing was wasted and where making an income and using resources carefully became part of the same process. A moringa entrepreneur (urban Kenya) began her enterprise after discovering that moringa helped stimulate milk production while breastfeeding her child. Over time, this developed into a business that included teaching farmers how to grow moringa while also building regenerative agricultural systems designed to reduce waste.

In these cases, motivations became increasingly interconnected through everyday work and production.

6.1.3 Women build environmental knowledge through nature interactions and daily labour

Women described their local environments in concrete ways, for example by explaining how soils changed with different inputs, how rainfall had become less predictable, where water was available, and how crops, trees and animals responded to these conditions. This knowledge came from their daily work with

land and resources, rather than formal training, and was used to make decisions about how to farm, process products and manage resources.

Climate change was one of the most common areas of observation among respondents. An agro-processing entrepreneur (semi-arid Kenya) described having seen clear changes in rainfall over time, and explained how flooding two years earlier disrupted her vegetable production cycle in ways she had not yet recovered from. The women artisans (eastern Kenya) also noted that maize no longer grows well in their area because conditions have become too dry.

Women understood what makes a healthy soil. The biofertiliser farmers (central Kenya) explained how they observed how chemical fertiliser makes the soil acidic and toxic over time, which led them to shift toward biofertilisers: "They keep the plants healthier and needing less water, and we've seen this across all the crops we've tried." They also tested the results: "We planted two kgs of beans and collected 55 kgs… people saw the difference and went to tell others; now even rice farmers are coming to buy." One farmer explained that organic fertiliser remains in the soil for longer, improves the quality of the soil and reduces the need for pesticides, which lowers both labour and costs.

Knowing how ecosystems work and are interconnected shaped women's production decisions. The Mangrove honey women's group (coastal Kenya) understood the connection between mangroves, bees and honey production: "The bees are relying on the mangrove forest… mangrove forest always having flowers." This led them to restore mangroves through seedling collection, nurseries, collective planting and monthly beach clean-ups to reduce ocean pollution. The moringa farmers (eastern Kenya, group 1) also described observing the changes from planting trees in the area: "The temperature in the valley is cooler now because of tree planting. It has created a natural cooling effect." A honey processing entrepreneur (urban Kenya) described how she made a conscious decision to combine beekeeping and tree planting within her enterprise because trees support bees while also helping regulate temperature.

This environmental knowledge directly shaped how women organised their production. The circular and waste-reducing practices described across the interviews were not designed from the outside, but built from what women understood about their local resources and how they connected. An agro-processing entrepreneur (semi-arid Kenya) described a system on her farm where farm waste feeds into a biodigester for cooking with biogas, solar energy is used to power irrigation, and avocado peels and beeswax are turned into briquettes and fire starters. A moringa farmer in Kanyambora described making biofertilisers from organic fruit waste and biogas from a fish pond system. A coconut farmers' group (coastal Kenya) described using all parts of the coconut, including flesh, oil, milk and leftover materials to feed livestock. A skincare entrepreneur (peri-urban Kenya) used papaya seeds left over from jam processing to produce papaya seed oil. A biochar entrepreneur (coastal Kenya) built her enterprise around coconut shells that were common along the coast but often discarded. The respondents also adjusted their production methods to what resources were locally available or limited. A sisal entrepreneur (peri-urban Kenya) redesigned the process she used to dye leather after realising that the standard methods required too much water, in an arid area where households already faced water shortages. The enterprise also moved to environmentally friendly dyes despite higher costs.

An agricultural policy researcher confirmed this pattern from an institutional perspective. He explained that women often understand the small-scale conditions on the farm in detail because they have constrained resources, which requires them to observe their farming closely: "They do micro, micro farming, so they know where there is a problem." He also pointed out that this knowledge came from women themselves, rather than from any institution: "Much of this knowledge is not connected to formal support systems because information is increasingly shared through digital platforms that many poor rural women cannot access."

Taken together, these findings show that women's environmental knowledge is built through their everyday work with land and resources, and is used to make decisions about how to produce, reuse materials and manage what is conserved or restored. Women's sustainable practices included reusing waste materials, integrating energy and production systems, restoring ecosystems and adapting production methods to local resource constraints. Sustainability was therefore not described as a separate activity, but as part of how production was organised in everyday work. The following theme shows that this knowledge and these practices are constrained because the material conditions needed for women to act on them are often missing.

6.1.4 Knowledge is not enough without capital, equipment and certifications

Although women know and practice sustainability, the interviews also showed there are clear limits to how far they could develop their sustainable practices. These limits are directly relevant to the research question: they explain why the practices described in Theme 3 take the forms they do, and why they do not go further. For reasons such as lack of equipment, limited capital, weak technical support and barriers to certifying their products, women were often restricted in how much they could develop, even if the knowledge and motivations were present.

Although some entrepreneurs had clear ideas for how to improve their circular production, they were not able to move these forward due to a lack of money, equipment or technical support. A herbs and oils entrepreneur (urban Kenya) wanted to turn leftover herb materials into stocks but had not been able to do so without the necessary equipment. A food processing entrepreneur (central Kenya) described product development as expensive and difficult without expert guidance: "If we had an expert… we wouldn't go on so much losses on product development… because now it's a trial and error… we've had to go on so much losses before we get it right." A biochar entrepreneur (coastal Kenya) explained: "We already have the big dryer structure from the funders, but it is not yet finished… the dryer just stands there." Here, both the knowledge and the intention were in place, but the resources needed to act on them were missing.

The lack of equipment was especially common among the women groups. The coconut farmers' group (coastal Kenya) explained that the lack of machinery limited how much value they could create from coconuts: If we can get someone who will come and give them the capital to make those things also, it will be good… because we don't have the machines." The Pastoralist women's group

(northern Kenya) described a similar situation: "It's only the knowledge to be able to make it that we are lacking." In these cases, the raw materials already existed, but technical skills and financial support were missing. The women artisans (eastern Kenya) also described problems with meeting large orders because they could not afford the upfront costs to buy material: "The hardest part: get an order from a client, we can't afford to buy the materials which we have to buy ourselves, especially when we get a big order."

Certification created another barrier. The production of several enterprises was already organic in practice, but without formal certification this could not be translated into market access. The institutional dimensions of this certification gap are examined more fully under RQ3. A biofertiliser entrepreneur (central Kenya) explained how her product, which she sold for 2,500 shillings, competed against chemical fertiliser priced at 5,000. Government subsidies reduced that difference to the point where the incentive to switch largely disappeared. "I would simply put it as corruption," she said. In this case, knowledge and sustainable production methods exist, but are undermined by policy conditions that favour alternatives that harm the environment.

6.2 RQ2: Gender norms and entrepreneurship

Across the five themes gender norms shape women's entrepreneurship through connected barriers at institutional, household and financial levels. These barriers directly limit women's access to recognition and resources, and constrain the pathways through which entrepreneurial practice might translate into economic mobility. Although women develop strategies to manage these challenges, the strategies help them navigate the barriers rather than remove them.

6.2.1 Women are symbolically devalued as economic actors

Across the interviews, women described how institutional spaces such as government offices, funding processes and professional networks were male-dominated environments where their ideas often carried less weight and leadership was associated with men.

A herbs and oils entrepreneur (urban Kenya) described visiting government offices and finding that most people in positions of influence were men: "It's almost like maybe a gentleman's club or something." An agro-processing entrepreneur (semi-arid Kenya) reflected on trying to navigate these spaces through networking: "I used to play golf, then I realised that's not my place… if this is the strategy for networking, I'm not quite sure I'm cut out in this way." A biofertiliser entrepreneur (central Kenya) described repeatedly presenting her project to county government officials without being taken seriously: "Maybe because you're a woman and your voice is not… it's not taken. Not considered… whereas a man who would present a similar project… would have been heard more."

This lack of recognition also shaped access to funding and how women's businesses were perceived. A sisal entrepreneur (peri-urban Kenya) described losing a funding pitch to a man who never implemented his project, despite her enterprise receiving the highest scores for social impact and circularity: "They still didn't give us the funding." She also described how women-owned businesses are

often spoken about in ways that reduce their legitimacy: "There's a way they talk about women-owned business. It's like a business you're running from your kitchen. For men, even if it's a kibanda… it's a full-on business… making profit. They'll talk about (enterprise name), but not as a business – more of a social aspect."

The experiences were not limited to formal institutions. A biofertiliser entrepreneur (central Kenya) described receiving criticism from her own community when she started collecting waste from farms, as this type of labour was seen as inappropriate for women: "You hear women telling you, if I were in your position, I would rather get a richer man to marry." The pressure became strong enough that she temporarily stepped back from the project. Over time, however, her position shifted: "Now they are my number one customers… the village, the community, has embraced the product." This suggests that community resistance, while significant, is not always fixed.

Within group-based enterprises, women also described a gap between who does the work and who makes decisions. While women carried out most of the labour, leadership positions were often held by men. Gender norms also made it difficult for women to redistribute this work; moringa farmers in eastern Kenya, group 1, explained that even when they needed help, they felt unable to ask for it: "Would you want someone to assist you… Yes. Do you dare to ask? No." A circular economy entrepreneur (urban Kenya) explained: "90% of the work is being done by a woman, but the positions are taken by the male…" A coconut farmers' group (coastal Kenya) described a similar pattern: "Even if they are majority women… if one man says no, it is no…" Women described doing most of the work while men retained decision-making power.

At the same time, experiences differed across contexts. In coastal Kenya, members of the mangrove honey women's group described men as collaborative rather than dominant: "The men don't try to take over. Everybody's collaborating." A honey processing entrepreneur (urban Kenya) described her home community in Kamba county as supportive of women's work: "They don't look down on their women… they're almost even more encouraging." In eastern Kenya, group 2, a male moringa farmer referred to his female partner as "the manager," but added "I come up with the ideas, and she executes them." This suggests that leadership patterns vary between communities and are shaped by local gender norms.

Women's enterprises were not only disadvantaged in access to resources, but treated as a different and lesser kind of economic activity – a form of symbolic devaluation with concrete consequences for who receives funding, whose work is taken seriously, and whose leadership is recognised. The symbolic devaluation documented in institutional spaces was mirrored within the household, where domestic labour expectations both reflected and reinforced women's position as secondary economic actors.

6.2.2 Domestic responsibilities constrain women's time and capacity, but in some cases it can be changed with income

6.2.2a: Domestic labour reducing women's time, capacity and flexibility

The interviews show that women's unpaid domestic responsibilities shape how their businesses are organised, how much they can grow, and what decisions they are able to make. Women described carrying most of this work alongside running their enterprises, not as a personal choice but as an expected part of their roles. Entrepreneurship therefore had to be managed alongside domestic responsibilities.

A honey processing entrepreneur (urban Kenya) described: "When you're an African woman… you'd find you're the one spending most of the time with the children. You're the one doing the most cooking. You're the one doing most of the cleaning." A circular economy entrepreneur (urban Kenya) explained how these expectations clashed with running a business: "It's like men believe that women should just be in the kitchen… sometimes… you are having late meetings… and the children are like, 'Mom, why are you in meetings every now and again?"

Women also described the physical exhaustion that followed these expectations. The women artisans (eastern Kenya) described having little time to rest: "We do everything… we don't have rest days as women, we only rest when sleeping at night." They connected this directly to lower productivity: "We are weak to perform and make things because sometimes we have not eaten." At the same time, women described that this burden was difficult to reduce.

These constraints shaped the kinds of trade-offs women had to make in both their personal lives and their businesses. A food processing entrepreneur (central Kenya) described giving up much of her social life to sustain the business, and described the tension between work and family as unavoidable: "You will not be there all the time. Something will give… your family will suffer, yeah, because you won't be there." A herbs and oils entrepreneur (urban Kenya) also suggested that entrepreneurship would be difficult to sustain while raising young children: "If I had a small family, then I'd probably have to give up on this."

This pressure also shaped how women organised their businesses. An agro-processing entrepreneur (semi-arid Kenya) explained that she eventually hired more young men instead of women, as women's domestic responsibilities made it harder for them to sustain a full working day: "I had three women before, now I have one and increased two youth, young men." In this way, domestic labour did not only affect individual women's time, but also influenced how women-led enterprises were structured and who they employed. This has consequences beyond the individual: when women are structurally prevented from sustaining full working days, their path to leadership roles within enterprises becomes narrower.

An agricultural policy researcher confirmed that this pattern is structurally imbalanced, explaining that women provide much of the agricultural labour: "Farming is actually women… they provide much of the labour." A science and innovation regulator observed the same dynamic: "It's the women who do the taking care of the land, but the men will do the business." Where family support exists, however, this burden can be partially minimised: a honey processing

entrepreneur (urban Kenya) noted that "If you get support from your husband or your family, it is easier to make it."

6.2.2b: Income can change authority, but it varies between contexts

Even where women do generate income, this does not automatically lead to more resources or power to make decisions. As the same agricultural policy researcher noted, women often lack access to assets and financing, meaning that income operates against a baseline of structural resource deprivation.

Power relations within households varied across the dataset and were shaped by local norms and control over income. For example, a coconut farmers' group (coastal Kenya) explained that: "Even if you have the money, the men here don't listen to you, you have to bite by their rules." In these cases, men's authority was not linked to their economic contribution. The women artisans (eastern Kenya) described households where men remained decision-makers despite contributing very little: "Men are lazy, not responsible, alcoholics, but are still the head of the household and make all decisions."

Several women entrepreneurs described similar patterns, where income did not translate into control or decision-making power. A biochar entrepreneur (central Kenya) explained: "Usually the woman is the breadwinner of the family, even though the man makes all the decisions." This was also observed at an institutional level, with a science and innovation regulator noting that even where women invest time and labour in production, "You're not getting the benefits of what you produce."

However, this was not the case in all contexts. A pastoralist women's group (northern Kenya) described how earning income had begun to shift decision-making dynamics in their households: "Before, all decisions depended on the man because he was the one providing. Now the woman can also provide, so the man can listen to her decisions." They also explained that this increased their ability to act independently in situations such as paying school fees. A member of the mangrove honey women's group (coastal Kenya) described a similar shift: "Since he can see that I can provide something, then come we discuss something, we do something." In these cases, income was not only about earning money but also about gaining a stronger voice in household decisions.

This suggests that while income can shift household dynamics, the extent of this change depends on local norms and social structures. The Laikipia and mangrove honey examples, where collective and publicly visible income-earning preceded the shift in household power, suggest that how income is earned (collectively, visibly, and with community recognition) may matter as much as the amount.

6.2.3 Land ownership is the base of financial inclusion and amplified by social pressures around debt

Without a land title, women cannot offer collateral, which closes off formal credit and pushes them toward riskier or smaller borrowing options. This structural exclusion shapes everything that follows: women's relationship to debt, how

institutions design financial products, and how women work around these obstacles as a response.

Women's decisions around borrowing were shaped by both family responsibilities and social pressure. An agro-processing entrepreneur (semi-arid Kenya) described how risk decisions were tied to family: "I think we look at our families, our children, if we go this way, what will our children… how will we look like?" A sisal entrepreneur (peri-urban Kenya) described social judgement around debt as a further barrier: "The society is also judging you as a woman. 'Oh, you have taken debt'… but if a man does it, nobody will question it." She also explained that her family supported her brother taking debt but discouraged her from doing the same.

A food processing entrepreneur (central Kenya) observed that women were often cautious about borrowing as a result: "It's just a scary scenario if you're not able to meet the interest rates." A sisal entrepreneur (peri-urban Kenya) challenged the assumption that women receive more financial support: "Women founders have more funding, which is not true. We just have more programmes. The funding is less as compared to guys… we get smaller pools of funding as compared to guys who get one large pool that sustains them longer." The institutional mechanisms behind this exclusion – collateral requirements, land ownership systems and programme design – are examined in RQ3.

Some women found partial routes around these barriers. A skincare entrepreneur (peri-urban Kenya) noted that some Kenyan banks prefer lending to women because they are seen as reliable in repayment. A honey processing entrepreneur (urban Kenya) described accessing finance more easily by applying as a company as a joint director with her husband rather than as an individual woman. These examples suggest that some barriers can be overcome, but access often depends on having formal business structures, partnerships, or institutional connections that are not available to everyone.

Several women explained that there is a misconception of women entrepreneurs lacking formal organisation or documentation, and challenged it. A herbs and oils entrepreneur (urban Kenya) described arriving at an institution with all her paperwork in order, including KEBS certification, tax returns and a business plan: "It's as if they expected to find something missing so they could say, 'we can't help you,' and once they realised my papers were in order, they just went quiet." The same pattern appeared among women's groups.

Both the women artisans (eastern Kenya) and the mangrove honey women's group (coastal Kenya) described clear leadership and administrative roles used to organise decision-making, accountability and daily operations. Responsibilities often rotated between members, creating shared ownership and leadership experience. That women-led enterprises continue to be treated as informal despite clear evidence that they are highly organised and have their documents in order reflects the same pattern of symbolic devaluation identified in Theme 1 – and it directly shapes who is granted access to financial resources.

For women's groups, there is an alternative source of finance through collective savings groups. One member of the pastoralist women's group (northern Kenya) explained: "If a child is sent home from school due to fees, I can turn to my savings group and access the money quickly, unlike men who depend only on the

market." These groups provided quick access to money and helped women handle needs in the short-term.

The sisal entrepreneur (peri-urban Kenya) connected financial exclusion to a much longer history: "My own grandmother used to weave baskets but never got the benefit of it… 30 years ago they had a market… they'd sell it for 20-50 shillings… and today the problem really hasn't changed." In some cases, women may remain in smaller-scale production not because of limited ambition, but because increased visibility can lead to loss of control over the activity.

Faced with exclusion at the institutional, household and financial levels simultaneously, women did not stop. The most concrete gains came not from individual workarounds but from collective organisation, though as the following accounts show, collective strategies had their own structural limits.

6.2.4 Women make gains from organising collectively, but are held back by structural limits

Across the dataset, women described that their lives had changed in meaningful ways since starting their enterprise, and forming groups was the thing that seemed to help most. Where individual workarounds allowed women to keep operating, collective organisation went further by producing gains in income, recognition and household influence that individual adaptation alone rarely achieved.

Collective organisation was described throughout the interviews as producing some of the most concrete changes. A honey processing entrepreneur (urban Kenya) described the significance of seeing these changes extend beyond her own enterprise: "When you realise, oh, this thing is changing people's lives, not just mine. Wow, it's not just about profitability." An agricultural policy researcher described groups as a way for women to protect their interests and pool labour: "When they are in a group, they can really fight back. They come and even do the harvesting together, and the money is in the group." A circular economy entrepreneur (urban Kenya) described the broader value of working collectively: "When you do it collectively, it becomes even easier, because nobody is a monopoly of knowledge… everybody's bringing their expertise… that is when we can co-create and bring solutions that are lasting."

Collective savings mechanisms were also widely used. The women artisans (eastern Kenya) described how table banking allowed them to grow their savings: "We use table banking to save in our group, and our money increased when we started doing this." The pastoralist women's group (northern Kenya) similarly noted that group membership created access to credit that would otherwise be unavailable: "A woman can reach out to the woman group and be able to get a loan through them." In eastern Kenya, group 2, a woman farmer described organising informal rotating savings and farming arrangements, in so-called merry-go-rounds, and notably kept these hidden from their husbands: "They usually don't tell their husbands they do because then the men will want to take their money." This last example shows that collective strategies were not only financial tools but also a way of maintaining control over resources in households where income would otherwise be appropriated.

The pastoralist women's group (northern Kenya) described how men first allocated 500 hectares of land and women later formed a committee to manage a

lodge. Over time, they kept control over revenues, created bursaries for school-going children and set aside income for women's activities. Members also described increased recognition from men in the community: "Now even the men are seeing the change they saw what the women did to the lodge and the change they have brought to the environment." Collective organisation had also created leadership roles that were not available to women individually, such as managing revenues, chairing committees, and taking public responsibility for outcomes the wider community could see. A honey processing entrepreneur (urban Kenya) connected this to a shift in confidence that collective engagement made possible: "Coming to this point of empowering women… you transfer that sort of confidence… you're able to change even without capital."

The women artisans (eastern Kenya) described how collective learning created change, with some members moving from food insecurity and limited sewing skills to stronger economic participation. The sisal entrepreneur (peri-urban Kenya) presented the hand-woven bags on Instagram as sustainable and handmade by women, positioning herself towards customers in Nairobi. While the visibility created recognition for the group's work, members still described difficulties in affording materials, relied on manual production methods and were without a proper production space. Collective organisation did not dissolve the structural constraints women faced, but it created conditions in which women could act with more resources, more visibility, and more solidarity than they could alone.

6.2.5 Women consciously adapting strategies to keep operating within gendered constraints that are not being removed

Despite the constraints described in earlier sections, women across the dataset had developed different ways of navigating male-dominated spaces, managing expectations of them within the household and keeping their businesses up and running.

Several entrepreneurs described adjusting their behaviour in institutional and professional environments to be taken seriously. An agro-processing entrepreneur (semi-arid Kenya) explained that she learned to approach situations from what she described as a male perspective: "I look at this thing from a man's point of view… and then I mellow it" – suggesting that she tried to tone down emotion to be taken seriously. She also described becoming more assertive to avoid being overlooked: "I had to be sharp and to be skilled… I'm a go getter. I will not take no for an answer." A biofertiliser entrepreneur (central Kenya) described persistence as essential: "As a woman, it's about persistence. You have to keep pressing, reminding people, and stepping up to present your case." A biochar entrepreneur (coastal Kenya) described turning external doubt into personal drive: "Whenever they're telling me, you can't do it. Can you as a woman? Will you manage? But I decided – if I can't manage, maybe I will be pushing other women not to fight for their opportunities."

Some women described developing strategies to manage the gendered constraints they met within their business or personal lives. A honey processing

entrepreneur (urban Kenya) explained that within her enterprise she arranged profit-sharing in a way to avoid tension between her and her male business partner: "We've structured ourselves in a way to avoid such conflicts… you just have to put strategies, how you're going to share the profit." Other women invested in their own position over time. A circular economy entrepreneur (urban Kenya) described returning to education as a strategy for strengthening her credibility: "That's why I went back to school. I'm also doing my masters in social transformation, sustainable development." Life stage also shaped what was possible. A herbs and oils entrepreneur (urban Kenya) described starting her business later in life as an advantage because she had fewer care responsibilities: "I have the experience of age… I have a young adult daughter… I don't have as many things demanding for my time."

The interviews also showed that gender constraints were not experienced in the same way by everyone. One unmarried moringa farmer in Tharaka Nithi described making decisions independently, without needing to negotiate with a partner. An agricultural policy researcher described profitability as a turning point in gender dynamics. He explained that men often become more involved once an activity begins generating higher returns, and that some women deliberately remain in subsistence-level production to avoid attracting that attention: "There is a tendency for the woman to keep to the very subsistence things so that they don't attract attention."

Several entrepreneurs described persistent internal barriers alongside the external ones. An agro-processing entrepreneur (semi-arid Kenya) noted that confidence remained a challenge: "Women are not confident enough to break the glass ceiling. I think… we are very timid, and we think there are things we can't do." Both she and others framed confidence as something that could be built through sustained engagement and visible results, but not through training or resources alone. This framing is significant: confidence here is not a personal deficit but a relational condition, shaped by whether women's authority is recognised and their work taken seriously in the spaces around them.

This helps explain why many of the women in this dataset described strategies aimed not only at growing their businesses, but also at protecting control over them. Women exercised agency in different ways, including negotiating, adapting, organising collectively and reshaping how they ran their businesses. Yet agency does not automatically translate into changed outcomes if wider structural conditions remain unchanged. The women in this dataset found ways to navigate barriers, but they still operated within systems shaped by land ownership patterns, collateral requirements and institutional gatekeeping. Building confidence or individual capability is not enough if the broader structures producing inequality stay the same.

6.3 RQ3: Institutional conditions for participation

Across the dataset, women described institutional conditions that consistently reinforced each other. The below themes capture how barriers in finance, infrastructure, markets and policy shaped what women could produce, sell and earn – and what the exceptions suggest about what more enabling conditions could look like.

6.3.1 Without land titles, formal credits stay out of reach

Getting access to finance was a problem for almost every woman in the dataset. Without land titles, most could not meet collateral requirements for formal loans. Savings groups, grants and informal finance filled some of the gap, enough to keep businesses running, but rarely enough to grow them.

The collateral barrier was strongly linked to land ownership. Many women did not hold land titles and therefore could not meet the requirements for formal loans. A science and innovation regulator explained this directly: "It is the women who are tilling the land who are producing. But inherently, they can't even have access to financial services, because they have nothing to give as collateral." A moringa entrepreneur (urban Kenya) described facing the same problem when trying to access loans without a title deed in her own name. A biofertiliser entrepreneur (central Kenya) explained that banks viewed her agricultural business as too risky and unfamiliar to support.

Beyond the collateral requirement itself, the design of financial systems reinforced the exclusion. A private sector representative described how funding opportunities, while formally open to all, were rarely structured to account for unequal starting points: “Open competition therefore favours those who already hold land, assets or business records.” He also pointed to barriers within women-focused programmes, such as age limits and bookkeeping requirements that made it harder for informal entrepreneurs to qualify.

Without access to formal credit, many women relied on slow accumulation of resources and personal savings. A biofertiliser entrepreneur (central Kenya) described building her production unit gradually: "All you can see has been the result of small, small savings, bootstrapping, and now we are here." A circular economy entrepreneur (urban Kenya) described taking a loan before starting her business that became difficult to manage during Covid: "I cried in the streets of Nairobi… so the experience I have, I said, let me just crawl, then I'll walk, and then I'll run — slow but sure." She also described a mismatch between innovation and financial systems: "They do not finance innovation. They finance consumption."

For businesses that had already grown beyond the smallest scale, access to larger financing created a second challenge. A skincare entrepreneur (peri-urban Kenya) described reaching the limits of what available loans could provide: "You'll find there's a cap to what loans they can give you to grow… you want to grow in a big way, but you cannot access the funds that will maybe take you to the next level." A biochar entrepreneur (central Kenya) described being excluded because her business had not yet reached the required threshold: "There is a limit below which you're not accessible, you do not qualify. So we haven't reached there yet. Is it because you're too small? Yes."

Grants and NGO support provided an alternative for some women. A biofertiliser entrepreneur (central Kenya) described receiving two competition grants in 2020 worth 5000 USD. A food processing entrepreneur (central Kenya) received support from international entrepreneurship and innovation programmes, alongside access to a national incubation centre that provided machinery, certification support and market access.

These examples show that outside support could make a major difference when it became available. At the same time, access was uneven and competitive.

Women often needed the knowledge, time and confidence to identify opportunities and apply for them. A biofertiliser entrepreneur (central Kenya) pointed to unequal funding flows: "There's also that imbalance between funds from the development partners and the people who are actualizing the innovations on ground."

Collective informal finance created another layer of support. A sisal entrepreneur (peri-urban Kenya) described how increased enterprise orders brought more money into the community's table banking system, improving income for the artisans. The pastoralist women's group (northern Kenya) described an internal financial system that included school bursaries, sick funds and shared revenue across villages. These arrangements provided financial stability that formal systems often did not offer.

A private sector representative described a broader design problem in financial systems. Funding opportunities may be formally open to everyone, but they are not designed to account for unequal starting points. This creates open competition where women often begin at a disadvantage: "It creates a huge competition aspect. So that's how the women feel left out." He also pointed to exclusions within programmes aimed at women, including age limits and record-keeping requirements that disadvantage informal entrepreneurs.

The dataset also included exceptions. A honey processing entrepreneur (urban Kenya) described accessing finance without difficulty by applying through a registered company with both directors listed rather than as an individual woman: "Honestly, I can't say women have been disadvantaged, because if you've met the requirements you got the money." Her experience suggests that formalisation and shared company ownership can sometimes reduce gendered barriers, although these options are not equally available to all women. Where access to finance did shift outcomes – through grants, collective savings or being formally registered as a business – the common factor was institutional design that either pooled resources or reduced the barriers women faced individually. These exceptions point to what enabling financial conditions could look like.

Financial exclusion rarely operated alone. Without the physical infrastructure needed for production – electricity, transport and equipment – even women who found routes around the credit barrier faced further constraints on what they could produce and where they could sell.

6.3.2 Missing equipment and infrastructure puts a physical burden on women

Infrastructure problems appeared across the dataset and affected how much women could produce, where they could sell and whether enterprises could grow. These constraints were strongest in rural, coastal and arid areas where services and facilities were less reliable.

Electricity was a common challenge. A biochar entrepreneur (coastal Kenya) described losing power for days at a time, which forced her to continue production manually even when targets remained the same: "The only thing is the machine which we don't have – we are using the manual ones." A honey processing entrepreneur (urban Kenya) similarly described a lack of electricity leading to manual work. The mangrove honey women's group (coastal Kenya)

described the lack of electricity making processing slower and quality control more difficult.

Water access was another basic requirement. A honey processing entrepreneur (urban Kenya) described water infrastructure as essential for production: "Things like boreholes and irrigation systems are essential." Without reliable water supply, farming enterprises faced limits on what they could grow, how much they could produce and whether organic methods could be sustained without irrigation support.

Transport also shaped market access. A biochar entrepreneur (coastal Kenya) described transportation as one of her biggest barriers when trying to reach customers across Kenya. A coconut farmers' group (coastal Kenya) described similar difficulties, explaining that reaching Nairobi markets often required intermediaries because direct transport was too difficult or expensive. This reinforced the market dependency described in the following theme – without reliable transport, women had fewer opportunities to sell directly and remained dependent on brokers.

Lack of proper equipment appeared across several enterprises. A coconut farmers' group (coastal Kenya) described seeing nearby companies process coconut shells using machinery that they could not afford themselves: "If they can get someone who will come and give them the capital to make those things also, it will be good… because they don't have the machines." The mangrove honey women's group (coastal Kenya) described having an apiary that was too small for the number of bees they managed. They also described theft and vandalism, including burnt hives, which led members to spend personal time guarding the site.

The absence of machinery revealed something about institutional priorities: the equipment that would have reduced physical demands and increased productive capacity was consistently out of reach, while women's sustainability work continued to be praised without attracting the investment needed to develop it.

The women artisans (eastern Kenya) described asking for support to complete their workspace by adding windows and a door to the stone building they used. Although help was promised, it never came. Without a secure door, they could not leave equipment inside overnight and instead had to carry furniture and materials back and forth each day. These infrastructure constraints reinforced the financial barriers described in Theme 1. Without machines, transport or reliable electricity, enterprises could not increase production or reduce costs. They also reinforced market barriers: without transport, women remained dependent on intermediaries, and without access to testing and certification infrastructure, they struggled to reach higher-value markets. The most consistent infrastructure gaps – electricity, transport, equipment — were not unique to any single enterprise but reflected where institutional investment in bio-based production had and had not reached.

6.3.3 Aware of the price gap without power to negotiate

Where infrastructure constrained what women could produce, market conditions shaped what they could earn from it. Women-led enterprises across the dataset struggled to get a fair price for what they produced, to access markets and to keep more value from their production. Instead of describing the problem as a lack of

demand, women described value chains where buyers, brokers and intermediaries controlled prices, set conditions and captured most of the profit.

Dependence on a single buyer or intermediary was one of the most common constraints. A coconut farmers group in coastal Kenya explained that they had little room to negotiate because they only had one buyer: "We don't have the power to negotiate… because it is one source." Mangrove honey women's group (coastal Kenya) described a similar situation. They sold to the same organisation that had funded their training and equipment, even though they believed the price was too low: "We get paid 1000 for 1 kg honey, it is not a good price, we tried to negotiate with the buyer but they refused… we feel stuck. The buyers are the organisation that paid for the project from the start." In both cases, dependence on a funder or single buyer limited women's ability to leave or negotiate better terms.

Large gaps between producer prices and consumer prices appeared across several cases. women artisans (eastern Kenya) described baskets that took two weeks to make but were sold to brokers for 500-700 Kenyan shillings before reaching final buyers for much higher prices. A coconut farmers' group (coastal Kenya) did not know what their oil sold for in Nairobi because this information was never shared with them. A sisal entrepreneur (peri-urban Kenya) described a similar pattern among artisans, where baskets sold for 2,000 Kenyan shillings in Nairobi while producers received only 50-100 shillings: "The person who made it made it for 50 or 100 bob, which isn't enough to cover the labor and the raw material."

The sisal entrepreneur (peri-urban Kenya) responded by creating a digital platform that connected artisans directly to retailers. She explained the goal clearly: "There needs to be direct access to a market – that's why (company name) makes sense, because it's direct access with smartphones, with orders and pricing." Reject rates of the products dropped from around 50 percent in 2021 to 7 percent by 2024-2025. Better pricing also increased participation, with the number of women producing bags growing significantly within one community.

The pastoralist women's group (northern Kenya) described another form of market control. Although they partnered with an investor to run a lodge, they retained authority over revenues: "We're still the ones who manage every revenue that comes out of that." This arrangement allowed them to access a market while keeping control over the income distribution.

Limited access to market information was another recurring barrier. Many women did not know what their products sold for further along the chain. The women artisans (eastern Kenya) only learned the final selling price of their baskets after doing outside research: "Once we checked how much a big basket that it took two weeks to make was sold for, it was sold for 10,000 kes, and we sell it for 500-700 Kenyan shillings to the broker."

However, the more significant finding is that information alone did not produce power. When the women artisans (eastern Kenya) discovered the price gap, they could not act on it. Brokers responded to any attempt to negotiate by threatening to go elsewhere: "If we try to negotiate, the brokers threaten to find something else." The women described how this made them feel: "It made us feel very bad, like we don't matter." The constraint was not awareness but power: women knew they were being exploited but lacked the market alternatives, collective bargaining capacity or institutional support to change the terms. This is

what value chain researchers describe as captive governance – a relationship in which the supplier understands the asymmetry but cannot exit it because no structural alternative exists.

A science and innovation regulator described this as part of a wider structural issue. Kenya exports many bio-based products in raw form, while value addition remains limited. Women-led enterprises could potentially capture more value, but this depends on infrastructure, certification systems and market access that are often missing for smaller producers.

Moving into stronger positions within value chains requires changes in who controls pricing, information and market access – not only improvements in individual business skills. The sisal platform and the Laikipia lodge model are examples of efforts to shift these conditions by creating more direct market access and retaining income control. In both cases, collective organisation and intentional support structures made this possible, but these conditions were rare rather than common.

6.3.4 Institutions and policies consistently fail to reach the women they are meant for

A consistent finding across the dataset was the gap between what institutional support and policy existed in principle and what actually reached women-led bio-based enterprises in practice. This gap operated at two levels: the support programmes and knowledge systems designed to strengthen women's enterprises, and the formal regulatory and policy frameworks that shaped whether those enterprises could access markets and grow. At both levels, it was the design of institutions – not the absence of policy or intent – that determined who benefited.

6.3.4a: The works and access to support programmes and knowledge systems

Several entrepreneurs described teaching themselves in the absence of formal support. A food processing entrepreneur (central Kenya) explained that product development had been a process of self-learning: "This has been a self-taught journey on how to bake cakes using cassava flour, bake cookies using chickpea and sorghum flour." A biofertiliser entrepreneur (central Kenya) described the difficulty of accessing tools to measure soil biology: "In Kenya we do not have the gadgets to measure like the biology of the soil, the good bacteria, the good fungus, the protozoa and things like that – if you get such a service, it's quite expensive." A honey processing entrepreneur (urban Kenya) described moving from traditional beekeeping to improved methods such as honey warmers, centrifuges and Langstroth hives, while also noting that unreliable electricity limited how much technology could be used.

Where institutional support did reach women, the effects were often significant. A food processing entrepreneur (central Kenya) described KirDI's incubation facility as a place where machinery, certification and market access were combined: "You work, produce, you are certified from there, and then you reach the market." A biofertiliser entrepreneur (central Kenya) described support from AGRA as transformative, including access to a business programme at the University of Utah: "The support from AGRA was incredible." A biochar entrepreneur (coastal Kenya) described a chain of support that connected her to

training through KFS, the Kenya Forest Research Institute and the WIRE programme from Energy for Impact. An agro-processing entrepreneur (semi-arid Kenya) described participating in a GIZ programme that supported ISO certification across quality, environmental and occupational health standards.

A science and innovation regulator described a structural gap behind these uneven outcomes: "We currently do not have enough incubators to accommodate the growing number of small-scale enterprises that are coming up." Without incubation facilities, enterprises struggled to test products, access machinery or reach the certification requirements for higher-value markets – precisely the gap that KirDI's model addressed, but in only one location.

A sisal entrepreneur (peri-urban Kenya) described the most advanced use of technology in the dataset. In contrast, the women artisans (eastern Kenya) shared that the smartphone the leader of their group received from the sisal entrepreneur was stolen. They could not afford a new one and thus could not access the technical assistance available.

This level of technological integration was unusual within the dataset rather than typical. An agricultural policy researcher described a very different reality for many women farmers, especially those in rural areas who could not access information because it was shared through digital systems they could not reach: "The farmer is not being reached, and especially the poor women, because they don't even have access to the instruments that can get the information which is going through the digital platforms." He also questioned the usefulness of policy that does not reach local communities: "Let me tell you the bioeconomic strategy, if it is not translated up to the local level, it's so useless."

He argued for a different approach based on participation, local knowledge and ongoing feedback between institutions and farmers – building support around how farmers already learn and exchange knowledge, rather than expecting farmers to adapt to technology systems. The contrast between the sisal entrepreneur's digital platform and the exclusion he described highlights a wider technology divide across the dataset. For enterprises with access to technology and connectivity, digital tools could improve quality, market access and coordination. For women without these resources, technology became another barrier limiting access to information, support and opportunities.

Knowledge sharing within groups also played an important role. The pastoralist women's group (northern Kenya) described knowledge as the main barrier preventing further value addition in honey production: "We really need a lot of capacity, a lot of training on how to utilise all the chains on honey… we are only having traditional knowledge… we never got any training." They identified products such as candles, lotions and soaps made from beeswax but lacked the technical skills to produce them. The mangrove honey women's group (coastal Kenya) also described ongoing learning needs: "We are trying, but we are not perfect yet."

Key informants pointed to structural reasons why support did not consistently reach women-led enterprises. A private sector representative explained that many training programmes were held in Nairobi, making them difficult to access for women living in other counties: "You can't get everybody from all these counties in Kenya." He also described how the gender-neutral event design often resulted in a majority of male participation in workshops. He noted that gender targets

only became common after donor requirements pushed organisations to include women and youth: "If we were doing it earlier, I don't think they would see that need to give us those directions." This suggests that inclusion was often driven by funding conditions rather than institutional practice.

A bioeconomy programme manager described a different approach. Their fellowship programme for women scientists was designed around care responsibilities: "We would allow them to come with their babies… we make it light. We also give them a stipend." Most participants later started businesses or became business partners. This suggests that when programmes account for women's time constraints and care work, participation and outcomes improve. However, this type of design remained uncommon across the broader institutional landscape.

A circular economy entrepreneur (urban Kenya) described the challenge of simply knowing where support exists: "A lot happens at the grassroots… but you can never know about these platforms if you don't show up… and if you have no knowledge, because going to school is an enabler." This points to a reinforcing cycle: accessing support requires information, networks and confidence, yet many women lacked access to the spaces where this information circulated. Training held in Nairobi, delivered through digital platforms or aimed at formal businesses often failed to reach women working informally, living in rural areas or carrying heavy care responsibilities. An agricultural policy researcher's observation that women are strong in regenerative agriculture because they lack resources also points to how women's knowledge is sometimes treated as a response to hardship rather than as expertise that deserves investment and support.

6.3.4b: Regulatory and policy systems are insufficient

Across the dataset, women described a clear gap between policy commitments and what happened in practice. The issue was described as not a lack of policy, but a lack of implementation.

Several entrepreneurs described direct experiences of this gap. A herbs and oils entrepreneur (urban Kenya) explained that she began a KEBS certification review in 2024, paid for the process and was still waiting in 2026: "There's a mismatch – they don't quite know where to place somebody like myself." Her enterprise did not fit existing regulatory categories, leaving her without a clear pathway. A biofertiliser entrepreneur (central Kenya) described a similar challenge. No standard existed for insect-based organic fertiliser, which pushed her to create an industry association to support standardisation herself. She also described how government fertiliser subsidies created unequal competition: her biofertiliser sold for 2,500 shillings while subsidies reduced the cost advantage. "I would simply put it as corruption," she said.

Certification failures shaped market access as directly as buyer behaviour. A moringa entrepreneur (urban Kenya) described losing an export order worth 15 million shillings because organic certification had not been secured: "We've lost another order of 15 million because we didn't have organic certification." Although production methods were already organic, the absence of formal certification blocked entry into higher-value markets. The regulatory system did not fail to exist – it failed to fit the enterprise, and the cost fell entirely on the entrepreneur.

Several participants described policy failure as a problem of implementation rather than absence. A sisal entrepreneur (peri-urban Kenya) explained that minimum wage policies for weavers existed but were not enforced: "It's not that there are no policies in place. It's implementation." She also described missed opportunities where government procurement could directly support artisan producers but was not reaching rural women.

Government funding programmes were also described as disconnected from the conditions the entrepreneurs faced in practice. A circular economy entrepreneur (urban Kenya) pointed to another barrier where policy information often existed in formats that were difficult to understand or navigate: "The people the policy is meant to help have no idea it exists – if you want to hide something from an African, put it in a document." Group interviews reinforced the same pattern. The women artisans (eastern Kenya) described being promised goats through a county government programme but never receiving them: "Institutions lie to you, politicians lie, they only tell you lies before an election, that they will help you."

A private sector representative argued that Kenya already has many policies, but that they often lack a gender lens: "We have enough policies in Kenya. What they lack is gender lens." He explained that policies presented as neutral often produce unequal outcomes because they do not account for women's specific conditions. He used the KOKO bioethanol project as an example, where a removed tax exemption weakened an initiative that had supported both women and environmental goals.

A science and innovation regulator described a similar concern. She argued that recognising gender in policy language is not enough if this recognition does not lead to targeted action: "It's not just enough to say we will consider gender when we are developing the policy… the problem is how far do we go to actually put in concrete interventions." She described policies that acknowledged marginalisation in general terms but did not create specific support for women who faced structural barriers. A government policy official also noted that the same regulations designed to support enterprise could become obstacles: "It is the same government that put it, it's what is also hindering their growth."

A private sector representative also described licensing as a heavy burden. He noted that establishing a flower farm in Kenya requires close to 58 licenses, creating a process that is especially difficult for smaller enterprises with limited administrative capacity. The gap between policy intention and policy reach is not accidental. Policies may exist, but they are implemented through institutions that are not always designed around the realities of those they are meant to support. Taken together, the support and policy failures documented across this theme reflect the same underlying pattern: institutions designed around formal, urban, documented enterprises, rather than around the women most actively engaged in bio-based and sustainable production.

7. Synthesis: Structural Dynamics Across the Findings illustrated through a Causal Loop Diagram

The results chapter illustrates a set of interconnected patterns across finance, markets, production capacity, care responsibilities and support from institutions. These patterns are reinforcing each other in ways the thematic analysis alone cannot fully capture. Thus, a Causal Loop Diagram (CLD) is used to illustrate these interactions.

Barbrook- Johnson and Penn describe CLDs as a mostly qualitative method that is capable of drawing out the dynamic logic of a system that qualitative methods alone cannot capture. CLDs cannot measure the size of effects, instead, they show how variables in a system influence one another over time and through feedback. Thus, they are well suited to use in a qualitative study with the central argument not only concerning women's barriers, but why these barriers are durable and mutually enforcing.

This CLD was developed from the patterns identified across the results themes reported in the results chapter. It does not attempt to model Kenya's bioeconomy in full. Following Barbrook-Johnson and Penn's guidance that twenty nodes represent a practical upper limit before a diagram becomes difficult to interpret, the CLD focuses on the core variables and feedback loops that together explain the structural translation gap the results document: why women's knowledge, labour and sustainability practices consistently fail to translate into recognition, capital and economic mobility.

7.1.1 Selecting variables and developing links from the patterns

Several concepts were set aside on this basis. Environmental knowledge, though analytically central to the thesis, functions in the data as a stable condition rather than a dynamic variable since it does not increase or decrease in ways that generate feedback within this system. Certification and institutional recognition were also excluded as both operate as mechanisms within broader variables already present in the diagram. Including them as separate variables would have made the relationships less clear, which Barbrook-Johnson and Penn suggest avoiding by combining related concepts rather than adding more nodes.

The eleven variables included are those where participants directly described changes in one condition affecting another: land and collateral access; formal credit and equipment access; production capacity; income stability; domestic care burden; entrepreneurial time and capacity; single buyer dependence; bargaining power; access to market alternatives; collective organisation strength; and pooled savings and resources.

Barbrook-Johnson and Penn explain that identifying the core system engine depends more on interpretation and judgement than on strict technical rules. Focus is instead put on the variable that appears to drive system behaviour or that participants describe as particularly important. Across all thirteen results themes,

income stability emerged as the variable functioning both as a cause and a consequence across the patterns identified. Although participants did not describe income as their main goal, it appeared to shape whether other activities and ambitions could be sustained. Income stability was therefore placed at the centre of the core system.

7.1.2 How the diagram illustrates reinforcing relationships across the results themes

Each loop is read as a chain: a change in one variable triggers a change in the next, which eventually circles back to reinforce the starting condition.

7.1.2a: R1 The Capital Trap

R1 connects land and collateral access, formal credit and equipment access, production capacity, and income stability through a reinforcing loop. Women who lack land titles are typically unable to meet requirements of collateral, which limits their access to credit and equipment. This keeps production manual and small-scale, which restricts income and makes it difficult to accumulate more assets.

The loop therefore reinforces existing inequalities: those with assets can build capacity, while those without remain excluded. This pattern connects to RQ2 through gendered land ownership and to RQ3 through limited access to formal finance. It also shapes how far the sustainability practices identified in RQ1 can be developed in practice.

7.1.2b: R2 The Care Burden Trap

R2 links domestic care burden, entrepreneurial time and capacity, and income stability in a reinforcing loop. Greater care responsibilities reduce the time available for enterprise activities, which limits the generation of income. Lower income then reduces the ability to access support that could ease care responsibilities. Thus, the loop reproduces itself over time.

This pattern appeared consistently in RQ2, where women described balancing the work in their business with unpaid household labour. It aligns with Elson's (1998) argument that unpaid care work supports economic activity while remaining largely invisible, and with Razavi's (2007) care diamond, which highlights how care responsibilities often remain concentrated within households.

7.1.2c: R3 The Market Power Trap

R3 connects the dependence on a single buyer, bargaining power, income stability, and access to market alternatives in a reinforcing loop. Dependence on one buyer weakens bargaining power, leading to lower prices and less stable income. Limited income makes it difficult to build alternative market relationships, which increases continued dependence on the same buyer. This creates a self-reinforcing pattern where women remain locked into unequal trading relationships.

The loop reflects findings from RQ3 and aligns with Gereffi, Humphrey and Sturgeon's (2005) concept of captive value chain governance, where suppliers have little power to change the terms of exchange.

7.1.2d: R4 The Collective Organisation Cycle

R4 is the only reinforcing loop in the diagram that operates in a positive direction. It connects the strength of collective organisation, pooled savings and resources, and stable income. Stronger collective organisation increases the ability to pool resources, which creates access to capital otherwise unavailable through formal systems. Greater income from collective enterprise can then strengthen participation and reinforce the collective further.

Examples from RQ3, including the pastoralist women's group (northern Kenya) the mangrove honey women's group (coastal Kenya) SACCO and the women artisans (eastern Kenya) table banking arrangements, are all illustrations of this pattern. However, Barbrook-Johnson and Penn's "limits to success" archetype also applies here. Collective organisation can strengthen women's position, but growth eventually meets the structural constraints maintained by the capital and market loops. Collective savings can help meet short-term needs, but they cannot replace larger investments or changes in market conditions.

7.2 Figure 1: Causal Loop Diagram illustrating reinforcing dynamics

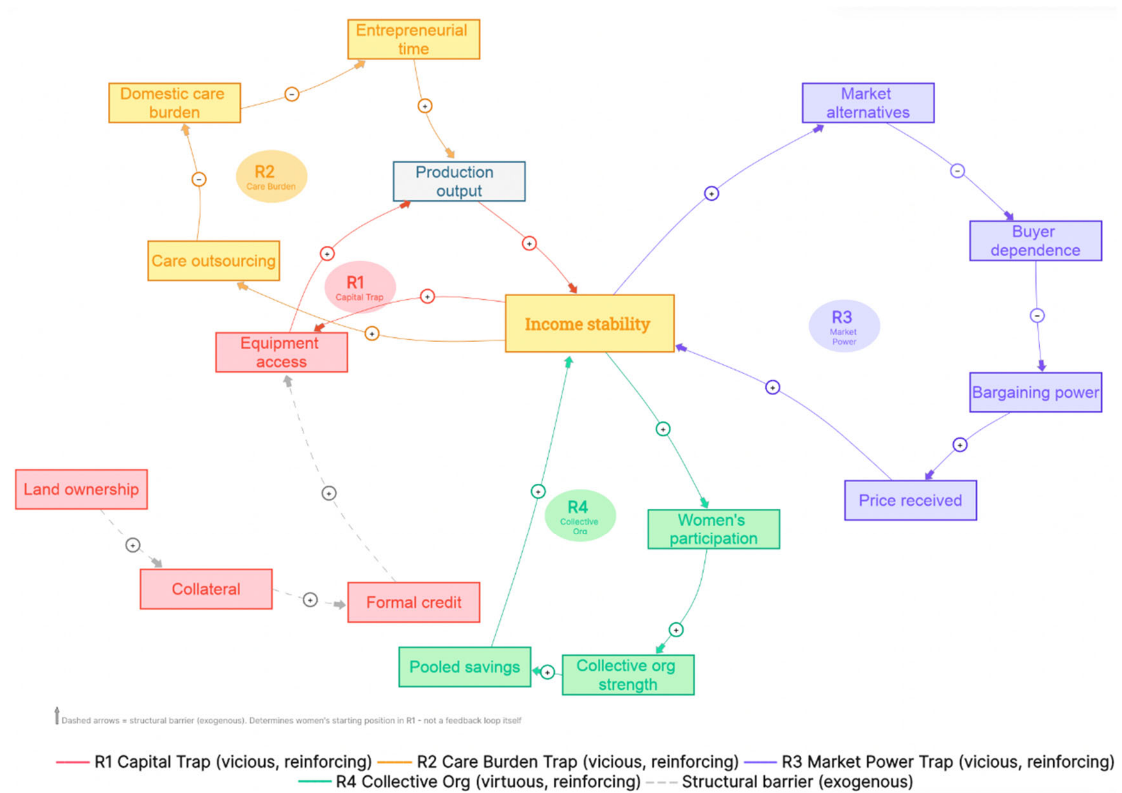

Figure 1. CLD showing reinforcing relationships identified across themes in section 7. Source: Author's own illustration, created in Boardmix

8. Discussion

The dataset includes women in two distinct positions: individual entrepreneurs navigating institutions and making strategic decisions directly, and women participating as group members. Both are included because the barriers documented here operate across both positions, though differently. Where these differences matter analytically, the discussion distinguishes between them.

This discussion argues that the barriers women face in Kenya's bioeconomy are not separate problems but a system, each reinforcing the others. The result is a consistent translation gap: women bring real knowledge, capability and sustainability practice, yet the institutions around them are not organised to recognise or reward it.

8.1 RQ1: Sustainability practices and environmental knowledge

The empirical findings show that women were working consciously with the environment and scarce resources long before this was framed as bioeconomy activity, yet a consistent gap exists between what women were doing and what Kenya's bioeconomy institutions are organised to recognise, support and resource.

8.1.1 Meanings of sustainability

The women described sustainability in terms of what it meant to them, by mentioning the practical realities required to keep enterprises, communities and local environments functioning over time – maintaining a healthy soil, ensuring access to raw materials, reducing waste and protecting future livelihoods and generations to come.

Rather than using policy language, they spoke from their own experience managing natural resources, with meanings of sustainability developing through the daily work of making a living under changing environmental conditions.

Similar to Haraway’s (1988) concept of situated knowledges, most women’s initial contact with the environment was through living and interacting with it. As Haraway argues, this kind of knowledge is not less valuable just because it is practical and based on experience rather than formal "expertise." It mirrors what Rocheleau (1991) says about women's environmental knowledge as developing through everyday responsibilities rather than formal training.

Sustainability developed as women tried to solve everyday problems rather than as a separate goal, and working with limited resources led them to pay close attention to soils, waste flows and ecosystem relationships. Yet these same constraints became barriers when they tried to stabilise or scale. Women generally had the ideas, knowledge and motivation, but lacked the equipment, certification, technical support and investment to act on them.

8.1.2 Women’s expertise and the limits of recognition

Across the interviews, women were practicing production in environmentally sustainable ways, but they rarely described receiving recognition or support for doing so.

Similar to Rocheleau's (1991) observations of women in Machakos, Kenya, whose environmental knowledge was continuously undervalued, this seems to be the case for the women in this study as well, as they could clearly explain and understand the importance of organic fertiliser for soil health, how restored ecosystems would increase production and how to reuse waste.

As the agricultural policy researcher explained, women’s knowledge came from having few resources they could not afford to lose, also pointing out that this knowledge rarely reaches institutional levels, who in turn communicate to farmers through digital platforms rural women cannot access, examined further in RQ3. This finding could suggest that Haraway’s (1988) argument on decisions about what counts as legitimate knowledge is political rather than neutral, can help explain why women's practical environmental knowledge is weakly connected to institutional support, despite being relevant for sustainable farming.

This also connects to what Hackfort and Saave (2024) describe about bioeconomy frameworks favouring technical expertise over local knowledge and practical experience. The privileging of technical expertise is a political choice on whose knowledge counts and might signal that it is structured in ways in Kenya, that makes women’s environmental knowledge invisible, and in this case has consequences for who receives support for their sustainability practice in the bioeconomy and who does not.

This choice had material consequences for women who, across interviews, would describe how they had reached a point where they could no longer expand without more equipment, infrastructure, certifications or financial support, despite being motivated to grow. Several women described how these barriers were stopping them from getting to the next step with their enterprise, despite doing everything in their power to overcome – such as paying for more organic certifications despite already producing organically, applying for more support programmes and attending more trainings, although as described by the agro-processing entrepreneur, still lacking the machinery needed to apply what she had learned.

This points to women's enterprises being under-resourced partly because their environmental work continued to be treated as informal, small-scale or oriented toward survival, rather than recognised as expertise worth investing in.

Women were also expected to carry responsibility for environmentally sustainable production without access to the resources or decision-making power needed to sustain it, a contradiction that becomes harder to ignore when considered in relation to what the bioeconomy transition actually requires.

If the shift toward bio-based production is to be environmentally meaningful rather than a rebranding of existing consumption patterns, it depends on precisely the type of practitioners as the women in this dataset, who understand how to work with ecosystems over time, manage resources under scarcity and adapt to changing environmental conditions.

Their knowledge was acquired through living and working in close relationship with their environments, often building on knowledge passed through generations.

Measured against what a genuine bioeconomy transition needs, this knowledge is not a deficit to be corrected through more training, but a resource that institutions are currently failing to draw on.

The recognition gap described in this section is therefore not only a gender equity problem but a structural inefficiency: the knowledge most relevant to sustainable production is held by the people least connected to the institutions driving the transition. Understanding why requires looking beyond epistemological hierarchies to the gender norms that shape which actors institutions take seriously in the first place.

8.2 RQ2: Gender norms and entrepreneurship

Across the interviews, women described limited recognition in formal spaces, unequal domestic responsibilities, and restricted access to land and credit, which often worked together and made it more difficult to gain economic security and recognition through their work.

Despite this, women found ways to navigate within these conditions, as shown in the following discussion. Gender norms are operating as a system that shapes who institutions take seriously, what domestic arrangements make possible, and what strategies are developed in response.

8.2.1 How gender norms position women as less credible economic actors

Women in the dataset experienced the spaces they had to navigate in as where male authority was the standard against which women's own ideas and leadership were measured – and often treated as secondary.

The biofertiliser entrepreneur described how she was not taken seriously when she presented her business to county officials and the sisal entrepreneur lost a funding call to a man without an actual project despite already running an established business – only two examples of many when women were not recognised in the same way as men's within an institutional setting. As a private sector representative said, funding is formally open to all but women start from a weaker position, therefore the outcome reflects the gap and not women's capabilities.

Kagume (2022) documented similar persistent gender inequalities in entrepreneurship in Kenya, with women's unequal access to resources and credit, suggesting that what women experienced in this study is structural rather than exceptional. This pattern mirrors Rocheleau's (1991) recognition gap: though she applies it to environmental knowledge, the logic holds here too. The problem is not what women produce or know, but whether the institutions they encounter are structured to recognise and value it.

Women described that their enterprises would be assessed based on the assumption that men have higher credibility and are better at leading and growing a business. Some respondents did note that women's positions as entrepreneurs in Kenya have improved compared to previous decades, which suggests these patterns are not static, and this study does not claim that the injustices described reflect intentional discrimination against women. Rather, it suggests that the

findings show that institutions in Kenya operate through norms and assumptions that do not serve women and men equally. As Fraser (1995, pp. 70-71) describes, social justice is two-dimensional: misrecognition as a cultural injustice that leads to women not being taken seriously, and maldistribution as their unequal access to resources.

This study suggests that these dimensions need to be understood together when designing more inclusive strategies – when an institution fails to award a funding pitch to the most qualified candidate, it simultaneously fails to recognise the losing woman's work and redirects resources away from her. Fraser (2000) shows how cultural devaluation becomes institutionalised in ways that limit economic participation. When women were spoken about as running a "kitchen business", it did in fact shape who was taken seriously in funding applications and whose leadership and knowledge was recognised.

Where RQ1 showed that women's environmental work went unsupported despite their knowledge and effort, this section shows the same dynamic in entrepreneurial spaces, where inclusion in programmes did not shield women from having their work assessed through assumptions about credibility and capacity. This connects to what Adams, Juran and Ajibade (2018) found in Malawi, where women's formal inclusion in programmes did not give them authority over decisions, and where the authors concluded that targeted representation and leadership roles were needed to produce equitable outcomes.

There is also a community dimension to this pattern. The biofertiliser entrepreneur described being criticised by her own community for collecting waste, since this type of labour was not seen as appropriate for women. The criticism became strong enough that she temporarily stepped away from the project before later continuing the business after gaining recognition for her work. Institutional devaluation was not only happening in formal spaces, but also through social norms that can reinforce or complicate what happens within institutions. At the same time, the shift in attitudes within her community mirrors what some respondents noted more broadly, that women's position in Kenya has changed over time, and that the norms shaping recognition are not fixed.

The same logic that devalued women's authority in professional spaces was also embedded in the financial systems they depended on.Women continuously described barriers to loans as reinforced by social norms around women and debt. Several women described how men taking loans were often seen as ambitious and business-minded, whereas women would be judged as irresponsible or risking their reputations if they did the same. As North (1990) describes, these kinds of informal norms are institutions that shape behaviour even when there are no formal rules enforcing them, and as Helmke and Levitsky (2004) explain, informal institutions operate alongside formal systems and shape how they function.

I found that social judgments around loans and finance strengthened the barriers women were already facing in accessing credits, which points to the fact that the same assumptions that devalued their authority in professional spaces were also embedded in the financial systems they depend on. This asymmetry shows how the same norms that frame male borrowing as ambition and female borrowing as recklessness actively advantage men in capital markets. Thus, I would argue that the gap in women's access to finance is also a product of the

social environment in which the criteria to access finance are applied. The institutional mechanism behind this exclusion, how the collateral requirements become gendered through land ownership and inheritance rules, are examined further in the discussion of RQ3.

Most strikingly, women described how their enterprises continued to be treated as informal or less serious even when they had tax records, certifications and documentation in order, as assuming that women-led enterprises were less capable of growth. Applying Fraser's framework on this, the devaluation was cultural rather than administrative, meaning misrecognition and maldistribution functioned as a single process. The domestic sphere reproduced the same logic where women's workload reinforced an expectation that their enterprises were secondary, which I would argue made devaluation at home and within institutions two expressions of the same norm.

Women in the interviews described their domestic responsibilities as shaping how much time they had, and how seriously they were taken within their households and in relation to their work. Women managed households and childcare alongside their enterprises, often with husbands contributing minimally or not at all. I found the issue was not only that women had less time, but that their workload reinforced an expectation that their enterprise remained secondary to their responsibilities as wives and mothers.

Building on their earlier argument about the privileging of technical expertise, Hackfort and Saave (2024) also observe that care and reproductive work is treated as something women are simply expected to do, rather than as labour requiring time and resources, a pattern that appeared in this study both within households and in programmes that did not account for domestic responsibilities.

As Razavi (2007) describes, care work in low- and middle-income contexts largely falls on women, reducing their time and energy for economic activities, which women in this dataset confirmed through accounts of exhaustion and lost productivity. Mölders (2019) connects this to a deeper structural logic: reproductive and subsistence labour underpins economic systems yet remains economically invisible.

I find one observation especially telling, with the agro-processing entrepreneur who consciously hired more men than women after seeing how domestic responsibilities prevented women from sustaining full working days. This points to a wider problem than non-recognition of care work: without active support for women's domestic burden, the risk is that women delay their economic participation until children are grown, as with the case of the herbs and oils entrepreneur described in relation to her own timing. The agro-processing entrepreneur's hiring decision shows how the care burden can cause women themselves to shut other women out – reproducing from within the very inequalities that constrained them from the start.

8.2.2 How women navigate within these conditions, and what it reveals

As women faced devaluation at institutional, financial and household levels simultaneously, they did not stop but developed varied and conscious strategies. The strategies are as analytically significant as the barriers themselves.

Income on its own was not automatically leading to women having more decision-making power. The coconut farmers' group (Kilifi) described how men made decisions regardless of who earned the money, while the biochar entrepreneur described households where women were the breadwinners but men still made the decisions. This is in line with Kabeer's (1999, p. 437) argument that access to resources only leads to changed outcomes when the surrounding social conditions also allow women to convert those resources into greater power and agency.

In cases where income did change household dynamics, a pattern emerged. In northern Kenya, the pastoralist women's group felt more listened to by men once they started contributing economically, and the mangrove honey women's group said the same. What seemed to matter was not the income alone, but that women's contributions became publicly recognised and benefitted the wider community. This is coherent with what Mollett and Faria (2013) describe as gender constraints being shaped by specific social and geographical conditions, in Watamu, women described men as collaborative rather than dominant, while in coastal Kenya, a single man could override the majority of women. Women's experiences should therefore be treated as context-specific when designing support programmes.

I found that women who organised collectively reported the most gains across the dataset in income, recognition, access to capital and influence in the household. In Laikipia, women collectively controlled revenues, funded bursaries for their community, and took on leadership roles. In eastern Kenya, group 2, rotating savings groups were described to give women access to capital that was theirs to control. In eastern Kenya, table banking helped members grow their savings in ways they described enabled them to participate in economic life. When women describe how savings groups were kept hidden from their husbands, this was both a financial strategy and a way of quietly resisting the social norms that position household income under male control. The financial dimension of collective organising and its institutional limits are examined further in RQ3.

Navigating these conditions required women to develop conscious strategies for keeping their enterprises going. Some learned to present arguments from what one entrepreneur called a male point of view by adapting how they communicated to be taken seriously in professional spaces. Others refused to adapt by pushing back, following up, refusing to accept an initial refusal as final. One entrepreneur described how she turned external doubt into personal doubt, as she decided to use the doubt to push herself and other women to fight for their opportunities. One entrepreneur went back to complete a master's degree to strengthen her credibility, another made sure to structure the profit-sharing within her business partnership carefully to head off conflict before it started. Kabeer defines this as agency, which is the ability to define one's goals and act on them through negotiating, resisting, adapting and strategising, all of which the women in this study were doing.

Not all navigation was outward-facing. As explained by a key informant, some women deliberately keep their activities at subsistence level to avoid drawing male attention once the work became profitable, staying small was a way to protect their position and not evidence of limited ambition. This has direct implications for how support programmes should be designed: interventions focused on scaling women's enterprises may inadvertently increase women's

vulnerability within their households if the underlying ownership dynamics are not addressed first.

The strategies women developed largely worked as seen through their enterprises still running and in some cases growing. But the constraints themselves remain. This is most visible in how women describe confidence, not as a personal trait but as a relational condition, shaped by whether their authority was recognised and their knowledge taken seriously in the spaces around them. No amount of individual strategising could substitute for that recognition. Changing it requires changing those spaces, not developing individual women's self-belief. The strategies discussed here reveal that the burden of navigating a system not built for them fell on women themselves, and the analytical task is not to explain why women struggle, but why the system continues to produce these conditions.

8.3 RQ3: Institutional conditions for participation in bio-based value chains

This section discusses how formal and informal institutions translate gender norms into material outcomes such as credit systems, market structures, policy design and infrastructure. The institutional conditions shaping women's participation were interconnected in ways that made each barrier harder to escape.

Finance, infrastructure, markets and policy each created their own constraints, but they also compounded one another and together, they consistently worked against women whose enterprises were already operating at the margins of what formal systems were designed to support.

8.3.1 Financial exclusion and infrastructure as compounding constraints

Women who do not hold land cannot offer collateral, and without collateral they cannot access formal credit regardless of how their enterprises are organised or performing – a pattern Doss (2013) and Agarwal (2010) identify as a direct consequence of inequalities in gendered land ownership structures. What this study adds is that exclusion persisted even when women arrived with documentation in order, shaping who counted as creditworthy from the outset regardless of how their enterprises actually performed.

As the herbs and oils entrepreneur described, institutions seemed to expect something missing, and went quiet when they found nothing. Waylen (2014) explains this as it is not the collateral requirement that is the root problem, rather that it becomes a gendered barrier through the inheritance rules and social norms that have historically prevented women from owning land in the first place. The biofertiliser entrepreneur had environmental knowledge, community relationships and a working product, yet described building her production unit through "small, small savings" over years – not by choice, but because financial capital was structurally out of reach. This confirms what Bebbington (1999, pp. 2028–2029) argues: that knowledge, labour and networks can only translate into growth when financial capital is also available. Kagume (2022) documented similar persistent gender inequalities in entrepreneurship in Kenya, with women’s unequal access to

resources and credit, suggesting that what women experienced in this study is structural rather than exceptional.

As mentioned in RQ2, women found ways to work around these barriers through grants, collective savings and jointly registering with a male co-director, but none of these routes were taken on equal terms. Grants were competitive and hard to access without the right networks, collective savings were not enough to create real growth and choosing to jointly register their business with a male counterpart shifted the problem rather than solving. Other barriers women described such as unreliable electricity, poor transport, absent or unaffordable equipment are part of this same dynamic as the financial exclusion above.

As the CLD's R1 loop illustrates, capital and productive capacity are mutually reinforcing – without one, the other stays out of reach. Physical capital was a precondition for turning knowledge and labour into a viable livelihood, and that gap was visible across the dataset. I argue that women didn't choose to keep production manual, but had to because the capital to do otherwise was unavailable, which directly shaped their access to markets. Without transport, women depended on intermediaries, without equipment, they could not meet the volume or quality requirements of higher-paying buyers. Women producing honey on the coast processed manually because they had no electricity, coconut farmers in Kilifi could not reach Nairobi markets without going through intermediaries they had no power to negotiate with. This supports Agarwal's (2010) argument that women who own few productive assets have a limited ability to negotiate the terms on which they participate in markets.

This is where R1 connects to the market power trap (R3): limited productive capacity reduced bargaining power, which kept income low, which kept capital out of reach. This is where the financial exclusion and market captivity connect. The market problems women described were about who controlled the terms of trade, which was made possible partly because women had no capital to exit or negotiate from. Women's groups were concentrated in primary production and early processing, while buyers, brokers and intermediaries dominated the more profitable parts of the chain. Gereffi, Humphrey and Sturgeon (2005) call this captive value chain governance: suppliers understand the asymmetry but cannot exit because no structural alternative exists.

The eastern Kenya and coastal Kenya cases illustrate why having the information alone does not solve this, women in both groups knew exactly what their products sold for further along the chain, but that knowledge gave them nothing to negotiate with when the only alternative was losing the buyer entirely. Fischer and Qaim (2012) document a similar pattern in Kenya, where women carried most of the labour of production while most of the value was captured further up the chain.

The problem in both cases was not awareness but power and specifically that knowing about the unfairness made no difference when there was nowhere else to sell. These findings add empirical evidence to the gap Hackfort et al. (2024) identified around how women retain or lose control over bio-based products – showing how this dynamic plays out across multiple sectors simultaneously. Women built the knowledge and production capacity, yet value was captured by those better positioned in the chain.

For both the mangrove honey women's group and the eastern Kenya artisans, the organisation or person buying their products was also the one that had funded or trained them. This made pushing back on price or finding another buyer feel almost impossible. When a single actor combines the roles of funder, trainer and sole buyer, it creates a dependency that is worth paying attention to wherever NGOs and development organisations are involved in value chains. Where market position did shift (the sisal entrepreneur's platform and the Laikipia women retaining control over lodge revenues) the change was structural. What improved outcomes was not women performing better within existing arrangements but a change in who set the terms and who captured the value. These cases are evidence of what would need to change more widely for women's market position to improve.

8.3.2 Institutional design and the gap between policy and reach

Several key informants noted that Kenya has adequate policy frameworks for enterprise development and gender inclusion. The problem was not their absence but whether they reached the women they were meant for.

Brodkin (2012) shows that even well-designed policies rarely arrive as intended when implementation is unclear or under-resourced. Torre (2021) adds that gender-sensitive language does not automatically change outcomes if the procedures underneath stay the same. This dataset shows these dynamics operating together: policies that included women existed, and gender was mentioned in programme documents and discussions. But the practical reasons why many women could not access support in the first place, such as trainings held exclusively in Nairobi, information shared through digital platforms, eligibility criteria built around formally registered businesses, assumed a particular kind of participant. As discussed in RQ2, care and reproductive work falls disproportionately on women; the programme design failures described here reproduced that burden rather than accounted for it – assuming a participant without significant domestic responsibilities. Women in rural areas, informal workers and/or with a heavy care burden were not accessing the support because it was not built for them. A private sector representative explained how gender targets might become part of programme design after donors require them, showing how inclusion might be added on rather than part of the initial design.

What this digital divide shows is that when information and support moves primarily through digital platforms, it excludes women without resources such as devices or reliable connectivity. Hackfort and Saave (2024) show how digital and technical framings of farming systems tend to push out producers whose knowledge and practice is local. In this dataset, the information existed but could not be reached. Regulatory frameworks produced the same problem in a different form. Some women found that standards had simply not been developed for what they were producing. The biofertiliser entrepreneur found no existing category for insect-based fertiliser, the herbal products entrepreneur's business did not fit existing national certification categories two years after paying for a review and there were minimum wages for weavers existing, but not enforced. Institutions were built around established products and actors and left those outside the categories without a clear way forward. What the digital divide and regulatory gaps share is the same underlying logic as the financial exclusion described

above. Institutions are designed around an assumed participant that most women in the dataset were not.

8.3.3 Collective organisation and the conditions for change

Collective mechanisms such as table banking, SACCOs, rotating savings groups and shared market platforms were filling roles that formal institutions were not – providing access to capital outside collateral-based lending systems and pooling resources that formal credit systems could not reach.

As Kinyanjui (2014) and Johnson et al. (2010) document, women in Kenya working through collective financial mechanisms is not a new phenomenon but a historically grounded response to institutional exclusion. Chen (2012) adds that women's position in the informal economy is shaped by institutions rather than individual choice, meaning collective organising is better understood as a structural response than a cultural preference. That this pattern persists across the dataset suggests institutions have long been aware of the gap and have still not addressed it.

The question is why collective organisation became necessary in the first place. In most cases, women relied on collective mechanisms because formal financial systems were structurally inaccessible to them – a direct consequence of the collateral and infrastructure barriers described in 8.3.1. Where collective savings were also kept separate from household finances, as discussed in RQ2, this too reflected the absence of financial systems that gave women independent and protected access to credit and savings.

At the same time, the study also shows the limits of what collective organisation can achieve on its own. Nightingale (2006) observes that gender is continuously shaped through how people work and organise together, and this was visible in the dataset: when women organised collectively and shared accountability and leadership, the act of organising together itself produced gains beyond what any individual could access alone. Even this had limits.

The eastern Kenya artisans continued to rely on manual production methods and lacked a dedicated workspace; collective organisation had not resolved their access to materials, equipment or stable markets, and brokers still set the prices they received. Barbrook-Johnson and Penn's (2022) "limits to success" archetype captures why: the R4 collective loop operated within a wider system still shaped by the capital trap (R1) and the market power trap (R3). Collective savings could reduce short-term vulnerability and support gradual growth, but they could not substitute for the kind of investment that fundamentally changes productive capacity.

The pastoralist women's group in northern Kenya illustrates what collective organisation depends on institutionally. The group's gains rested on access to lodge infrastructure and an already established market – enabling conditions that had been put in place before the collective model took effect. Most other women-led groups in the dataset had not received comparable support at the outset. Laikipia is therefore not a straightforward model for replication but a demonstration of what collective organisation can produce when the conditions are supportive.

The enabling exceptions in the dataset help clarify what those conditions would actually need to look like. One incubation facility combined giving access to

machinery, supporting certification processes and connecting women to markets within the same facility so women did not first need to accumulate capital independently before reaching markets. A business development programme combined financial support with training and access to networks, allowing women to strengthen their businesses without already having the resources normally needed to do so. A fellowship programme for women in the bioeconomy also recognised care responsibilities by providing stipends, flexibility around childcare and manageable time demands, meaning women did not need to solve their domestic responsibilities before they could participate. In doing so it directly addressed the care burden trap (R2): by absorbing some of the domestic costs women carried, it freed up the entrepreneurial time and capacity the loop would otherwise restrict.

Agostino et al. (2023) distinguish between women being formally included and having meaningful access to what is on offer, arguing that participation alone will not guarantee that they can engage with opportunities. Cornwall (2016, pp. 355–356) argues that lasting change requires attention to both structural conditions and individual capacity at the same time. Their rarity in the dataset is itself significant: support designed around women's actual conditions required deliberate choices that the broader system did not tend to produce by default. All three were also externally initiated and remained dependent on continued donor or institutional support. None had become self-sustaining in ways that would allow them to persist independently. They show what enabling institutional conditions can look like, without resolving how those conditions could be made to last.

Across RQ3, the institutional conditions shaping women's participation tended to reinforce each other in ways that isolated interventions could not address. The collateral system turned gendered land ownership into financial exclusion. Infrastructure gaps limited what women could produce, while buyers and brokers captured most of the value. Support programmes rarely reached the women they were designed for. Collective organisation helped, but only so far. The enabling exceptions in the dataset show what a different approach could look like, and their rarity makes clear that the current system is not generating these conditions by itself.

These exceptions raise a question this study cannot fully resolve: whether the bioeconomy transition is genuinely transformative, or a rebranding of existing consumption patterns. The conditions that enabled them were structural and not about women performing better under the same constraints. That distinction matters for what comes next. The exceptions documented here are consistent with these arguments – they show what an enabling institutional environment can produce. Their rarity confirms the current system is not organised around these principles by default. If institutions continue to exclude women practising the most grounded forms of sustainable production, what changes is the language, not the distribution of power or resources. Genuine transformation depends on rebuilding institutions around the people already doing the work.

8.4 Future research

There are dimensions this study cannot fully resolve. Whether the financial terms women encounter when they do access credit match the realities of bio-based

production timelines remains unexplored. As Namayengo et al. (2023) found in Uganda, they often do not, and there is no reason to assume Kenya's bioeconomy is different. The household dynamics that lead some women to stay at subsistence level as a protective strategy also deserve focus, given the direct implications for how scaling programmes are designed. Men are largely absent from this analysis yet central to the dynamics documented – research examining how men's behaviour and institutional positioning shape women's outcomes would directly extend these findings. Finally, all enabling exceptions in the dataset remained donor-dependent. What conditions allow collective and institutional models to become self-sustaining is a question this study raises but cannot answer.

9. Conclusion

This study asked how women in Kenya's bioeconomy practise sustainability and navigate their enterprises, and whether that practice translates into recognition, resources and economic mobility. The answer, across all three research questions, is that it largely does not. The reason is institutional rather than individual.

The study combined feminist political ecology, Haraway's situated knowledges and Fraser's misrecognition and maldistribution because each operates at a different level of analysis. Haraway establishes that the environmental knowledge women develop through daily interaction with soils, ecosystems and scarce resources is a form of knowing differently positioned, not a lesser. Feminist political ecology locates that knowledge within the material conditions shaping it: gendered land rights, unequal resource access and the labour of managing natural systems under pressure. Fraser completes the explanation by showing why institutions systematically fail to recognise or resource women's work even when it is directly relevant to their stated goals.

What the findings show is that this gap operates through a system. Collateral requirements turn gendered land ownership into financial exclusion – a pattern Kagume (2022) identifies as structurally persistent across Kenyan entrepreneurship, not exceptional to this dataset. Infrastructure gaps lock women into manual production and dependency on a single buyer. Programmes are not designed for participants with care responsibilities or rural constraints. The economic invisibility of reproductive and subsistence labour is structural rather than incidental, and a feature of how dominant economic systems are organised. This logic extends into how bioeconomy institutions decide whose knowledge and practice count: women's environmental knowledge, developed through years of working directly with land and resources, is not recognised by the institutions that could support it. These conditions compound each other and cannot be addressed through isolated interventions.

Across the dataset, collective organisation through savings groups, SACCOs and table banking filled the gaps formal institutions left. This is a historically grounded response to institutional exclusion in Kenya, not a workaround – one Kinyanjui (2014) traces across decades of informal finance. Its persistence suggests institutions have long been aware of the gap without addressing it. Collective organisation helped, but could not substitute for the capital investment

that changes productive capacity or the structural shifts that change who captures value in markets.

What risks being obscured when focusing on barriers is who these women are. The women in this study built enterprises from limited starting points, developing environmental knowledge without formal training, organising collectively when formal finance was unavailable, and continuing despite being consistently failed by institutions. The barriers documented here are structural – they do not reflect women's capacity.

For policy and programme design, the findings point toward several concrete directions: financial instruments adapted to small-scale production, support built around women's actual rather than assumed conditions, and shifts in who captures value in markets, not only expanded access to training. The enabling exceptions in the dataset show what this could look like in practice. An incubation facility combining machinery, certification and market access; a fellowship designed around care responsibilities; a digital platform giving artisans access to markets. Designed around women's actual conditions and not just formally open to them. The rarity of such approaches in the dataset indicates the current system is not generating them on its own.

Where conditions did shift, it was because something structural changed. Diaz-Chavez (2025) argues that gender equality must be a central element of a sustainable transition to a bioeconomy, not an addition, directly supported in this dataset. Sanz-Hernandez et al. (2025) suggest women's leadership shapes how transitions unfold more broadly.

If institutions driving Kenya's bioeconomy continue to be built around assumed participants that most women in this study were not, and celebrate women's environmental knowledge without resourcing it, the transition changes the language rather than the distribution of power and resources. A genuine bioeconomy transition depends on rebuilding institutions around the people already doing the work, and treating the knowledge, labour and organising capacity documented here as the resource it already is.

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Appendix 1: Interview respondents

Individual interviews

Name	Role	Location	Cluster	Sector / activity
Biochar entrepreneur (coastal Kenya)	Founder / Entrepreneur	Coastal Kenya	Sustainable bioenergy	Briquettes, biochar, clean cooking solutions
Biochar entrepreneur (central Kenya)	Founder / Entrepreneur	Central Kenya	Bio-based agricultural inputs	Biochar, organic soil conditioner
Biofertiliser entrepreneur (central Kenya)	Founder / Entrepreneur	Central Kenya	Bio-based agricultural inputs	Biofertiliser, biopesticides
Moringa entrepreneur (urban Kenya)	Founder / Entrepreneur	Urban Kenya	Value addition to primary produce	Moringa and botanical products
Skincare entrepreneur (peri-urban Kenya)	Founder / Entrepreneur	Peri-urban Kenya	Value addition to primary produce	Bio-based skincare products
Circular economy entrepreneur (urban Kenya)	Founder / Entrepreneur	Urban Kenya	Bio-based industrial development	Waste recycling, circular economy products
Food processing entrepreneur (central Kenya)	Founder / Entrepreneur	Central Kenya	Value addition to primary produce	Gluten-free flours, food processing
Honey processing entrepreneur (urban Kenya)	Founder / Entrepreneur	Urban Kenya	Value addition to primary produce	Honey processing, packaged foods
Agro-processing entrepreneur (semi-arid Kenya)	Founder / Entrepreneur	Semi-arid Kenya	Value addition to primary produce	Dried fruits, herbs, agro-processing
Sisal entrepreneur (peri-urban Kenya)	Founder / Entrepreneur	Peri-urban Kenya	Bio-based industrial development	Sisal and leather products (bags, mats)
Herbs and oils entrepreneur (urban Kenya)	Founder / Entrepreneur	Urban Kenya	Value addition to primary produce	Herb-infused oils, specialty food products

Group interviews

Name	Participants (n)	Location	Bioeconomy cluster	Value chain role
Coconut farmers group (coastal Kenya)	4	Coastal Kenya	Primary production	Raw material production

Name	Participants (n)	Location	Bioeconomy cluster	Value chain role
Pastoralist women's group (northern Kenya)	12	Northern Kenya	Value addition + circular systems	Production, processing, service provision
Mangrove honey women's group (coastal Kenya)	15	Coastal Kenya	Value addition + ecosystem-based production	Production + environmental management
Biofertiliser farmers (central Kenya)	4	Central Kenya	Bio-based agricultural inputs	Primary production
Moringa farmers (eastern Kenya, group 1)	2	Eastern Kenya	Value addition + circular systems	Primary production
Moringa farmers (eastern Kenya, group 2)	2	Eastern Kenya	Value addition + circular systems	Primary production
Women artisans (eastern Kenya)	14	Eastern Kenya	Bio-based industrial development	Processing / manufacturing

Key informant interviews

Name	Institutional type	Relevance to study
Private sector representative	Private sector / policy	Private sector engagement, MSME support, circular economy
Agricultural policy researcher	Research institution	Agricultural systems, innovation, policy
Government policy official	Government	Industrial policy, regulation, enterprise development
Science and innovation regulator	Government / research	Innovation systems, research-policy interface

Bioeconomy programme manager	Regional innovation programme	Enterprise support, bioeconomy development

Appendix 2: Thematic coding example

Verbatim Quote	Interviewee / Group	Descriptive Codes	RQ
"If you start today, you're able to keep it going tomorrow and the day after and for years to come."	Herbs and oils entrepreneur (urban Kenya)	Enterprise continuity; future orientation; whole-system sustainability	RQ1
"When I hear sustainability, I think of using what is available without harming the planet, and considering the generation that comes after me."	Circular economy entrepreneur (urban Kenya)	Environmental sustainability; intergenerational responsibility; resource stewardship	RQ1
"The bees are relying on the mangrove forest… mangrove forest always having flowers."	Mangrove honey women's group (coastal Kenya)	Ecological interdependence; situated environmental knowledge; ecosystem knowledge	RQ1
"I am just tired of attending trainings… I don't need another PowerPoint; I need equipment."	Agro-processing entrepreneur (semi-arid Kenya)	Knowledge-practice gap; mismatch of support; equipment barrier	RQ1
"Maybe because you're a woman and your voice is not… it's not taken. Not considered."	Biofertiliser entrepreneur (Central Kenya)	Symbolic devaluation; gendered credibility gap; institutional exclusion	RQ2
"We do everything… we don't have rest days as women, we only rest when sleeping at night."	Women artisans (eastern Kenya)	Care burden; physical exhaustion; gendered labour distribution	RQ2
"Before, all decisions depended on the man because he was the one providing. Now the woman can also provide."	Pastoralist women's group (northern Kenya)	Income and household authority; shifting gender dynamics	RQ2

"It is the women who are tilling the land. But inherently, they can't even have access to financial services, because they have nothing to give as collateral."	Science and innovation regulator	Collateral barrier; financial exclusion; gendered asset gap	RQ3
"We don't have the power to negotiate… because it is one source."	Coconut farming group (coastal Kenya)	Captive value chain; buyer dependence; bargaining power	RQ3
"We have enough policies in Kenya. What they lack is gender lens."	Private sector representative	Gender-blind policy; institutional design failure; structural inequality	RQ3

Appendix 3: Key concepts

Several key concepts are used in specific ways throughout this study, and clarifying them upfront avoids ambiguity in how the findings are interpreted.

Gender is used throughout to refer to the socially constructed roles, expectations and hierarchies that shape how women and men are positioned in society, rather than biological difference (Detraz, 2017; Elmhirst, 2011). The study examines gender as a structuring condition that shapes access to resources, recognition and economic opportunity, and attends to how these relations are constituted differently across the geographic and social contexts where data was collected.

Woman is used throughout the study to refer to participants as they are identified and described within the research context. The term follows CEDAW's broad and inclusive understanding, recognising that "woman" cannot be reduced to a single biological or identity-based criterion. Instead, it reflects a diverse range of lived realities and self-identifications, consistent with how the category is used in everyday practice (Meyer, 2016).

Women-led enterprise is used to describe enterprises where a woman or group of women holds primary ownership, founding or leadership roles and is actively involved in day-to-day decision-making and management. This includes cooperatives and community groups where women hold recognised leadership and decision-making roles, as well as cases where enterprises are jointly owned or managed with a spouse, provided both the woman and her spouse recognised her as the initiator and leader of the enterprise. In practice, the boundary between women-led and jointly-led enterprises was not always clear-cut, and this is acknowledged as a limitation of the study. In practice, the dataset includes both individual enterprise founders and members of collective groups whose primary economic activity is production within a bio-based value chain. These positions differ in capital, formalisation and market power, and are distinguished where this difference is analytically relevant throughout the discussion.

Bioeconomy is used as an analytical category to describe enterprises working with biological resources across the four clusters identified by the ABDK project: value addition to primary produce and circular food systems, bio-based agricultural inputs, bio-based industrial development, and sustainable bioenergy (SEI, 2025b). Importantly, all participants did not identify their work using bioeconomy language, the term is therefore applied analytically by the researcher rather than assumed to reflect how participants understand their own work.

Sustainability is not fixed to a single external definition in this study. As the findings in RQ1 show, participants defined sustainability in their own practical and future-oriented terms, integrating economic, social and environmental dimensions together. The study examines sustainability both as an analytical concept and through participants' own understandings, treating their definitions as analytically significant rather than as approximations of a policy standard.

Formal and informal enterprises are not treated as fixed or mutually exclusive categories. Following Chen (2012) and Kinyanjui (2014), informality is understood as a structural feature of economic life rather than a transitional phase, and enterprises operating across both formal and informal systems were included deliberately in the study design.

Appendix 4: Example of interview questions

Theme	Question	RQ
Opening	Can you tell me about your enterprise and your role in it?	—
Opening	How long have you been working in this activity or enterprise?	—
Sustainability practices	What does sustainability or sustainable production mean in your everyday work?	RQ1
Sustainability practices	What kinds of practices do you use to manage natural resources or reduce waste?	RQ1
Sustainability practices	Have you made any changes over time to become more environmentally friendly, and what motivated those changes?	RQ1
Sustainability practices	How easy or difficult is it to maintain or improve sustainable practices?	RQ1
Institutions and markets	What kinds of support have been most important for your enterprise so far?	RQ2
Institutions and markets	How easy or difficult is it for you to access finance or credit, and why?	RQ2
Institutions and markets	Where do you sell your products, and how stable are these market relationships?	RQ2
Gendered realities	How do gender roles or expectations in your household or community affect your work in the enterprise?	RQ2
Gendered realities	Do you think women and men have equal opportunities in this sector, and why or why not?	RQ2
Gendered realities	Have you ever felt that you were not taken seriously as a business owner or producer?	RQ2
Policy and design	What changes would make it easier for women-led enterprises to succeed in this sector while also being environmentally responsible?	RQ3
Policy and design	If you could advise policymakers or organisations supporting the bioeconomy, what should they prioritise to better support women like you?	RQ3
Closing	Is there anything important we have not talked about that you think decision-makers should understand?	—

Appendix 5: Popular Science Summary

Ask a woman running a biofertiliser operation what sustainability means, and she won't reach for a policy document. She will tell you about her mother's fields, about soil that degraded with the seasons, about the cost of chemical fertiliser that finally pushed her to find something else. She figured it out herself, tested it with neighbours, watched the yields change. Now larger farms come to buy from her.

That story runs through a new study following 64 women running bio-based enterprises across nine counties in Kenya: honey, biochar, moringa, sisal, agroecology, circular food systems. Most of these women are not benefiting from Kenya's push toward a greener economy. Not because they are not doing the work, but because the institutions meant to support it weren't built with them in mind.

The women had real environmental knowledge built from years of close contact with land, water, and changing weather, not from formal training. They knew which soils degraded under chemical inputs. They had watched rainfall become less predictable. A mangrove honey group on the coast understood the relationship between mangroves and bee productivity so well that they organised a restoration programme. But knowledge alone does not pay rent or buy equipment, as women described hitting the same ceiling repeatedly: no machinery, no reliable electricity, no land title to use as loan collateral.

Land ownership sat at the root of most financial barriers. Without a title, women could not access formal credit or grow. Some turned to collective savings , but could still not fund the investments that would take their enterprise to the next level.

In markets, women faced buyers who set prices they could not negotiate. Artisans spent two weeks making baskets that brokers bought for 500 shillings and resold in Nairobi for 10,000. When they pushed back, brokers threatened to go elsewhere. Knowing the gap existed gave them nothing to bargain with.

There were exceptions. An incubation facility that combined machinery, certification, and market access in one place. A fellowship designed around childcare constraints. A digital platform that connected artisans directly to buyers, cutting out brokers entirely. They worked because they changed something structural, not because women had somehow performed better under the same conditions.

Kenya is building a national bioeconomy strategy. The knowledge most relevant to making that transition real, how to farm sustainably under pressure, how to build circular production from scarce resources, how to adapt without a manual, is held by the people least connected to the institutions driving it. That's not their failure, it's a design problem.

Appendix 6: AI Disclosure Statement

Two AI tools were used in the preparation of this thesis.

NVivo was used to transcribe the audio recordings from interviews and group discussions. All transcripts were reviewed and corrected manually against the original recordings before being used in the analysis.

Research Rabbit was used to identify and explore relevant academic literature during the literature review phase. All sources identified through this tool were read and assessed independently before inclusion.

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