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# Gender norms and women's economic resilience to climate change challenges: a case study of Ogun and Oyo states in Nigeria

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**ABSTRACT**

This paper uses case studies of three agri-food systems in Nigeria – cassava, catfish and chicken – to demonstrate the impact of gender norms on women's economic resilience to climate change impacts. It provides insights into how transforming gender norms helps build economic resilience for women. It is based on data collected in Ogun and Oyo states through a stakeholders' workshop, 55 Individual and Key Informant Interviews and 18 sex-disaggregated Focus Group Discussions. A gender-sensitive resilience approach was developed from literature on resilience approaches and gender transformative processes and used to analyse the data. The paper concludes that gender norms create gendered opportunities and constraints for economic resilience to the impacts of climate change. These opportunities and constraints emerge at the intersection of social institutions, agency and power relations. More men than women have access to and ownership of resources for economic resilience, such as land and finance. Men can often make long-term/strategic plans compared to women's short-term survival tactics. Approaches to promoting women's economic resilience in climate change scenarios should challenge discriminatory gender norms and integrate gender-sensitive agricultural policies that encourage women's equal and meaningful participation in all spheres, including at household, community, organizational and macro-environmental levels.

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## Introduction

The long-term impact of adverse climate events on individuals and communities varies depending on various factors, including the individuals' and communities' economic resilience. Economic resilience is the ability of individuals and communities to cope, recover from, reconstruct, minimize losses and adapt to new circumstances after a shock (Hallegatte, 2014). Economic resilience to climate change challenges is influenced by several factors that intersect in complex ways to produce outcomes. These factors include power dynamics that shape access to resources for economic resilience. Resources for economic resilience include (i) political resources – access to decision-making power and processes, (ii) economic resources – land, finance and other assets, and (iii) social resources. Social resources are functional resources arising from interpersonal aspects such as social networks and community ties, for example, community and family support (Kaltiainen et al., 2024). Thus, social resources can be available through social institutions, such as family, community, education and government, that govern collective and individual practices. Interactions within and among these social institutions are mediated by social norms (Contzen & Forney, 2017; Černič Istenič, 2024). Social norms are informal rules that govern the behaviour of individuals and groups within societies (Bicchieri et al., 2023), and they can be enabling, limiting, or discriminatory. Social norms

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include gender norms, which are informal, deeply entrenched and widely held beliefs or ideas about gender roles, power relations, standards or expectations that govern how girls, boys, women and men are expected to be and to act in a particular social context and at a specific time United Nations Population Fund (UNFPA) and United Nations Children's Fund (UNICEF, 2020). This paper focuses on how discriminatory gender norms impact women's economic resilience in the face of climate change in Ogun and Oyo States, Nigeria.

Gender norms shape individuals' and communities' experiences of adverse climate events and their economic resilience. Discriminatory gender norms restrict women's roles, agency and access to decision-making centres, and prevent them from accessing, owning and utilizing the necessary resources for adaptation, such as new agricultural technologies and farming techniques. These limitations ultimately restrict women's economic resilience (FAO et al., 2023; Ume et al., 2021). For instance, norms on household division of labour often result in a higher domestic workload burden for women, leading to restricted mobility (Adeyeye & Fischer, 2024; Timsina et al., 2023). Time poverty and limited mobility, in turn, limit women's access to training on new agricultural technologies that may be necessary to address climate change challenges. Women's inadequate access to productive resources, like agricultural land, means they cannot make decisions that affect mitigation and adaptation plans and food production (United Nations Economic and Social Commission for Asia and the Pacific (ESCAP, 2022; Kristjanson et al., 2017). Women are underrepresented in climate policy decision-making at all levels (FAO et al., 2023; Huyer et al., 2020). Assan et al. (2018), analyzing the ability of smallholder farmers in Ghana to cope with and adapt to climate change, observed that more male heads of households could adopt and use climate adaptation innovations compared to female household heads. Despite the significant impact of discriminatory gender norms, many government programs in Nigeria implemented by the Ministry of Women Affairs focus mainly on poverty alleviation for women (Ntiwunka, 2013; Jawo et al., 2023) without addressing the gender norms that keep women in a state of disempowerment.

Women and other socially marginalized groups continue to experience the more significant impact of the climate crises, particularly in countries like Nigeria, with a high dependence on agriculture. Yet, the interplay among gender, climate change and food security in Nigeria and many other countries is poorly documented (Anugwa et al., 2023). It is important to understand how discriminatory gender norms negatively impact women's economic resilience in the face of climate change challenges. This is because women's lower economic resilience could negatively impact the overall economic resilience at household, community and national levels. A better understanding by policymakers of the impact of discriminatory gender norms on women's economic resilience may lead to policies that are gender transformative. Gender transformation in international development and society refers to 'societal transformations towards gender equalities' through changing 'the underlying paradigms and values' that shape human interactions (MacArthur et al., 2022, p. 2). As Ume et al. (2021) point out, there is a need for more qualitative studies in order to acquire deep and contextual information necessary to develop appropriate policy interventions. This paper contributes to the literature through a qualitative exploration of how the interplay of gender and social norms affects women's economic resilience to the impact of climate change.

This paper also makes a unique contribution to the existing literature because, to better understand the impact of gender norms on women's economic resilience to climate change, it uses an agrifood systems approach instead of a value chain approach. Value Chain approaches assume that changing Value Chain structures and governance will lead to the redistribution of benefits across and between Value Chain actors (Mausch et al., 2020). However, Value Chain approaches often result in single-point interventions that lead to conflicting results along the value chain (Mausch et al., 2020). For instance, upgrading the sweetpotato value chain in Malawi made it more profitable, but rather than benefiting men and women equally, this resulted in men taking over the formerly women-dominated activity of producing and selling sweetpotato vines and sweetpotatoes (Mudege et al., 2018). On the other hand, an agrifood systems approach focuses on the wider systemic context and connects complex food production and consumption systems so that 'performance is understood in aggregate terms and at the system level' (Mausch et al., 2020, p. 2). By paying attention to the systems' complex interconnections, the agrifood systems approach is a more holistic approach that helps in understanding how

norms affect women's economic resilience to the climate change impacts.

This paper advocates for transformative changes in gender norms to promote women's resilience. It uses case studies of three agri-food systems in Nigeria – cassava, catfish and chicken – to demonstrate the impact of gender norms on women's economic resilience to climate change impacts. It aims to provide insights into how transforming gender norms may help build sources of economic resilience for women. The paper will answer three main questions (1) what are the climate shocks for farmers and what are their impact on chicken, cassava and catfish food systems?, (2) how do gender norms shape men's and women's sensitivity to climate change shocks? and (3) how do gender norms influence adaptive capacities and, ultimately, economic resilience to the impacts of climate change?

## Context

Nigeria is highly dependent on agriculture and its natural resource base, increasing the likelihood of climate variability and environmental degradation significantly impacting individuals' and communities' livelihoods. Nigeria's climate has changed, and the country is increasingly experiencing rising temperatures, unpredictable rainfall patterns, rising sea levels and flooding, drought and desertification, land degradation, increased frequency of extreme weather events, depleted freshwater supplies, and a decline in biodiversity (Ebele & Emodi, 2016; Elisha et al., 2017; Olaniyi et al., 2014). Low agricultural productivity has been a key impact of climate change in Nigeria (Omoyemen, 2010).

Women in Nigeria are at a greater disadvantage when dealing with the impact of climate change due to discriminatory gender norms and other factors. Women contribute 60–80% of food production in the country, and yet a majority of them are excluded from climate decisions (Ume et al., 2021). Furthermore, it is traditionally accepted that men can have multiple streams of income, while women are perceived as homemakers and therefore expected to 'only make do with farm produce and resources within the homes' (Ume et al., 2021, p. 2103). Nigeria, therefore, offers valuable insights into the impact of discriminatory gender norms on women's economic resilience in the face of climate change challenges.

This study was conducted in Ogun state (fish food system) and Oyo state (chicken and cassava food systems). Ogun and Oyo states are two of Nigeria's six states in the Southwest geo-political zone (See Figure 1). Ogun state hosts the largest hub of aquaculture enterprises in West Africa and is among the top catfish-producing states in Nigeria. Many women in the state are not economically empowered, as evidenced by their lower levels of education, lower participation in marketing associations and limited access to credit facilities (Babalola et al., 2015; Ntiwunka, 2013). Women in Ogun state are highly engaged in catfish processing but earn low incomes (Adam & Njogu, 2023). Women in the state also suffer various forms of domestic violence, such as beatings by their spouses, verbal abuse, deprivation of financial and physical resources by their spouses, which affects their performance in agriculture and engagement in a variety of livelihood activities (Ashimolowo & Otufale, 2012; Gbolahan & Ayodapo, 2013). In a study in Ogun state, Ashimolowo and Otufale (2012) found that a majority of women participating in the study (62.56 per cent) would not defy the perpetrator of domestic violence. Thus, domestic violence fuels discriminatory gender norms because it limits women's ability to challenge them.

Oyo state is one of the top ten cassava-producing states and a high producer of broiler chickens. Many women in the state have low economic empowerment levels, and gender income inequalities persist (Donkor et al., 2022). For example, for cassava producers in the state, Donkor et al. (2022) note women generate 43.2% of the income and the rest is generated by men. In a study conducted in the Southwest region of Nigeria, including Oyo State, Ikuemonisan (2024) found that male broiler chicken farmers had an average income of N285,049, whereas female farmers had an average income of N215,714. Additionally, in a production cycle, male producers managed 426 broiler chickens weighing 759 kg, while female producers managed 110 weighing 317 kg (Ikuemonisan, 2024).

The two states provide compelling cases to explore how discriminatory gender norms increase women's vulnerability to the impacts of climate change and limit their economic resilience. Such an exploration could help to identify key levers to foster gender-equitable transformative change that improves women's adaptive capacities.

## Analytical framework

To understand how gender norms shape women's economic resilience to climate change impacts, we

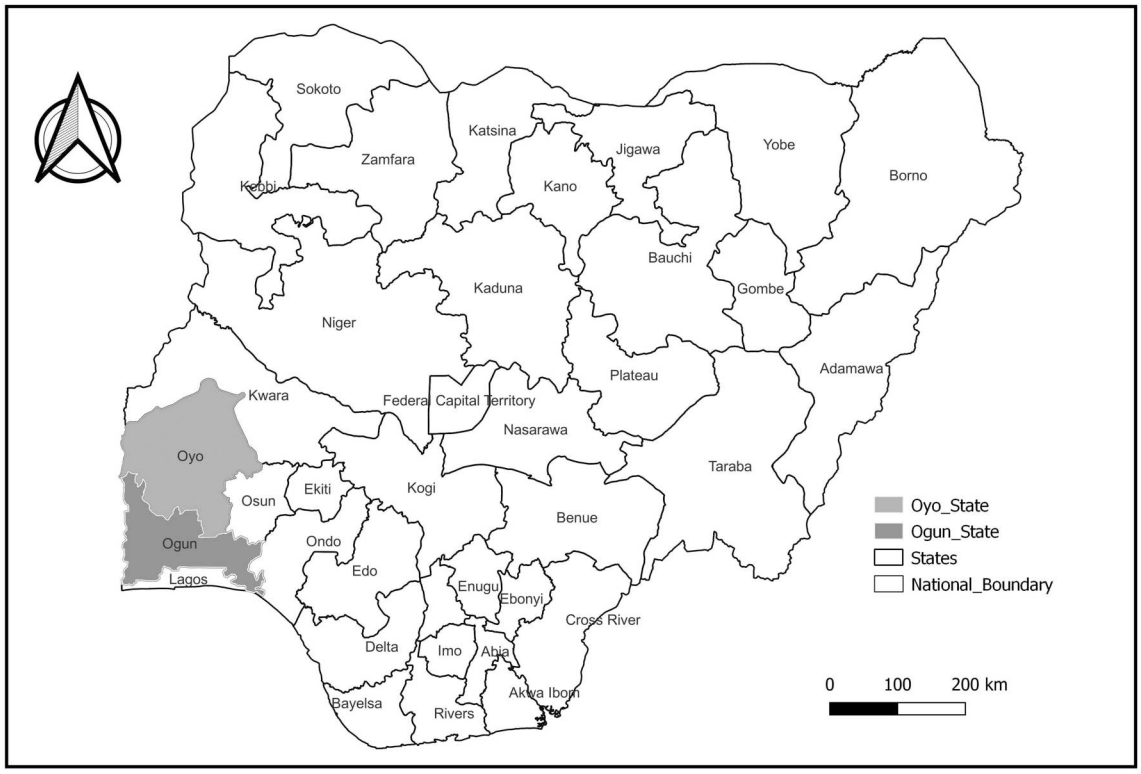



**Figure 1.** Map of study districts.

developed a gender-sensitive resilience framework (see Figure 2) by combining a resilience approach and a gender transformative approach. We conceptualized economic resilience in line with Nelson et al. (2007), who state that resilience is based on complex systems and emphasize system

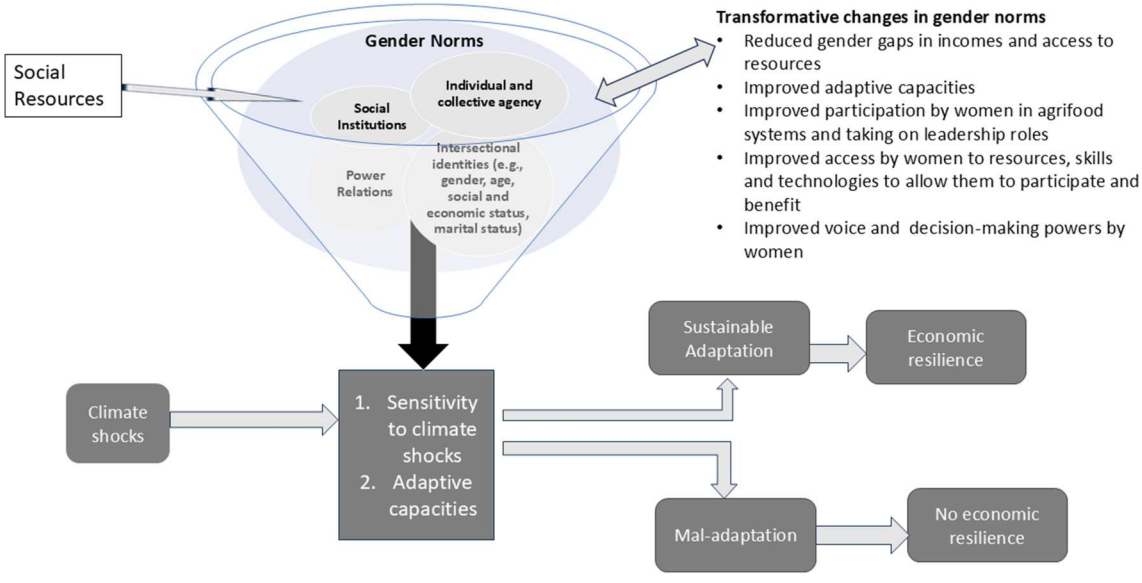



**Figure 2.** Gender-sensitive resilience framework.

renewal, developing sources of resilience and providing space for agency. System renewal refers to individuals, communities or countries restructuring processes that address the drivers of vulnerability to climate impacts. System renewal can include for example, a shift towards climate-smart technologies that promote the reduction of methane gases, soil fertility, and efficient use of available water resources to enhance the sustainability of agrifood systems.. System renewal is essential because it offers pathways for meeting current and future challenges, including anticipated and unanticipated climate changes. Agency is 'the ability to define one's goals and act upon them' (Kabeer, 1999, p. 438), and incorporates 'individual and collective capacities (knowledge and skills), attitudes, critical reflection, assets, actions, and access to services' (Hillenbrand et al., 2015, p. 5). Individual agency is shaped by personal traits, self-efficacy and motivation, while collective agency relies on collective support through social institutions such as family. Agency can be tactical or an agency of the weak, where individuals or collectives act within certain constraints to seize available opportunities, or it can be strategic, where those in power anticipate and plan for long-term gains (Honwana, 2006). Agency is important to system renewal since system renewal implies taking deliberate actions to change the situation. Nelson, Adger and Brown's approach aligns with the agrifood systems approach that focuses, as described earlier, on complex interconnections within a wider systemic context.

We consider three issues that Thompson-Hall et al. (2016) consider as key to a resilience approach: exposure to shock, sensitivity and adaptive capacity. Sensitivity refers to the likelihood of being harmed once exposed to the shock, and adaptive capacity refers to the tools and resources that can be used to adapt to the change and their utilization (Thompson-Hall et al., 2016).

To the resilience approach, we add a gender-transformative approach, which emphasizes a holistic approach that transforms power dynamics and social systems that serve to reinforce gendered inequalities (Cole et al., 2020; Hillenbrand et al., 2015; Kantor et al., 2015; McDougall et al., 2021; Njuki et al., 2023). Transforming power dynamics is important because women's economic empowerment that ignores power relations has, in many cases, failed to bring about significant gender transformative change in societies (Hillenbrand et al., 2015; Kantor et al., 2015; McDougall et al., 2021; Njuki et al., 2023). We conceptualize gender transformative change as a process comprising (i) agency, (ii) power relations among people in the home, groups, community, organizations and broader society, (iii) and formal and informal social institutions, such as family, community, educational and government, that govern individual, collective and institutional practices (FAO et al., 2023; Hillenbrand et al., 2015). Thus, the work of gender-transformative processes should be shared across political structures and by people of all genders as members of society through collective responsibility and political engagement and action (Cole et al., 2020; Liu et al., 2023; McDougall et al., 2021; Njuki et al., 2023). This holistic approach aligns with the agrifood systems approach in that, instead of focusing on single-point interventions such as self-improvement among women, it looks at the entire system of gendered power.

In conceptualizing the groups 'women' and 'men', we use an intersectional approach (Crenshaw, 1989; Hillenbrand et al., 2015; Jawo et al., 2023; Njuki et al., 2023; Thompson-Hall et al., 2016). As such, we consider men and women categories as heterogeneous groups whose members may have varied adaptive capacities, even when exposed to the same shocks. This is because members of the same group can have different lived experiences, identities, histories, and experiences of power relations across class, ethnicity, sexuality, religion, (dis)ability, gender and other systems of oppression.

Gender norms are neither static, universal, nor immutable (McDougall et al., 2021; Save the Children, 2023). They change over time as they shape and are shaped by power relations, individual and collective agency and the practices of government, economic, educational, family, religious and other social institutions. This dynamism means norms may be questioned in ways that 'can provide space for negotiation, contestation, and change' (McDougall et al., 2021). The gender-sensitive resilience framework emphasizes that transformative change in gender norms requires an understanding of complex systems of power that interact in complex ways. This is because gender norms not only shape interactions among individuals but are embedded in social institutions and all areas where power operates. Transformative change is necessary to achieve sustainable adaptation, which is both socially and environmentally sustainable. This is because it ensures that harmful gender norms are eliminated so that there can be gender-equal access to resources

for economic resilience. Strategies that do not incorporate transformative change in gender norms will lead to mal-adaptation because women's ability to contribute to agrifood systems will continue to be limited. Mal-adaptation 'is when an action results in conditions that are worse than those which the original strategies were trying to address' and thus, leave people 'even more likely to be negatively affected by climate change' (Schipper & Lisa, 2020).

Drawing from the framework, the paper will address how gender norms shape men's and women's sensitivity to climate shocks, their adaptive capacities and, ultimately, their resilience to the impacts of climate change. It pays attention to how gender norms permeate the functions of social institutions and power centres, thus impacting individual and collective agency, which are necessary for building adaptive capacities in agrifood systems.

## Data collection and sampling

All study participants were purposively selected from the cassava, catfish and chicken food systems to include participants from all five spheres of influence outlined in FAO et al.'s (2023) framework for measuring gender transformative change in the context of food security, nutrition and sustainable agriculture. Individual men and women and households were selected with the help of extension officers who identified smallholders and households to be interviewed. A mapping exercise during stakeholder workshops helped to identify the communities, leaders, service providers and organizations to be interviewed. The five spheres of influence are.

(i) Individual

This sphere focuses on individual men and women. It helps to understand how changes in weather patterns have affected the performance of the food system and the livelihoods of individual smallholders who depend on it. It also helps to understand how gender norms are affecting individuals and their ability to cope with climate change impacts.

(ii) Household

This sphere focuses on families and intrahousehold relationships. It helps to understand how households are coping with climate change impacts and how gender norms at the household level affect families' economic resilience.

(iii) Community

This sphere focuses on leaders, local service providers, and groups such as input suppliers, finance providers, aggregators/traders/middle persons, and supermarkets. The sphere helps to provide the background social, economic, and political information about the community, and the timeline of key climate events over the past decade. This sphere also provides insights into community gender norms and how they affect men's and women's economic resilience to climate change. It also offers insights into perceptions about gender norms and their effect on service providers' ability to provide services to men and women operating in the food system.

(iv) Organizational

This sphere focuses on public/private sector, research and development organizations, and civil society. These organizations help to identify and map the key stakeholders in the respective food systems of interest. They also provide an overview of key climate events over the past decade and national/regional expertise on norms constraining women and other groups' ability to build economic resilience.

(a) Macro-environmental

This sphere includes government, donors, and development banks. It provides background social, economic, and political information at the national and regional levels. The sphere offers more insights into gender norms and also an understanding of how government policies affect the ability of men and women to cope and be resilient to the impact of climate change.

Including respondents from all five levels of influence ensured a more holistic approach that considers various perspectives along the chain of influence from the micro level (individual) up to the macro level (see Table 1).

First, a stakeholders' workshop was hosted in Ibadan, Nigeria, to collect data. Seventeen stakeholders (eight men and nine women) from the Academia, Non-Governmental Organizations (NGOs), Government Departments, private sector, farmers'

**Table 1.** Participants description.

| Sphere of influence | Target respondents/ participants | Institution |
|---|---|---|
| **Individual** (men and women) | • Including producers, processors and traders in rural and peri-urban areas. | |
| **Household** (families, intrahousehold relationships) | • Household members involved in the food systems, including producers, processors and traders (in rural and peri-urban areas). | • Social |
| **Community** (leaders, local service providers, groups) | • Community leaders.<br>• Community-level producers (fish, livestock, and cassava), processors, traders, and service providers (e.g. input suppliers, aggregators/ traders/middle persons, and finance providers). | • Social |
| **Organizational** (public/private sector, research and development organizations, civil society) | • University Faculty, NGOs, the private sector, and representatives of producers. | • Social |
| **Macro-environmental** (government, donors, development banks). | • Government Departments. | • External social institutions that affect individuals, households, communities and organizations through policymaking. |

associations, and other agri-food system actors with a national/regional perspective of the agri-food systems of interest participated in the workshop. During the workshop, we elicited information about how critical events, including climate change-related events, affected the agri-food systems during the past ten years. In addition, we conducted gender mapping of the agri-food systems of interest to get a gender profile of the various activity nodes in the systems because gender power dynamics also shape these profiles.

**Table 2.** Description of the sample (individual interviews and key informant interviews).

| | Individual interviews (IDIs) (Spheres: individual and household) | | Key Informant Interviews (KIIs) (Spheres: community, organizational and macro-environmental) | | |
|---|---|---|---|---|---|
| Food system | Male | Female | Male | Female | Total |
| Cassava | 5 | 5 | 4 | 4 | 18 |
| Catfish | 5 | 5 | 4 | 5 | 19 |
| Chicken | 6 | 5 | 3 | 4 | 18 |
| Total | 16 | 15 | 11 | 13 | 55 |

We also conducted 55 Individual and Key Informants Interviews (see Table 2). The cassava and chicken food systems had eighteen respondents each, and the catfish food system had nineteen. Respondents consisted of actors in all five spheres of influence. They included producers, processors, traders, supporters, service providers, farmers' association leaders, and government and non-governmental organizations' officials. The team made an effort to have an equal number of men and women participate in the study.

We also implemented 18 sex-disaggregated Focus Group Discussions (FGDs) (nine with men's and nine with women's groups), with a total of 27 men and 27 women participating in FGDs for each of the three food systems. The FGD participants consisted of producers, community-level processors and traders.

All participants in individual and key informant interviews signed a consent form and knew participation was voluntary and that their responses would be treated with confidentiality. FGD participants gave verbal group consent after the study was explained to them. They were informed that participation was voluntary and that they were free to refuse to participate without any implications for their ability to participate in and benefit from projects in the future; they could refuse to answer any questions, and they could end their participation at any time. The study team also explained that all collected information would be anonymized during analysis to protect their identity.

Data analysis involved three key activities: (i) developing a codebook using the study tools. (ii) reading the transcripts to update the codebook from the dataset. (iii) using NVIVO coding software to code the data. After data collection, the researchers refined the themes by reading and re-reading all

transcripts to identify recurring data. Team members reviewed and verified selected codes and themes. Thus, a hybrid deductive-inductive approach was used for analysing the interview data collected from the fieldwork and in developing the codebook. For the deductive approach, the researcher identified themes using literature and the research framework during the tool development stage.

The data was analysed by a team of multidisciplinary individuals from various regions of Africa, including Nigeria, Zimbabwe and Zambia. We acknowledge that our analysis of the data reflects our embodied knowledge as both insiders and outsiders to the communities studied. It also reflects our collective long-term experiences of engaging affectively as feminists and/or individuals committed to seeking ways of promoting gender equality in communities in Sub-Saharan Africa. Data analysis involved a constant exercise of (self-)reflection, both individually and as a team, to ensure that we paid attention to the contexts, cultures, perspectives and agency of the individuals who contributed to the data.

## Findings

The following themes were identified through the coding exercise: (1) Exposure to climate shocks and their impact on chicken, cassava and catfish food systems, (2) Gendered sensitivity to the economic impacts of climate change challenges on food system actors, and (3) gender norms' impact on women's adaptive capacities and economic resilience to climate change challenges.

### *Exposure to climate shocks and their impact on chicken, cassava and catfish food systems*

Key climate change challenges identified by actors across the three different food systems were: drought, sunshine, early or delayed rainfall or excess heat, flooding or excessive rain; pest/insect attack; and no sunshine. These adverse weather conditions affect production and distribution costs for all three food systems. For instance: *Chicken* farmers noted that excessive rain exposes chickens to diseases, and increases in chicken diseases mean farmers require more medications and other bio-security measures. Flooding also affects the production of chicken feed inputs such as maize, soya beans, and sunflowers. Chicken houses may get flooded, or their roofs may leak, requiring repairs, rebuilding, or relocation of the chickens. Chicken farmers may temporarily drop out of chicken farming, affecting other input suppliers such as hatchery operators and drug and vaccine sellers by reducing the demand for their products. Excessive rain and insufficient water (in the case of a drought) lower egg production. When there is too much heat, labour and financial demands increase because farmers must cool down their chickens to minimize loss through poor egg production and high chicken mortality and morbidity. For example, chicken farmers may put ice blocks in drinking water or spend more money on plastic containers for the chickens to drink from. When there is excessive heat, broiler farmers also reduce the number of broilers to improve airflow in the chicken coop.

*Cassava* farmers noted that excessive rains destroy cassava roots, rotting them and leading to low productivity and poor harvests. On the other hand, extreme heat causes the ground to be too hard, presenting problems for cassava farmers during harvest. A female chicken farmer who also produced cassava said villagers had received government loans during the COVID-19 pandemic and used them to farm cassava. However, up to 100 hectares out of the 250 hectares of cassava cultivated under the loan scheme had yet to be harvested because the ground was too hard, and getting labourers to work on the farm was challenging.

*Fish* farmers mentioned excess heat as problematic since it increases fish mortality and affects water quality and the biological processes of the fish. Very high temperatures dry the ponds, particularly for farmers who depend on groundwater and swamps to cultivate their fish. When confronted with ponds drying, farmers harvest their fish early. Early harvesting leads to losses for the farmers since the fish is harvested before reaching the desired market size. Some farmers planted bananas around the pond to provide shade or put in place measures to manage the water flow to cool pond water.

Adverse weather events also result in increases in post-harvest losses. For instance, in the case of flooding or excessive rain, cassava on the farm may rot, and fish and chicken may spoil due to increased transporters' duration on bad roads or because buyers/traders cannot travel to affected villages and communities to acquire the products. For cassava, when rain comes with heavy wind, women who process garri have problems frying their garri, and they will also not have access to good cassava since they cannot go to the farm to get cassava during

rain. Also, excessive rain and little sunshine result in lafun (cassava flour) processors struggling to dry their cassava sufficiently. Furthermore, when there is flooding, excessive heat or a dry spell, fish processors, mostly women, do not have access to fish for processing. During these times, the price of fish goes up due to scarcity, making business more challenging for those who sell and process fish. Additionally, when there is excessive rain, it takes longer to smoke fish using charcoal, which sometimes needs drying before it can be used. Prolonged drying may cause the fish to spoil, leading to losses. Although this problem with smoking fish is expected during the rainy season, extreme weather changes have exacerbated the problem.

Several male and female respondents attributed extreme weather events to God and felt that nothing could be done to stop them except beg God for divine intervention and to help them endure suffering until better weather prevailed. One respondent stated that she needed God to protect her from working like an elephant but suffering under 'the yoke of poverty' because of adverse weather patterns. But, 'working like an elephant' suggests she also relied on individual agency to survive and cope. For those who believed in divine intervention, this belief existed alongside views that provided space for individual and collective agency and responsibility. For instance, while some respondents called upon divine intervention or did not believe that the excessive floods resulted from the impacts of climate change, they placed accountability on human action, at both individual and institutional level. They mentioned poor infrastructure development, such as lack of proper drainage systems, growth of unplanned cities, and building on wetlands or other water channels affecting ecological patterns and the morphology of rivers, as significant causes of flooding. Respondents mentioned poor city planning in Ogun as a major source of floods that sweep fish away and contaminate ponds, causing high fish mortalities and leading to the collapse of some fish farms. As such, individual agency (e.g. working harder) and collective agency (e.g. through institutional policymaking, planning and support) were necessary to address the challenges individuals and communities were facing. However, despite differing perceptions on the causes of extreme weather events or what exacerbates their impacts, the study findings show that these events have gendered economic impacts.

## Gender norms and sensitivity to the economic impacts of climate change shocks

Sensitivity to the economic impact of climate/weather-related events is gendered. That is, it varies among men and women depending on how gender norms shape their roles in agri-food systems. This section highlights how gender norms shape men's and women's sensitivity to climate change shocks.

### Catfish

Men and women play different roles along the catfish food system. During the workshop stakeholders conducted a gender mapping of the agri-food system as illustrated for catfish below (Table 3).

Women are over-represented in fish trade and processing. In input supply, according to stakeholders, women usually operate shops and farms as paid and unpaid labourers but do not own the farms or businesses. Women often said their husbands owned the businesses or the fish farms. The cooperatives and the state mainly own cold rooms to maintain the cold chain. Men usually own those cold rooms run by individuals (as opposed to cooperatives) due to the high capital investment needed. Most producers are male. There are few women in small-scale production and even fewer women in large-scale production. Commercial fish farms also mainly employ men rather than women. Likewise, the private sector employs very few women.

Fish processors are mainly women. Most fish traders on the open markets are women**.** Men are the ones who go to the farms to buy fish and bring it to their wives to sell because of the perceived security risks that women may face if they go to the farms alone to buy fish. Women are mainly involved in small-scale trading because men find vending difficult and not appropriate for their status as men. According to the stakeholders, vending requires one to talk and negotiate, and women are much better than men.

The economic losses that men and women in the catfish food system suffer due to weather events depend on the nodes at which they operate. For example, male fish farmers mentioned losing billions of Naira at the production level when climate events disrupt fish farming. Those with ponds far from the river and those who harvest their fish before the floods come are usually not affected. Women are affected mainly at the retail and processing stage, where they are heavily involved because they may

**Table 3.** Gender mapping of the catfish food system actors by stakeholders at the stakeholders' workshop.

| | Input supplier | Production | Fish trade | Processing | Consumers |
|---|---|---|---|---|---|
| Actors | Hatchery (Fingerlings suppliers) 20% F<br>Feed Millers 10% F<br>Feed Traders Agro-dealers 20% F<br>Equipment traders 30% F | Small Scale farmers 40% F<br>large Scale Farmers 10% F | **Traders**<br>Supermarket 80% F<br>Eateries/fast food 80% F<br>Open market traders 50% F | Smoking Processors (60% F)<br>Fish sausage producers<br>Cold rooms freezing (States, Individual entities 100%M, Cooperatives 20% women) | Pepper soup joints (10% F)<br>Restaurants 30% women<br>Households 50% F<br>Schools 50% F |
| System supporters | Associations, Financial services provider s | Extension Services, Information services and linkages<br>Vet/lab providers | Transporters | Ice sellers, charcoal sellers | |

have to pay more when buying fish from men if there is not enough fish on the market. Also, female processors and retailers will take longer than usual to source catfish. The waiting period to access fish affects women's businesses and their profits. Female fish retailers are affected during the dry season since wholesale fish prices increase. Fish processors, primarily women, are also negatively affected by excessive rainfall because they cannot dry their fish sufficiently due to the scarcity of charcoal.

Some men and women suggested that men cope better than women because men have more income-generating opportunities. However, some respondents mentioned that men and women work together within families as spouses within households. As a result, they are affected equally by adverse climate events. There is no denying that household units feel the impact of climate change challenges on incomes and the decline of the household lifestyle, and might benefit from collective agency through pulling their resources together. But, in their capacities, men and women are impacted differently depending on the roles they play in the food system.

### *Cassava*

In the cassava food system, men are normatively regarded as cassava farmers and dominate activities such as farming, transportation, and grinding with machines. Women dominate processing cassava into garri and cooking it (Table 4).

Although study participants noted that when climate events instigate a crop failure, men are more impacted because they are cassava farmers, they also stated that the ripple effects affected women cassava processors because when little or no cassava is harvested, cassava processors, who are primarily women, have their livelihood adversely affected. When the heat is excessive, and the ground is too hard, female cassava farmers may also fail to get the labour to harvest their cassava.

A male processor noted that although men and women in the cassava food system face similar challenges, women who own farms and depend on hired labour may suffer more than men when they experience adverse weather-related events. Women engaged in cassava farming must employ male labour for certain activities, which they still need to pay for even when their crop fails.

> The women who own farms and employ labourers to work with them suffer […] For instance, you have agreed to pay a labourer #400,000 at the end of the year, and then, all the money you as a farmer realise is #450,000; what do you do then? You start running up and down to borrow money to fulfil the agreement with the labourer. (Individual Interview, Male Processor, Cassava, Oyo State)

Some women cassava food system actors mentioned that they can better cope with climate change events than men because they can engage in petty trading as a coping mechanism in the event of crop failure and make garri for sale when they find the cassava. In contrast, men often have challenges engaging in petty trading because they find it belittling.

### *Chicken*

Although women and men can own hatcheries and raise chickens, there are contrasting views on whose role it is to manage chicken farms (Table 5).

Some see it as a woman's project because women spend more time at home and can watch over chickens; even if a man owns the business, his wife or female employees manage it. Some see men as responsible as they can live on the farm; women

**Table 4.** Gender mapping of the cassava food system by stakeholders at the stakeholders workshop.

| | Input supplier | Production | Processing | Trading[a] | Consumption[a] |
|---|---|---|---|---|---|
| Actors | Land (20% F)<br>Herbicides (20% F)<br>Cassava Stems (30% F)<br>Sprayers (5%F)<br>Tractors (0.1% women) | Land clearing (30% F)<br>Ploughing (10% F)<br>Spraying (10% F)<br>Harvesting (20% F)<br>Haulage (20% F)<br>Marketing/selling (30% F) | Buying roots (60%F)<br>Peeling roots (95% F)<br>Washing (100% F)<br>Grating (20% F)<br>Soaking (Fufu/Lafun) (90%F)<br>Sieving (90% F)<br>Dewatering/pressing (30% F)<br>Pulverizing (10% F)<br>Roasting Gari (95% F)<br>Drying Fufu/lafun (80% F) | Local markets<br>Offtakers or aggregators<br>Regional markets | Local consumers<br>Regional Consumers |
| Agri-food systems supporters | Private extension services | Cassava Cooperatives/ associations | | | |

[a]No information on gender.

must care for their children and families, which will not allow them enough time to stay at the hatchery and manage it like men. Men were also seen as the ones employed in processing factories because operators were often required to work overnight, which women could not do because of their home responsibilities.

Some respondents felt that adverse climate events affect men and women similarly, but those without knowledge of managing the impacts are affected more. Others pointed out that extreme weather events impact women more than men because women often have fewer chickens and fewer resources to help them recover:

> It affects everybody. But men are more prosperous; they have more money and more chicken. They may not feel it the same way as women because women have fewer chickens than men, and they may not have as much money as men. (Individual Interview, Female producer community chicken, Oyo state)

A common theme among women was the financial and economic ruin they experienced from climate events and sometimes the inability to recover and reconstruct afterwards. For example, some

**Table 5.** Mapping of the chicken food system by stakeholders at the stakeholders workshop.[a]

| | Input supplier | Production | Processing and storage | Trading/ Marketing | Consumption | Chicken By Products produced during processing and consumption |
|---|---|---|---|---|---|---|
| Actors | Hatchery<br>Operators<br>Feed millers<br>Agro-dealers | Homestead chicken farmers<br>Commercial chicken farmers | Slaughters<br>Defeathering<br>Cutting<br>Grilling<br>Packages<br>Cold Chain Storage | Offtakers<br>Farmgate salesmen | Eateries<br>Restaurants<br>Hotels<br>Households<br>Schools<br>Individuals<br>Secondary processors | Labourers<br>Farmers<br>Ingredient suppliers and processors |
| Agri-food system supporters | Private extension services<br>Banking and microfinance<br>Insurance | Extension agents<br>Animal Scientists<br>Engineers<br>Poultry Nutritionists<br>Transporters<br>Poultry Association of Nigeria | Warehouses | Transporters<br>Poultry/ haulage truckers<br>Association of Nigeria<br>Brand printers | | Transporters<br>Packaging materials suppliers |

[a]Missing data on gender.

participants noted that men own land and other assets they can use to relocate their chickens quickly or raise the chicken coops if needed when flooding occurs. Some participants believed excess heat affected women more than men because it increased women's labour. For instance, women may need to be at the chicken farm frequently changing water or adding ice blocks to chicken drinking water to help them cool down or to take battery-charged fans to the chicken coop to try to cool the temperature down.

In addition to sensitivity to the economic impacts of climate change shocks, gender norms also impact adaptive capacities. The next section outlines how discriminatory gender norms impact women's adaptive capacities and, therefore, their economic resilience.

## *Gender norms' impact on adaptive capacities and women's economic resilience to climate change challenges*

In this section, we will investigate how gender norms influence adaptive capacities and, ultimately, economic resilience to the impacts of climate change. The different agri-food systems in Nigeria are governed by some cross-cutting norms that influence women's and men's ability to build adaptive capacities across the three food systems and, therefore, their economic resilience to climate change shocks. These gender norms include those related to accessing credit and other forms of finance, ownership and control of assets, division of labour and mobility (see Table 6).

### *Gender norms and accessing credit or other forms of finance*

The impact of the intersection of gender and other identities is clear when it comes to norms regarding access to credit. Male and female respondents strongly agreed that unless a woman is single, widowed or divorced, she should not get credit or loans without the approval of her husband. Women mainly mentioned that they needed their husbands to approve when they got credit so that their husbands could support them in repaying if things did not work out well and they could not service the loan: 'So, people require the consent of their husbands, and some require the support of their husbands to give them courage'. Lending institutions prefer giving credit to a man over a married woman because they are uncomfortable talking to married women without their husbands.

> Men love to deal with men when selling on credit. When the time for payment comes, the issue can be misconstrued; the husband's brother or the husband himself can accuse a man of having a sexual relationship or trying to embarrass someone's wife, so the lender can even lose everything in such cases. (A female participant in Nigeria's stakeholders' workshop)

Men can also easily access credit because they have collateral. Access to credit means they can more easily access critical inputs like herbicides and pesticides that are needed to cope in contexts where pests and diseases are increasing due to climate change. Women across the three agri-food systems mainly mentioned lack of funds as the major hindrance to adopting technologies that can help them be resilient to climate change, such as irrigation systems. For instance, men fish producers said that some men manage to buy technologies such as pumps to pump water into ponds during the dry season, but women farmers face financial challenges to do so. Cassava farmers noted that women are more vulnerable to irregular rainfall, which is made worse by their dependence on rainfed agriculture because they do not have access to funds to acquire climate-smart agriculture technologies like irrigation systems. For cassava, stakeholders agreed that more women than men close factories because of their failure to cope with climate events that affect their business. In chicken farming, women said the cost associated with adopting certain technologies was prohibitive.

> What happens is that this vogue (referring to a type of sprinkler machine for chickens to cool the chickens when it's too hot) that we are talking about is very costly, so not many women can afford it, so they will not use it; the nipple alone costs N3000. (Individual Interview, Female chicken producers, Oyo State)

Thus, norms preventing women's access to finance are a significant obstacle to promoting women's economic resilience to climate change impacts. The seeming persistence of gendered inequalities in accessing credit and other forms of financing places women at a great disadvantage. Women's efforts to cope with climate change shocks are more likely to result in mal-adaptation if they do not adopt new technologies.

### *Gender norms and ownership and control of assets*

Some stakeholders noted that some men do not regard women working and earning their own

**Table 6.** Cross-cutting norms mentioned in the agrifood systems.

| | Cassava | Catfish | Chicken |
|---|---|---|---|
| Access to credit and other forms of finance | A woman cannot get credit or a loan for cassava farming without the approval of her husband. | A woman cannot get credit or a loan for fish farming without the approval of her husband. | A woman cannot get credit or a loan for chicken farming without the approval of the husband |
| Ownership and control of assets | Women should not own land for cassava production. | Women should not own fishponds. Men should primarily be the ones who control the earnings obtained from the sale of fish. | Women should not own land for chicken production. |
| Division of labour | Women should not supply inputs such as improved cassava varieties (cuttings), fertilizers and herbicides. A man will be considered less of a man if he is involved in cassava peeling, washing, sieving and toasting. Women cassava farmers should not negotiate prices with traders who come from outside their residence. A woman should not be a chairperson or leader of a cassava association or cooperative. | Women should not operate catfish hatcheries. A man will be considered less of a man if his wife is involved in fish farming. Women should primarily be the ones who clean and process fish. A woman should not be a chairperson or leader of a catfish association or cooperative. | Women should not operate hatcheries. A man will be considered less of a man if he is involved in the processing of chicken, such as dressing chicken. Women chicken farmers should not negotiate prices with traders who come from outside their residence. Men should be responsible for marketing chicken, not women. A woman should not be a chairperson or leader of a chicken association or cooperative. |
| Mobility | Women should not go alone to buy stem cuttings. Women should not be the ones who travel when transporting fresh or processed cassava for sale outside their place of residence. Women should not spend long periods outside their homes engaging in the sale or trade of fresh or processed cassava. | A woman cannot go to a hatchery to buy fingerlings for catfish production. A woman cannot go to fish farms to buy catfish for sale or processing. Women should not be the ones to transport the inputs (for production) and catfish for sale outside their place of residence. | Women should not own chicken farms away from their homes. Women should not be the ones to transport the inputs (for production) and chickens and chicken products for sale outside their place of residence. Women should not spend long periods outside their homes engaging in the sale or trade of chickens and chicken products. |

money as a threat or challenge if they are involved and are aware of what the woman is doing. Opportunities for land ownership are increasing for women as norms against women owning land are being challenged, particularly in urban areas where more women buy land and build houses in their names. Thus, the intersection of gender and location is significant in this regard. But women must still inform their husbands or other male relatives before purchasing land.

Unlike in urban areas where women can buy land and own houses in their names, some male and female respondents stated that women in rural areas could own land in their community, but in many instances, they could not buy land in their own right. Land ownership for women was not encouraged and, in some cases, actively discouraged. A male respondent who said that it is not true that women cannot own cassava farms since some women are even better farmers than men went further to say:

> If a woman owns the land, it'll be in her husband's name. Even if she buys the land, it will be purchased in her husband's name […] If she is not yet in her husband's house, she must buy it in her father's name. (Individual Interview, Male producer)

Married women needed permission from their husbands to purchase land. A woman who suggested that if a woman did not own land, she was not a farmer stated that she sought permission from her husband to buy the land. Even when running successful businesses, women need permission from their husbands before further investments or expanding their businesses.

In a discussion (vignette), all men in the catfish group did not approve of a woman buying land in her name and would not support it. All women in the catfish group approved of a woman buying land only if she put her and her husband's names on the title deed. There was variation among the women's chicken group. The majority agreed that putting the wife's name on a joint deed would be better so that

the purchasing wife's investment would be protected if the husband died or married another wife. However, it was noted that the wife should inform the husband before putting her name on any title deed because if she does not tell her husband, it may lead to problems in the family. In the chicken FGD, men suggested that if a wife bought land without the husband's permission and put her name on the title deed, the husband may withdraw his support for the wife.

Norms that prevent women from owning land make them more vulnerable to the adverse impacts of climate change. For example, many women do not own farms but rent, and after a catastrophic climate event, they may be unable to rent land the following season. Landowners, primarily men, may cope with adverse climate events by moving their production activities to unaffected areas. For instance, cassava farmers cope with flash floods by moving their farms to other land that is not flooded. Both men and women are affected, but more women struggle to cope with this problem because of their limited access to land. Male fish farmers can also relocate their ponds from lands that frequently flood but women who do not have access to land are not able to do so. Thus, women's lack of access to land ownership may lead to mal-adaptation.

Sometimes, women may wish to rent, but the landowner may refuse to grant them access, making their businesses unstable. Landowners can also easily access credit and other commercial inputs, such as herbicides and new technologies, using land as collateral. Additionally, when women do not own productive assets, they are not regarded as farmers but as helpers, which makes it challenging to benefit fully from their efforts. Some participants suggested it did not make economic sense for women to invest in expensive technology for little returns because they did not have meaningful control over assets. For instance, many female chicken farmers own only a few chickens, unlike men.

When women could own land, opinion was split on whether women could own farms away from home. Some stated that women with young children to care for should not own farms away from home, while others said it depended on the age of the women, revealing an intersectional aspect to land ownership. However, not owning land far from home sometimes prevented women from expanding their businesses or responding appropriately to climate change impacts. For example, without owning land far from home, women could not keep large amounts of chickens and could not respond appropriately by relocating their chickens to higher ground during floods. Farming close to home often meant engaging in small-scale chicken rearing, which is not highly lucrative.

### *Gender norms and division of labour*

Norms governing the gender division of labour also shape men's and women's economic resilience to climate change impacts. For example, the processing of garri and cassava flour was considered a woman's role, while men's role was mainly to produce cassava; people would look down on a man who made cassava flour. Sleeping at the farm is not encouraged for women as it prevents them from doing household chores. Women's limited time to engage makes them less likely to be involved in activities such as catfish hatchery, which requires one to sleep on the farm, tending to the eggs and fry that need continuous monitoring because the husband or parents (if single) may disapprove. Chicken producers also noted that community members may not support a woman operating a chicken hatchery and may ask why she is encroaching on men's work. While in catfish farming norms against women purchasing fingerlings from hatcheries are related to security issues as catfish hatcheries are far from home.

Designating specific roles to men or discouraging women from doing specific tasks increases women's reliance on men's or hired labour. This delay activities on women's farms, raising the probability of mal-adaptation:

> While we are still searching for labourers, men can use their strength to work for themselves. (Female Respondent, Individual Interview, Cassava agri-food system)

Additionally, when women pay men helpers for tasks they cannot do because of gender norms, it raises the cost of doing business. Women who own cassava farms and depend on hired male labour may suffer more than men in the event of poor harvests due to weather-related events because they still need to pay for the labour. When the heat is too high and the ground becomes too hard, women farmers may also fail to get enough labourers to harvest their cassava, leading to losses and mal-adaption.

Norms governing the gender division of roles are being challenged, demonstrating a potential for improving women's adaptive capacities that could lead to sustainable adaptation. For instance, at the

intersection of gender, age and education, educated young women in the chicken value chain are increasingly engaging in large-scale agriculture businesses compared to women with low levels of education. However, the educated young women may still require the support of influential male figures to manage their male workers who may not readily comply with their directives. Men are also challenging gender norms by working in nodes traditionally considered more appropriate for women. For example, participants noted that men had started engaging in some processing activities that women previously did. However, men suffer less stigma or societal sanctions, particularly when the women-dominated nodes they join attract high financial gains. For instance, although cassava processing is mainly regarded as a woman's job, no one will look down upon a man involved in commercial large-scale processing. If men engage in normatively women's agribusiness or activities on a larger scale, societal sanctions are not imposed on them because they are regarded as 'doing it for business'. The larger the business is, the more acceptable it is for men to engage in a traditionally defined female occupation. Men are often targeted for employment in processing plants because of the belief that they 'work harder and faster'. On the other hand, women who want to move into men's roles may be viewed negatively, and this increases the potential for mal-adaptation. For example, chicken producers noted that community members might not support a woman operating a chicken hatchery and may ask why she encroaches on men's work. Additionally, men may resist their wives doing certain activities because they fear being judged by others. In some cases, women who challenge norms may get divorced or lose prestige in their community and family, resulting in marginalization or disempowerment.

Some participants highlighted that empowering women to challenge discriminatory gender norms was not enough to bring about their economic resilience:

> You can't just empower a woman and leave the husband. If you do that, you will be putting pressure on the woman. The man can even start refusing to support his children. He will direct them to their mother whenever they want something because she has more money now. (A female participant in the stakeholders' workshop in Nigeria)

Some participants viewed norms that regard men as household heads as putting pressure on men when faced with adverse climate events that cause production failure. This is because men are expected to be providers. Building women's adaptive capacities could potentially relieve that pressure through meaningful collaboration. Collective agency that brings men's and women's efforts together is significant for sustainable adaptation.

Some stakeholders noted that more women could diversify than men 'due to the ability of women to multitask and quickly perceive the danger ahead'. For instance, women can take up menial jobs such as fetching water to survive in the short term, while men are not willing or able to take up these jobs because they perceive that such jobs do not fit their status as men. However, these strategies by women seem to point to coping rather than to adapting.

### *Gender norms and women's mobility*

In the three food systems, both men and women respondents agreed that women should not spend extended periods away from home. Some men may not allow their wives to sell their produce, especially if it means being away from home, meaning these wives would depend on their husbands to sell their produce at harvest time. Many people would disapprove of women taking on roles that would take them away from home for long periods, which is regarded as negatively impacting their home life. When women work outside the home in environments where they may interact with men, they may be labelled as prostitutes, which also restricts the businesses that women may freely engage in. For example, women are only expected to be involved in pepper soup joints if they are not married.

Overall, research participants often noted that men cope better with the impacts of climate change because they can easily travel to meet clients and do business, while women are tied down by children and homecare duties. Societal norms that restrict women's mobility and demand that women be responsible for caring for the children limit women's economic resilience:

> If men fail to sell their products in one place, they will go to other places and can travel easily. But for a woman like me, I cannot travel. I have so many things to do at home and cannot move quickly to other places. I'm limited to my immediate environment or some things I can do online. Sometimes, your customers demand to see you face to face and have a meeting, but I'm limited because my kids are still very young. They are so young, so there's a limit to how much I can travel.

(Individual Interview, Female Chicken Input Supplier, Oyo State)

Restrictions to women's movement also meant that they closed their businesses earlier than men so that they could be home at a respectable time and sometimes opened late so that they could take care of their domestic chores. This limits women's adaptive capacities and could potentially lead to mal-adaptation if they cannot respond to climate shocks through mobility or flexibility in their operations.

## Discussion and conclusion

This paper used an agrifood systems approach to offer valuable insights into gender norms as drivers of gender inequality which impact women's resilience to the impact of climate change. The paper also added a gender transformative lens to resilience frameworks by using gender-sensitive resilience framework to analyze data. A gender transformative lens offered a pathway to explore women's economic resilience to climate change impacts in ways that account for gendered experiences and power relations within specific contexts.

Currently, women suffer from low economic resilience due to discriminatory gender norms that do not meaningfully support women's adaptive efforts. This is also reflected in studies in other African countries such as Ghana and Benin (see Assan et al., 2018; Mangheni et al., 2019). These gender norms permeate the complex interactions among men and women, communities, social institutions and productive work at the intersection of gender and other social categorizations such as age, marital status, education and location. For instance, gender norms in Ogun and Oyo states are shaped by patriarchal power relations and influence how men and women imagine their capabilities and the capabilities of others depending on, for example, the level of education and age. This, in turn, influences expectations in terms of the roles they play in agrifood systems. For instance, while women generally have limited access to higher-paying nodes, young educated women have better access than older uneducated women.

Men are often considered household heads, providers and community leaders and, therefore, are expected to have power over women at all levels of influence and interaction, including household, community, organizational and macro-environmental. As such, men are responsible for making strategic plans that affect present and future economic outcomes for themselves, their families and the broader society. This paper illustrated that in the three food systems in Nigeria, gender norms often disempowered women from making decisions such as how to source and use land, finance and other resources. For example, when women receive loans, norms that favour decisions being made by male heads of households strip women of their agency and power to decide how to manage their finances and investments. This is not unique to the case studies. See, for example, Miruka et al., 2016 who, in a six-country study (Malawi, Tanzania, Ghana, Mali, Bangladesh and India), found that in general (except in women headed households in Africa), women had less power to decide on critical issues that affect them. The paper demonstrated that transformative changes in gender norms are necessary to increase the possibility of attaining sustainable adaptation outcomes and avoid mal-adaptation. For example, changes that enhance women's mobility and access to finance, ownership and control of assets and higher income nodes can significantly enhance women's agency in their efforts to build their economic resilience to climate change and participate meaningfully in system renewal. Furthermore, transforming gender norms needs to be holistic and cut across entire systems. Access to resources, for example, needs to be complemented by participation in decision-making for women to be able to achieve resilience to climate change impacts.

Nelson et al. (2007) recognize the complexity of resilience involving systems renewal, developing sources of resilience and agency. If this complexity is not unpacked and understood within agri-food systems, it will be difficult to transform to promote women's economic resilience to the impacts of climate change. For example, women's agency is constrained because they are expected to be 'led' by men, yet this leadership curtails women's decision-making power. Women in Nigeria's agrifood systems often must seek permission from husbands, fathers or other male family members if they wish to get a loan, invest in assets such as land or participate in certain sectors of the agri-food system that may or may not be considered appropriate for women.

Lack of control over resources increases the possibly of mal-adaptation for women when faced with adverse climate events. Additionally, because women lack access to assets such as land and are not permitted to perform certain tasks, they need to

depend on male labour. This dependence on male labour can trap them in a vicious cycle of debt in the case of a climate induced crop failure as they still need to pay for the labour they hired without any financial proceeds from their failed crop. Thus while finance is needed to help women farmers adopt climate-smart technologies it is equally important to have low interest disaster risk finance. Katongole (2020) defines this as an approach where implementers detect disasters early and provide financial resources to affected communities to take care of their needs during and after the disasters.

Some women demonstrated their individual agency by talking about how hard they worked on their farms or businesses to survive and cope. However, they suffered from low adaptive capacity because of social and institutional factors, such as gender norms and other expectations, that do not support their efforts to adapt. We regard gender norms as an institution since they often exert a powerful influence that shape men and women's behaviour in society. Gender norms limited women's agency and the extent to which they could develop sources of resilience. Some gender norms prevented women from accumulating assets needed to reduce sensitivity to climate shocks and increase adaptive capacities. In Nigeria, those who own land (mostly men) are better able to fare during a climate calamity, while as evidenced in this paper women who depend on rented land may loose access because the owner is no longer willing to rent the land or because women have lost the capability to pay for the land. The cassava case clearly illustrated that some climate events especially those that affect farm production can trap women in debt as they try to pay for already incurred production costs and prepare for the next season without any assets to cushion or buffer them. Quisumbing et al. (2011) had similar findings in Uganda where drought negatively impacted women's non land assets as women deposed of their assets to deal with the drought situation.

For some women who owned productive assets, such ownership did not necessarily translate to having resources for economic resilience because the men in their families controlled the assets. Restrictive gender norms also prevented women from adopting technologies or receiving services they needed to address increasingly challenging agricultural production. Women engaged in fish, cassava and chicken agrifood systems mentioned being unable to adopt climate-smart technologies because of a lack of resources. Therefore, structural barriers, including insufficient physical infrastructure and unsupportive regulatory and policy environments, expose men and women to risks affecting their economic resilience to climate change in agri-food systems. However, discriminatory gender norms created gendered opportunities and constraints for economic resilience, with men having more access than women to resources for economic resilience. This necessitates a transformative change in gender norms.

A transformative change in gender norms entails a shift in paradigms, values and attitudes that shape the relationship and interactions between men and women (see MacArthur et al., 2022, p. 2) and promote women's strategic agency. In agri-food system approaches, such transformation will promote strategic agency among women through transforming social institutions that govern access to resources so that they are more gender equal and inclusive.

Social institutions should play a key role in transformative activities. This helps to minimize the backlash against those who challenge gender norms, which is often more severe for women than men. Involving social institutions, including family and community structures, and creating a sense of collective responsibility (Cole et al., 2020; McDougall et al., 2021; Njuki et al., 2023) in transformative processes can lead to the creation of safe spaces for women to exercise their individual and collective agency in their struggle for economic resilience. However, as illustrated in this paper, this type of transformative change is yet to be realized. For instance, although, at policy level, it is possible for women to access finance, access is mediated by gender norms, men working in financial institutions prefer to deal with men when giving loans. This preference is motivated by a desire to avoid sanctions that may be meted out against them by communities when they deal directly with women. In some instances, women are regarded as more resilient in the short term because they can engage in petty trading to survive an adverse climate event compared with men. But engaging in petty business is a short-term/tactical strategy that does not build resilience to adapt to future shocks. Such strategies are often an indicator of mal-adaptation since they do not support long term recover after the adverse climate event is over. There is a need for strategic approaches in agri-food systems

to promote women's access to and control of key resources and services in order to reduce women's reliance on short-term survival strategies.

Some gender norms are shifting, becoming more flexible and contested. For example, some men and women are advocating for women's land ownership and promoting equal access to all sectors of agrifood systems. The findings of this study demonstrate a level of critical reflection among respondents upon which transformative energies can be grown. For example, some respondents raised the idea that gender-equal transformation can only be achieved through collective responsibility and commitment by both men and women. Therefore, one way of propelling gender-equal transformation is to fan individual and collective critical consciousness through, for example, inclusive participatory behaviour change communication approaches (Cole et al., 2020; Kantor et al., 2015). Participatory behaviour change communication approaches include participatory change campaigns that involve community discussions at in-person meetings, contributions by community members through relevant media (e.g. radio) and use of women and men opinion leaders who support gender-transformative processes within the community. A change in general community attitudes towards and beliefs about gender norms and roles is critical since it provides fertile ground for formally constituted transformative policies and programmes to be implemented effectively. For instance, policies that support equality in access to and ownership of land would be more effective in a context where gender norms support such equality (McDougall et al., 2021).

Thus, using an agrifood systems approach and a gender transformative lens, the paper has illustrated that growing more cooperative forms of power and relationships can lead to more equitable gender norms (Hillenbrand et al., 2015), which will, in turn, promote women's adaptive capacities and resilience and reduce their sensitivity to climate shocks. Transforming power relations to promote women's resilience to the impacts of climate change would require collective responsibility, political engagement and homegrown solutions through inclusive participatory processes at all levels of influence (Hillenbrand et al., 2015; Kantor et al., 2015). Inclusive, participatory processes should ensure that gender-transformative changes are not imposed from the outside but driven by members of the affected communities. Inclusive processes minimize resistance and promote individuals' and collectives' willingness to engage in gender-transformative change processes and the development of solutions that suit the communities' contexts (Kantor et al., 2015; Mdege, 2020).

In conclusion, transforming gender norms could increase women's strategic agency in relation to access and ownership of resources necessary to build economic resilience when facing climate change challenges. Gender transformative processes aimed at building women's economic resilience must be multipronged and target all the spaces where harmful gender norms operate. Thus, there is a need for comprehensive approaches to challenge discriminatory gender norms and structures. Gender-sensitive agricultural policies that promote women's economic resilience in climate change scenarios through equal participation in all spheres of influence must be integrated into program planning and implementation. The paper demonstrates the importance of working with men and women agrifood systems actors, in all spheres of influence to challenge restrictive gender norms and balance power relations in ways that increase the capacities of women agrifood systems actors to build economic resilience to climate change challenges. Deeper-level changes including institutional changes and changes in the macro-environment are required to strengthen women's capacities to build economic resilience to climate change challenges.

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## Author contributions

CRediT: **Netsayi Noris Mudege:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Writing – original draft, Writing – review & editing; **Norita Mdege:** Conceptualization, Formal analysis, Methodology, Resources, Writing – original draft, Writing – review & editing; **Olajumoke Adeyeye:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project

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## Data availability statement

Data is available upon request

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