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Women and Climate Adaptation in Rural Sub-Saharan Africa

Constraints and Research Priorities

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Abstract

Sub-Saharan Africa is highly vulnerable to climate change, with rural women dis- proportionately affected due to pre-existing gender inequalities that both increase their need for adaptation and constrain their ability to adopt strategies. This paper reviews empirical evidence on key barriers to women's climate adaptation, identifies critical knowledge gaps, and outlines a gender-informed policy and research agenda. Focusing on on-farm and off-farm adaptation strategies–including climate-smart agriculture, weather insurance, income diversification, and migration– the paper highlights key constraints limiting women's adaptive capacity: financial limitations, restricted asset control and ownership, gender norms positioning women as primary caregivers and shock absorbers, lower human and social capital, and limited access to climate and technology information. Substantial gaps remain in understanding how women's financial literacy, institutional trust, risk and climate perception, and social networks affect their adaptation. Evidence-supported interventions include information provision on climate-smart agricultural technologies and social protection, while emerging but less established interventions include socio-emotional skills programs, childcare, and land titling. Underexplored yet promising interventions involve expanding women's access to digital climate services, strengthening social networks, and engaging men in shifting intra-household roles. Significant knowledge gaps persist regarding the main constraints women face in adopting migration as an adaptation strategy.

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Women and Climate Adaptation in Rural Sub-Saharan Africa: Constraints and Research Priorities

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Introduction

Sub-Saharan Africa has experienced increasing climate variability, with extreme weather events and shifting agricultural seasons disrupting livelihoods and forcing farmers to adapt (Nicholson, 2018; Panthou et al., 2018). While adaptation is critical, rigorous evidence on both the adoption and effectiveness of adaptation strategies remains limited, particularly in low-income contexts (Feriga et al., 2025). A robust evidence base on the effectiveness of various adaptation policies appears necessary, as market failures and resource constraints can limit individuals' ability to make optimal adaptation investments (Carleton et al., 2024). Climate change impacts are not evenly distributed. Pre-existing gender inequalities heighten women's vulnerability while restricting their ability to adopt adaptive strategies, exacerbating poverty and widening disparities (see Box 1). Addressing these constraints is essential for equitable adaptation and resilience-building.

This paper synthesizes empirical evidence on gender-specific constraints in climate adaptation, identifying policy-relevant interventions and research gaps. It examines four key adaptation strategies: on-farm adaptation, including climate-smart agriculture (CSA) and weather insurance, and off-farm adaptation, including income diversification and migration. Additionally, it assesses the role of adaptive social protection in improving access to these strategies for vulnerable women. Given the immediate and severe effects of climate change in low-income countries, this paper focuses on adaptation strategies rather than mitigation (see Box 2). The review highlights three key findings.

First, women face greater barriers than men in adopting climate change adaptation strategies, both on-farm and off-farm. While much of the literature is correlational, emerging experimental evidence suggests that structural constraints, rather than intrinsic preferences, explain lower female adoption rates of CSA and weather insurance. Women also encounter greater challenges in income diversification and migration, which remain male-dominated.

Second, this paper identifies gender-specific constraints to climate adaptation that go beyond those faced by men. Women's on-farm adaptation, particularly investment in CSA technologies, is hindered by land tenure insecurity, limited access to climate information, and lower household bargaining power, making riskier investments even more challenging. Their higher risk aversion, driven by economic and structural factors, further reduces CSA adoption. Male dominance in agricultural networks also restricts women's access to knowledge and decision-making opportunities. Limited information contributes to women's low uptake of weather insurance, compounded by their greater idiosyncratic risks — including health shocks linked to fertility and childcare — and their role as 'shock absorbers', which lead them to prioritize emergency savings. Household responsibilities further constrain their engagement in off-farm activities, reducing opportunities for income diversification and migration in response to climate shocks. These challenges are exacerbated by low expected returns, limited resources, and restricted bargaining power. The effectiveness of adaptive social protection in supporting women's climate resilience depends on how well programs address gendered constraints, including mobility restrictions, bargaining power imbalances, and domestic responsibilities.

Third, an evidence map categorizes adaptation interventions by the strength of empirical support. *Credible* interventions — supported by substantial evidence of effectiveness — include CSA information programs targeting women or both spouses and social protec-

tion initiatives like cash transfers and economic inclusion programs. *Emerging* interventions — such as socio-emotional skills training, childcare services, and land titling programs — show promise but require further validation. *Frontier* interventions — where rigorous evidence is currently lacking — include digital climate information services, gender-responsive weather insurance, and norm-changing initiatives challenging gender roles and enhancing women's decision-making power. Further research is needed to assess the most effective gender-sensitive provisions in adaptive social protection programs, and the ones that translate most into adoption of individual adaptation strategies.

Significant knowledge gaps remain for a comprehensive understanding of gender dynamics in climate change adaptation. Household-level agricultural data often obscure intra-household inequalities, limiting understanding of women's constraints in CSA adoption on the plots they manage.[1] The causal effects of climate information on women's risk preferences and adaptation decisions are still under-examined. Further research is also needed on how time constraints, household structure and intra-household dynamics influence women's participation in off-farm employment, and on the role of gender norms and land tenure insecurity in shaping women's migration decisions. Additionally, little is known about the adaptive capacity of women left behind when men migrate.

The remainder of the paper is organized as follows. We present our methodological framework in Section 1. We review the evidence on gender gaps in the adoption of four adaptive strategies: CSA (Section 2), weather insurance (Section 3), income diversification (Section 4) and migration (Section 5). Section 6 highlights the key challenges adaptive social protection must overcome to ensure greater access to these adaptive strategies for more vulnerable women. We present in Section 7 an evidence map reviewing experimental evidence on interventions seeking to address the key constraints previously identified for each adaptation strategy. We outline priority research questions in Section 8 before concluding.

1 Methodological Note

This targeted review of the recent literature synthesizes qualitative, empirical, and experimental studies on gender differences in climate adaptation. We distinguish between descriptive analyses, which document adaptation disparities, and causal analyses, further distinguishing between quasi-experimental and experimental studies.

The review is divided into three main sections. The first section tackles evidence on gender differences and constraints faced by women and includes both qualitative and causal studies, as well as interventions that shed light on gender-specific barriers. The second section reviews interventions that address these constraints in an evidence map, citing experimental evidence showing proof of effectiveness and highlighting promising but untested approaches for future research. The third section presents key research gaps identified in the first two sections.

We define climate adaptation at the micro level, focusing on on-farm and off-farm adaptation among rural and agricultural populations in Sub-Saharan Africa. Broader macro

[1]The LSMS-ISA surveys are a notable exception. They collect plot-level data which provide gender-disaggregated indicators at the plot-manager level, critical for identifying barriers to women's agricultural productivity.

Box 1. Gender gaps in vulnerability to climate change

Climate change disproportionately affects women, exacerbating pre-existing gender inequalities in health, safety, livelihoods, and agricultural productivity. In Sub-Saharan Africa, women contribute significantly to agricultural labor yet face lower productivity due to limited access to inputs, land, and market opportunities (Kilic et al., 2015; Aguilar et al., 2015; Alik-Lagrange et al., 2025), while experiencing higher food insecurity following climate shocks (Kakota et al., 2011; Zakari et al., 2014) and increased maternal and infant health risks from rising temperatures (Grace et al., 2015).[a]

Climate shocks also heighten gender-based violence risks (Brown, 2008). Droughts and floods increase intimate partner violence (Cools et al., 2020; Abiona and Koppensteiner, 2016), sexual exploitation (UNHCR, 2022), and feminicide (Miguel, 2005). Drought-induced income shocks raise child marriage rates (Corno et al., 2020; Hotte and Marazyan, 2020), reinforcing fertility and adverse health outcomes and undermining women's education, labor force participation and agency.

Economically, climate shocks increase women's unpaid domestic and care work and restrict their education and labor market participation (Kakota et al., 2011; Moshoeshoe et al., 2021). Women's responsibilities, such as fetching water, expand in response to climate stressors and they are more likely than men to exit employment and struggle to re-enter the workforce post-shock (Erman et al., 2021). Furthermore, girls are more likely than boys to be withdrawn from school to contribute to domestic duties, exacerbating gender disparities in education (Björkman-Nyqvist, 2013; Babugura, 2008).

[a]Gender-sensitive adaptation strengthens household resilience, as constraints faced by women in rural couples can weaken the entire family's ability to cope with climate shocks. Since household decisions are often joint endeavors, addressing women's adaptation barriers not only empowers them but also promotes inclusive decision-making and efficient resource allocation across the household.

policies, such as green jobs and sustainability initiatives, are excluded, as are downstream consumers of agricultural products.

The review includes both studies explicitly examining gender differences and those revealing gendered heterogeneity. While the primary focus is Sub-Saharan Africa, studies from other low-income regions are included when Sub-Saharan African evidence is insufficient. We also distinguish between gender differences within households (male vs. female household members) and between households (male- vs. female-headed households), specifying these distinctions throughout.

2 Climate-Smart Agriculture

The adoption of CSA is critical for reducing food insecurity among smallholder farmers facing unpredictable rainfall. The World Bank defines CSA as "an integrated approach to managing landscapes, cropland, livestock, forest and fisheries that address the interlinked challenges of food security and climate change" (World Bank, 2023).

Box 2. Why focus on climate adaptation (rather than mitigation)?

Climate change and poverty are deeply interconnected, as climate shocks threaten to push millions into extreme poverty, particularly in Sub-Saharan Africa, where agriculture remains highly climate-sensitive (Rozenberg and Hallegatte, 2015). Despite contributing minimally to global CO2 emissions (IPCC, 2022), the region faces disproportionate vulnerability due to its reliance on rain-fed agriculture, limited economic diversification, and constrained adaptive capacity.

While global mitigation efforts are critical for limiting long-term climate change, adaptation is the more immediate and pressing priority for low-income countries that already experience severe climate shocks. Unlike mitigation, which focuses on reducing emissions, adaptation directly enhances resilience by enabling households and communities to adjust to climate change's inevitable consequences. Strengthening adaptive capacity is particularly urgent for women who are disproportionately affected by climate shocks, not only as a matter of equity but also as a necessary condition for both poverty reduction and sustainable development in climate-vulnerable regions. [a]

[a] Estimates indicate that Sub-Saharan Africa will require $15 billion annually for agriculture and food system adaptation, while the cost of inaction could be more than 10 times higher, surpassing $200 billion annually (Ijjasz-Vasquez et al., 2021).

Farmers employ various CSA strategies including crop diversification (Mertz et al., 2009), drought-resistant crops (Emerick et al., 2016), diversification between crops and livestock (Seo, 2010), tree planting (Tambo, 2013), agro-forestry, land fragmentation (Veljanoska, 2018), adjusted crop choices (Below et al., 2010) and planting dates (Adzawla et al., 2019), water management (Fishman, 2013), improved seed varieties, modern inputs (Dercon and Christiaensen, 2011; Tambet and Stopnitzky, 2021), irrigation, soil conservation (Di Falco and Veronesi, 2013), and conservation agriculture (Beaman et al., 2021).

However, costly on-farm adaptation strategies can trap smallholder farmers in cycles of poverty (Dercon and Christiaensen, 2011). In Malawi, climate-induced poverty traps confine poorer households to low-value maize cultivation, restricting their ability to adopt CSA practices, such as improved seed varieties and fertilizers (Sesmero et al., 2018). Barriers to CSA adoption include resource constraints; small farm sizes; limited access to credit, markets and knowledge; as well as land tenure insecurity (Descheemaeker et al., 2016; Mersha and Duguma, 2019).

Gender disparities in adoption rates

Qualitative and correlational evidence on gender differences in CSA adoption yields mixed findings. Some studies report higher adoption rates of water conservation and crop diversification among female-headed households in South Africa, Zambia and Zimbabwe (Nhemachena and Hassan, 2007) and greater intercropping among households with more female members (Benin et al., 2005). Others find no significant gender differences, as shown in a large-scale survey across 11 African countries (Maddison, 2007) and a study of agro-pastoralists in

Kenya (Silvestri et al., 2012).

However, most research — including recent experimental evidence — finds that men adopt CSA strategies at higher rates than women. Male-headed households are more likely to invest in new agricultural technologies and irrigation in Uganda (Nabikolo et al., 2012) and Ghana (Adzawla et al., 2019). In Ethiopia, male-headed households are more likely to conserve soil, change crop varieties, plant trees (Deressa et al., 2009), and use irrigation (Gebrehiwot and Veen, 2013). In Ghana, men are also more likely to plant early-maturing and drought-tolerant seed varieties (Adzawla et al., 2019), while in Nigeria, women adopt improved rice production technologies at lower rates than men (Arimi and Olajide, 2016). A comprehensive review similarly finds that women lag behind men in adopting high-yielding crop varieties and agricultural technologies (Doss, 2001). Experimental evidence from Niger suggests that women adopt CSA strategies at lower rates due to structural barriers such as limited land ownership and restricted financial access (Aker and Jack, 2023).[2]

Emerging evidence suggests that when women have access to reliable information and resources, they favor long-term, conservative adaptation strategies over short-term coping mechanisms. In East Africa, women perceive conservation agriculture as more beneficial than men do (Murage et al., 2015). In Uganda, women are more inclined to transition from subsistence to cash crops, facilitating income smoothing over time (see Box 3 for more details on gendered crop specialization). During climatic shocks, women reallocate land to market-oriented crops, while men prioritize off-farm employment (Agamile et al., 2021). While these findings remain suggestive, they underscore the need for further causal analysis of women's perceptions and preferences for CSA practices. Existing evidence suggests that external constraints, rather than intrinsic preferences, primarily drive women's lower adoption rates and reliance on short-term coping strategies. The next section examines these constraints in detail.

Box 3. Gendered crop specialization

Across Africa, agricultural labor is gendered, with men primarily cultivating cash and export crops while women grow subsistence crops (Croppenstedt et al., 2013). Women's focus on lower-risk, lower-return crops supports household food security during climate shocks (Duflo, 2003; Lovo and Veronesi, 2019) but limits their market access, reinforcing poverty traps and constraining investments in adaptation strategies such as CSA, weather insurance, income diversification, and migration. In Uganda, Agamile et al. (2021) find that drought-induced labor shifts alter household crop allocation. As men seek off-farm work, women increase farm labor and reallocate land from subsistence to cash crops. However, restrictive gender norms continue to limit women's engagement in income-generating agriculture, constraining long-term adaptation despite their potential preference for commercial crops.

[2]The review of gender disparities in adoption rates departs from the unitary household model, recognizing that in many Sub-Saharan African contexts, husbands and wives manage separate plots and make individual farming decisions.

Women's constraints to adoption of CSA

Risk aversion

Extensive evidence indicates that women exhibit greater risk aversion than men (Nelson, 2015; Sarin and Wieland, 2016), which can hinder their adoption of climate adaptation strategies.[3] Risk preferences shape land use decisions (Chavas et al., 2010), agricultural choices (Adger et al., 2008; Charness et al., 2013), and adaptation strategies (Tam and McDaniels, 2013). More risk-averse farmers tend to use fewer inputs, invest less in new technologies, and prioritize lower-risk, lower-return strategies (Molua, 2011). Empirical evidence supports this pattern. Risk aversion reduces women's adoption of productivity-enhancing agricultural inputs, as seen in lower fertilizer use among female farmers in Ethiopia and Kenya and limited technology adoption in Cameroon (Kebede, 2022; Sheremenko and Magnan, 2015; Molua, 2011).

Information on climate change and weather forecasts

Unequal access to information is a major barrier to women's adoption of CSA (Quisumbing and Pandolfelli, 2010). Reliable information helps correct misperceptions about climate change (Box 4), update farmers' beliefs (Burlig et al., 2024), and reduce uncertainty surrounding CSA investments.

Given that economic and structural factors induce women tend to be more risk-averse than men, improving access to climate information is critical. Climate Information Services (CIS), which provide timely weather updates, have been shown to enhance CSA adaptation capacity (Autio et al., 2021; Maggio et al., 2019; McKune et al., 2018; Ngigi and Muange, 2022; Yegbemey et al., 2023). A framed field experiment in Zambia shows that CIS enabled both men and women to invest in higher-return technologies, demonstrating the potential of information to reduce risk aversion and promote CSA adoption (Kramer et al., 2023a).

Women face additional barriers to CIS, especially in rainfed agricultural systems (Roudier et al., 2014; Tall et al., 2018; Autio et al., 2021). In Kenya, men have greater access to early warning systems, while women rely on weather forecasts, which have less impact on CSA adoption (Ngigi and Muange, 2022). Limited smartphone ownership further restricts women's access to mobile-based services, leaving them dependent on radio broadcasts (Partey et al., 2020; Ngigi and Muange, 2022). Cultural beliefs may also undermine trust in weather forecasts, reducing CIS use in some regions (Diouf et al., 2019). Even when women access CIS, household power dynamics may constrain their ability to act on the information. In Zambia, providing forecast information to both spouses improved joint decision-making, highlighting how intra-household dynamics shape CSA adoption (Kramer et al., 2023a).

In sum, women's limited access to and benefit from climate information stems from digital exclusion, climate misperceptions, and household decision-making constraints, but little is known of interventions that enhance women's access to CIS and ability to act upon this

[3]Women's greater risk aversion is due to a combination of economic dependence, social roles, limited access to resources, and structural inequalities. Their primary caregiving responsibilities, lower access to information and networks, increased vulnerability to economic and environmental shocks and cultural norms contribute to more cautious decision-making.

information. The interaction between women's risk aversion, CIS access, and CSA adoption also remains an open question (see Section 8 for a detailed research agenda).

Box 4. Climate change perception and adaptation

Accurate climate change perception is crucial for adopting long-term adaptation strategies, as perception is the first step in the adaptation process and may affect access to climate information, as seen in Ghana (Partey et al., 2020) and in Kenya (Ngigi and Muange, 2022). The literature suggests that education and experience shape climate perception and adaptation (Maddison, 2007; Tambo, 2013; Silvestri et al., 2012; Komowski et al., 2015; Atchikpa et al., 2017; Gittard, 2024b), with experienced farmers more likely to perceive climate impacts and those with higher education more inclined to adopt adaptation strategies (Ishaya and Abaje, 2008; Maddison, 2007). Few studies examine gender differences. In Senegal, while women have less access to CIS than men, a key reason explaining both women's and men's reduced access to CIS may be limited perceptions of climate-related risks and usefulness of climate information. (Diouf et al., 2019). There is currently a lack of rigorous evidence on how perception of climate change influence access to CIS and whether these perceptions are gendered.

Information on climate-smart agricultural technologies

Unequal access to information on technologies is a significant barrier to women's adoption of CSA technologies, particularly for costly innovations. While numerous studies examine the impact of information interventions on agricultural technology adoption (Hanna et al., 2014; Emerick and Dar, 2020; Glennerster and Suri, 2018; Aker and Jack, 2023; Barrett et al., 2022), few assess gender-specific effects. Experimental evidence from Niger suggests that information is a stronger constraint on technology adoption than liquidity or credit (Aker and Jack, 2023). Training on *demi-lunes*, an agricultural technique that mitigates land degradation, significantly increased adoption rates, with women adopting significantly less *demi-lunes* than men. However, despite constraints such as lack of private land ownership and limited financial access, the training still led to substantial adoption gains among female farmers. Similarly, in Mozambique, a program training both women and men in dairy farming techniques increased milk production more than training men (Johnson et al., 2015). Joint training likely improved women's understanding of new technologies, increased their participation in dairy activities, enhanced their role in household decision-making, and strengthened their contributions to profitable agricultural enterprises. In Côte d'Ivoire, joint household training for rubber farmers enhances task allocation, increases wives' responsibilities, and leads to better farm management, boosting tree planting and crop harvest values two years post-training (Donald et al., 2022). In Uganda, the effects of video trainings have higher effect on women's adoption of recommended practices and inputs when the women received the information alone than with their husband (Lecoutere et al., 2023).

In summary, findings from these experimental studies highlight that information gaps on agricultural technologies, rather than financial constraints alone, limit women's adoption of

CSA technologies, and that targeted information and training leads to higher adoption rates among women.

Social networks

Limited access to social networks is a significant barrier to women's adoption of CSA in Africa. Social networks facilitate the diffusion of information and foster social learning, as farmers observe and learn from peers about the effectiveness and profitability of agricultural practices (Conley and Udry, 2010; Krishnan and Patnam, 2014; Emerick and Dar, 2020). However, women's social learning is constrained by restricted access to these networks (Meinzen-Dick et al., 2014). Studies indicate a gender gap in group membership and informal network participation, with men more likely to join agricultural cooperatives and hold leadership positions, while women are more frequently members of religious groups (World Bank, 2010). Unequal access to these networks limits women's ability to obtain reliable climate information (Gumucio et al., 2020), thereby reducing CSA adoption. In Uganda, for example, social networks are key to information diffusion, yet men have greater access than women (Katungi et al., 2008).

Beyond network access, the depth and quality of women's participation in social groups may also shape their ability to adopt CSA. A descriptive analysis shows that the presence of other women in agricultural groups enhances women's confidence in speaking publicly in Zambia, Malawi and Mozambique, which is positively associated with adopting soil conservation practices (Gotschi et al., 2008). When women feel empowered to participate actively in group discussions, CSA adoption increases. However, male dominance in agricultural networks and leadership roles often discourages women's engagement. Women may avoid participation if they believe their voices will not be heard, viewing attendance as an inefficient use of time and energy (Dikito-Wachtmeister, 2001). Evidence from an RCT in rural Kenya supports this, showing that women's attendance at community meetings increases when NGOs emphasize their participation and schedule meetings at convenient times (Leino, 2007).

Despite these insights, evidence on the extent to which gender inequalities in social networks hinder women's CSA adoption in Sub-Saharan Africa remains limited.

Education

Low literacy rates and limited education significantly hinder women's adoption of CSA technologies (Kwauk and Braga, 2017), particularly when compounded by limited access to information. Effective adaptation to climate change requires the ability to interpret climate data, assess risks, and implement appropriate strategies using available resources (Striessnig et al., 2013; Cinner et al., 2018). Education and traditional knowledge both play crucial roles in individuals' adaptive capacity (Weir and Knight, 2004; Aswani et al., 2018; McCarter, 2011).[4] In Sub-Saharan Africa, women generally have lower educational attainment than men (Shapiro, 2012; Shapiro and Tenikue, 2017), which constrains their ability to adopt

[4]In rural Ethiopia, household education levels influence the timing of technology adoption, with educated farmers acting as early adopters who benefit from knowledge diffusion (Weir and Knight, 2004).

on-farm adaptation strategies. Evidence from Kenya highlights the complex relationship between formal education and risk perception. Following participation in drought awareness programs, pastoral women with formal education exhibit greater risk aversion, as education enhances their ability to process and respond to climate risks (Walker et al., 2022).

In summary, while low education levels are recognized as a key barrier to CSA adoption, few studies examine gender differences, despite women's generally lower educational attainment.

Access to financial services

Research consistently shows that women are more excluded from the financial sector than men (Morsy, 2020), limiting their access to credit, savings, and insurance — key financial instruments for investing in climate-resilient agricultural practices and technologies. Insurance protects valuable assets against risk, savings and remittances smooth consumption, and access to credit is crucial to invest in costly CSA. In Zimbabwe, men's preference for high-yielding maize varieties is driven by their greater access to financial assets and formal marketing institutions, whereas women's tendency to choose open-pollinated varieties is driven by the fact that they do not require loans for fertilizer and seeds (Bourdillon et al., 2003). While the literature on the extent to which credit or cash flow limitations hinder the adoption of agricultural technologies remains scarce, recent RCTs suggest these constraints might only affect a small portion of farmers (Karlan et al., 2014; Beaman et al., 2023; Crépon et al., 2015). Financial limitations seem to be a less significant barrier compared to other factors that limit adoption (Akresh et al., 2016; Benhassine et al., 2015; Baird et al., 2011), such as the spread of information about technology (Aker and Jack, 2023).

Land ownership

Women's limited property and contractual rights over land, water, and natural resources restrict their ability to implement on-farm adaptations. Secure land tenure encourages long-term agricultural investments, including CSA (Holden and Ghebru, 2016; Murken and Gornott, 2022), with studies showing that tenure interventions increase both agricultural investments (Higgins et al., 2018) and productivity (Lawry et al., 2017). However, in Sub-Saharan Africa, women have significantly lower access to land ownership and formal tenure security than men (Doss, 2018), partly due to discriminatory statutory laws favoring male ownership (Mutangadura, 2007). A World Bank study finds that only 13% of women claim sole ownership, compared to 36% of men, while 38% of women own land jointly versus 51% of men (Gaddis et al., 2018). Customary laws further restrict women's land ownership, granting access only through male relatives, as mentioned for example by Aker and Jack (2023) in Niger.

Land insecurity reduces women's agricultural investments (Murken and Gornott, 2022; Higgins et al., 2018) and can discourage CSA adoption, as they may hesitate to invest time, effort, and resources into initiatives when fearing potential land disputes or loss of access to their agricultural assets. In Ghana, tenure insecurity leads women to shorten fallow periods to avoid displacement, reducing soil fertility and productivity (Goldstein and Udry, 2008). Experimental evidence from multiple interventions indicates that addressing these barriers

significantly improves investment incentives. In Uganda, incentivizing co-titling of land for spouses increased the use of improved seeds and greener maize cultivation (Cherchi et al., 2019). A land formalization program in Rwanda boosted soil conservation investments, particularly among female-headed households, highlighting the role of tenure security in conservation agriculture (Ali et al., 2014). Similarly, a large-scale RCT in Benin found that strengthening women's tenure security increased fallowing (Goldstein et al., 2015), a critical practice for soil health, sustainable land management and long-term climate resilience.

3 Weather Insurance

Weather insurance is a risk management tool that can help rural households manage the economic consequences of climate extremes by providing payouts based on measurable weather indices. In Sub-Saharan Africa, various types — such as rainfall, index-based, livestock, crop, parametric, and catastrophic insurance — address specific risks, including agricultural losses, extreme weather events and livestock mortality, thereby enhancing resilience and adaptation (Platteau et al., 2017; Koloma, 2014). These products offer financial protection, encourage agricultural investment (Sundar and Ramakrishnan, 2013; Hill and Robles, 2011), promote risk-taking (Mobarak and Rosenzweig, 2012; Dercon et al., 2014; Karlan et al., 2014), and improve welfare (de Nicola, 2015a). Farmers benefit from reduced contract disputes through exogenous weather station data (Devereux and Guenther, 2009) and faster payouts (Greatrex et al., 2015). Experimental evidence shows that weather insurance increases yields and improves food security management during climate shocks (Delavallade et al., 2015; Dercon et al., 2014; Barnett, 2014; Karlan et al., 2012).

Despite its benefits, adoption of weather insurance products remains extremely low in Africa (Cole et al., 2013; Hill and Viceisza, 2012). Key barriers include basis risk — the imperfect correlation between payouts and actual losses due to rainfall variability (de Nicola, 2015b; Tadesse et al., 2015; Dicko et al., 2014) — as well as cost-protection trade-offs (Berg et al., 2009; Koloma, 2014), poor understanding of insurance concepts (Tadesse et al., 2015), financial constraints (Belissa et al., 2019), risk preferences (Mude and Barrett, 2012), subjective expectations (Mude et al., 2010), trust issues, and liquidity limitations (Cole et al., 2013). Demand increases with payout experience, adverse conditions, and training (Dercon et al., 2014; Karlan et al., 2014; Mobarak and Rosenzweig, 2012), while insufficient stakeholder cooperation and farmer involvement in product design further hinder uptake (Muller, 2012; William et al., 2018).

Gender disparities in adoption rates

The consensus from the experimental literature points to women in low-income countries adopting weather insurance at lower rates than men (Delavallade et al., 2015; William et al., 2018; Gine and Yang, 2009; Akter et al., 2016; Jordan et al., 2021; Aheeyar et al., 2019; Timu and Kramer, 2023). Most studies focus on willingness to pay (WTP) rather than actual adoption. In Burkina Faso, male-headed households have higher WTP amounts than female-headed households (William et al., 2018). Choice experiments show significant aversion to insurance among female farmers (Akter et al., 2016), while randomized trials in Senegal and

Burkina Faso reveal lower adoption rates among women, who prioritize emergency savings due to higher exposure to life cycle risks (Delavallade et al., 2015). A literature review by Timu and Kramer (2023) shows that agricultural insurance products are rarely designed with gender-specific needs in mind, limiting their accessibility and benefits for women. Addressing these barriers is essential to increasing women's insurance uptake and coverage.

Women's constraints to adoption of insurance

Basis risk

Delavallade et al. (2015) find lower adoption rates of index-based agricultural insurance in Senegal and Burkina Faso among female farmers. They hypothesize that this is due to their higher exposure to basis risk — the portion of income risk that remains uninsured in weather contracts. Women may face greater basis risk due to heightened vulnerability to health shocks from pregnancy and childbirth, as well as caregiving responsibilities for children. Despite equal exposure to yield risk, these additional life cycle risks remain uninsured, potentially discouraging women from purchasing standard weather insurance. However, there is a dearth of experimental evidence on how differential basis risk affects women's insurance decisions in Sub-Saharan Africa or whether integrating life cycle risks into insurance design could improve uptake.

Control over land and assets

Inequality in land tenure security constrains women's bargaining power (Doss and Meinzen-Dick, 2020), agricultural investment (Murken and Gornott, 2022; Higgins et al., 2018), and thus uptake of weather insurance (Behr, 2023). Secure land rights may enhance the value of insurance by reducing uncertainties related to land loss relative to climate-related risk. In Ghana, this constraint is particularly binding, as formal land titles are required for insurance access (Otsuki and Jasaw, 2017). A WTP experiment in Kenya found higher demand when payouts were deposited directly into beneficiaries' mobile money accounts, suggesting that lack of direct financial control may hinder women's adoption of agricultural insurance (Kramer et al., 2023b). However, there is limited causal evidence on how restricted asset ownership directly and indirectly affects women's uptake of weather insurance.

Trust in financial institutions

Women's lower trust in financial institutions may pose substantial constraints for their adoption of weather insurance in Sub-Saharan Africa. This constraint is supported by quantitative evidence from a study by Akter et al. (2016) conducted in Bangladesh, which utilized a choice experiment to assess WTP for hypothetical insurance products. The research found that female farmers displayed significant aversion towards insurance products, and this aversion was primarily attributed to gender disparities in the level of trust in insurance institutions. Importantly, this reluctance was not explained by differences in risk and time preferences, decision-making power, or specific attributes of the insurance product. Suggestive evidence from Kenya indicates that women may be more likely to take up insurance when insurance agents are also women, potentially overcoming the lack of trust constraint (Cecchi et al.,

2021). However, there is a lack of both descriptive and causal evidence on how women's distrust in financial institutions might hinder their uptake of weather insurance in Sub-Saharan Africa.

Information and financial literacy

Limited financial literacy and information gaps — driven by lower education, restricted networks, and limited agency — may significantly constrain women's adoption of weather insurance in Africa. In Ethiopia, Tadesse et al. (2015) find that most rural households misunderstand crop insurance, with 64% viewing it as a financial tool primarily designed for wealthier individuals, akin to motor insurance. However, evidence on the role gender disparities in financial literacy play in the uptake of weather insurance remains scarce. In Burkina Faso, a study based on a participatory design shows that information and income are key determinants of weather insurance demand, with male-headed households exhibiting higher WTP than female-headed households (William et al., 2018). An experiment by Arteaga et al. (2023) finds that reframing insurance benefits in more relatable terms increases women's uptake, further supporting the information constraint. Qualitative evidence from South Asia underpins the crucial role played by intertwined factors, including gender norms on mobility, social exclusion, and male-dominated decision-making, in limiting women's financial literacy and confidence, and ultimately low female adoption rates of weather insurance (Aheeyar et al., 2019). Whether similar mechanisms prevail in Sub-Saharan Africa as well requires further rigorous testing.

4 Income Diversification

Why use income diversification as an adaptive strategy to weather shocks? Diversifying livelihoods helps rural households smooth income, manage risks (Macours, 2012; Macours et al., 2022; Banerjee et al., 2021; Ellis, 2005), and adapt to severe climatic changes, especially in low-income countries (Howden et al., 2008). This is particularly crucial for poorer households with limited capacity for ex-post consumption smoothing, requiring ex-ante risk management to stabilize income. While on-farm diversification strategies focus on boosting agricultural output and minimizing crop losses (Di Falco and Chavas, 2008), non-farm diversification generates income through wage labor and self-employment. Farmers frequently rely on non-farm wage jobs as an adaptive strategy to weather shocks and climate change (Chuang, 2019; Asfaw et al., 2014; Bertoni et al., 2016; Asravor, 2017).

Income diversification is a key lever for women's economic empowerment in Africa and a critical tool for limiting the impact of climate change on their well-being. By increasing income, reducing risk, and enhancing autonomy, diversification is particularly beneficial for rural women, who face lower agricultural productivity due to limited access to inputs (Croppenstedt et al., 2013; Quisumbing et al., 2014). In addition, transitioning to off-farm activities strengthens women's bargaining power, as suggested by evidence of a positive correlation between diversification, commercialization, and household decision-making in Ethiopia, Kenya, and Tanzania (Tavenner and Crane, 2019).

Gender disparities in adoption rates

Both qualitative and experimental evidence reveals gender differences in income diversification strategies. Women tend to favor long-term, ex-ante risk management approaches. In rural Nicaragua, women opted for income diversification when provided with productive transfers (Macours, 2012). In Ghana, experimental evidence shows women prefer long-term investment in non-farm activities over on-farm farming, a preference influenced by gender stereotypes around skills (Kramer and Lambrecht, 2019).

Despite this preference, income diversification remains male-dominated, with women's participation varying greatly across contexts (Van den Broeck and Kilic, 2019; Khan and Morrissey, 2020; Eriksen et al., 2005; Coulibaly et al., 2017; Kakota et al., 2011; Hesselberg and Yaro, 2006; Asravor, 2017). Men are more likely to engage in wage employment, while women rely on self-employment (Asravor, 2017). Marital status also plays a role; in Tanzania, divorced women diversify income sources more than married or widowed women but still less than men (Van Aelst and Holvoet, 2016).

Women's constraints to income diversification

Time use

The heavy workload of women, who are primarily responsible for specific agricultural tasks such as subsistence farming, and most, if not all, domestic chores and caregiving, consistently limits their ability to engage in income diversification across diverse contexts. Descriptive evidence suggests that female-headed households are indeed less inclined to engage in casual labor due to competing household responsibilities (see also Box 3 on gendered crop specialization). In addition to subsistence farming, women are responsible for water and firewood collection, food preparation, childcare, and healthcare — tasks that often follow rigid schedules, unlike men's more flexible routines (Kakota et al., 2011). Many of these responsibilities depend on natural resources, and climate change-induced resource depletion further increases women's labor burden, reducing both the time and energy available for income-generating activities (Ribeiro and Chauque, 2010; Nelson et al., 2002). In Tanzania and Kenya, time constraints make it difficult for women to engage in sustained, intensive income diversification efforts (Eriksen et al., 2005). Experimental evidence highlights the impact of alleviating women's time constraints on income diversification. In Burkina Faso, providing mobile childcare services through a public works program increases women's ability to engage in alternative income-generating activities (Ajayi et al., 2022). Similarly, an RCT in the Democratic Republic of Congo found that community-based childcare centers significantly boost women's engagement in commercial agriculture, processing, and wage work (Donald et al., 2023). These two studies establish a causal link between alleviating women's time constraints and engaging in income diversification.

Intra-household dynamics, gender norms and occupational choice

Underlying the time and labor constraints discussed in the previous section, gender norms shape acceptable economic activities for women and men, restricting women's income diversification opportunities. Gender norms around labor allocation dictate that women prioritize

subsistence farming to meet short-term household needs, restricting their participation in cash crop production, which would facilitate diversification (Coulibaly et al., 2017). In Tanzania, social and cultural obligations discourage women from entrepreneurship and business expansion to avoid neglecting family duties (Isaga, 2018). In Niger, a large RCT testing psychosocial interventions (among others) — including community discussions on gender norms and support for women's economic participation — significantly improved women's outcomes and diversification (Bossuroy et al., 2022). The intervention increased household income by expanding women's involvement in off-farm enterprises and raising the labor they allocated to these activities, highlighting the restrictive role of gender norms in off-farm diversification.

Marital status and prevailing household structures further influence women's agency and decision-making, and thus their ability to diversify income-generating activities. In Kenya, women need male household heads' consent to undertake certain activities, such as tree felling (Eriksen, 1999). In Burkina Faso, polygamous women are more likely than monogamous women to engage in independent income-generating activities (Guirkinger et al., 2021). Household structure likely influences which constraints are most binding. Married women may have better access to information, while divorced, widowed, or polygamous women may have greater autonomy to diversify income, as observed in rural Tanzania and Burkina Faso (Guirkinger et al., 2021; Van Aelst and Holvoet, 2016). While gender inequalities in decision-making limit women's control over resources and income sources, causal evidence on the role of household structure and intra-household dynamics in women's income diversification remains scarce.

Land and asset ownership

Gender inequalities in asset ownership (Doss, 2001; Meinzen et al., 2013), particularly in land access, significantly hinder women's ability to use income diversification as a climate adaptation strategy. Ownership of and control over assets play a crucial role in shaping livelihood opportunities available to women. For example, formal land ownership enhances tenure security and allows women to retain land and livestock while pursuing off-farm income (Goldstein and Udry, 2008). Experimental and quasi-experimental evidence supports this link: a land title registration program in Ghana increased women's engagement in non-farm activities (Agyei-Holmes et al., 2020), while an RCT in Burkina Faso showed that strengthening women's control over assets expanded their income-generating opportunities (van den Bold et al., 2015).

Capital

Limited land and asset ownership constrains women's income diversification as part of a broader challenge: restricted access to capital. Women face significant barriers to financial services, including credit and insurance, which are essential for initiating and sustaining diverse income activities. In Niger, Bossuroy et al. (2022) find that capital is a binding constraint, as a lump-sum cash grant, combined with other productive inclusion interventions, increased the number of income sources for women. Experimental evidence from Malawi and Zambia further supports this, showing that multi-faceted economic inclusion programs

that include a capital injection increase women's likelihood of diversifying economic activities (Botea et al., 2023; Bedi et al., 2024). Taken together, these findings provide robust evidence that capital constraints significantly limit women's ability to diversify income sources.

Education and skills

Unequal access to education can limit women's ability to adopt new income-generating strategies, particularly those requiring specialized skills or knowledge. In Sub-Saharan Africa, women are, on average, less educated than men (Shapiro and Tenikue, 2017), and constraints such as time and resource limitations prevent them from acquiring training necessary to engage in non-agricultural livelihoods.

Gaps in formal education restrict women's opportunities to develop managerial, entrepreneurial and technical skills (Gannon et al., 2022). Evidence highlights vocational and entrepreneurship training as critical for improving women's skills and expanding livelihood options, suggesting that education and skills are a binding constraint to women's income diversification in response to climate change. In Uganda, an entrepreneurship program increased women's self-employment in rural settings (Gavigan et al., 2020). Experimental evidence from Malawi shows that women face higher drop-out rates from training due to family obligations and adverse shocks, whereas men's participation remains stable and benefits from greater financial support from their family (Cho et al., 2013). In Niger, a large-scale RCT integrating microenterprise and life-skills training with community sensitization and business plan preparation increased household income and expanded women's involvement in off-farm enterprises (Bossuroy et al., 2022).

For vocational training to effectively increase women's participation in off-farm activities, barriers to accessing training must be addressed (Gannon et al., 2022). These include mobility restrictions (Perez et al., 2015; Singh and Belwal, 2008; Mersha and Sriram, 2019), time constraints due to household responsibilities (Arbache et al., 2010; Jost et al., 2015), and spousal permission often required to attend training programs (Nyantakyi-Frimpong, 2019; World Bank, 2014).

5 Migration

Climate-induced migration varies in distance and duration, from international and rural-urban migration (Marchiori et al., 2012; Cattaneo and Peri, 2016; Cattaneo et al., 2019; Missirian and Schlenker, 2017) to shorter-distance rural-rural movements (Dillon et al., 2011; Henderson et al., 2017; Defrance et al., 2022; Mueller et al., 2014; Gittard, 2024a), and can be permanent, seasonal, voluntary, or imposed. It may serve as a planned household strategy, a last-resort survival mechanism, or a complement or substitute for on-farm and off-farm adaptation.

Labor migration can be strategic or anticipatory, as remittances alleviate financial constraints, facilitating local adaptation and innovation adoption, and thus complement other on- and off-farm adaptation strategies. However, when local adaptation strategies fail, migration becomes a last-resort strategy and high migration costs may restrict resource-constrained households to short-distance movement or prevent migration entirely, trapping

them in climate-affected areas.

Gender disparities in adoption rates

Evidence from Sub-Saharan Africa suggests that rural-urban labor migration in response to weather extremes is predominantly male-driven. Men migrate strategically to diversify income and send back remittances, while women use migration as a short-term coping mechanism and are typically more vulnerable when doing so (Henry et al., 2004; Mueller et al., 2014; Dillon et al., 2011; Houria et al., 2011; Gray and Mueller, 2012; Thiede and Gray, 2017; Morten, 2019).

Migration patterns vary by context. In Burkina Faso, women migrate mainly for family reasons (e.g., marriage, separation), whereas men undertake long-distance moves for economic opportunities, such as agricultural expansion (Henry et al., 2004). In Ethiopia, droughts increase men's labor migration — especially among land-poor households — but reduce women's mobility (Gray and Mueller, 2012). In Mali, Findley (1994) observes that women and children relied on short-cycle circular migration to cope with the 1983–1985 drought, while long-distance, permanent migration was mainly undertaken by resource-connected young men.

Household structure also influences female migration. In Nigeria, droughts typically lead to male migration, but the presence of girls in the household or a male household head increases the likelihood of female migration (Dillon et al., 2011).

Women's constraints to migration

Liquidity and wealth

Migration is costly, with fixed costs posing significant barriers, especially for low-income households (IOM, 2018). Women typically face greater liquidity constraints than men, limiting their ability to finance migration. Expenses include transportation, relocation, and higher urban living costs. In Bangladesh, subsidizing bus tickets increased rural-urban migration (Bryan et al., 2014), but little is known about how liquidity and wealth constraints affect women's migration decisions in Sub-Saharan Africa or the impact of easing these constraints.

Expected returns

Women's underrepresentation in climate-induced migration may stem from lower expected returns. Since remittances drive migration decisions (Marchiori et al., 2012; Henderson et al., 2017), households may be reluctant to send women if their returns are lower or more uncertain than men's. Across Sub-Saharan Africa, women's lower education and skills reduce their employability in destination areas, as supported by experimental evidence (Ashraf et al., 2020). Migration often requires adapting through skill acquisition, and education is a key driver of climate-induced migration (Defrance et al., 2022; Baez et al., 2017; Gittard, 2024a), yet no evidence exists on whether improving women's education and technical skills increases their likelihood of engaging in climate-induced, strategic migration. In addition, female entrepreneurs often earn lower profits and returns to capital than men, making them

less viable candidates for strategic labor migration as a household-level income diversification strategy (de Mel et al., 2008; Berge et al., 2015; Bernhardt et al., 2018; Carranza et al., 2018).

Evidence on the returns to rural-urban migration in response to climate change is mixed, with some studies finding minimal gains (Hamory et al., 2020; Alvarez, 2020) and others reporting significant benefits (Baysan et al., 2024; Pulido and Swiecki, 2019; Imbert and Papp, 2020; Lagakos et al., 2022). Migration can lead to uncertain outcomes, as migrants often face integration challenges due to skill mismatches and labor productivity gaps (Bryan and Morten, 2019; Harris and Todaro, 1970). Uncertainty in migration returns may be more restrictive for women, who experience higher unemployment and lower earnings than men. However, evidence on gender differences in migration-related uncertainty remains inconclusive. More research is needed to assess how lower returns to climate migration affect women's ability and decision to migrate as an adaptation strategy.

Gender roles

Gender norms defining the expected roles and suitable activities for men and women may limit women's access to migration as an adaptation strategy. As primary caregivers, women often cannot leave children behind or migrate with them. Following adverse climatic events, they typically take on the dual responsibilities of caregiver and shock absorber, managing subsistence crops (see Box 3), preparing meals and fetching water — tasks that become more time-intensive due to rainfall deficits and resource scarcity (Björkman-Nyqvist, 2013; Ribeiro and Chauque, 2010; Babugura, 2008). These responsibilities limit women's mobility, confining them to the household. Male-dominated migration further increases women's domestic workload when men leave, reinforcing their immobility (Houria et al., 2011). Women also have limited decision-making power in determining who migrates, when, and where, as seen in East Africa (Abebe, 2014). By contrast, men's migration can, in some cases, empower women by increasing their control over household resources and decision-making, enabling them to engage in traditionally male-dominated activities (Agamile et al., 2021). However, there is no causal evidence on the relative importance of these mechanisms through which gender norms may limit women's ability to migrate as a climate adaptation strategy.

Social networks

Women typically engage in small, community-based, informal groups, while men tend to have stronger ties to formal networks beyond their local communities (Perez et al., 2015; Westermann et al., 2005; Huyer, 2016). Migrant networks at destination play a crucial role in shaping migration patterns by reducing migration costs, such as in the Mexico-US migration channel (McKenzie and Rapoport, 2010), facilitating economic and social integration, expanding job opportunities (Patel and Vella, 2007; Drever and Hoffmeister, 2008), and providing material support, information and assistance (Mazzucato, 2009), such as in Senegal-France/Italy migration (Chort et al., 2012). However, the extent to which women's limited formal networks constrain climate-induced migration in Sub-Saharan Africa remains unexplored.

Land tenure insecurity and mobility

Women's greater land tenure insecurity may discourage their migration, as remote plot monitoring increases the risk of expropriation. In Ghana, women shorten fallow periods to avoid losing uncultivated land (Goldstein and Udry, 2008), potentially limiting their ability to migrate. However, no causal link has been established between women's fear of expropriation and restricted climate-induced migration (Goldstein and Udry, 2008). In Benin, a large-scale RCT found that land demarcation improved women's mobility, enabling them to shift production from secure to less secure land outside the village (Goldstein et al., 2015). In addition, in Côte d'Ivoire, restrictive land tenure laws limit migrants' land rights (Fenske, 2009; Colin and Ayouz, 2006), further constraining women's mobility after climate shocks. These findings suggest that land tenure insecurity is a key barrier to women's climate-induced migration, yet there remains a gap in the literature on the causal channels involved.

Risks of violence

Climate-induced migrants face numerous risks during their journey and at destination, particularly in irregular migration, including physical and sexual violence, forced labor, financial exploitation, trafficking, and even death (Reuveny and Moore, 2009; Tacoli, 2009; Black et al., 2013; McKenzie and Yang, 2015; IOM, 2018; Bah et al., 2023), and can be exposed to conflict due to tensions with host populations (Reuveny and Moore, 2009; Fröhlich and Brzoska, 2015; McGuirk and Nunn, 2024; Thoenig et al., 2020). Female migrants face heightened risks of sexual and gender-based violence, often citing lack of safe shelter as a major concern following climatic events (Brown, 2008; Mitchell et al., 2007). Climate-induced mass migration frequently leads to resettlement in urban slums or camps, where women and children are particularly vulnerable to sexual and gender-based violence and trafficking (Verma et al., 2011). Despite these risks, the extent to which migration dangers influence women's decision to migrate as an adaptation strategy remains understudied.

Information campaigns have expanded to raise awareness about the risks of irregular migration, particularly from Africa to Europe, where smuggling networks often misinform migrants (Geiger and Pécoud, 2019) but evidence on their effectiveness is limited. Peer-to-peer information has been shown to increase risk awareness and reduce irregular migration intentions in Senegal (Tjaden and Dunsch, 2021). However, the role of (mis)information in shaping women's migration decisions remains largely unexplored.

6 Adaptive Social Protection

Adaptive social protection programs — such as cash transfers, public works, and economic inclusion programs — are a key policy lever to help vulnerable households cope with climate shocks in the short term and facilitate individuals' access to longer-term private adaptation strategies by alleviating financial constraints. Without these programs, extreme poverty and market failures often prevent households from investing in market-based interventions, such as improved farming techniques or weather insurance, or adopting individual strategies such as investing in off-farm businesses.

While women are often the primary beneficiaries of adaptive social protection programs in Sub-Saharan Africa — 72% of all Social Safety Nets included in a systematic review for low- and middle-income countries targeted women (Peterman et al., 2024) — they still face specific barriers that limit their ability to fully access and benefit from these programs, thereby constraining their uptake of adaptation strategies.

Bargaining power and financial autonomy

While the gender of cash transfer recipients does not significantly impact household well-being and resilience (Akresh et al., 2016; Benhassine et al., 2015; Bauchet et al., 2021), gender-targeted transfers have been effective in increasing women's income and strengthening their intra-household bargaining power (Bastagli et al., 2016). However, recent empirical evidence from a lab-in-the-field suggests that cash transfers to women increase their demand for agency but do not change the intra-household balance of power enough to allow them to express it publicly (Bakhtiar et al., 2024). Gains in women's agency, if not in their bargaining power, have led to increased investments in traditionally female-dominated areas such as human capital, children's nutrition, and clothing (Fafchamps et al., 2014). However, these programs have not consistently translated into productive capital accumulation or investments in women's entrepreneurial activities (Duflo, 2012; Duflo and Udry, 2004; Bernhardt et al., 2019; Friedson-Ridenour and Pierotti, 2019). In the context of climate adaptation, women may lack financial autonomy to invest in resilience-enhancing activities — such as climate-smart agriculture or diversified livelihoods — due to intra-household pressures and gendered financial obligations (e.g. the kin tax) that prioritize their partner's or family's needs over their own income-generating opportunities (Andrews et al., 2011; Peterman and Gilligan, 2019). For example, Liberia's Cash for Work Temporary Employment Project showed that while women allocated a higher proportion of their public works income to farm investments, men diversified their investments more broadly, suggesting a limited impact on income diversification for women (Andrews et al., 2011).

Safety and mobility

Gender norms around mobility and safety concerns further hinder women's participation in adaptive social protection programs. For instance, while the Central African Republic's Londo public works program improved shock resilience for both men and women, its asset transfer component — a bicycle given to beneficiaries — only increased men's mobility, failing to address gender norms restricting women's movement (Alik-Lagrange et al., 2023). Innovations such as mobile money transfers offer potential solutions. A program in Niger demonstrated that mobile transfers reduced travel distances and increased women's bargaining power within households compared to traditional cash transfers (Aker and Ksoll, 2016).

Gender norms and domestic responsibilities

Gender norms around caregiving responsibilities intensify in the face of climate shocks, further restricting women's ability to benefit from adaptive social protection (Kakota et al.,

2011; Sorenson et al., 2011; Moshoeshoe et al., 2021). During crises, women's caregiving and household management burdens increase, limiting their participation in public works programs, as observed in India's National Rural Employment Guarantee Act (NREGA) (Chopra, 2019). Accommodating maternal needs is crucial for ensuring program accessibility. In Ghana, providing on-site childcare and sanitation facilities, along with flexible employment conditions, increased women's participation in public works programs (Dadzie and Ofei-Aboagye, 2021). Similarly, in Burkina Faso, providing affordable childcare for public works beneficiaries significantly improved women's well-being and resilience (Ajayi et al., 2022).

Structural and institutional barriers

Even when women access adaptive social protection, their benefits are often constrained by structural inefficiencies. Decision-making dynamics at the local level significantly impact the effectiveness of adaptive social protection programs for women. Local authorities — where women often have limited voice and influence — may prioritize projects that predominantly benefit men, reducing the overall impact of adaptive social protection on women (Jordan et al., 2021).

Addressing these multifaceted challenges requires gender-sensitive program design, including adjustments in operational features to directly address the constraints faced by women in both economic and complementary programming components. Reviews suggest that targeting women and incorporating gender-sensitive operational features — such as literacy support, flexible program requirements, proximity-based service delivery, and childcare facilities — are essential for ensuring that adaptive social protection programs effectively benefit women (Bastagli et al., 2016; Gavrilovic et al., 2022; Peterman et al., 2024). However, there remains a notable gap in the causal evidence on such interventions in the African context and especially on their ability to foster women's adoption of climate adaptive strategies.

7 Intervention Evidence Map

Despite the critical role that women can play in adapting to climate change and the significant opportunities that their inclusion in adaptation strategies presents, this paper highlights numerous constraints that still hinder women's ability to implement adaptation strategies both on and off the farm. This section presents an evidence map of interventions that may increase the adoption of each of the four strategies identified in the paper as well as enhance the reach and impact of adaptive social protection. For each strategy, policy options are proposed or identified along with the current strength of the evidence in support of that intervention. The categories referenced in the "State of the evidence" column are defined as follows: *credible* indicates that more than one impact evaluation from Sub-Saharan Africa demonstrates consistent, positive impacts of an intervention; *emerging* indicates that just one impact evaluation (from Sub-Saharan Africa) shows positive impacts or multiple impact evaluations show mixed or not exclusively positive results; *frontier* indicates that there are no impact evaluations showing strong positive impacts, but other nonexperimental evidence suggests that the intervention could address the given constraint. Papers cited in the ta-

ble are exclusively those with experimental or quasi-experimental evidence for Sub-Saharan Africa.

Table 1: Evidence Map

Policy Objective	Policy Options	Main Conclusion	State of Evidence
Climate-Smart Agriculture			
Promoting women's access to information on climate change	Providing digital devices to women[5]	Digital devices facilitate access to information, especially for women whose access to Climate Information Services (CIS) is restricted due to reliance on traditional media such as radio.	Frontier
	Delivering CIS to both spouses together	Providing forecast information to the couple helps them agree on investment decisions and increases women's voice in agricultural decision-making within the household (Kramer et al., 2023a).	Emerging
Increasing women's access to information on new technologies	Formal and informal training on CSA, new technologies, water management	Training sessions, by providing technical advice and filling knowledge gaps and skills increase women's adoption of new agricultural technologies (Aker and Jack, 2023; Johnson et al., 2015).	Emerging
	Information and Communication Technology-based extension programs	Farmer-to-farmer videos, participatory videos, and phone-based extension trainings have been shown to increase agricultural outputs more than traditional training (Aker, 2011; Aker and Ksoll, 2016).[6]	Credible
	Providing women with subsidized inputs along with essential information on their use	Providing subsidized inputs increases women farmers' fertilizer use and boosts their agricultural production, consequently increasing their adoption of CSA strategies (Diagne, 2006; Agboh-Noameshie et al., 2008; Dibba et al., 2012). In particular, improving access to agricultural extension services for women increases their use of these inputs (Buehren et al., 2019).[7]	Credible
	Training programs targeting both spouses	Targeting women or including both spouses in agricultural extension training increases women's empowerment, agricultural productivity, and investments. Including both spouses in training increases women's participation in decision-making and improves planning by reducing frictions (Lecoutere et al., 2023; Donald et al., 2022).	Credible
	Training programs led by female extension agents	Women farmers are more likely to adopt new practices and make decisions in the household when trainings are delivered by female extension agents (Kondylis et al., 2016; Lecoutere et al., 2023; BenYishay and Mobarak, 2019).	Credible

[5]Digital devices include smartphones and tablets.

[6]For a review on the impact of mobile phone-enabled services on smallholder farmers, see Baumüller (2018).

[7]For a review of impact evaluations of agricultural input subsidies including subsidies for seeds or fertilizers in Africa, refer to Hemming et al. (2018).

Policy Objective	Policy Options	Main Conclusion	State of Evidence
Increasing women's participation in agricultural social networks	Structuring social groups to fit women's time constraints, e.g. female-friendly scheduling	Women's participation in community meetings increases when facilitated by NGOs that prioritize women's participation and when meetings are scheduled at times convenient for them.	Frontier
	Gender quotas in leadership within agricultural social groups	Gender quotas in leadership positions within agricultural social groups can address the barriers created by male dominance, strengthen women's voices and increase their active participation in these groups.	Frontier
	All-women social groups	All-women social groups, such as micro-credit groups, savings groups, self-help groups, health groups or innovation platforms, could significantly boost women's participation in CSA by offering a space for peer learning and collective action.	Frontier
Increasing long term investment incentives	Land titling formalization	The formalization and strengthening of women's land tenure leads to increased investments in conservation agricultural practices (Ali et al., 2014; Goldstein et al., 2015).	Credible
Weather Insurance			
Increasing women's knowledge and understanding of insurance products	Training sessions on weather insurance and financial literacy	Increasing women's knowledge and understanding of insurance institutions could reduce their distrust and enhance adoption rates.	Frontier
	Women insurance agents	Involving women as actors of the insurance value chain, for example by having female extension workers enroll farmers in insurance schemes, could increase women's take-up of the products by improving trust and accessibility.	Frontier
	Framing insurance products in terms of benefits to women	Changing the way insurance products are framed to emphasize the benefits for women, for example by changing units of insurance sold in terms of number of household members at risk can boost demand for insurance (**?**).	Emerging
Tailoring products to women's needs	Designing insurance products that include women's life cycle risks.	Designing insurance products that address women's higher basis risks, such as vulnerabilities related to their life cycle risks, could increase their adoption of weather insurance.	Frontier
	Designing insurance products that account for women's lack of land tenure security	Developing insurance products that take into account women's land tenure insecurity could increase their uptake of weather insurance as land tenure is often a prerequisite for insurance enrollment.	Frontier
	Combining insurance with mobile money	Paying insurance payouts directly on women's personal mobile money accounts increases their willingness to pay for agricultural insurance (Kramer et al., 2023b).	Emerging
Income Diversification			
Unlocking women's access to capital and ownership of assets	Cash transfers and public work programs	Consumption support increases income diversification, especially among women (Alik-Lagrange et al., 2023; Natali et al., 2016).	Credible

Policy Objective	Policy Options	Main Conclusion	State of Evidence
	Economic inclusion packages with capital injection	Multifaceted packages with capital injection increase women's income diversification. (Bossuroy et al., 2022; Botea et al., 2023; Bedi et al., 2024)	Credible
	Land titling formalization	Strengthening women's control over assets such as land can expand their income-generating opportunities by increasing women's decision-making power (van den Bold et al., 2015).	Emerging
Alleviating women's skills and social norms constraints	Socio-emotional skills training	Socio-emotional skills trainings increase women farmers' participation in non-farm activities (Bossuroy et al., 2022; Boxho et al., 2025).	Emerging
	Information and Communication Technology provision	The provision of mobile phones, and learning how to use them, increases women's crop diversification (Aker and Ksoll, 2016).	Emerging
	Community norm-changing interventions	Community level norm-changing interventions, such as edutainment interventions and facilitated community discussions, could promote women's involvement in off-farm and non-farm activities.	Frontier
	Trainings and interventions led by female mentors	Female role models and mentors can challenge gender norms regarding sectoral choices, while also expanding women's networks and boosting their confidence to enter higher-return, male-dominated sectors.	Frontier
Relaxing women's time constraints	Engaging men to increase participation in house and care work	Gender-transformative trainings that engage men to participate more in domestic chores can help alleviate women's time constraints and increase their ability to diversify income sources.	Frontier
	Childcare services	Childcare access can allow mothers to move from lower-wage jobs with flexible schedules to higher-paying jobs, and facilitate greater income diversification (Ajayi et al., 2022; Donald et al., 2023).	Credible
Migration			
Promoting women's labor relocation	Information session on women's integration in migrant networks	Migrants' networks lower migration costs and ease integration. Information sessions on migrant networks for women could facilitate both social and economic integration.	Frontier
	Land titling formalization	Insecurity in women's land tenure can discourage migration due to the heightened expropriation risks. Strengthening women's land tenure security encourages them to shift production from secure land to less secure areas outside the village and could enhance their ability to migrate (Goldstein et al., 2015).	Emerging
Relaxing women's capital constraints	Subsidized transportation for seasonal migration or cash transfers	Subsidizing transportation costs for women could lower their financial barriers to migration by reducing expenses.	Frontier
Reducing women's risk of violence	Information campaigns	Information campaigns that outline the dangers of climate-induced migration, compare risky versus safer pathways, and specifically address the risks faced by women could reduce their insecurity and reluctance to migrate.	Frontier

Policy Objective	Policy Options	Main Conclusion	State of Evidence
	Peer-to-peer transmission and role models	Peer-to-peer information campaigns reduce intentions to migrate irregularly.	Frontier
Adaptive Social Protection			
Making adaptive social protection work better for women	Gender-sensitive provisions in public works programs	Accompanying public works programs with gender-sensitive provisions, such as flexible hours, childcare support, and safe transportation, could improve women's participation and adoption of on- and off-farm diversification (Ajayi et al., 2022).	Emerging
	Female quotas in public welfare decision-making	Strengthening women's voice and leadership in designing and allocating public welfare programs, such as implementing female quotas in decision-making bodies, could enhance gender-inclusive policymaking.	Frontier
Leveraging adaptive social protection for women's climate adaptation	Climate adaptive interventions in economic inclusion packages and/or cash transfers	Adding climate-adaptive interventions to economic inclusion packages and cash transfers could enhance women's climate resilience.	Frontier
	Cash transfers framed for climate adaptation	Framing cash transfers as part of climate adaptation strategies could enhance their effectiveness in building resilience for women.	Frontier

8 Priority Research Questions

This section identifies key under-researched areas critical to understanding and addressing barriers to women's climate adaptation. While not exhaustive, these questions are derived from the preceding analysis and are organized by adaptation strategy.

Climate-Smart Agriculture

How do risk aversion, preferences, and climate information interact? Little is known on the interaction between women's preferences for long-term strategies, their typically higher risk aversion, and their access and exposure to information about climate change and agricultural technologies. In particular, more causal evidence is needed on women's preferences for long-term agricultural conservation strategies over short-term coping mechanisms. Further causal analysis is needed to better understand women's perceptions and preferences regarding sustainable agricultural practices. Lack of information on climate change and sustainable technologies, combined with higher risk aversion, limits their adoption of CSA. However, risk aversion also potentially translates into a higher preference for long-term strategies that are protective against the effects of climate change and extreme climatic events. Providing accurate information on the benefits of sustainable strategies could therefore represent an opportunity for increased adoption among women. However, little is known on how these constraints interact with each other. Key questions that should be explored in priority to better understand how to increase women's adoption of CSAs include: Does women's higher risk aversion represent an opportunity, rather than just a barrier, for increasing their adoption of CSA practices? If so, can delivering accurate information on climate change and

technologies leverage this opportunity?

How best to address women's limited knowledge of climate change and its effects? There is currently little evidence on the extent to which women perceive the climate change phenomenon as a long-term trend to which they need to adapt, especially in particularly exposed regions of Sub-Saharan Africa. More research is needed to understand the causal effects of climate perception on adaptation and whether access to accurate information can change those perceptions. What are effective interventions that address women's limited access to climate information services?

What role do social networks play in adopting climate-smart agriculture? Improving women's adoption of sustainable agricultural practices depends on a comprehensive understanding of knowledge diffusion within social networks and strategies to overcome barriers to learning and training. This includes elucidating the impact of male dominance in agricultural social structures on women's engagement and accessibility within these networks. What are effective approaches to social groups organization that overcome gender barriers and time constraints, thereby facilitating women's long-term adoption of sustainable agricultural practices?

To what extent does land tenure insecurity limit women's investment in CSA practices? How does land tenure insecurity influence women farmers' risk perceptions and decisions regarding investment in CSA practices, particularly those requiring long-term land use changes like fallowing?

Weather Insurance

Which insurance products work for women? There is currently little evidence on alternative insurance products that are designed to work for women and to increase women's take-up. Do weather insurance products that also cover women's life cycle risks, such as pregnancy and their children's health events, increase women's uptake and use of such products? Do insurance products that also address women's lack of land tenure security, such as offering coverage for crops grown on leased or borrowed land, increase their uptake compared to traditional insurance options? More empirical evidence is also needed on the design of insurance parameters, such as how benefits are paid out.

What are effective ways to deliver information on insurance products to women? What types of trainings and communication products can alleviate women's information and literacy constraint? Does subsidizing access to training sessions on insurance products, through covering transportation costs for example, increase women's participation and ultimate take-up of products? Would increasing access to information on weather insurance and its efficiency increase women's uptake by increasing their trust in financial institutions and products and reducing inaccurate beliefs? More evidence is needed on the effect of "women-friendly" framing of insurance products and on the extent to which feminizing insurance institutions might alleviate women's reluctance to enroll in insurance schemes. How does improving women's access to climate adaptation information increase their take-up of weather insurance by increasing the relevance of the product to their needs, given their typically higher risk aversion?

Income Diversification

Which gender norms hinder women's participation in income diversification? To what extent does lack of time hinder women's engagement in off-farm activities? Can engaging men to increase their share of housework be effective in increasing women's income diversification? To what extent does women's lack of decision-making power within the household affect their decisions to diversify income sources for climate change adaptation? There is a need to better understand in which contexts different constraints are more binding for women. For instance, married women may access more information and resources through their husbands, while divorced, widowed, or women in polygamous marriages might have greater decision-making autonomy. How do intra-household dynamics within various household structures influence women's agency and ability to diversify their income in response to climate change, considering both their time and labor constraints and their decision-making power?

Migration

Which interventions can improve women's returns to migration? Can interventions that address gender disparities in migration outcomes, such as skills training or economic inclusion programs designed for women, help them overcome lower returns and limited decision-making power, ultimately increasing their participation in labor migration?

How best to overcome the liquidity constraint? Migration is a costly adaptation strategy, and women, who often experience greater liquidity constraints than men, encounter higher barriers to pursuing this option. Does easing women's financial constraints, such as subsidizing transportation costs, increase their likelihood of migrating in response to climate shocks, particularly in Sub-Saharan Africa?

What role do social networks play? There is limited understanding of how restricted access to social networks deters women's climate-induced migration. Migrants' networks lower migration costs and aid integration, while limited networks discourage women from migrating. Can interventions such as information sessions that facilitate the social and economic integration of female migrants who lack social networks at their destination improve their migration outcomes?

To what extent does women's land tenure insecurity reduce their willingness to migrate after climate shocks? While there are established causal links between women's fear of expropriation and their reduced ability to monitor their plots remotely, the link has not been formally established with limited climate-induced migration.

What is the role of gender norms in limiting women's climate-induced migration? There is a lack of causal estimation to comprehensively understand how factors such as women's role as caregivers and shock absorbers, and their limited participation in intra-household decision-making, influence and restrict women's migration following adverse climate events. Experimental designs are needed to assess whether economic inclusion programs that take into account women's time allocation and household roles can improve their opportunities in climate-induced migration. Empirical studies are needed to assess whether addressing gender imbalances in bargaining power through joint training for wives and husbands can improve decision-making around who in the household migrates, and potentially increase women's migratory prospects.

What is the impact of male migration on women's adaptive capacity? The male dominance in climate-induced migration restricts women's ability to migrate and increases their household tasks and responsibilities. However, this shift can also empower women by giving them greater control over household resources, enabling them to take on leadership roles and engage in traditionally male-dominated activities. Further empirical and causal analysis is therefore needed to understand whether and how male migration in response to adverse weather events may mitigate or exacerbate gender inequalities in climate change adaptation. To what extent does male migration create a burden on women's labor load, relative to the increase in empowerment afforded by men's absence?

Adaptive Social Protection

How to enhance women's participation and decision-making in adaptive social protection? Which program design elements enhance women's participation and retention in adaptive social protection schemes? Empirical evidence is needed to assess the impact of gender-sensitive provisions—such as flexible work hours, childcare support, and safe transportation—on women's ability to engage in public works programs and other adaptive social protection interventions. To what extent do mobility constraints and domestic responsibilities limit women's ability to benefit from adaptive social protection? Further research should examine the role of gender norms and intra-household decision-making in shaping women's uptake and use of adaptive social protection, as well as potential interventions to relax these constraints. What mechanisms can strengthen women's leadership and decision-making power in adaptive social protection programs? Investigating the impact of female representation in welfare decision-making bodies and participatory governance mechanisms could help ensure that social protection programs are designed to effectively address women's needs.

What are the most effective complements to economic inclusion packages for supporting women's climate resilience? Research should explore which additional components—such as financial training, access to savings mechanisms, or bundled climate-adaptive interventions—are most cost-effective in promoting women's investments in sustainable adaptation strategies. How can adaptive social protection prevent maladaptive coping strategies among women and girls? Evidence is needed on the effectiveness of social protection in reducing harmful climate-induced responses—such as child marriage, school dropout, or reduced labor market participation—and promoting sustainable adaptation pathways.

How can adaptive social protection facilitate women's access to climate risk management tools? More evidence is needed on how linking cash transfers and economic inclusion programs to early warning systems, weather insurance, and anticipatory action can enhance women's resilience to climate shocks. How can digital payment systems and financial training improve the long-term resilience benefits of cash transfers for women? More research is required to determine whether and how innovations such as mobile money, early payment options, and financial literacy training influence women's ability to allocate transfers toward adaptation investments rather than short-term consumption.

9 Summary and Discussion

This paper reviews the evidence on the constraints women face in adopting climate adaptation strategies, outlines interventions that effectively address these constraints, identifies critical knowledge gaps, and proposes priority research questions. The review focuses on four key adaptation strategies available to women in rural settings in Sub-Saharan Africa: climate-smart agriculture (CSA), weather insurance, income diversification, and migration. It also discusses gender differences and constraints in access to adaptive social protection, which serve as a policy lever to support short-term coping with climate shocks while enabling long-term adaptation investments.

Women face greater barriers than men when adapting to climate change, both on-farm and off-farm. While some constraints are common across genders and adaptation strategies, others are gender- and strategy-specific. Constraints for which there is robust evidence that they are binding on the adoption of several strategies include women's financial limitations and restricted control over assets, gender norms that position them as primary caregivers and shock absorbers, and women's limitations in human and social capital.

Limited access to financial resources significantly hinders women's ability to invest in CSA and other adaptation strategies. Restricted access to credit, savings, and insurance products prevents women from making critical investments in adaptation measures, safeguarding assets, and using savings or remittances to reduce food insecurity and smooth consumption.

Women's limited control over assets, particularly land, diminishes their capacity to adapt to climate change. Insecure land tenure reduces women's ability to invest in agriculture, diversify livelihoods, or migrate. While the impact of land tenure insecurity on women's adoption of adaptive strategies remains underexplored, it represents a key area for further empirical investigation, especially in relation to long-term investments in CSA and other climate adaptation strategies.

Gendered societal expectations significantly restrict women's adaptation options. Societal norms that designate women as caregivers, shock absorbers and primary providers of subsistence crops limit their time and flexibility for crop selection, migration, and income diversification. These gendered responsibilities, combined with time constraints, hinder women's ability to fully engage in CSA. Engaging men in household tasks, improving childcare access, and promoting gender-equitable norms and behaviors will be important to facilitating women's adaptation. Research on norm-changing interventions targeting restrictive gender roles is needed.

Access to accurate information on climate and new technologies is crucial for effective adaptation. Lack of access to such information increases uncertainty about the returns and effectiveness of CSA. Further research is needed on how women's higher risk aversion could represent an opportunity for increased adoption of CSA practices, particularly with the delivery of accurate information on long-term strategies. Lack of information about weather insurance products is also a constraint limiting the use of those products. Research on how women perceive climate change and whether targeted information interventions can address this perception gap should be prioritized, as it can directly affect adoption rates, particularly for on-farm adaptation strategies.

Women's limited access to education and skills training reduces their ability to adopt

CSA and other adaptive measures. Their limited social capital further restricts their access to information, which impedes their ability to migrate or engage in more sustainable on-farm and off-farm activities. There is a significant gap in the literature on how social networks and gendered barriers to information diffusion impact women's access to agricultural and climate adaptation knowledge.

The empirical literature on interventions that address women's constraints to adaptation is still scant, especially for Sub-Saharan Africa. We categorize existing interventions into three groups: (i) credible — with substantial evidence of impact on adaptation, (ii) emerging — with one piece of rigorous evidence identifying impact, and (iii) frontier — for which there is currently no rigorous evidence for Sub-Saharan Africa.

Two intervention types have *credible* evidence supporting their effectiveness in facilitating women's adaptation: CSA information delivery and social protection programs. Programs that provide information on CSA through female extension agents or that target both spouses for agricultural decision-making have proven successful. Similarly, social protection initiatives, such as cash transfers and multi-faceted economic inclusion programs have demonstrated positive impacts by relaxing financial, skills, and network constraints, thus enabling women's on-farm adaptation, income diversification and possibly migration. *Emerging* interventions for which the evidence base is thin but growing include those targeting women's socio-emotional skills, addressing time constraints, and improving their access to assets and land ownership. Socioemotional skills training is a growing area of policy interest and has been shown to have an impact on women's ability to diversify off-farm. Childcare is also emerging as an intervention that can support women's off-farm and non-farm activities, by lifting their time constraint. Land titling programs also show promise, though more evidence is needed to confirm their direct impacts on climate adaptation. Several intervention areas, classified as *frontier*, lack robust evidence and remain underexplored. These include initiatives aimed at improving women's access to climate information, especially through digital platforms or climate information services. Research on increasing women's access to weather insurance products is another critical frontier. Additionally, interventions focused on enhancing women's social networks, such as structured groups with gender-responsive features, are promising but require further study. Norm-changing interventions that address restrictive gender norms and improve women's intra-household bargaining power are another critical area for future research. Community-level norms interventions and engaging men to shift societal norms around women's roles in decision-making, housework, and caregiving could play an important role in supporting women's climate adaptation.

By its multifaceted nature, adaptive social protection plays a crucial role in alleviating simultaneous constraints that hinder the most vulnerable women's ability to access sustainable adaptation strategies. However, despite being the primary recipients of many social protection programs, women face persistent barriers — including limited financial autonomy, mobility constraints, and caregiving responsibilities — that restrict their ability to fully leverage these programs for climate adaptation. Addressing these gender-specific constraints through targeted program design, such as mobile transfers, childcare support, and gender-sensitive operational adjustments, is essential to enhancing women's adaptive capacity. Further research is needed to establish which operational features are the most cost-effective in making adaptive social protection work for women, and causal links between social protection and women's adoption of adaptive strategies, particularly in the African context.

Finally, a significant gap exists in the literature on women's migration as a climate adaptation strategy. Further research is needed to explore the specific constraints women face in migration, the interventions that can facilitate their mobility, and whether migration serves as an effective adaptation strategy or simply reflects a coping mechanism. Empirical studies will be essential for understanding the dynamics of women's migration, particularly in how social networks and gendered constraints impact mobility, and its potential as a long-term adaptive response to climate change.

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