

Governing agrifood systems for climate resilience and gender inclusivity: A strategic review of the evidence

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ABSTRACT

Women's limited voice in governance and decision-making impedes inclusive climate resilience. This scoping review identifies barriers that hamper women's participation in AFS decision-making and assesses interventions that amplify their voice and agency. Drawing on two analytical frameworks—the women's empowerment in AFS governance framework (Ragasa et al., 2022) and the Reach-Benefit-Empower-Transform (RBET) framework (Quisumbing et al., 2023)—we synthesize evidence from 47 studies in the Global South. Barriers are found in two domains: access to climate-relevant agricultural innovations and exclusion from local governance processes. Best practices include gender-responsive extension, social innovations such as self-help groups and digital tools, and organizational strategies including gender budgeting and men's engagement. We conclude that advancing women's leadership in AFS governance requires multi-level interventions that address structural, sociocultural, and informational inequities.

1. Introduction

Agrifood systems (AFS), which encompass everything from food production to processing and consumption, are both major contributors to climate change and highly susceptible to its impacts (Wheeler and Von Braun, 2013; Woodhill et al., 2022). Mitigating the effects of agricultural production on climate change and increasing the resilience of farmers and farming practices to the effects of climate change will be central to ensuring future global food security.

Both mitigation and adaptation raise key governance challenges, such as resolving collective action dilemmas, addressing externalities of activities of individual entities on systems, and making at-scale investments in climate-resilient infrastructure. Amid absent policy solutions, the World Bank estimates that 43 million people in Africa alone could fall below the poverty line and experience food insecurity due to climate-induced falling crop yields (Baptista et al., 2022). Thus, governance—the systems and processes through which decisions within a community are made and implemented—will be critical for securing agrifood systems through climate change (High Level Panel of Experts, 2017).

Neither the climate crisis nor existing governance systems are gender-neutral. Women and girls experience the greatest impacts in ways that amplify existing inequalities and pose threats to their livelihoods, health, and safety (Amoak et al., 2022; Awiti, 2022; Jost et al., 2016). Yet their perspectives and experiences are not adequately considered in AFS policymaking (Lau et al., 2021; Njuki et al., 2022; Ragasa et al., 2022). Particularly, there exists an imbalance between men and women in terms of their access to decision-making

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authority, knowledge, abilities, assets, and networks, leading to gender-based differences in environmental risk exposure and susceptibility (Awiti, 2022; Grillos, 2018). The absence of deeper engagements of women's participation in governance can result in policies and solutions that do not effectively address their needs and interests, making it difficult to encourage and implement climate-sensitive AFS practices among those most impacted. Similarly, women's minimal oversight and representation in community-level leadership can result in lower levels of participation, which in turn can lead to decisions that do not adequately reflect their needs and interests. This lack of representation can negatively impact the effectiveness of decisions made and the community's overall development. Hence, it is essential to address gender disparities within the food system, such as unequal representation and distribution of benefits, in order to effectively enhance productivity, adapt to climate change, manage climate risks, and reduce agricultural emissions (Huyer and Chanana, 2021).

This review aims to document the barriers women face as well as best practices to increase their voice and agency in climate-relevant AFS governance. Based on two frameworks, we assess women's participation and leadership in AFS governance. First, we follow the framework for women's empowerment in AFS governance proposed by Ragasa et al. (2022) to examine the various dimensions of improving agency and empowerment for women in decision-making processes (design, implementation, evaluation, and learning). To be considered gender-sensitive, an intervention must meet three criteria: consider the needs and perspectives of women, include women in the decision-making process, and allow women to influence the outcome. Second, we apply vital tenets of Johnson et al. (2018) Reach–Benefit–Empower framework to evaluate how community-driven interventions engage, benefit and empower women to apply the lessons learned to achieve their goals. This approach was later broadened to incorporate a fourth element, “Transform”, to better capture deeper shifts in power and gender norms (Quisumbing et al., 2023).

2. Methodology

We employed a strategic rapid review methodology to synthesize the evidence on gender barriers and best practices for improving AFS governance. In addition to time efficiency, rapid reviews are designed to be completed quickly, typically within a few weeks or months, making them a valuable tool for decision-makers who need to act on the latest evidence but do not have the time for a more comprehensive review (Khangura et al., 2012). Also, rapid reviews focus on the most recent and relevant evidence, making them a good resource for practitioners and policymakers who need to stay up-to-date with the latest research in their field. Finally, rapid reviews are best designed for new or emerging research topics, updates of previous reviews, and critical topics to assess what is already known about a policy or practice. Furthermore, this project relied on expert knowledge, including working group members and database searches for relevant literature. In addition to the rapid review method, we also utilized a snowball search methodology by reviewing the reference list of relevant studies for related articles.

We used a multi-track retrieval approach (Web of Science, Scopus, and Google Scholar), relying on peer-reviewed and grey literature and including qualitative and quantitative studies. The objective was to encompass a broad range of scholarly research across multiple disciplines on the topics under examination. However, due to limitations in search tools and keyword sensitivity, some relevant articles or studies may not have been captured. The definitions of search terms used to identify relevant studies for this review are listed in Table 1. We included two primary types of studies at the nexus of gender, AFS governance and climate change. First, we included studies investigating the barriers women may face in the context of climate-relevant AFS governance and processes that amplify their voice and agency in AFS governance. Second, we limited the scope to studies since 2010, focusing on the Global South, and published in English. For clarity, we broadly define the Global South as countries located in Africa, Latin America, Asia, and Oceania. The term is not strictly geographical but signifies a shared history of colonialism and structural disadvantage in the global political economy (Dados and Connell, 2012). The inclusion criteria are outlined in Table 2.

Table 3 provides the search terms, databases and output recorded. Overall, the search parameters yielded 9157 papers. Out of these, 1778 were duplicates while 1146 did not meet our geographical specifications, year of publication, and quality of peer-review. A total of 6233 underwent full abstract review. At this stage a further 5989 articles excluded due to lack of empirical data, wrong outcomes of study, the use of non-humans in study and lack inaccessibility to full text. The remaining 244 were given a full-text assessment. After using our screening criteria, we excluded 197 articles due to poor methods, inappropriate study design and non-

Table 1
Theme and key search terms.

Key Theme	Key Terms Search
Shocks and Stressors	Climate change resilience; resilience agriculture; climate change; vulnerability agriculture; sensitivity shocks; adaptation agriculture
Agri-food systems	Food security; safe nutrition; sustainable consumption agriculture; food consumption; calorie intake; nutrition; food value chain
Women's agency	Leadership food systems; leadership agriculture; decision-making agriculture
Governance	Decision-making; Leadership; participation; women's empowerment
Gendered norms and expectations	Social norms; gendered practices; patriarchy
Barriers to AFS governance	Structural inequality agriculture; cultural Barriers; safety and security agriculture; educational agriculture; literacy agriculture; psychological agriculture; technology agriculture
AFS Governance best practices	Social protection agriculture; participatory agriculture; gender-responsive agriculture; financial inclusion agriculture; economic empowerment agriculture

Adopted from Njuki et al. (2022).

Table 2

Inclusion and exclusion criteria for literature covered in the review.

Inclusion Criteria	Exclusion criteria
Published between 2010 and 2022	Not published between 2010 and 2022
Reports empirical data or reviews	Grey literature is NOT from a reputable institution
Focused on local or community-level rather than national studies	Focused on national level
Report outcomes related to governance, decision-making, empowerment	Does not report outcomes related to governance, decision-making, empowerment
Full text accessible in English	Full text not accessible or not in English
Peer reviewed article or grey literature	Grey literature NOT from a reputable institution
Evidence is from the Global South	Evidence is NOT from the Global South

Table 3

Search Strategy and Initial Reference Identification identified with the inclusion criteria.

Search terms	Databases searched	Records identified
<i>Barrier's women face in agri-food systems governance</i>		
"Governance" or "rules" or "procedures" or "voice" OR "influence" OR "influencing" OR "speaking" OR "decision-making" OR "government" OR "service delivery" OR "laws" OR "regulations" OR institutions AND Women OR Gender OR Female OR girl* AND Agriculture OR farming OR "food security" OR "food insecurity" OR "food systems" OR "agri-food" OR "food systems governance" OR Rural OR "Climate Change" OR drought OR rainfall OR temperature AND Challenges OR Barrier* OR inequality* OR "social inequality" OR "structural inequality*" OR "cultural Barriers" OR "safety and security" OR "unequal power dynamics" OR patriarch* OR "educational constraints" OR "literacy constraints" OR "psychological constraints" OR "rural technological constraints" OR "structural inequality*" OR "rural gendered differences" OR marginali*AND "Nigeria" OR "India" OR "Malawi" OR "Ghana" OR "Sub-Saharan Africa" OR "Global South" OR "Third World" OR "Developing World" OR "South Asia" OR "SSA" OR "Latin America and Caribbean (LAC)" OR "Middle east and north Africa"	Databases • Web of Science • Scopus • CCAFS <i>Journals hand-searched</i> Websites search • FAO • UN Women	2543 2221 47 22 2
<i>Opportunities/Best practices to improve voice and agency</i>		
"Governance" or "rules" or "procedures" or "voice" OR "influence" OR "influencing" OR "speaking" OR "decision-making" OR "government" OR "service delivery" OR "laws" OR "regulations" OR institutions AND Women OR Gender OR Female OR girl* AND Agriculture OR farming OR "food security" OR "food insecurity" OR "food systems" OR "agri-food" OR "food systems governance" OR Rural OR "Climate Change" OR drought OR rainfall OR temperature AND "Opportunities" OR "Community level" OR "best practices" OR "gender transformative" OR "climate-smart" OR "climate resilient" OR "traditional knowledge" OR "gender transformation" OR "social innovation" OR "affirmative action" OR "social protection" OR "participatory agriculture" OR "gender responsive" OR education OR "self-help groups" OR "gender-inclusive" OR "gender equality" OR "gender-based" OR "women leadership" OR "Women empowerment" AND "Nigeria" OR "India" OR "Malawi" OR "Ghana" OR "Sub-Saharan Africa" OR "Global South" OR "Third World" OR "Developing World" OR "South Asia" OR "SSA" OR "Latin America and Caribbean (LAC)" OR "Middle east and north Africa"	Databases • Web of Science • Scopus • CCAFS <i>Journals hand-searched</i> Websites search • FAO • UN Women	1721 2559 22 17 3

empirical findings. At the end, we identified 47 papers with findings relevant to the question of barriers and opportunities to enhance women's voice and agency in AFS governance. This type of scoping review is particularly important for the accumulation of scientific knowledge on this policy-relevant topic, as knowledge and evidence are spread across many different disciplines, and there have not been similar efforts to date to bring together studies at the nexus of climate change, AFS governance, and gender.

The reach-benefit-empower-transform framework informs our criterion for identifying interventions (Quisumbing et al., 2023; Johnson et al., 2018). This lens measures the extent to which programs and interventions include and meet women's needs. Principally, the framework assesses how program activities *reach* (involve) women and *benefit* them (in terms of wellbeing outcomes such as health, income, food security etc.). Beyond reach and benefits, the RBET lens considers how interventions *empower* women to make decisions and choices (agency). At the same time, *transform* connotes the ability of the project to go beyond the woman and her household but rather change/challenge gender norms at the societal level (Quisumbing et al., 2023). In this study context, best practices that enhance women's voice and agency in AFS governance meet the following criteria: the consideration of women's perspectives, the potential enhancement of their welfare through these measures, their capacity to shape decisions, and the potential for broader societal changes (Ragasa et al., 2022). Fig. 1 presents a summary of the interventions based on the RBET framework. The best practices fall within two more general categories: 1) social innovations and 2) organizational strategies (See Table 4 for a summary).

3. Findings: barriers women face in climate-relevant agrifood systems governance

The studies reviewed highlighted two main forms of barriers that women face in the context of AFS governance. The first set of barriers relates to limited access to agricultural inputs and practices for adapting farming practices to a changing climate. The second set of obstacles pertains to women's challenges in shaping local approaches to climate-relevant AFS governance.

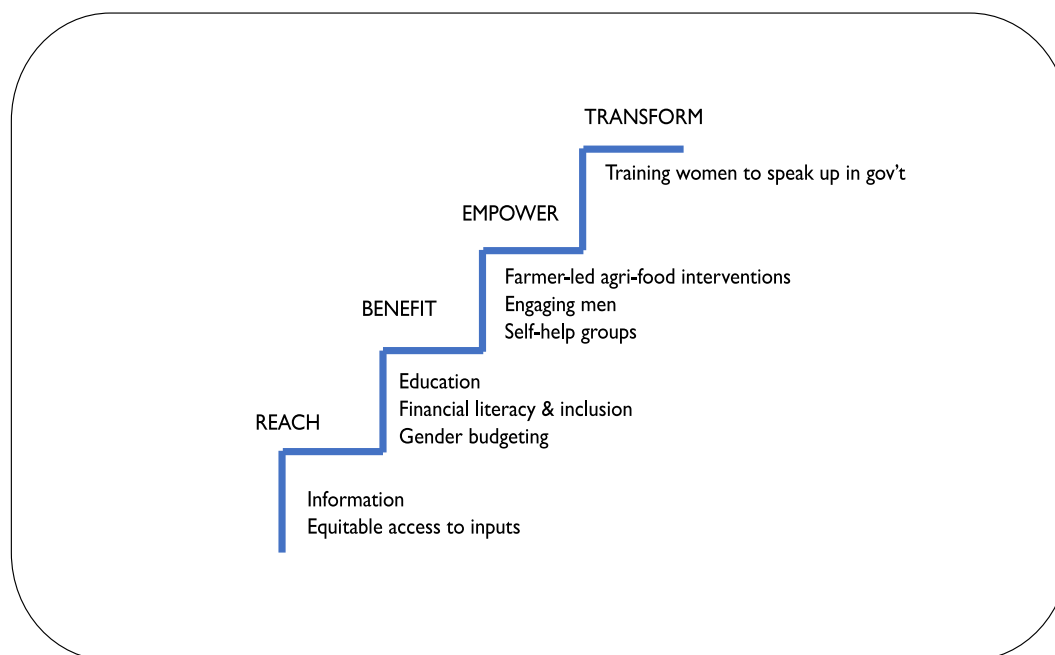


Fig. 1. Authors' illustration of the reach-benefit-empower-transform framework.

3.1. Barriers to accessing agricultural innovations and services

Formal breeding programs in developing countries have acutely underrepresented women's voices in terms of their varieties and seed preferences. Most plant breeding programs (government and private) have focused mainly on seeds with commercialization potentials and high yield, typically cultivated by men, including maize, wheat, soybeans, and groundnut, with little attention to food crops and vegetables (Kramer and Galiè, 2020). In Ethiopia and Ghana, for example, seed-breeding training sessions usually exclude women farmers, thereby disempowering them (Teklewold et al., 2013), while women participants' contributions during plant breeding programs are less likely to be considered in breeding programs (Nyantakyi-Frimpong and Kerr, 2015). This systematic exclusion of the voices of women in the breeding process has implications for women's empowerment, food security, and autonomy (Mudege et al., 2017), while sidelining landraces, traits and varieties preferred by women (Bezner Kerr, Hickey, et al., 2019; Kansanga et al., 2021).

Furthermore, evidence suggests that women do not meet their **climate information needs** or benefit fully from rural climate services (Gumucio et al., 2020). For instance, there is evidence to suggest extension workers prefer men over women farmers regarding information diffusion (Witinok-Huber et al., 2021), and often assume women's limited role in farming and decision-making (Cohen and Lemma, 2011). In line with these observations, it was found that women in several regions across the Global South have significantly less access to drought information than men across the various climate-smart villages studied (Twyman et al., 2014), are less likely to be recruited to participate in climate-smart technology and information programs (Alidu et al., 2021), and have limited access to timely early warning climate information (Elias et al., 2018; Ngigi et al., 2017). These constraints undermine women's confidence in participating in AFS governance and leadership, as they lack the necessary information to contribute effectively.

The constraints to women's effective inclusion in AFS governance amid climate change are also evident when assessing gender disparities in access to **improved technology** (Mizik, 2021). These include poor access to machinery, fertilizers, and high-yielding seed varieties that boost agricultural productivity (Nyasimi and Huyer, 2017). This is exacerbated by policies aimed at improving farmers' access to climate-related technology, such as improved seed varieties, which fail to realize that men and women have different preferences in accessing agricultural technologies (Cherotich et al., 2012; Ngigi et al., 2017). Such disparities are further reflected in studies from low-income countries, which show that agricultural assets are not equally accessible to men and women due to persistent intra-household and gendered power dynamics. For instance, Kansanga (2017) found that in Northern Ghana, access to agricultural inputs such as tractors was mediated by gender. In some cases, men openly opposed the use of technology by their spouses for fear of insubordination when their wives became financially independent (Badstue et al., 2020).

3.2. Structural and Normative barriers to Women's leadership and governance

Inequalities in **educational attainments** between men and women have been a long-standing obstacle to bridging the AFS governance gender gap, especially in agrarian regions (Todes and Turok, 2018). A recent report by UNESCO (2022) stated that in South and Central Asia and sub-Saharan Africa (SSA), there is a persistent gender gap in adult literacy, with 81 literate adult women for every

Table 4

Community-level best practices that improve women's participation in governance.

Intervention tested	Gender markers	Outcome for women	Country/Author(s)
Farmer-led agroecological innovations	- More than 50 % of farmers in MAFFA program women Women-leadership role - Gender analysis in design, implementation, and evaluation - WEAI empowerment pathways	- Increased uptake of leadership roles in community - Increased engagement in community activities - Enhanced joint-decision making on agriculture. - Improvement in decision-making, and independence. - Increase in increased women's decision-making authority	- Malawi (Bezner Kerr, Kangmennaang, et al., 2019; Kansanga et al., 2021) - Tanzania (Galiè and Kantor, 2016)
Adult education, literacy, and inclusion	- Recruitment of female headed HH - Adult literacy campaigns for women - Use of 'safe space' gender courses offered to young women. - passage of legislation enhancing women's rights and supporting women's participation in political structures	- Educated women were more likely to take up leadership roles in local association; local government; participate in meetings - Intervention empowered women to share their new knowledge and insights with others in their networks can lead to a change in social norms - Increased support for women's political leadership	- Ghana(Nkansah, 2022) Kenya (Kim et al., 2018) - Nigeria (Cislaghi et al., 2019)
Gender inclusive crop breeding	- Use of a segmenting-targeting-positioning (STP) framework for consumer marketing. - Gender targeting	- Bridging gender gaps by ensuring that women's voices (trait preferences) are considered - Effective participation in the cassava value chain measured using the Women's Empowerment in Agriculture Index (WEAI)	Nigeria (Orr et al., 2018)
Gender inclusive livestock breeding	- Community-based breeding programme (CBBP) - African Chicken Genetic Gains (ACGG) project - Gender sensitive value chain analysis (division of labour, gender-based constraints and opportunities, benefits) - randomised control design - Preponderance of women in programme	- The creation of cooperatives - Leveraging the cooperatives to build capital - Improvement in food security - Empowerment of poorer households, including female headed. - enhance women's participation in the value chain - women's equal access to value chain benefits and services, - promoting gender equality and women's economic empowerment.	- Ethiopia (Haile et al., 2019; Mulema, 2018) - Burkina Faso (van den Bold et al., 2015) - Nigeria (Yakubu et al., 2020)
Self-help groups	- Program targeted women and female household heads facing economic deprivation. - Sex-aggregated data	Women who participated in women's self-help groups are more politically active and take advantage of more public entitlement programs than non-members	- India (Malapit et al., 2020) - Ethiopia (Alemu et al., 2018) (Brody et al., 2017)
Women farmer leads	- Interviews with women - Lead female farmer approach to extension service	- An exclusively female-led lead farmer approach led to better information access for women. - Women were empowered to take up leadership roles. - Women challenged household and community gender norms.	Pakistan (Cardey et al., 2019)
Engaging men in women's advancement	- Men and women received equal intervention. - Encouraged collaboration between men and women	- Men questioned gender norms - Committed to ending gender based violence - Changes in attitudes towards GBV - Transformative change in men's view on gender norms - Improvements in women access to economic opportunities	- Rwanda (Sleghe et al., 2013) - Uganda (Ambler et al., 2021; Kavuma et al., 2022)
Gender-balanced Information diffusion	- Involvement of women participants - Women-specific interventions	- increased involvement has led to a shift in gender roles - women's inclination to take on leadership and decision-making roles	- India (Rengalakshmi et al., 2018). - Ghana (Etwire et al., 2017) - Pakistan (Cardey et al., 2019)

100 literate men in 2018. For women with low levels of educational attainment, this disparity could serve as a roadblock to effective agricultural production and participation in AFS governance. Specifically, women's lower level of education has hampered their adoption of inorganic fertilizers in Malawi (Government of Malawi, 2017) and their understanding of climate-smart practices (Fapojuwo et al., 2018).

Moreover, **legal constraints** can significantly hinder women's abilities to participate in food system governance and assert their leadership and decision-making power. In many agrarian regimes in the Global South, few laws often protect women against discrimination. These could be laws that protect women's equal access to land, property, media, and information, as well as laws that protect individuals from gender-based violence or harassment. In cases where these laws exist, laws that protect women's rights and their ability to realize those rights are not consistently enforced (Eastin, 2018). These gaps in legal protection can significantly negatively impact women's lives in these communities. These legal constraints range from laws that exclude them from accessing production and distribution aspects of the food system and have the potential of reproducing existing vulnerabilities. For instance, in addition to poor access to environmental and economic resources, women face legal constraints in accessing improved seeds in

Northern India, a fundamental unit of agricultural production (Pionetti, 2011).

Similarly, traditional inheritance and marriage dissolution practices in SSA exacerbate the gender asset gap as they often do not favour women (Peterman, 2012). Additionally, when seeking redress (e.g., for land disputes), the legal frameworks are usually unfair and discriminatory against women, especially in the context of multiple legal frameworks. In Nigeria, it was highlighted that rulings on plot-level land-related disputes at community and traditional courts tend to favour men over women (Edeh et al., 2022). These constraints in seeking legal redress are specially compounded due to the age of farmers, poverty, and low-level formal education, which hinders poor and destitute women from seeking more formal channels (Edeh et al., 2022).

Furthermore, **normalized routines and social norms** often (re)produce inequalities that translate into cultural inscriptions of what a girl child should or should not do. These social norms dictate societal expectations of how women and men should behave, spend their time, and interact with each other, often limiting women's abilities to participate in activities outside of their traditional domestic roles (Mudege et al., 2017). Social norms frequently reinforce unequal access for women to critical resources, including land, labor, capital, and information, by legitimizing these disparities through dominant cultural narratives and gendered expectations (Elias et al., 2018; Nyahunda et al., 2021). Similar patterns have been observed in Nepal, where social norms forbid women from certain agricultural activities, such as the use of machinery and land preparation (Farnworth et al., 2019). Similarly, in Bangladesh, it is considered taboo for women to use mechanized rice and wheat reapers/harvesters (Theis et al., 2019). A comparable restriction is observed in Ethiopia, where women's ploughing is also considered a cultural taboo (Gebru, 2011). These gendered constraints are also evident in Malawi and Zambia, where married women's adoption of climate-smart agriculture often depended on their husbands' approval (Khoza et al., 2019). Moreover, **mobility and transportation barriers** restrict women's ability to attend training sessions, access information on innovations, and express their views on their adoption (Sorgho et al., 2020). This limited mobility outside the home often results in reduced awareness of available services, diminishing women's opportunities to learn about improved agricultural practices or take on leadership roles (Eastin, 2018). Additionally, women's limited free time and the burden of unpaid domestic work may discourage participation in lengthy training sessions, given the impact such commitments have on their household and caregiving responsibilities (Cohen and Lemma, 2011). In addition, certain restrictions are placed on women's mobility and spatial access during menstruation (MacLean et al., 2020). These constraints limit women's ability to travel to training centers during this period, reducing their opportunities to learn about new technological innovations. Broader cultural norms that restrict women's mobility or interactions with men further hinder their participation in productive meetings and associations, ultimately impeding their advancement and engagement in agriculture (Manfre et al., 2013).

4. Findings: opportunities for enhancing gender equality in agrifood system governance

To better understand how gender-responsive interventions function within agri-food systems, we apply the Reach–Benefit–Empower–Transform (RBET) framework as an analytical tool for categorizing evidence from the literature. Rather than viewing these stages as a strict sequence, this approach helps to identify how different interventions align with varying levels of gender inclusion and change.

4.1. Reach: involving women in interventions

Studies focusing on the provision of agricultural information and equitable access to inputs typically fall under the “reach” category, where women are included as participants but not yet guaranteed meaningful gains. These interventions often aim to ensure visibility and initial access, addressing barriers such as exclusion from extension programs or unequal distribution of resources.

4.1.1. Gender-balanced climate information diffusion

Studies show that access to climatic services, including climate information, may help local actors (such as women farmers) challenge the limiting roles of gender norms and practices and improve their decision-making and representation in the food systems governance (Gumucio et al., 2020; Rengalakshmi et al., 2018). For instance, the availability of weather forecasts in India has enabled women to make informed agricultural decisions, and their increased involvement has led to a shift in gender roles, in which women are now seen as more than farm labourers, and men are no longer the sole decision-makers (Rengalakshmi et al., 2018). Across SSA, a collaboration between stakeholders, including national governments, research organizations, and farmers, has improved farmers' access to information. For instance, with the help of an ICT platform owned by a private organization in Ghana, farmers in the northern part of the country receive market price alerts, agro-advisories, weather forecasts, and voice messages about climate-smart agriculture. Over 835 farmers (of which 33 % are women) have been trained on this platform to access and use downscaled seasonal forecasts and agro-advisories through their mobile phones (Etwire et al., 2017). This initiative is critical for enhancing climate-change adaptation given the high farmer-to-extension service worker ratio, underfunding of public extension services and limited technological know-how of some extension workers and fewer women extension staff (McNamara et al., 2014). Similar findings were observed in Pakistan, which improved women's inclination to take on leadership and decision-making roles (Cardey et al., 2019).

4.1.2. Equitable access to agricultural resources

In the context of climate change, the literature presents best practices that improve gender equality in decision-making and leadership opportunities at the local level. These opportunities help amplify women's resilience and adaptive capacities. Programs that advance **equitable access to agricultural resources** (e.g. technology and seeds), such as AKIS (Agriculture Knowledge Information Systems) app in Sierra Leone, have enabled women to have better access to up-to-date information on the latest weather and market

prices to help them to take crucial agricultural decisions (Kamara et al., 2019). Making climate information accessible through text messages to farmers has also been particularly beneficial to women farmers who previously had to rely on the sporadic visits of extension service workers and their husbands (Nyantakyi-Frimpong, 2020; Sarku et al., 2021). This technology has enabled women farmers to access accurate information on average crop prices in their local market, weather updates, and contact details for suppliers and the government's agriculture advisory services. In lieu of this service, women can manage their time better, leaving room to take up community organizing and other paid roles. Furthermore, research conducted in Eastern India and Bangladesh revealed that women who had access to improved seeds and were trained in seed production claimed that their social status had improved; they perceived themselves as farmers and not just homemakers. They also gained confidence in decision-making, enhanced their knowledge, had a marketable surplus, and experienced better status within households and the community (Dar et al., 2020).

Gender-responsive breeding is a new approach to ensuring modern breeding takes advantage of opportunities to improve gender equality in agriculture. Proponents in the agrarian development landscape, such as the International Potato Center (CIP) on behalf of the CGIAR Research Program on Roots, Tubers and Bananas (RTB) and the CGIAR Gender and Breeding Initiative have developed a gender-responsive, social targeting approach used in public and private sector breeding termed gender-responsive participatory plant breeding (GPPB). The GRPPB, through which women and men farmers and scientists work together to assess and improve varieties suitable for local farms, including selecting locally preferred traits (Vernooy, 2022), has been introduced to address some of these shortcomings. In Northern Nigeria, for instance, Orr et al. (2018) found that by using a gender-sensitive plant-breeding approach, women who were structurally marginalized and silenced due to religious and cultural reasons were able to partake in innovative farming practices, including plant-breeding and smart-farming practices. Ghana also reported similar findings (Ifie et al., 2022). According to Evans (2021), a women's community-based breeding program (wCBBP) for sheep farmers in Ethiopia that utilized gender-targeted capacity development and transformative action through community conversations resulted in improved involvement of women in community-level decision-making, both in mixed-gender settings and within their communities. The program also led to the formation of cooperatives by women, which improved their bargaining power and incomes. The program also led to the formation of cooperatives by women, which improved their bargaining power and incomes.

4.2. Benefit: improving Women's well-being

Literature that documents improvements in women's access to education, financial services, or gender budgeting initiatives corresponds to the "benefit" stage. Here, women not only participate but begin to experience tangible advantages that enhance their well-being and livelihoods, such as increased income, knowledge, or nutritional outcomes.

4.2.1. Education and financial literacy and inclusion

Evidence from 70 countries in the Global South shows a positive association between women's educational attainment and their influence in household decision-making on financial and non-financial matters, such as small and large household purchases and their own healthcare choices (Le and Nguyen, 2020). Education can provide individuals with the knowledge and skills necessary for effective governance, including literacy, public speaking, and an understanding of group dynamics. Higher educational attainments can also increase individuals' interest in governance and their sense of self-efficacy, leading to greater participation. For women specifically, knowledge about their rights, policies, laws, and programs related to AFS is essential for their empowerment and ability to advocate for themselves. Education plays a role in promoting gender equality by challenging gender stereotypes and raising awareness about the importance of women's participation in decision-making while building women's business management policy analysis, as well as leadership development and communication skills (UNESCO, 2022). In the context of the governance of the agriculture value chain, Quisumbing et al. (2021) reported that education played a crucial role in women's empowerment and greater decision-making in Bangladesh, Benin, Malawi and the Philippines.

Along the same lines, financial literacy affects people's choice of financial products so that financially literate individuals are more likely to seek and use relevant information and make better use of information (Kim et al., 2018; Vivek, 2016). According to Calcagno and Monticone (2015), financially literate women are more likely to look for advice from financial advisers and are also more likely to get helpful advice to take up financial products such as a bank account or a loan. In the context of Uganda, Bongomin et al. (2018) found that cognition combined with financial education helps low-income families, including female-headed households, to make economically sound decisions and choices about the consumption of financial services and products provided by formal financial institutions. Financial literacy is a critical strategy for women farmers to improve their bargaining power—such an effort increased awareness of money management and self-employment in India. Similarly, designing the right commercial banking product can have an incremental impact on women's economic empowerment. M-PESA, a mobile financial transaction platform launched in Kenya in 2007, gave rural women an opportunity to save and build up financial cushions and weather occasional shocks (Kim et al., 2018).

Women's reliance on family members, friends, and advisers for financial planning and limited interest in participating in investment planning can be addressed through education on financial literacy (Aziz et al., 2022). This dimension covers the strength of financial decision-making that benefits economic growth, financial access, credit, social cohesion, local participation, and interaction of formal financial transactions to improve their lives. In this regard, developing countries should give priority to financial literacy for more financial inclusion to improve the economic empowerment of their women. Kumari et al. (2020) conducted a study to investigate the relationship between financial literacy and economic empowerment among rural poor women in Sri Lanka. They used five indicators to measure women's empowerment: decision-making power, control over income and expenditure, leadership in the community, control over time allocation, and financial well-being. Results showed that financial literacy had a significant impact on women's economic empowerment in rural Sri Lanka, with more financially literate women being more likely to participate in

community food governance and having more autonomy in household financial decision-making.

4.2.2. Gender budgeting

Integrating gender-related concerns into national policy has become prominent in many parts of the world, and one of the notable tools is gender budgeting. Gender budgeting (GB), also known as gender-responsive budgeting and gender-sensitive budgeting, is a public financial management practice that has been adopted by many governments across the globe as a way of ensuring that their budgets respond to the needs of all people (Nolte et al., 2021; Stotsky, 2016). GB is about using public financial management practices to correct inequalities between and among various populations, with a particular focus on using public services, infrastructure, and social protection to achieve gender equality (Akalbala et al., 2020). Countries that have implemented GB at multi-scalar administrative levels include Ghana, Ethiopia, and Tanzania (Akalbala et al., 2020; Taye et al., 2021). Chakraborty (2016) indicated that India stands out for implementing GB at the national and sub-national levels of government. India has integrated the gender budget within the expenditure budget and given instructions to integrate it into the outcome budget. India's GB has resulted in its successful institutionalization at both national and subnational levels. It also has led to gender mainstreaming in the budget, with more and more gender-neutral sectors adopting GB and reporting to the Ministry of Finance on their efforts to address gender equality through fiscal policies. Similarly, the incorporation of gender-sensitive approaches in funding climate change adaptation and mitigation initiatives by the Green Climate Fund (GCF), under the UNFCCC's financial mechanism, has resulted in gender mainstreaming in climate-change policies and programs (Budlender, 2017).

4.3. Empower: building Women's agency and decision-making power

Interventions that build women's agency, decision-making power, or collective action mechanisms align with the "empower" category. Examples include farmer-led initiatives, self-help groups, and programs that engage men to address harmful gender norms. These efforts contribute to strengthening women's confidence and voice within households and communities.

4.3.1. Farmer/women-led agroecological interventions

Agroecological practices such as crop diversification, intercropping, agroforestry, mixed crop-livestock systems, soil management measures, and farmer-to-farmer networks have been reported to have positive food security and nutrition outcomes and improve women's autonomy in the household and community (Bezner Kerr et al., 2021, 2022; High-Level Panel of Experts, 2019). Notably, adopting farmer-led strategies and interventions and participatory praxis in climate change governance has unique benefits for women farmers. In Malawi, studies reveal that when the power imbalances between "authorities" and the farmer are disrupted, farmers, especially women farmers, have a voice and agency in AFS governance. In the patriarchal context of Malawi, where access to resources is socially mediated, Bezner Kerr, Hickey, et al. (2019) asserted that participatory methods, such as horizontal farmer-to-farmer sharing, farmer experimentation, and observation contributed to the shift in socio-ecological metabolism in communities. For instance, the MAFFA agroecological intervention promoted joint decision-making with spouses on agricultural production, encouraged women's leadership, led to farmers being more food secure, and empowered women within the household and communities (Bezner Kerr, Kangmennaang, et al., 2019). These interventions also have the potential to increase women's autonomy in their communities and empower them to challenge gender norms.

4.3.2. Engaging men in the advancement of women

Improving women's participation in AFS governance requires greater involvement of men in women's advancement. According to the World Health Organization (2010) and Resurreccion et al. (2019), by involving men in efforts to address gender inequality and promote women's participation in decision-making processes, it can help to challenge and change harmful gender norms and stereotypes that limit women's opportunities and rights; builds support and allies for women within households and communities; and helps to hold men accountable for their actions and attitudes towards women, and promote men's active involvement in promoting gender equality and women's empowerment. For example, CARE Rwanda implemented a Village Savings and Loans intervention in Rwanda in 2012, delivered a structured group discussion and training activities on business skills and health and wellbeing (including sessions focusing on negotiation and decision-making between women and men and a cycle of workshops in household activities) (Sleggh et al., 2013). The intervention's qualitative evaluation revealed that patterns of sharing care work had changed; as one man said, "I learned that I can do women's work and my wife can do man's work" (Sleggh et al., 2013, p. 23). Other participants reported increased sharing of domestic tasks. The author found that in the group where men were involved, the women reported increased economic empowerment and reduced domestic violence. In contrast, the control group, which involved no men, did not report any significant improvements in their living conditions (Sleggh et al., 2013).

4.3.3. Women self-help groups (SHG) and associations

Women's organizations and networks can provide a valuable platform for women to come together, share knowledge and experiences, and advocate for their rights and interests. According to a systematic review of self-help group programs in developing countries, women's economic SHGs have been shown to have positive effects on economic and political empowerment, women's mobility, and women's control over family planning (Brody et al., 2017). SHGs mainly aid in building networks and collaborations, enhancing skills and knowledge, promoting gender equality, and providing a supportive environment (Patil and Kokate, 2017). They can also offer opportunities for women to learn new skills and knowledge, such as business management, financial literacy, and leadership development, which can help them to become more effective decision-makers and leaders (D'Souza, 2010). In Ethiopia,

Alemu et al. (2018) study showed positive and significant impacts of SHG participation on empowerment, suggesting that SHGs can be an effective platform for women to share information and raise awareness about their rights. Finally, SHGs can create a supportive and empowering environment for women, where they can feel safe to speak out, share their ideas, and advocate for their rights and interests (De Hoop et al., 2014).

4.4. Transform: challenging and Shifting gender norms

Finally, “transform” interventions are those that seek to shift structural conditions and power relations—often the least represented in the literature. These include initiatives aimed at changing institutional norms or supporting women’s leadership in governance and decision-making spaces, such as training women to engage in policy dialogues or participate in government bodies.

By mapping the literature onto these four domains, the RBET framework allows for a nuanced analysis of where current efforts are concentrated and where further transformation is needed to achieve gender-equitable agri-food systems.

4.4.1. Training women on how to approach government/leaders and influence community decision-making

Women’s active participation at the community level is needed to amplify their voices in decision-making. Training them on how to do it can be a critical tool to transform policies to meet women’s needs. Gender-sensitive education may help women better appreciate the importance of participating fully in various stages of the agricultural systems and value-chain systems. For instance, the Suchana Intervention, a large-scale development program in Bangladesh, actively provided social intervention on behaviour change communication to empower women belonging to the poorest social segment of women’s decision-making power. Haque et al.’s (2022) study assessed the impact of Suchana on various indicators related to women’s decision-making power. The findings showed a substantial influence of Suchana’s intervention on the latent variable of women’s decision-making power. In Rwanda, the World Food Programme and partners (including fellow UN agencies FAO, IFAD and UN Women) have also implemented an initiative that seeks to empower rural women by reducing gender inequalities and poverty, improving food security, and enabling women to be leaders, decision-makers, and agents of change. The program has empowered women to be more confident and participatory in decision-making (Sesonga, 2021). By harnessing the power of collaboration with local partners and using randomized control trials, the IFPRI project in Nigeria explores various ways to amplify women’s voices and political participation through advocacy training (Adida et al., 2021).

5. Discussion

Major Trends of Evidence from the Global South: Gender equality in community-level AFS leadership and decision-making is vital for climate change adaptation, resilience building and the realization of the Sustainable Development Goals. Our findings highlight that the AFS governance system is saddled with inequalities that work to disproportionately underrepresent women’s voices and agency in decision-making and meaningful participation at all scales, especially at the community level (Eldidi et al., 2021; Huyer, 2016; Nyantakyi-Frimpong, 2019). These constraints significantly entangle women in a low productivity trap (Glemarec, 2017; UN Women, 2015) and limit their ability to adopt climate adaptation strategies (Jost et al., 2016; Mishra and Pede, 2017). The barriers identified include resource constraints (e.g., land, water, livestock, and fisheries), low access to drought-adapted seeds and agricultural inputs, financial exclusion, limited climate information services, and restricted participation in decision-making (Adida et al., 2021). Importantly, these setbacks are deeply rooted in patriarchal norms and cultural practices, reinforcing women’s disempowerment and narrowing their adaptive options (Marimo et al., 2021; Gumucio et al., 2020; Gonda, 2019).

Gaps in the Evidence: Despite recognition that gendered social norms and cultural preferences play a decisive role in shaping women’s underrepresentation in AFS governance, prior research has not sufficiently examined how these norms specifically undermine women’s agency and leadership (Eastin, 2018; Njuki et al., 2022). Psychological constraints—such as diminished confidence and sense of inadequacy stemming from entrenched gender norms—remain underexplored, yet they critically limit women’s willingness to assume leadership roles (Adida et al., 2021). Additionally, while the importance of involving women in adaptation decision-making is acknowledged, there is limited empirical evidence on interventions that effectively integrate women at all stages of policy and program cycles (design, implementation, evaluation) (Ragasa et al., 2022). More research is also needed to systematically document the impacts of initiatives that involve men as allies in challenging gender norms (Greig, 2018) and to evaluate community-based approaches like MAFFA in Malawi or women-led extension services in Ghana (Adams et al., 2021; Kangmenang et al., 2017; Kansanga et al., 2021).

Opportunities for Policy, Practice and Knowledge Action: The findings, analyzed through the Reach–Benefit–Empower–Transform (RBET) framework, underscore the need for interventions that not only include women but also foster structural transformation. Education and awareness-raising campaigns, along with gender-responsive policies and programs that enhance women’s access to and control over productive assets, are essential. Social innovations such as gender budgeting, farmer-led initiatives, and organizational strategies that involve both women and men can promote sustainable empowerment. Crucially, interventions must be context-specific to avoid exacerbating existing inequalities, as shown in CGIAR gender-sensitive breeding programs (Galiè, 2013; Mueller et al., 2015). Men’s involvement as allies in gender-transformative efforts is particularly important to shift social norms and redistribute decision-making power. Community-driven initiatives led by women, when adequately resourced, can further amplify women’s voices and agency in AFS governance. Ultimately, prioritizing marginalized and vulnerable women in these efforts is key to building equitable, inclusive, and resilient food systems (Nyantakyi-Frimpong, 2017).

6. Conclusion

There is alarming gender inertia and inflexibility in the agricultural system, which tilts production, marketing, distribution, and decision-making in the direction of men. Making agrifood systems work better for women will entail ensuring that they are at the forefront of leadership and decision-making. This review demonstrated robust evidence of existing gender barriers women face in exercising voice and agency in agricultural food systems. We identified a range of structural impediments, such as lower education, information, and asset control which systematically hampers women's involvement in AFS governance. While these barriers pose significant threats to women's adaptive possibilities amid climatic stressors, we found several approaches implemented at varying scales that can be scaled up to improve their voice and agency in climate-relevant AFS governance. For instance, investing in women's leadership can yield far-reaching dividends, not only for women themselves but also for the institutions they represent, their communities, and society at large. Evidence has shown that having active women leaders can result in increased funding for the services women prioritize, more robust policies related to gender-based violence, and even eliminate the gender gap in yields (Beaman et al., 2012; Burke and Jayne, 2021). But for women to affect these kinds of positive change, they need to be directly involved in making policy decisions, which includes challenging the systemic barriers that often prevent them from participating in policymaking. To get women directly involved in policy decision-making, women need to be empowered through training to foster confidence, self-awareness, strategic advocacy, and communication skills to galvanize change. Furthermore, there is the need for policy and legislative reforms and programs that facilitate equitable and just access to and management of resources for women who have traditionally been excluded in AFS governance.

In light of these findings, we suggest that future research could build a theoretical framework to map how structural barriers, sociocultural norms, and psychological constraints intersect to limit women's agency in agri-food system governance. Such a framework would integrate the three interrelated dimensions. The first dimension concerns structural barriers, including unequal access to land, credit, agricultural inputs, extension services, and climate information systems, as well as institutional biases that restrict women's participation in leadership and decision-making. The second dimension relates to sociocultural norms, specifically the deeply embedded gender roles and patriarchal practices that define responsibilities, restrict women's mobility, and reinforce unequal power relations within households and communities. The third dimension addresses psychological constraints, encompassing internalized perceptions of inadequacy, lack of confidence, and limited sense of agency that often result from prolonged exclusion and marginalization.

This framework would not only account for these three dimensions individually but would also illustrate their dynamic interactions, showing, for example, how structural inequalities reinforce restrictive sociocultural norms, and how these in turn translate into psychological barriers that further entrench women's exclusion. Importantly, it would highlight entry points for interventions at different levels. At the policy level, the framework would emphasize the need for legislative and institutional reforms to secure women's land rights, adopt gender-responsive budgeting, and mainstream gender equality in agricultural and climate policies. At the practice level, it would underscore the importance of capacity-building programs, the promotion of women-led cooperatives, and the development of inclusive extension services that directly enhance women's skills, agency, and access to resources. At the knowledge level, it would advocate for participatory research, context-sensitive innovations, and the systematic collection of gender-disaggregated data to ensure that interventions align with women's needs and priorities.

By connecting these dimensions with concrete intervention points, the proposed framework would provide a practical roadmap for policymakers and practitioners. It would enable them to design and evaluate interventions that not only reach women but also empower them and transform the gender relations that shape agri-food systems.

CRediT authorship contribution statement

Daniel Amoak: Writing – review & editing, Writing – original draft, Investigation, Formal analysis, Conceptualization. **Dina Najjar:** Writing – review & editing, Funding acquisition, Conceptualization.

Declaration of competing interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by us.

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Data availability

No data was used for the research described in the article.

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