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EDITED BY
Patrick Meyfroidt,
Université Catholique de Louvain, Belgium

REVIEWED BY
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Makerere University, Uganda
Jane Mbolle Chah,
University of Nigeria, Nsukka, Nigeria

*CORRESPONDENCE
Cathy Rozel Farnworth
✉ cathyfarnworth@hotmail.com

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Women's seed entrepreneurship in aquaculture, maize, and poultry value chains in Ghana, Kenya, and Tanzania

Cathy Rozel Farnworth[1]*, Alessandra Galiè[2], Tatiana Gumucio[3], Humphrey Jumba[2], Berber Kramer[4] and Catherine Ragasa[5]

[1]Independent Gender Researcher, Münster, Germany, [2]Policies, Institutions and Livelihoods, International Livestock Research Institute (ILRI), Nairobi, Kenya, [3]Department of Research, Evaluation, and Learning, Landesa, Washington, DC, United States, [4]Markets, Trade, and Institutions, International Food Policy Research Institute, Nairobi, Kenya, [5]International Food Policy Research Institute, Washington, DC, United States

Seed systems are essential to bring good genetic material to farmers. Women farmers, however, have benefited less than men farmers from seed systems in low and middle income countries. We identify factors that inhibit and promote women's success in seed businesses through three case studies of women's and men's entrepreneurship across seed-related value chains and country contexts: tilapia seed production in Ghana, marketing and trading of improved maize and sorghum seeds in Kenya, and chicken seed dissemination in Tanzania. Applying a gender lens, we use key informant interviews and focus group discussions to analyze women's and men's motivations to engage in seed businesses, the challenges they confront to start and build their enterprises, and prospects for sustainability and continued success. We use quantitative data to characterize the levels of empowerment of the agripreneurs sampled. For women, the results show that the social normative context of the sector is critical. Time flexibility and profitability are important considerations for women's engagement. Furthermore, across all three country cases, family and external support are frequently key to women's participation and success in seed agripreneurship. The article discusses the importance of government bodies, NGOs, and donors in challenging the normative context around gender resource gaps, as well as provide technical packages and training to develop business acumen. Supporting change of restrictive gender norms in non-threatening ways - such as ICTs - is key.

KEYWORDS

gender, agripreneurship, fish seed systems, poultry seed systems, maize seed systems

1 Introduction

All agricultural production starts with seeds: plant seeds (botanical seeds, crop seeds, tubers, cuttings, and so on), animal seed stock (eggs, semen, young animals, and birds), and fish seed or fingerlings. Development actors including governments, donors, private sector, and research organizations are investing heavily in breeding improved varieties and breeds for smallholder producers to enhance farm productivity, support livelihoods, strengthen food and nutrition security, and, in some cases, to work explicitly toward gender equality, youth, and social inclusion. To ensure smallholder farmers' adoption of these improved genetic materials, efforts to strengthen the formal and informal seed systems through which high-quality seed of improved varieties and breeds can be disseminated are intensifying (Louwaars et al., 2013; Donovan et al., 2021). Efforts to enhance seed systems—the sets of activities that contribute to seed development, production, use and dissemination—include

improving infrastructure, value chains, and business models to strengthen the availability, accessibility, use, and control over quality seed among smallholder farmers (McGuire and Sperling, 2011).

Since improved seed systems have reached and benefited fewer women farmers than men farmers, particularly in remote areas, some research is being directed toward strengthening the gender-responsiveness of seed systems (Kramer and Trachtman, 2023). Women's access to and adoption of improved seed, and their control over the benefits generated through this seed—for example through seed entrepreneurship—have the potential to enhance women's empowerment, thereby contributing to Sustainable Development Goal (SDG) 5 (Galiè, 2013). Women's adoption of improved seed is expected to strengthen farm productivity, thereby contributing to SDGs 1 and 2. Women with better access to productive resources and information, and with more control over income and mobility, are more likely to know about the availability of improved seed, access it, control its use, and contribute to variety or breed development (Galiè, 2013).

In this article, we are particularly interested in the potential of women's involvement in seed entrepreneurship for increasing incomes and empowering them. Dias et al. (2019) note the variety of terms related to agricultural entrepreneurship (agrientrepreneur, agricultural entrepreneur, farmer-entrepreneur, and so on), suggesting that the research area is still consolidating. We use the term agripreneur in preference to other terminology in this article. Currently, women's involvement in seed agripreneurship in low- and middle-income countries is limited, and evidence on the mechanisms that support or hinder women from engaging in it, or on how seed agripreneurship may contribute to women's empowerment, is meager (Puskur et al., 2021). In this article, we posit that such evidence is necessary to develop more functional, effective, and equitable seed systems that support the empowerment of all farmers and actors along seed value chains (Kramer and Galiè, 2020; Puskur et al., 2021; Kramer and Trachtman, 2023). Through case studies, we aim to deepen the evidence base on the challenges women seed actors face and suggest ways forward.

Our hypothesis is that *enhancing women's seed agripreneurship without simultaneously changing norms toward more gender equality does not empower women*. To investigate this hypothesis, we pose the following research questions:

1. How are women's empowerment, gender norms and agripreneurship interrelated?
2. How important is it to address local gender norms in the seed sector to facilitate women's ability to start seed entrepreneurship and stay in the seed sector over time?
3. How and in what form can external support help women agripreneurs overcome normative gender constraints?

We address these research questions by analyzing quantitative and qualitative data obtained from three case studies on seed agripreneurship across different value chains and countries: tilapia (fish) seed production in Ghana, marketing and trading of improved maize and sorghum seeds in Kenya, and dissemination of chicken seed (28-day-old, improved chicken breeds) in Tanzania.

Section 2 presents our conceptual framework and literature review. Section 3 discusses methodology. Section 4 presents the quantitative and qualitive findings, and Section 5 discusses the results and recommendations for promoting women's agripreneurship in seed systems.

2 Conceptual framework

FAO et al. (2023a) and Njuki et al. (2023) present the conceptual framework we used to analyze the factors that facilitate or inhibit women's agripreneurship and empowerment in the three selected seed systems.

Women need livelihood capital and resources (financial capital, human resources and skills, social capital, land and water, and physical assets) to engage in agribusiness. Yet the interplay of gender dimensions at the household, community, and macro and organizational levels can (detrimentally) affect women's access to capital and resources, which in turn affect their empowerment and agripreneurship ability. FAO et al. (2023a) and Njuki et al. (2023) highlight the following dimensions (depicted in column 1, Figure 1).

1. The enabling environment for women's agripreneurship, including the gender-responsiveness of policies and organizational support.
2. Gender norms affecting social acceptability, aspirations, mobility, and choices of activities by women and men.
3. The gender division of labor across market and non-market activities and trade-offs in time use and development outcomes.
4. Intra-household power dynamics affecting access to and control over resources, assets, and income, and strategic livelihood decisions.

As shown in Figure 1, these dimensions act and interact across nested scales, from the household level through the community level to the macro and organizational level. The intermediate outcomes of these systemic interactions affect the ability of women to access the various types of capital (financial, social, etc.) they need to become successful agripreneurs. The ways in which gendered dynamics across nested scales play out determine whether the final desired systemic outcomes are reached. In our case, they are (i) equitable gender opportunities in seed entrepreneurship, and (ii) women's empowerment in the seed system. Self-evidently, the various factors highlighted in Figure 1 are interrelated, dynamic and multi-directional. Changes in outcomes in terms of women's agripreneurship and empowerment in seed systems feed back into, influence, and reshape, these dimensions in continual and highly complex systemic processes.

This article focuses on women—and to a lesser extent—men agripreneurs attempting to start up, develop, and maintain their seed businesses in challenging rural environments. Entrepreneurship involves taking risks, innovating, identifying opportunities, making decisions, allocating resources, obtaining resources, and maximizing their use in order to create products and services that meet consumer needs (Mukhtar et al., 2018; Baliyan et al., 2020). Successful agripreneurship generates employment opportunities, develops income, reduces poverty, and helps create sustainable livelihoods (Wongnaa et al., 2019). Although some agriculture takes place in peri-urban and urban environments, agripreneurs in low and middle-income countries (LMIC) generally operate in rural environments (Korsgaard et al., 2015). These are generally, though not exclusively, characterized by low

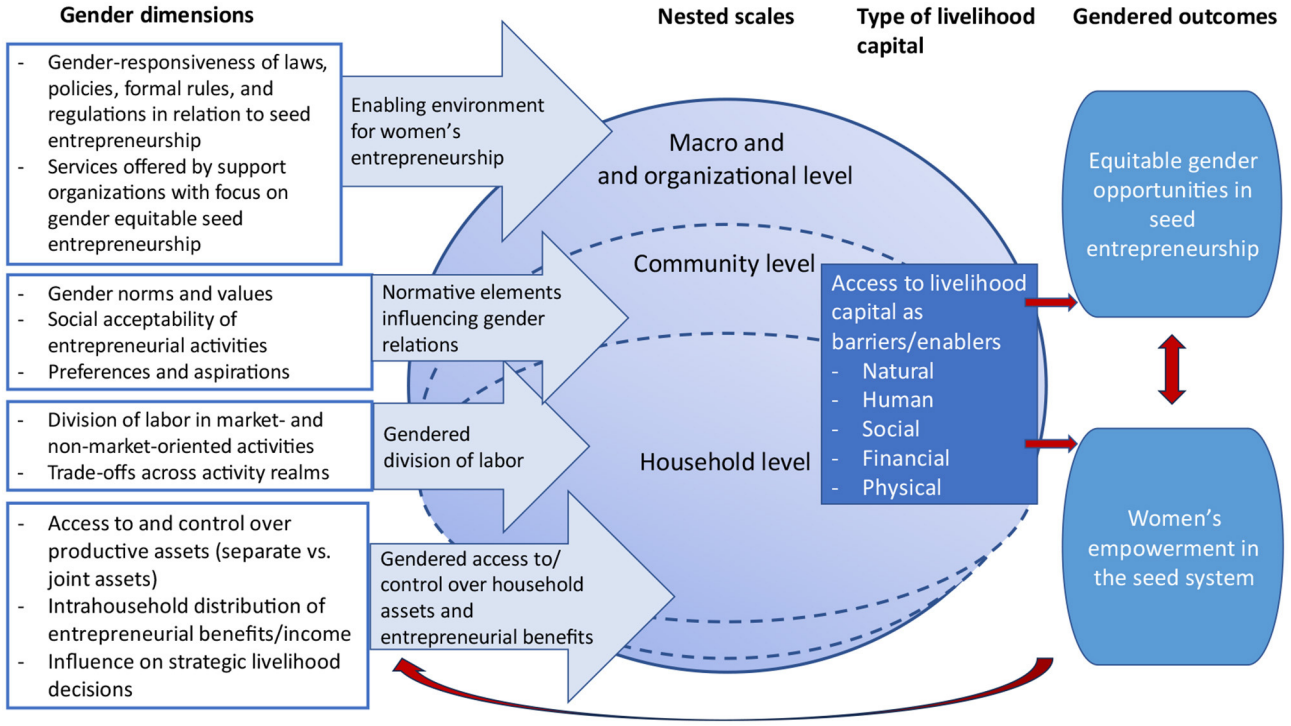

FIGURE 1
Conceptual framework of factors affecting women's agripreneurship and empowerment in the seed system. Large, light blue arrows represent the gender dimensions that affect women's access to livelihood capital. Thin red arrows denote the direction of influence. Gender dimensions affect livelihood capital, which affects women's agripreneurship and empowerment.

levels of human and financial capital, relatively small markets, and poor communications infrastructure. These pose significant challenges to the efficacy of value chain development and the development of effective entrepreneurial behaviors (Dias et al., 2019). Input and output markets, including seed markets, are frequently weakly commercialized and in some contexts may need to be created.

The conceptual framework posits that women's empowerment is both an expected outcome and a means of women's agripreneurship in the seed system. Women's empowerment is "about the process by which those who have been denied the ability to make strategic life choices acquire such an ability" (Kabeer, 1999, p. 435). Kabeer (1999) contends that the process of empowerment involves interactions between agency, resources, and achievements. For women agripreneurs, this process involves agency (the ability to access, control and benefit from) over the essential resources needed to successfully develop their business, including land, water, finance, technology, labor, and information. However, women do not exercise agency in a vacuum. Rather, they are knitted into normative structures that pose a range of gendered barriers which inhibit the ability of women to act freely in entrepreneurial ways (Alkire et al., 2013; Galiè et al., 2018; Malapit et al., 2019).

Gender norms, ideologies and power relations shape the ways in which women and men participate in value chains, and the benefits they accrue (Ihalainen et al., 2021). They frequently construct men as breadwinners and women as supportive actors to men's efforts with women being primarily tasked to take care of the home and the people within it (Bernard et al., 2019; OECD, 2021). In line with man's breadwinner role, gender norms widely establish men as the primary owners of productive resources and as key decision-makers (OECD, 2021; Rietveld et al., 2023). As a consequence, women frequently have less access than men to the resources needed for engaging in seed businesses (Nyantakyi-Frimpong, 2019). Gender norms frequently undermine women's efforts to establish themselves as agripreneurs (Achandi et al., 2023). For instance, financial institutions rarely see women as agripreneurs, making it challenging for women to obtain loan, even when they can provide loan collateral. In addition, women are rarely targeted by business training bodies and may not be treated as professionals by male agripreneurs or customers (Galiè et al., 2022). Gender norms around women's roles in domestic work and care affect workload and women's valuation of opportunities and trade-offs around entrepreneurship (Ragasa et al., 2023). Local environment, harassment, and norms around women's mobility also affect women's entrepreneurship, especially younger women (Malapit et al., 2023).

3 Methods

3.1 Study context

This paper explores the interlinkages between gender dynamics in seed agripreneurship, empowerment, and gender norms using mixed research methods. Data were collected by this paper's

authors and their research colleagues in three countries, from women and men who participated in three different projects: the Women-in-Business (WiB) project for chicken seed dissemination in Tanzania; an aquaculture value chain and tilapia project in Ghana; and a project promoting stress-tolerant maize and sorghum varieties in Kenya.

3.1.1 Tanzania

The WiB project supported young women veterinary graduates and para veterinarians (we call them "vendors") in starting a chicken business to reach women farmers from remote areas with good breeds, animal inputs and advice, and access to markets. The vendors went through a business incubation process which provided them with training and mentoring in business and chicken brooding skills.[1] This women-led small-scale business model aimed to leverage and enhance the knowledge and skills of the graduates in order to provide them with a route to economic empowerment. In terms of seed, the WiB project was used as a vehicle to disseminate the improved Kuroiler chicken breed alongside well-performing local breeds.[2] Access to improved breeds, inputs and markets was expected to enhance also the empowerment of the women farmers. Overall, the aim was to provide a women-led agripreneurial model to improving household food and nutrition security among remote rural communities in. The WiB project strategically utilized social media to challenge restrictive gender norms around women's agripreneurship in order to create a conducive environment for young women taking up chicken vending to effectively run their businesses.

The project, developed and co-implemented by the International Livestock Research Institute (ILRI) with public and private partners in Tanzania, ran from January 2019 to October 2022. It was implemented in the Kilimanjaro region (Hai and Siha districts) in northeastern Tanzania, where most of the rural population depends on livestock and crop farming as its main source of income, and in the Lindi region (Mtama and Ruangwa districts) on Tanzania's southern coast, where farming and fishing are among the main economic activities. The interventions initiated under the WiB project are currently being scaled through the SAPLING Initiative.[3]

3.1.2 Ghana

The Ghana Tilapia Seed Project aimed to promote agripreneurship in the aquaculture value chain. Aquaculture is among the fastest-growing food value chains globally and surpasses capture fisheries in fish production (FAO, 2018). In Sub-Saharan Africa, aquaculture is growing almost twice as fast as in the rest of the world, largely because of rapid growth in tilapia and catfish production (Ragasa et al., 2022a). Ghana, the largest producer of tilapia in the subcontinent, is experiencing tremendous growth led mainly by large-scale commercial cage operators (Ragasa et al., 2022b). Small-scale pond farming, however, generally exhibits greater backward and forward linkages and a larger multiplier effect on local economic growth and poverty reduction than commercial cage farming (Kassam and Dorward, 2017). Aiming to ensure inclusive sustainable growth, the Government of Ghana and its partners are targeting small-scale rural aquaculture agripreneurs, especially youth and women (Ragasa et al., 2022b).

The aquaculture project in Ghana aimed to address challenges faced by different actors of the fish seed chain, starting with breeders and broodstock multipliers, hatchery and nursery operators, and grow-out farmers.[4] It also aimed to increase participation of women and youth along the chain (Ragasa et al., 2022b). Interventions included monitoring seed quality, providing technical support and training to different actors in the value chain, setting up broodstock multiplication centers and nurseries in strategic locations, piloting digital tools for various actors along the value chain, and supporting inclusive and sustainable hatchery, nursery, and feed production business models. The project studied the barriers to and enablers of women's and young people's effective participation along the seed value chain. The project interventions and research focused on six major producing regions (Ashanti, Ahafo, Bono, Bono East, Eastern, and Volta) that together account for about 95 percent of the country's aquaculture production.

The project was implemented in Ghana between February 2019 and December 2022 by a consortium led by the International Food Policy Research Institute (IFPRI), the Water Research Institute of the Council for Scientific and Industrial Research (CSIR-WRI), KIT Royal Tropical Institute in the Netherlands, WorldFish, Ghana Fisheries Commission (a government institution), and two private hatcheries (S-HOINT Ltd. and Crystal Lake Ltd.).

3.1.3 Kenya

A third project trained agripreneurs to promote the adoption of stress-tolerant varieties of maize and sorghum as well as crop insurance in seven counties in Kenya (Bungoma and Busia in the western region; Machakos and Makueni in the lower eastern region; and Embu, Meru, and Tharaka Nithi in the upper eastern region). Maize is a key crop grown by 90 percent of farmers in project locations. Hybrid varieties from past breeding efforts to improve maize productivity are widely adopted. However, although extension programs and seed companies ensure seeds of these varieties are widely available, popular varieties are becoming unsustainable due to climate change—particularly with respect to increasing uncertainty about the timing of rainfall and their water requirements. Crops such as sorghum and drought-tolerant maize varieties offer promising pathways to improve farmer resilience.

1 See https://www.ilri.org/research/projects/women-in-business for more information on the WiB project.

2 An earlier project had identified the Kuroiler breed, characterized by high productivity under low input requirements, as the breed most preferred by women and men farmers in Tanzania.

3 See https://www.cgiar.org/initiative/sustainable-animal-productivity/ for more information on SAPLING.

4 The life cycle of fish in aquaculture starts with hatcheries receiving broodstock: spawning adult fish which produce eggs that are hatched and conditioned into fish fry (1–10 grams weight). Nurseries use the fry to produce fingerlings (10–30 grams weight). Grow-out farmers receive fingerlings and grow them into table-size tilapia.

Yet adoption of new drought-tolerant crops and varieties remains low (Fisher and Carr, 2015; Cairns and Prasanna, 2018) due to inadequate information outreach and high seed prices (Fisher and Carr, 2015), failure to properly adopt suitable farming practices, and the risks of crop failure posed by pests and disease.

To address these constraints, the Kenyan project promoted sorghum and drought-tolerant maize through a network of 181 agripreneurs called "champion farmers", 60 percent of whom were women. Recruitment criteria included demonstrating an agripreneurial mindset and social influence in their communities. Champion agripreneurs received training to market and deliver seeds of improved varieties, crop insurance to protect farmers' investments in more expensive seeds, and agricultural advice. They also received a monthly incentive payment to mobilize farmers within their community and a commission per bag of seed or insurance policy sold.

The project was implemented between April 2019 and December 2022 by an IFPRI-led consortium including ACRE Africa, which is an insurance service provider operating in Kenya and other parts of East Africa, Kenya's Agricultural and Livestock Research Organization (KALRO), and Wageningen University. A diverse group of local seed companies partnered with the consortium to promote their new varieties through the champion farmers.

3.2 Qualitative research component

Using focus group discussions (FGDs) and individual key informant interviews (KIIs), we collected qualitative data from women and men who had participated in the three projects. The qualitative interview guides varied by project because of differing project goals and contexts, but they explored four similar topics across all three projects: (i) women's and men's motivations for taking on an agripreneurial role related to seed supply within their value chain; (ii) gender-based opportunities and the constraints women (and, in the Ghana and Kenya case, also men) face in running their businesses, and strategies for managing these challenges; (iii) respondent' recommendations for changes or additional support needed to help them develop their businesses and become more successful, and to assist them to identify prospects for sustainability and continued success; and (iv) the relevance of the seed businesses to the respondents' overall livelihood strategies (which researchers determined by inquiring into respondents' other livelihood activities). In Kenya, because of the high visibility of ACRE Africa's support for champion agripreneurs, the KII guide additionally included questions on how this support had been helpful to them.

Table 1 summarizes the KIIs and FGDs samples by country. With respect to KIIs, we interviewed women and men agripreneurs participating in the projects in Ghana and Kenya. However, in Tanzania, only women agripreneurs were targeted and interviewed. We conducted a total of 38 KIIs with women respondents: 23 poultry agripreneurs in Tanzania; 11 agripreneurs (three hatchery operators, two pilot nursery operators, and six grow-out farmers) in Ghana; and six women agripreneurs in Kenya (where we also interviewed six male agripreneurs).[5] We opted for interviewing agripreneurs through KIIs instead of FGDs because of their small numbers and physical remoteness from one another.

TABLE 1 Overview of respondents by country and qualitative research method.

Method		Sample		
		Tanzania	Ghana	Kenya
KII	Women	23	11	6
	Men			6
FGD	Women		4/[a]	1/[a]
	Men		2/[a]	1/[a]
	Mixed		1/[a]	

[a]Carried out with non-seed agripreneurs.

An important determinant of the success of agripreneurs is their potential clients. We therefore also collected data from non-agripreneurs, specifically, through FGDs with farmers in the communities where agripreneurs were operating, given that these farmers are their potential clients or potential agripreneurs. In Ghana, we organized four women-only, two men-only, and one mixed-gender FGDs with seven non-agripreneurs per FGD (for a total of 49 women and men respondents) to understand the aspirations of women and young men, and to gain insights into their motivation for engaging in aquaculture. In Kenya, we administered one women-only and one men-only FGD with 8–10 non-agripreneurs per FGD to document farmers' perception of male and female champion agripreneurs and to ascertain gender norms that could inhibit agripreneurs from reaching their aspirations.[6] We used FGDs instead of KIIs for non-agripreneurs because of their larger numbers, physical proximity to one another, and the value of having a group discussion around perceptions and norms held by potential clients of agripreneurs.

We used Nvivo (a qualitative computer-supported data management program) to inductively analyze KII and FGD data for the Kenya and Tanzania cases. Microsoft Excel was used for the Ghana case. Emerging patterns were identified using predetermined codes agreed among the three research teams. New codes were included as they emerged from the interviews from each country.

5 In Tanzania, we interviewed all 23 young women veterinary or animal health graduates who directly benefited from the WiB interventions. Because Ghana has few hatcheries and first pilot nursery operators, we sought to interview all of them, though a small number declined participation. In Ghana, from the list of women grow-out agripreneurs, we randomly selected 1–2 women per focus region. In Kenya, the qualitative research focused on Bungoma County because agripreneurs in this county had advanced more than in other counties. Participants were selected via random sampling, using a list from a previously conducted quantitative survey, and champion farmers represented a range of different villages.

6 In Ghana, we selected one fish-producing community in each focus region. In Kenya, the FGD focuses on Bungoma County, where agripreneurs had advanced more than in other counties.

3.3 Quantitative research component

We collected quantitative data on sociodemographic characteristics and empowerment status for targeted women (and men as well in the case of Ghana and Kenya) agripreneurs through computer-aided personal (face-to-face) interviews. To measure empowerment, all three projects used a version of the survey-based Women's Empowerment in Agriculture Index: WEAI (IFPRI, 2021). A first subindex of WEAI assesses the degree to which respondents are empowered in several domains in agriculture, including decisions about agricultural production, access to and decision-making power about productive resources, control over the use of income, community leadership, and time allocation (Alkire et al., 2013). A second subindex, the Gender Parity Index (GPI), measures the percentage of women who are empowered, or whose achievements are at least as high as those of the men in their households. In households not achieving gender parity, the GPI shows the empowerment gap that needs to be closed for women to reach the same level of empowerment as men in their households (Alkire et al., 2013; Quisumbing et al., 2023).

Because of modifications to WEAI over time in response to user needs, we used different versions in the three projects (Table 2). In Ghana, we implemented A-WEAI, an abbreviated version. The key domains of empowerment under A-WEAI reflect the content and coverage of WEAI. However, the tool is shorter and collects data for the five domains of empowerment through six indicators (Malapit et al., 2019). The interviewee in sampled households was either the manager or owner (if different) of the farm/firm, or the person who made most decisions on fingerlings and inputs, and thus would be most likely to attend a production training. The survey also interviewed the primary decision-maker of the opposite gender (often the spouse of the interviewee) to document gender-based constraints or opportunities and intrahousehold dynamics, and to measure gender parity. We interviewed a total of 567 agripreneur households. For these, 266 second respondents were interviewed as well.

In Kenya, we used the Project-Level WEAI (Pro-WEAI). This is an extension of A-WEAI similarly designed to measure the impact of agricultural development projects on women's empowerment. It includes, however, additional indicators to measure program impacts. Its indicators are grouped into three domains: instrumental agency, intrinsic agency, and collective agency (Table 2). Pro-WEAI data were collected from all 126 female and 61 male-agripreneurs in the project, as well as their spouses if available and willing to participate in the survey (thus yielding an additional 56 male and 49 female respondents). Whilst the qualitative research focused on Bungoma county, the Pro-WEAI survey was completed with agripreneurs across all seven counties where the project was active.

In Tanzania, we used the Women's Empowerment in Livestock Business Index (WELBI), an index that builds on the Women's Empowerment in Livestock Index (WELI) and focuses on agripreneurs in livestock value chains (Galiè et al., 2018). WELBI uses the same domains and indicators as Pro-WEAI (Table 2) but differs from it by focusing on livestock and integrating both business (economic) and household spheres of livelihood.[7] WELBI data were collected from 23 women chicken agripreneurs, essentially a census of all women agripreneurs engaged in the WiB project. Because a composite score requires non-missing responses across all modules, we were able to calculate WELBI scores for a final sample of 18 women chicken agripreneurs.

We followed Alkire et al. (2013) and Malapit et al. (2019) to construct the A-WEAI, Pro-WEAI and WELI indices. We constructed a measure of gender parity by tallying the proportion of households in which the woman either achieves empowerment or has an empowerment score equal to, or greater than, the man's empowerment score. Since we interviewed agripreneurs and their spouses in Ghana and Kenya, we can construct gender parity metrics for these two case studies. It is not possible to construct a GPI for the Tanzania sample because we did not interview male household members of women agripreneurs.

4 Results

The following subsections present our results: descriptive statistics of survey respondents/agripreneurs; quantitative results regarding the empowerment status of women and men agripreneurs; and qualitative results related to agripreneurs' motivation for starting seed businesses, challenges—and some opportunities—to starting up and continuing seed businesses, and agripreneurs' recommendations for creating an enabling environment.

4.1 Descriptive statistics of survey respondents

Table 3 presents basic demographic information about the agripreneurs respondents. Women and men agripreneurs in Ghana and Kenya are relatively older, with average ages of 49 and 48 years (Ghana) and 41 and 43 years (Kenya), respectively, compared to women in Tanzania, who have an average age of 29 years, as the project in Tanzania is focused on empowering newly qualified women veterinary/animal health graduates/paravets. A similar trend is observed in terms of marital status: most (above 62 percent) women and men respondents in Ghana and Kenya are married, with a substantial proportion of women in Ghana (26 percent) and some in Kenya (9 percent) divorced or widowed. In Tanzania, most (62 percent) of the women agripreneurs are unmarried.

Regarding formal education, the sample of women agripreneurs in Tanzania substantially differs from the samples of women and men agripreneurs in Ghana and Kenya. In Ghana and Kenya some respondents reported having completed postsecondary education, whereas all the young women agripreneurs in Tanzania had completed postsecondary education. In Kenya, a higher proportion of men (42 percent) than women (26 percent) reported having completed postsecondary education. In Ghana, however, a higher proportion of women (21 percent) than men (7 percent)

7 Both Pro-WEAI and WELBI are also similar to A-WEAI. The main difference is that, unlike Pro-WEAI and WELBI, A-WEAI does not include intrinsic agency.

TABLE 2 Overview of quantitative research methods.

Country	Tool	Key domains researched	Indicators	No. of women respondents	No. of men respondents
Ghana	A-WEAI	Production	Input in productive decisions	266	567
		Resources	Ownership of land and other assets. Access to and decisions on credit		
		Income	Control over use of income		
		Leadership	Group membership		
		Time	Work balance		
Kenya	Pro-WEAI	Intrinsic agency	Autonomy in income, self-efficacy, and attitudes toward domestic violence	126	117
		Instrumental agency	Input in productive decisions, ownership of land and other assets, access to and decisions on credit, control over use of income, work balance, and visiting important locations		
		Collective agency	Group membership		
Tanzania	WELBI	Intrinsic agency	Autonomy in income, self-efficacy, attitudes toward domestic violence, and respect among household members	18	n/a
		Instrumental agency	Input in productive decisions, ownership of land and other assets, access to and decisions on credit, control over use of income, work balance, and visiting important locations		
		Collective agency	Group membership and membership in influential groups		

TABLE 3 Demographic statistics of seed agripreneurs, by country (in % except for age).

Variables	Kenya		Ghana		Tanzania
	Women	Men	Women	Men	Women
Age in years (mean)	41.32	43.23	49.46	47.67	29.19
Marital status					
Never married	13	9	12	12	62
Married	77	89	62	86	38
Divorced/separated/widowed	9	2	26	2	0
Formal education					
Primary education not completed	4	3	21	7	0
Primary education completed	29	15	46	50	0
Secondary education completed	42	40	10	21	0
Postsecondary education completed	26	42	23	22	100
Number of observations	94	65	43	575	21

Source: IFPRI/CSIR-WRI household survey (2019), IFPRI/ACRE Africa/IPA household survey (2021), and ILRI survey (2021).

reported having zero years of formal education or not completing primary education.

4.2 Quantitative results: empowerment status of women and men agripreneurs

Table 4 presents summary statistics on empowerment for the three case studies, focusing on agripreneurs and their spouses.[8] We found substantial variation in the rates of achieving empowerment across the three case studies. Men agripreneurs in Kenya are the most empowered, with 72 percent achieving empowerment. Ghanaian men (58 percent), Ghanaian women (58 percent) and Kenyan women (57%) follow.

8 Note that there are slight differences in the indicators contributing to the overall indexes for the three empowerment tools (A-WEAI, PRO-WEAI, and WELBI), as discussed above and outlined in Table 2.

Tanzanian women agripreneurs are the least empowered group (28%).

We further computed gender parity gaps for Ghana and Kenya to identify agripreneur's empowerment relative to their spouse (Tanzania had no data on men, so we could not calculate gender parity). The results on gender parity show some commonality and substantial variation across the two contexts.

Households with a male agripreneur and female spouse achieve relatively low gender parity compared to households with a female agripreneur and male spouse. In the former households, male agripreneurs are relatively more empowered than their female spouses. This variation is particularly pronounced in the Ghanaian sample: only 34 percent of households with a male agripreneur and female spouse achieve gender parity, which could be attributed to the finding that only 22 percent of wives in households with a male agripreneur achieve empowerment in the Ghanaian sample. Some female spouses are helpers in the fish farm, while the majority are housewives or not involved in any entrepreneurship. However, all (100 percent) households in Ghana with a female agripreneur with a male spouse achieve gender parity. In these households, the female agripreneurs are as empowered as male spouses. This compares with 78 percent of households with a female agripreneur and male spouse in Kenya.

Figure 2 illustrates the contribution of each domain to men's and women's disempowerment in Ghana, decomposing total disempowerment (the total length of a bar) into disempowerment stemming from each domain (the total length of a colored section of a bar). Longer sections contribute more in absolute terms to disempowerment. A lack of group membership is the greatest contributor to the disempowerment of women and men agripreneurs. Moreover, limited or lack of control over income from agripreneurial activities, and lack of input into production decisions, are top contributors to men's disempowerment. For women agripreneurs, a lack of work balance and control over the use of income are the second and third largest contributors. Spouses show a similar trend, with lack of group membership and of decision-making regarding control and use of income contributing to disempowerment, particularly among female spouses.

In Kenya (Figure 3), Pro-WEAI results show that the major contributors to disempowerment do not differ as much across the type of respondent (agripreneur vs. spouse) or the respondent's gender (male or female) compared to the Ghana sample. However, in Kenya, women agripreneurs, and the female spouses of male agripreneurs, are less empowered than their male counterparts. Key indicators contributing to disempowerment among Kenyan women and men agripreneurs, as well as their male and female spouses are: a high workload; lack of control over the use of income; and lack of autonomy in decision-making. Unlike men agripreneurs and male spouses of women agripreneurs, however, women agripreneurs and female spouses of men agripreneurs tolerate gender-based violence (negatively influencing Pro-WEAI's attitudes toward domestic violence indicator). This greatly contributes to their higher disempowerment scores.

Figure 4 shows that a lack of work balance, tolerance of domestic violence, inability to visit important places, and lack of control over and use of income are the main contributors to the disempowerment of women agripreneurs in Tanzania. Unlike in

TABLE 4 PRO-WEAI, WEAI, and WELBI results.

	Kenya				Ghana				Tanzania agripreneurs[c]	
	Agripreneurs[a]		Spouses		Agripreneurs[b]		Spouses			
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Achieved empowerment	57%	72%	59%	54%	58%	58%	22%	69%	28%	
Achieved gender parity	78%	73%	73%	78%	100%	34%	34%	100%	n/a	
Average empowerment gap	0.11	0.14	0.14	0.11	0.0	0.56	0.56	0.0	n/a	
Number of observations	77	61	49	56	34	550	232	17	18	

[a]In Kenya, women and men farmers selected as seed agripreneurs (champion farmers) were evaluated using pro-WEAI.
[b]In Ghana, fry, fingerling, or table-size tilapia women and men agripreneurs were evaluated using modified A-WEAI.
[c]In Tanzania, women chicken seed agripreneurs were evaluated using WELBI.
Source: Baseline data from IFPRI/CSIR-WRI Ghana household survey (2019), baseline data from IFPRI/ACRE Africa/IPA Kenya household survey (2021), and baseline WiB Tanzania household survey (2020).

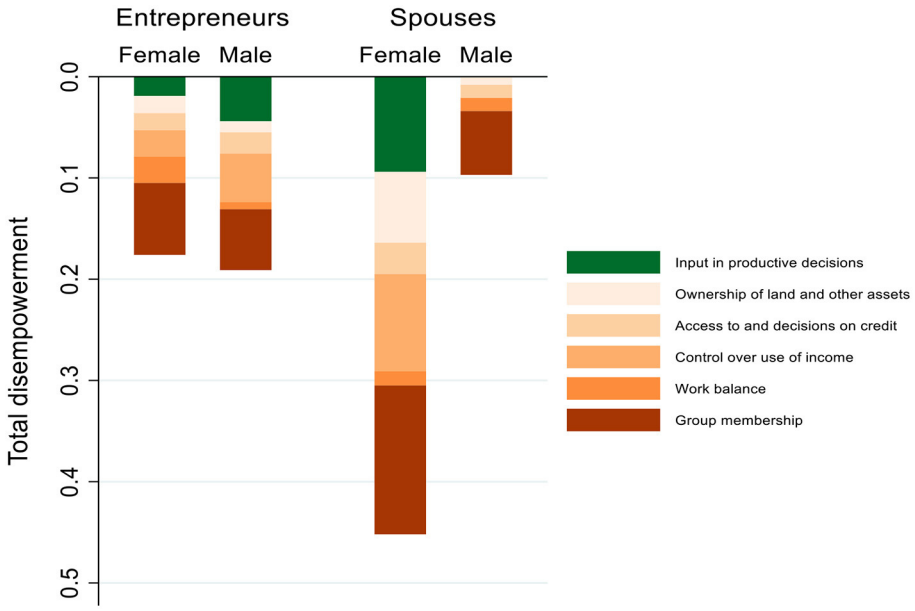

FIGURE 2
Contribution of each indicator to disempowerment of women and men agripreneurs in Ghana. Source: IFPRI/CSIR-WRI household survey (2019).

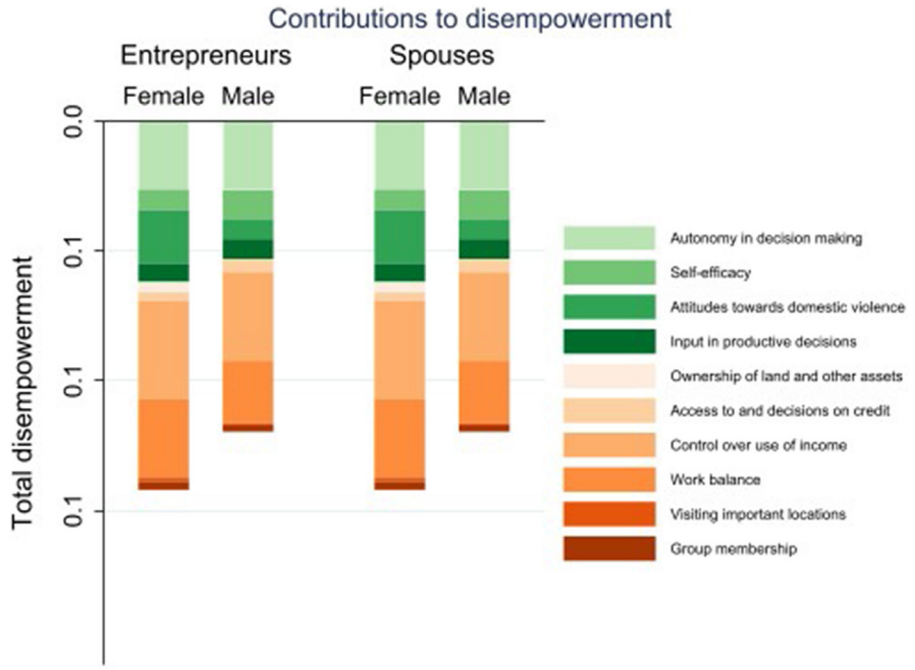

FIGURE 3
Contribution of each indicator to disempowerment of women and men agripreneurs in Kenya. Source: IFPRI/ACRE Africa/IPA household survey (2021).

Ghana, but like the case of Kenya, a lack of group membership has only a small contribution to disempowerment among Tanzanian women agripreneurs.

In summary, across all three countries, a lack of control over the use of income is an important contributor to disempowerment for agripreneurs and their spouses across genders. A lack of work balance and tolerance of domestic violence contribute to disempowerment of female agripreneurs in Kenya and Tanzania. In Ghana, although A-WEAI did not capture attitudes toward domestic violence, it did capture workload, finding that this indicator is not a major contributor to disempowerment. Instead, in the Ghana case, a lack of group

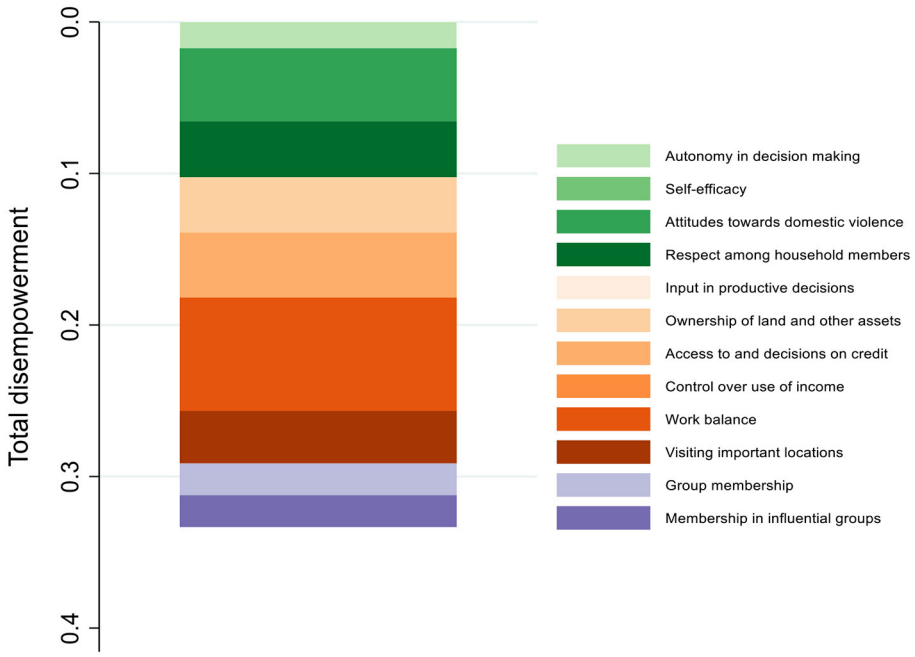

FIGURE 4
Contribution of each indicator to disempowerment of women agripreneurs in Tanzania. Source: ILRI survey (2021).

membership is the most important contributor to disempowerment of agripreneurs.

4.3 Qualitative results (1): motivations for starting seed business

In each country, we asked participants about their reasons for entering the seed business in order to understand the opportunities and challenges offered by the sector. Figure 5 summarizes the main pull factors that encouraged agripreneurs to enter the business across the three countries, marking pull factors reported by women only in green, and those reported by both women and men in blue.

4.3.1 Lack of alterative opportunities to work in their field

In Tanzania, most women seed agripreneurs who trained as veterinarians or animal health specialists ventured into selling chickens as a form of self-employment. Beyond self-employment, the chicken vending business gives seed agripreneurs a chance to practice the skills acquired through their veterinary and animal health courses in college. Before taking up chicken vending in the WiB project, many seed agripreneurs had engaged in volunteer or internship roles at Tanzania District extension offices, yet the majority asserted that they nevertheless failed to secure better-paying jobs in their chosen careers. Due to local gender norms, respondents argued, most farmers prefer to work with male livestock health specialists and veterinarians, who they believe to be more knowledgeable. They added that gender norms characterize men as stronger than women and thus better suited to veterinary work since this may involve restraining animals. Another gender norm suggests that women who travel widely in the course of their veterinary work are considered morally dubious because they travel in public spaces and enter client homes.

4.3.2 Strong market demand

In Ghana, women hatchery and grow-out farmers entered the sector because they believed the activity was good business and would provide better income than other livelihood activities. In Kenya, women and men noted that project incentives and commissions from seed sales motivated their involvement. In Tanzania, most seed agripreneurs were attracted to chicken vending because of the high demand for brooded chickens of improved breeds. Across the study sites, female smallholders commonly raise chickens, but low productivity means they cannot meet demand for improved breeds (in terms of egg production and improved weight), especially during festivals.

4.3.3 Low levels of bureaucracy

In Tanzania, seed agripreneurs reported lack of bureaucracy as attractive. All respondents have a brooding and vending capacity of <500 birds; taking their business to a larger scale would require them to obtain a license. They therefore can practice their business at home without the need for a business license. In contrast, veterinary service provision—regardless of scale—requires approval from the veterinary council of Tanzania and a license.

FIGURE 5
Summary of motivation for entry into seed business across the three projects. Green (blue) denotes motivations reported by women only (by women and men).

4.3.4 Capacity development courses

Ghanaian and Kenyan respondents expected to advance their careers through developing their knowledge and experience on seed businesses. Some Ghanaian women hatchery owners and managers hoped that doing so would help them eventually obtain jobs in aquaculture consulting and international agricultural organizations. Kenyan women and men agripreneurs associated their involvement with training provided by ACRE Africa. This offers capacity development courses on good farming practices, smartphone usage, and training of trainers to help promote dissemination. Without the impetus provided by ACRE Africa, most respondents considered they would not have become involved. Tanzanian women agripreneurs were similarly attracted by the training courses offered through the WiB project. This included good agricultural practices in relation to poultry care and specifically brooding, marketing, and networking skills.

4.3.5 Altruism

In Ghana, women respondents indicated that they were motivated by altruism, for example by a desire to provide employment opportunities to young people. In Kenya, women and men agripreneurs felt that they were addressing farmers' needs by providing them certified, good-quality seeds. Men emphasized that their capacity to facilitate easier access to seed and associated products and to provide a specific variety required by the farmer motivated their involvement. Respondents in Tanzania expressed similar thoughts. Some agripreneurs spend time helping their clients find markets for chicken eggs and mature chickens. Being able to provide improved breeds is also motivating. One agripreneur said, "I have a friend who now has around 300 improved chickens, Kuroiler, which she bought from me. Before, it was difficult for her to access the desired chicken breeds."

4.3.6 Recognition

In Ghana, women hatchery and grow-out farmers highlighted that a notable benefit of initiating their businesses is the self-confidence they have gained, coupled with the respect and recognition from community members who now view them as knowledgeable individuals. In Kenya, women champion farmers expressed motivation stemming from the opportunity to interact with farmers as customers, as trainees, and during project meetings.

4.3.7 Flexibility in time use

In Tanzania, the majority of women agripreneurs were attracted by the belief that chicken brooding is not particularly time-consuming, thus permitting them to pursue other forms of income generation, including providing veterinary services or running an agrovet shop, alongside brooding and selling their chicks. Yet respondents noted that intermittent peaks in labor demand in relation to poultry care impinges on their other income-generation activities. For instance, maintaining the warmth required for chicks under 14 days involves frequent monitoring and adjustment of room temperature, especially during the cold season. As the chicks

grow older, women have more time available for other income-generating activities. Similarly, women hatchery owners in Ghana find that their fish farming businesses provides them a form of relaxation and aligns with their interests in nature and being active in the field.

4.3.8 Prior experience

Prior experience and skills, together with resources, motivated women across the case studies to start seed businesses. In Tanzania, agripreneurs cited their life-long experience with poultry. Most were raised in livestock-keeping households, and they benefited at an early age from livestock sales. For example, some parents paid for their daughter's education in this way. Consequently, they have always viewed livestock, and particularly poultry, as a business. Having completed their studies in animal health or veterinary courses, they find it easier to brood and sell the chicks successfully. In Ghana, most women hatchery owners already had good financial resources, access to land or water resources, and access to skilled labor. Some women inherited their business from a father or husband who passed away or migrated. Women noted that possessing technical knowledge and resources important for hatchery and grow-out farming motivated them to start their businesses. They had previously obtained technical knowledge and assistance from other farmers and hatchery operators in the local area, from extension agents, and through information and communication technology tools. In Kenya, several women agripreneurs highlighted that their prior experiences in agricultural development projects and their previously developed customer base motivated them to engage with ACRE Africa.

4.3.9 Family support

Encouragement from family members is an important motivating factor for many Ghanaian and Tanzanian women to become involved in hatchery businesses.

4.4 Qualitative results (2): challenges- to starting up and continuing seed businesses

This section highlights the qualitative results related to challenges (Figure 6).

4.4.1 Family support

Across all countries, some single women (as well as women without a spouse, such as those divorced or widowed) require the permission of male household members to engage in a household business. In Ghana, there is a widely held perception that aquaculture is a man's business, and taboos around the menstrual cycle can limit women from engaging in cage fish farming. Similarly in Tanzania, business more broadly is considered a man's domain and women are often discouraged from engaging. As a result, agripreneurs in Ghana and Tanzania frequently contend with problems in the home stemming from a lack of acceptance of their work by husbands and other male family members. Some women seed distributors in Kenya associated their constrained mobility with difficulties in securing their spouse's agreement to their business activities. They must inform or, in some cases, seek their husbands' permission to attend meetings or engage in marketing activities beyond the home. Family can also provide support in carrying out the business. Although women agripreneurs in Kenya did not note help from husbands, they did mention that relatives assist with advertising. Their wives are also engaged in financing, advertising, and selling seed.

4.4.2 Insufficient experience

In Tanzania, many chicken seed agripreneurs complained about losing large numbers of chicks from their first batch (between 15 and 160 chicks from the first brooding batch of 200 donated to them by the local project partner; AKM Glitters). Despite receiving training about temperature control and how to administer vaccines, many women lost birds due to overheating in the brooder house and other failures. To resolve these issues themselves, they drew upon the information provided through the WiB training and their own knowledge. Women shared information between themselves, often using WhatsApp, to create informal self-help groups. One respondent explained, "After talking to friends and consulting suppliers, I found out that the brooding temperature varies according to area and weather in each place [Once I had learned this, this] resulted in a significant reduction in mortality rates of the brooded chicks."

4.4.3 Managing market demand

In Ghana, the provision of technical assistance, guidance and direction from veterinary services and aquaculture groups, visits and WhatsApp groups, have helped aquaculture farmers to remain in business. Even so, locating buyers remains an important challenge, particularly for women hatchery owners.

In Kenya, the challenge of maintaining a customer base is minimal for many respondents because they have prior experience and networks. They leverage their existing know-how on the best ways to market agricultural products and on how best to provide capacity building to farmers. To market seed and insurance products, they mobilize established social networks, including farmer organizations and agricultural and livestock development organizations, local markets, or religious institutions like the church. In several cases, agripreneurs save time and effort by advertising their products at meetings concerned with other initiatives they are engaged in. Male agripreneurs use their community contacts to advertise their products to others and conversely to be informed about farmer requests for seed. Women agripreneurs frequently help each other and share customers.

Both women and men agripreneurs in Kenya emphasized that communication and good marketing skills—"knowing how to talk to people"—contributes to their success in convincing farmers to purchase insurance alongside seed; although a married woman explained that she has better communication skills than most men and is more successful at convincing farmers to purchase her products. This skill also helps men and women manage difficult discussions, for example when seed does not arrive on time. Even so, managing competition poses a

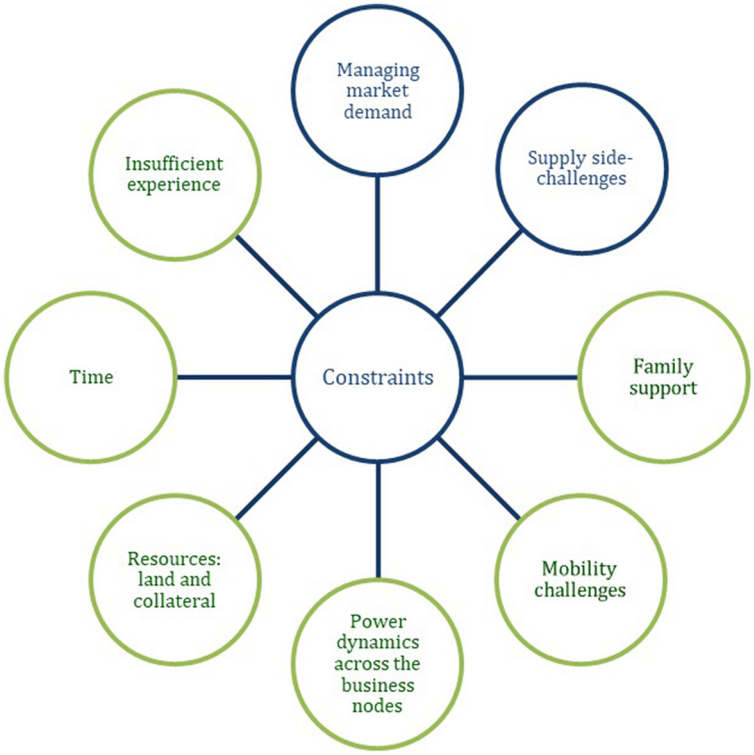

FIGURE 6
Challenges to entering the seed business across the three projects. Green (blue) denotes challenges reported by women only (by women and men).

significant challenge for agripreneurs in Kenya. The smallholder farmers targeted by these agripreneurs are in a powerful position. They often expect price reductions or permission to purchase seeds on credit, to which the agripreneurs feel bound to accede given competition from other vendors. Predicting smallholder demand for seeds of specific varieties poses another challenge.[9]

On a more positive note, women and men agripreneurs in Kenya benefited from ACRE Africa's support. Seed trial samples from ACRE Africa created good publicity for the sales services for both women and men. Seeds were of good quality and helped farmers trust the company and the agripreneurs. This in turn made it simpler to convince farmers that the insurance products were trustworthy. ACRE Africa's provision of seeds also helped establish market demand and the incentives for agripreneurs provided them with financial support to carry out their operations. Women reported that providing T-shirts branded with ACRE Africa's company name and logo was particularly advantageous, because T-shirts gave them publicity and made smallholders take them seriously.

9 Selling insurance can be a major headache. Some farmers expect to be given free items (seeds, other inputs) when they purchase insurance. Since farmers may not have a clear understanding of how agricultural insurance functions, they may expect (potentially substantial) compensation for any loss or argue that the insurance premium is too high. Discouraged insurance purchasers can become distrustful of the product itself as well as the agripreneur. This hampers the marketing of insurance and seed.

4.4.4 Time

Household and care responsibilities limit women's rather than men's time. In Ghana, some women are forced to neglect their businesses, whereas women who allocate more time to their businesses may face escalated household tensions. Married women can find work on their fish business particularly onerous. The timing and duration of their daily responsibilities in the home often overlap with the time of hatching, thereby inhibiting women's full engagement in the hatchery. One married woman who owns a hatchery and grow-out farm, and processes catfish, explained:

> "The time of the hatching is the major barrier hindering most women from being in the hatcheries. I have been taken through training on how to hatch the catfish, but I am not able to practice it because I need to be at the farm very early in the morning and the distance from my home to the farm is far. By the time I get there the worker has finished the hatching. When selling the fingerlings, the counting sometimes starts very late in the evening just at the time I have to go home, or very early in the morning when I have not yet got to the farm."

However, some women hatchery managers and owners manage their time constraints by ensuring that their fish farming activities are strictly scheduled and compatible with their household responsibilities. Some women managers and owners manage their time across fish farming and home care by training and hiring more labor to help in the farm. One woman who owns a hatchery and grow-out farm and processes catfish explained how she organizes

her time among multiple livelihood activities over the week: "With respect to household chores, I stay with my stepchild, after school she takes over. On Sunday, I work at home. I go to work on Monday, Wednesday, and Friday. I use the weekends to plait hair. I have been in the hair dressing business for 20 years now."

In Kenya, women and men recognize that women are more time-constrained in comparison to men. One single young woman explained:

> "A man will just wake up and leave but a woman has to do household chores before leaving for work. In the evening, a woman has to think about what people will eat for supper whilst a man works without distraction. The time that a woman spends in the business is less compared to the man."

Overall, women rarely spoke of hiring others to help them with their business or with their farm work. They argued that women do not have enough time to spend on mobilizing farmers and building networks despite recognizing the importance of these activities for marketing their seeds and (as applicable) insurance products. Another young single woman explained that she markets and sells her products whilst carrying out other livelihood activities.

4.4.5 Supply-side challenges

In Tanzania, most seed agripreneurs reported facing initial difficulties in accessing inputs such as feeds, vaccines, and drugs. The rural location of their business makes it difficult to access quality chicken feed from the smaller agrovets located within their area of operation. Some seed agripreneurs claimed that poultry feed purchased from local markets or agrovets is low quality, resulting in high levels of stunted growth and poor health among poultry. Two agripreneurs noted that some feeds caused health issues, such as severe bloating, and even death. They have resolved this by purchasing day-old chicks and quality feed directly from the hatcheries. In Lindi region, particularly Ruangwa, the main hatchery has established an agent that sells chicks and chicken feeds. In Ghana, many challenges, including rising feed prices and having to maintain water quality and biosecurity measures, affect women and men equally. Fish disease and mortality, particularly the low survival rate of catfish fryers, likewise contribute to increased production costs for both women and men hatchery owners. Respondents in Kenya likewise face supply-side challenges. Late arrival of project-procured seeds has made it difficult to sell seeds in time for farmers' seasonal planting requirements. If distributors do not have seeds available, customers source seed from competitors.

4.4.6 Power dynamics across the business nodes

In Tanzania, women face challenges associated with hired labor and lack of land ownership. Some women seed agripreneurs—when busy with other economic activities, such as marketing, providing veterinary services or attending a training course—use hired labor or family members to help them take care of the brooders. However, hired laborers frequently lack experience and may make mistakes adjusting the temperature in the brooder house. Unsuitable temperatures increase chick fatalities. Jealously can impact on the ability of agripreneurs to keep control over land they rent. When they become successful, landlords frequently argue that they are making money from the landlords' resources and increase rental prices or claim their land back. Some women agripreneurs complained about sexual harassment when visiting male farmers in their households. They argued that male farmers fail to see them as professional chicken agripreneurs and assume that women's visits to the farmers' houses show their interest in sexual interactions. Women respondents also reported being harassed when publicizing their business through leaflets that include their telephone number. Men call them assuming they are selling sexual services.

In Ghana, a lack of skilled and trustworthy workers affects both women and men hatchery agripreneurs. Youth disinterest in aquaculture reduces the pool of potential workers. Furthermore, even when agripreneurs find employees, informal norms that assign leadership roles to men over women make it difficult for male employees to accept supervision by a woman hatchery manager. This challenge particularly affects younger women and, to a more limited degree, young men. Management is also difficult for owners who tend to be absent from their farms (which is often the case for women due to their home and caring roles). To help enforce their decision-making power, Ghanaian women seed agripreneurs typically employ workers on short-term contractual arrangements rather than committing to long-term salaried contracts. This practice weakens men's ability to resist supervision by women, and generally is considered to promote worker efficiency. Some women hatchery owners address challenges related to their personal gaps in knowledge on hatcheries by hiring skilled employees to manage their farms for them. Another strategy is to employ young high school graduates or dropouts with no prior knowledge, provide them with on-the-job training, and support their additional training in hatcheries.

4.4.7 Mobility challenges

In Tanzania, seed agripreneurs generally cannot source day-old chicks locally and instead must transport chicks sourced further afield using public transportation. However, some chicks usually die on the way and transportation costs are high. Some agripreneurs transport fewer day-old chicks per trip to avoid losses. In Kenya, women and men agripreneurs often ask agrodealers with shops to store their seeds and advertise them. Doing so allows the agripreneurs to circumvent the challenge of transporting seed to farmers themselves, which is important especially for women agripreneurs, who reported feeling frustrated with the costly but necessary expense of transporting seeds via a hired bodaboda (motorbike), since driving a bodaboda is widely considered a man's activity and inappropriate for women.[10] In contrast, men agripreneurs commonly own a bodaboda and use it for seed delivery and other business-related tasks. Even so, they remarked on the high costs of fuel and motorbike repair. Agripreneurs therefore prefer to encourage client farmers to obtain seed directly from the agrodealer shop. In a few cases, women and men use

10 Although seed agripreneurs explained that this norm is weakening, it nevertheless remains prevalent and restricts women from driving bodabodas themselves.

their agrodealer contacts to source alternative seeds to sell when project-procured seeds are delayed.

4.4.8 Resources: land and collateral

In Tanzania, many agripreneurs are not native to the regions where they practice their businesses, and even when living closer to their parents, most ethnic communities allow only sons to inherit land, and daughters are not permitted to use family land for their own businesses. As such, most agripreneurs must rent land that is expensive and insecure for the construction of brooder houses. They may be forced to move their brooder houses when landowners raise rent or decide to use the land differently. In some cases, poultry units are forbidden. One agripreneur recalled that she had "rented a house where the owner did not allow the building of a poultry unit due to the noise and the air pollution caused by chicken keeping." Another agripreneur noted that, because she cannot find a location for her business, she shares a brooder house with a smallholder woman client. During the farming season, the client focuses on farming, letting the agripreneur use the brooder house. However, at the end of the season, the client takes over the brooder house to raise poultry herself, preventing the agripreneur from realizing her brooding and expansion plans. Overall, the land challenge is rather intractable. Women respondents explained that, because they cannot inherit, the only way to own land is to purchase it, but it is difficult for women to earn sufficient income to buy land. Securing sufficient business finance is another challenge. Some women agripreneurs draw on their limited savings and the per diems they received for attending the WiB seminars and workshops to renovate the brooder houses they rent. Other agripreneurs depend on men (close family adult male members and adult male friends or neighbors) to help them construct brooder houses. Culturally, women are not supposed to engage in any activities that involve construction, and those who do are stigmatized by the community.

4.5 Qualitative results (3): recommendations for creating an enabling environment

KII respondents (all men and women agripreneurs) were asked to identify measures that could help them scale their businesses and level the playing field. Figure 7 summarizes the topics they highlighted.

4.5.1 Subsidies and loans

In Tanzania, women highlighted a role for financial institutions to facilitate their access to capital and loans. For example, they want to be able to access loan products without having to use their husbands' names and want loans without onerous lending constraints. Respondents in Ghana suggested that dialogue with feed sellers on prices and feed support could help facilitate feed subsidies for their hatchery businesses. The provision of, or financial assistance to acquire, ponds and cages and fish feed would be valuable. Agripreneurs could pay back in installments until they complete repayment and take ownership of the ponds or cages. This would help address challenges faced specifically by women, who tend to have less access to land than men, as well as by young women and men, who often do not have the collateral needed to access bank loans. Kenyan respondents noted the importance of access to an agrodealer that could store seed as well as facilitate sales. Some agripreneurs have benefited from their existing access, and others argued that this access could improve their enabling environment. Agripreneurs also emphasized the need for financial assistance or ACRE Africa support to provide inputs along with seeds, provide seeds on credit, acquire a license to formalize their seed selling, and fund their transportation for marketing activities.

4.5.2 Value chain group membership

Lack of group membership contributes significantly to disempowerment of women agripreneurs in Ghana. Women argue that forming groups would enhance the collective power of women fish farmers concerning customers and facilitate negotiations for a standardized price for their fish. In some instances, Tanzanian women agripreneurs organized themselves in groups to help pool the resources needed to start their businesses. However, in other cases this was not possible. Respondents—who were largely unmarried—argued that marriage customs (patrilocal marriage) oblige women to relocate to their husband's home and community, making it difficult to set up a group. If a woman is likely to relocate, her reliability as a group member diminishes.

4.5.3 Training and capacity development

Agripreneurs in Ghana and Kenya highlighted that external support for capacity building on themes related to their businesses would help ensure success and innovation in their businesses moving forward. Women hatchery owners and managers specifically noted the need for knowledge on water quality management. Agripreneurs involved in hatcheries and grow-out farms emphasized the need for leadership skills training. Ghanaian respondents highlighted that young women and men could address challenges related to lack of capital by first acquiring knowledge on hatcheries. This would facilitate their employment as hatchery managers, thereby enabling them to earn income, and thus raise capital to start their own farms. Men agripreneurs in Kenya noted the need for training on marketing and on how to expand their customer bases. In comparison, women agripreneurs noted that they would benefit from agricultural trainings, to help them sell their products and support farmers better. Agripreneurs in Ghana also highlighted that sponsoring women and youth to visit hatcheries in countries with more successful fish farming sectors than their own would be an important area of support.

4.5.4 Land

Agripreneurs across countries emphasized the need for access to land. Those in Ghana noted that land and financial resources are key to starting a hatchery business. Similarly, Tanzanian women mentioned land as a key resource because of the need for land to rear birds. Women's inability to inherit land puts them at

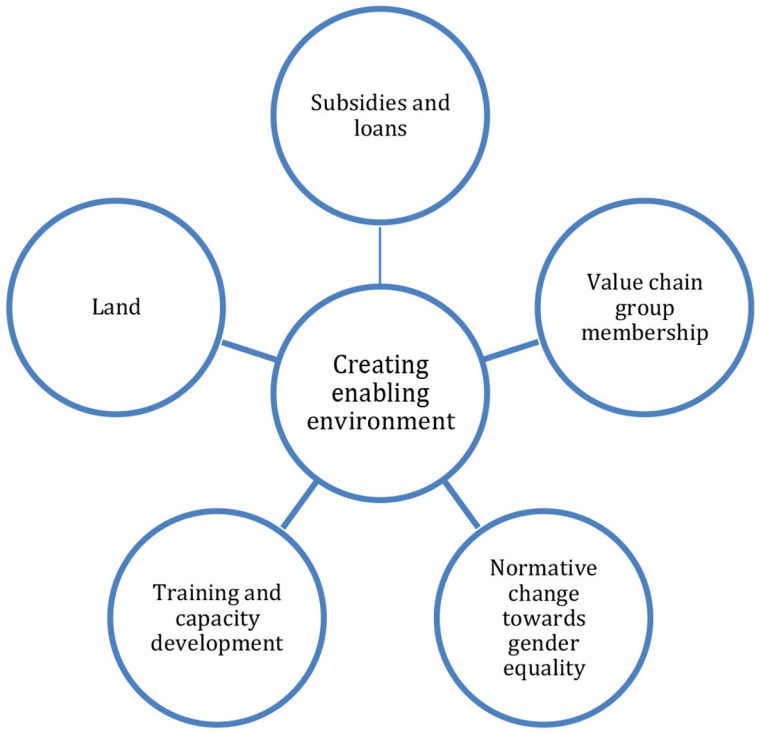

FIGURE 7
Creating an enabling environment for seed businesses.

a disadvantage to their male peers (see "Resources: Land and collateral" in the previous section).

4.5.5 Securing normative change toward gender equality

Agripreneurs in Ghana mentioned that raising awareness about the issues of women's involvement in hatcheries and fish farming in general would address important gender-related challenges to women's entry and success in the business. They suggested, for example, community-level gender awareness campaigns. Agripreneurs engaged in grow-out farming also mentioned that women's empowerment programs specifically targeted to the sector would help; and that leaders in the aquaculture sector can play an important role in addressing young women's and young men's disinterest and lack of skilled and trusted workers for hatchery and grow-out farming by making the sector more attractive to youth. Women and men agripreneurs in Kenya emphasized that donors, government, nongovernmental organizations (NGOs), and private sector players could all play important roles in raising awareness and educating farmers on the utility of certified seed, the various varieties, and the importance of insurance. Trust-building measures like these would help to improve their ability to successfully market seeds and insurance. Furthermore, they emphasized the need for the government to refrain from small business harassment created by costly regulations and required documentation; they also called for civil society mobilization to lobby the government to refrain.

5 Discussion and conclusion

Our cross-country study aimed to identify the main factors that inhibit and promote women's success in seed businesses, and to determine the roles played by gender norms and women's empowerment. Recapping our three research questions, we draw out key learning points.

5.1 Research question 1: how are women's empowerment, gender norms and agripreneurship interrelated?

First, it appears that access to resources and capital, training and information, and family support are key to women starting agricultural business. While gender norms around women's role in domestic chores and men's role in agripreneurship were strong disablers for women entrepreneurship in the study cases, the agripreneurs were able to deviate from and work through these norms. They were "deviants" from the norms and had to work extra hard to prove themselves. This indicates that some level of empowerment or specific empowerment domains relevant to the specific situation are important to the ability of women to

start an agricultural business. In the Ghanaian case study, for example, the comparative equality between women and men in some households can be correlated with the support these women receive from men in their household to start their hatchery businesses (causality cannot be established). In Kenya, women agripreneurs experience lower levels of empowerment compared to male Kenyan agripreneurs, and female and male Ghanaiain agripreneurs. However, women agripreneurs draw upon existing social capital in the form of group membership and social networks. They have important community contacts and, prior to project contact, were already social influencers in their villages. ACRE Africa's support through capacity building on insurance and marketing, and through branding women (alongside men) agripreneurs with T-shirts and badges, assists women to become effective agripreneurs. This finding shows that understanding which particular combination of empowerment domains, within a particular seed systems context, support women's agripreneurship can help to determine the most appropriate interventions.

Second, the findings raise the issue of how gender dynamics affect the significance of women's and men's empowerment scores in relation to their actual engagement in business. Achieving gender parity, with women and men having similar empowerment scores, may be insufficient to guarantee that women and men agripreneurs benefit equally from their business, given that empowered women will still face challenges in operating their business due to the existence of strong gender norms that disadvantage them. This issue is particularly important considering our finding that women agripreneurs do not only face common constraints faced by both men and women, but also additional gendered constraints, such as a lack of family support, limited mobility, high workloads, and limited access to land. Women, therefore, may need extra support in specific domains of empowerment associated with the success of their business to achieve a level playing field with their male colleagues and ensure comparable outcomes in their business. For instance, improving women's access to affordable and secure land, or challenging the perception that a woman cannot ride her own motorbike, could help address the factors that challenge women in specific empowerment domains. This conclusion is in line with the evidence on milk businesses led by women and men in Kenya and Tanzania (Galiè et al., 2022).

Third, based on additional findings not reported above, many women agripreneurs initially overestimated the ease of entering the business, and they did not necessarily recognize the salience of factors determining the success of their business, that later became critical. A notable example is family support. Women appear to have assumed that this would be forthcoming. In reality, gender norms around male breadwinning and the necessity of drawing upon household resources at start-up emerged to confound this expectation. Nevertheless, some women managed to win their families over. To manage expectations when encouraging young women and men to take on a role as agripreneur, capacity development and business incubation short courses could play a vital role. These programs could assist individuals in better assessing constraints and opportunities when establishing their businesses.

5.2 Research question 2. How important is it to address the normative gender context of the seed sector to facilitate women's agripreneurship over time?

The local gender normative context evidently influences women's capacities to continue as effective managers of their seed businesses. As the Ghana hatcheries and Tanzania chicken agripreneur cases show, ingrained norms concerning which gender ought to work in a sector limit the ability of women to fully develop business opportunities. When programs fail to achieve a change in gender norms, women risk losing control over their agricultural business as well as their place in the value chain, particularly when production and productivity increase (Omondi et al., 2014; Achandi et al., 2023).

The Tanzania case highlights how harmful gender norms contribute to systemic feedback loops which compound disadvantage upon disadvantage making it very difficult for women to act. In the cultural communities described in the case study, women cannot inherit land and as a consequence cannot use family land to rear their chickens (probably because the exercise of usufruct rights could potentially translate into ownership rights over the longer term). Renting land is also challenging as landowners can at any time wrest control over the land away from the agripreneur. The only way for women to own land is to purchase it. However, it is very difficult for women to earn sufficient money since, normatively, their businesses should remain small and be scarcely financially viable. This is because—as noted in the conceptual framework—higher level gender norms, in particular the norm that men are primary breadwinners, needs to be supported by male control over key productive assets, and over intra-household decisions regarding how to deploy assets and income (OECD, 2021; Achandi et al., 2023). While Tanzanian women agripreneurs recognize the importance of acquiring land for their chicken business, prevailing gender norms, especially those affecting single women, hinder the realization of this ambition. The women in question are typically young and unmarried. Although they could potentially benefit from participating in savings groups to pool resources for purchasing land, the influence of patrilocal marital gender norms presents a significant barrier. According to these norms, women are expected to relocate to their husband's community upon marriage. This expectation discourages young women from investing time and money into forming groups, as the likelihood of relocation diminishes their commitment and reliability as group members.

Finally, the culturally laden significance of the male breadwinner role means that women are not expected to become significant agripreneurs. Achandi et al. (2023) examined the interactions between gender norms and women's livestock businesses in Tanzania. They found that normative sanctions—such as insulting name calling and social marginalization—are applied to women who are perceived to be moving beyond acceptable gender norms in their efforts to develop dairy-related livelihoods.

Overall, our findings indicate that women agripreneurs often respond to harmful gender norms which penalize women with larger businesses through going "wide rather than deep" (see Pyburn and van Eerdewijk, 2021; Galiè et al., 2022 for further

evidence of this strategy). Rather than specializing in one node of the value chain, or a single commodity, many women prefer to engage in more limited ways in several businesses. This pluralistic strategy has a number of benefits. First, it allows them to spread risk. Second, the amount of income obtained by each small business is inevitably limited. This helps to ensure that women do not overtly challenge gender norms privileging men's income generation role whilst still enabling women to generate monies in their own name. Third, women (most likely) accrue a higher sum of money through their diverse businesses than may be apparent to their spouses and families. These are small wins, though. The downside is that this accommodative strategy leaves gender norms unchallenged and thus prevents women from investing their time and money in overtly lucrative ways. Diversification fragments women's involvement in each value chain—thus hampering their efforts to scale their involvement, improve their bargaining power, and obtain more income (Galiè et al., 2022). They are forced to spend considerable time and effort in developing and managing multiple income streams. Women may invest in crops and livestock that offer low returns, or invest in portfolios associated with women because the barriers to entry and continuing presence in these chains are less prohibitive (Okello, 2020; Ihalainen et al., 2021).

Overall, however, going wide rather than deep can increase women's time use and workloads without ensuring commensurate recompense in the form of increased income or status within the household and community (Stoian et al., 2018; Hirvonen et al., 2020; Mayoux, 2020; Ambler et al., 2021). Furthermore—and critically—would-be women agripreneurs are prevented from developing and exhibiting truly entrepreneurial behaviors. Instead, they shape their businesses around the exigencies of gender norms. In a time of climate change and other associated challenges, the inability of entrepreneurially-minded women to effectively exercise their agency in response to such challenges is likely to pose severe costs upon agrarian economies (Rietveld et al., 2023).

5.3 Research question 3. How and in what form can external support help women agripreneurs overcome gender-related constraints?

Women agripreneurs in the study received varying degrees of support to start and continue operating their seed-related businesses. Although women agripreneurs in the Kenyan case demonstrated strong existing social capital, our results suggest that women particularly appreciated ACRE Africa's support to formally recognize them as agripreneurs. This recognition facilitated their sales activities in their communities. The two other case studies indicate that women still struggled with securing community level acceptance as agripreneurs in aquaculture and chicken. Increased explicit recognition and support by external actors may have facilitated this process. The necessity of recognizing women in their roles as farmers, and agripreneurs, is widely noted in the literature (Safilios-Rothschild, 1985; Galiè et al., 2013; Haney and Knowles, 2021).

In response to such situations an initial entry point for external actors is frequently to design accommodative gender strategies which support women in their careful negotiation around, and manipulation of, gender norms. However, over time, strategies aimed at challenging and modifying harmful gender norms could be introduced with the overall aim of enabling women to go deep rather than wide (or as well as) in their businesses. It is essential that women be facilitated to build and exercise a suite of effective entrepreneurial behaviors.

Gender awareness campaigns, in association with technical support, could help guide normative change processes provided they engage with the long-term nature of the support required. Government bodies, NGOs, and donors can play a valuable support role in challenging the normative context around gender resource gaps, as well as provide technical packages and training to develop business acumen.

Challenging men's traditional role as breadwinners without creating win-win situations can lead to increase gender-based violence, potentially break up relationships, and marginalize women agripreneurs within the community (Coles and Mitchell, 2010; Farnworth et al., 2018a; FAO et al., 2023b). To help manage this conundrum, a number of behavioral strategies specifically designed to support gender-normative change in non-threatening ways have been developed and could be deployed at the community level and with value chain actors (Farnworth et al., 2018b, 2022, 2023; Ambler et al., 2021; Lecoutere and Van Campenhout, 2023). These can be complemented by making best use of information and communication technologies. In two of the case studies, WhatsApp was identified as an important source of information and social capital for the women. Television (TV) programs also serve as a powerful channel for promoting gender-normative change, embedding gender messaging within popular dramas and other TV programs, including those providing agricultural information. For example, "Shamba Shape Up," a popular farm makeover reality TV show in Kenya, broadcasted a drama in which it challenged the widespread tolerance of violence toward women taking on a proactive role in agriculture (Aju et al., 2022). This drama was informed partly by the findings from our research with men and women agripreneurs.

In conclusion, our conceptual framework examined how to create (i) equitable gender opportunities in seed entrepreneurship, and (ii) women's empowerment in the seed system. The findings show that harmful gender norms remain powerful in all three case studies and are particularly challenging in Ghana and Tanzania. In Ghana, the normative challenge appears to rest primarily on women entering a male-dominated value chain. In Tanzania, the normative challenge is even more fundamental. The very concept of women agripreneurs is questioned at a very deep level. In Kenya, by way of contrast, women agripreneurs appear to face fewer challenges due to their longer-term presence in the value chains studied.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by International Livestock Research Institute Ethics Committee. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

AG, CR, and BK contributed to the conception and design of the study. HJ organized the data and statistical analyses. TG with support from BK, CR, and AG wrote the first draft of the manuscript. TG, HJ, BK, and CR provided material for sections of the manuscript. CF wrote the second draft of the manuscript. All authors contributed to revising, reading, improving, and approving the submitted version and contributed equally to the manuscript and names are listed alphabetically in recognition of this.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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