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Advancing equitable livelihoods of people involved in Ghana's food systems: a scoping review of evidence

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Ghana's food system plays a critical role in sustaining livelihoods, particularly for smallholder farmers, women, and youth. Yet, these groups remain disproportionately affected by poverty, insecure land rights, weak market integration, and limited access to finance and public services. This scoping review synthesizes evidence from 72 empirical studies to examine the barriers and enablers of equitable livelihoods within Ghana's agri-food system. Studies were sourced from academic databases covering diverse agroecological zones and value chains including cocoa, rice, sweet potato, cashew, and fisheries. Most studies employed cross-sectional designs and focused on smallholder systems. The review identified five major thematic constraints: insecure land tenure, unequal access to credit and extension services, low resilience to climate and economic shocks, weak market linkages, and persistent gender disparities. These challenges are further compounded by low digital and financial literacy, infrastructural deficits, and exclusionary norms that marginalize women and youth. Despite these barriers, several promising interventions emerged. Gender-transformative approaches, digital financial tools, adult education, and membership in farmer-based organizations were shown to improve access to productive resources, income generation, and adaptive capacity. Findings reveal that equity in Ghana's food system cannot be achieved through isolated efforts. Integrated, context-sensitive policies that are grounded in intersectional evidence and local realities are needed to restructure institutions, enhance access to opportunity, and build resilience.

KEYWORDS

food systems, livelihoods, equity, sustainability, resilience, access

Introduction

Food systems are central to global employment and livelihoods, engaging approximately 4.5 billion individuals globally (Ebata et al., 2023). Yet paradoxically, many of those who sustain these systems such as smallholder farmers, women and informal workers, remain among the most disadvantaged and economically vulnerable (Fanzo et al., 2021). Their livelihoods are often threatened by limited access to land, finance and social protection and they remain vulnerable to climate and market shocks (Ebata et al., 2023; Fanzo et al., 2021). Efforts to transform food systems globally have increasingly emphasized the importance of equity, sustainability and resilience. International frameworks such as the Sustainable Development Goals (SDGs), specifically SDG1 (No Poverty), SDG 2 (Zero Hunger) and SDG 8 (Decent Work and Economic

Growth) stress the necessity of enhancing livelihoods for individuals reliant on food systems. The Food and Agriculture Organization (FAO) has also called for more inclusive and culturally grounded transitions that empower marginalized food system actors throughout agroecology, solidarity economies and participatory governance (Nicholls and Altieri, 2018). These global commitments are reflected in Ghana's food system priorities. Agriculture remains a cornerstone of the national economy, employing over 41.9% of the workforce and contributing significantly to Gross Domestic Product (GDP) and food security (Ministry of Food Agriculture, 2018). However, structural challenges persist. The sector suffers from low productivity, inadequate mechanization and poor market integration which disproportionately affect smallholder farmers, women and youth. These groups often lack access to critical inputs, technology and decision-making spaces. Women for instance, make up nearly half of the agricultural labor force yet encounter significant limitations in land tenure, credit access and agricultural extension services (Asante, 2024). Ghana's agri-food system features a mix of traditional, transitional and modern subsystems. Smallholder farmers dominate the traditional sector, typically working plots smaller than two hectares with limited resources and low profitability. Many supplement their income with off-farm work to survive (Asante, 2024). In contrast to farming, these off-farm components of the food systems such as processing, logistics and retail offer higher productivity and potential for job creation. However, these sectors remain underutilized and less developed than in other lower-middle-income countries, limiting their potential to absorb labor and drive inclusive economic growth (Diao et al., 2023).

Urbanization and rising incomes are reshaping food consumption patterns. Diets are increasingly becoming energy-dense and nutrient-poor, contributing to a growing burden of non-communicable diseases. Despite spending more than 40% of household income on food, nearly two-thirds of Ghanaians cannot afford a healthy diet. Micronutrient deficiencies of iron, zinc and vitamin B12 persist. These dietary challenges are worsened by post-harvest losses, poor storage infrastructure, and sharp regional disparities in food security (Asante, 2024). To address these multifaceted challenges, the Government of Ghana launched the investing for food and jobs (IFJ) framework in 2018, which built on previous strategies and aligned with the SDGs, the Africa Union's CAADP-Malabo Declaration and ECOWAP (Ministry of Food Agriculture, 2018). Flagship programmes under this framework included planting for food and jobs, rearing for food and jobs and planting for export and rural development all of which aimed to expand access to inputs, improve infrastructure and promote agribusiness development. Nonetheless, challenges remain. Ghana's agricultural policies have historically prioritized production and export, often neglecting issues such as food utilization, dietary diversity and environmental sustainability (Alliance for Food Sovereignty in Africa, 2021). Importable and less-traded value chains such as rice, pulses and small ruminants have shown promising growth. These sectors present opportunities for off-farm employment, value addition and inclusive growth (Asante, 2024). Ghana was selected as the focus of this review because it exemplifies a lower-middle-income country with diverse agroecological zones, rapid food system transitions and multiple national programmes aimed at promoting equitable livelihoods. Ghana's food system transformation agenda aligns with pathway 4 of the global food systems transformation framework, which calls for advancing equitable livelihoods for all food system actors. This review is situated within that framework and seeks to consolidate available evidence on the barriers and enablers of equity within Ghana's agri-food system. While prior reviews and sectoral assessments have examined specific dimensions of Ghana's food systems such as agricultural productivity or gendered access to resources, these typically focus on single commodities or interventions. To our knowledge, this is the first scoping review to synthesize evidence across the full food system with an explicit focus on equitable livelihoods. Accordingly, this review synthesizes evidence on the key barriers and enablers to equity within Ghana's food system, and identifies pathways for achieving more inclusive and resilient livelihoods.

Review questions

This review was guided by the following questions:

i. What types of research and interventions have been conducted in Ghana to advance equitable livelihoods among people involved in the food system?
ii. What evidence exists on the barriers faced by smallholder farmers in accessing land, capital, technology, and extension services?
iii. How do social safety nets, insurance systems, and resilience-building strategies support food system actors?
iv. What interventions have been implemented to strengthen market linkages and improve income generation?
v. What gender-specific challenges and solutions have been identified in relation to access to resources, training, and leadership opportunities?
vi. What programmes or initiatives address low levels of education and technical skills that hinder the adoption of sustainable agricultural and food system practices?

Analytical framework

The review questions served as both the conceptual foundation and analytical framework for this study. Each question corresponded to one thematic objective. During the synthesis, a hybrid thematic analysis was applied, which was deductively guided by these predefined objectives while allowing inductive identification of emerging patterns within and across studies.

Search strategies

This review included only peer-reviewed journal articles that were conducted in Ghana or were directly relevant to Ghana's food system. The review focused on literature published between January

2010 and June 2025. Searches were conducted in five academic databases: PubMed, AGORA, AGRIS, CABI Digital Library and Scopus. Each database was searched using tailored Boolean search terms aligned with the five thematic objectives drawn from pathway 4 of Ghana's National Food Systems Transformation Strategy. Searches were conducted exclusively in English only. The search was executed in two phases: the initial phase encompassed objectives 1 to 4 and took place on 22nd July 2025 across all 5 databases. The second, concentrating on objective 5 was conducted on 30th July 2025.

For objective 1, barriers to land, capital, technology and extension services were analyzed using Boolean terms that integrated keywords such as "smallholder farmers," "women," "land access," "capital," "technology," and "extension services" alongside "Ghana." To address objective 2, focusing on social safety nets, insurance and resilience strategies; employed terms such as "food system actors," "social protection," "insurance systems," "resilience," and "livelihoods," and restricted the search to studies conducted in Ghana. For objective 3, pertaining to market linkages and income generation, the search terms utilized were "market access," "value chains," "economic outcomes," and "interventions," filtered by location (Ghana). Objective 4, pertaining to gender-specific challenges and leadership opportunities, was investigated using combinations of the terms "women in agriculture," "access to resources," "training," "leadership," "barriers," and "interventions," specifically within the Ghanaian context. Objective 5 addresses low education levels, limited skills and sustainable practices, utilizing terminologies such as "education," "skills development," "sustainable agriculture," "agroecology," and "training programmes," in conjunction with "barriers" and "interventions."

Inclusion and exclusion criteria

This review focused on evidence relevant to Ghana and included studies conducted in or directly pertaining to the Ghanaian context. Peer-reviewed journal articles, project reports, student theses and documents from NGOs or government agencies were initially considered eligible for inclusion. However, most government and organizational documents were frameworks or reports that outlined planned interventions rather than empirically assessing their outcomes. Consequently, such documents were used to provide contextual information in the background section but were not included in the synthesis of results. The final review therefore focused on peer-reviewed journal articles that examined or evaluated interventions or related outcomes. Studies were included if they were published between 2010 and 2025, focused on livelihoods within Ghana's food system including any stage of the system such as agricultural production, food processing, distribution, marketing, retail or informal food vending and addressed dimensions of equity, such as gender, social protection or social inclusion. Studies were excluded if they were not based in Ghana, examined interventions unrelated to food systems or livelihoods or were purely theoretical without any empirical evidence.

Evidence synthesis

A total of 1,375 papers were retrieved online from five academic databases. Of these, 358 records were excluded due to duplication or being review papers. The title and abstracts of the remaining 1,037 papers were screened for eligibility. Nine hundred and fifty five records were excluded for not meeting the predetermined inclusion criteria. Eighty-one (81) full-text articles were assessed for eligibility based on inclusion criteria. Of these, 9 were excluded due to inaccessible full texts, leaving 72 studies included in the final synthesis (Figure 1).

The papers included were synthesized based on thematic coverage, dimensions of equity and food system components. The majority of research concentrated on smallholder production, informal processing and market involvement, though others also examined retail, food vending and access to training and services. Across the studies, equity themes such as gender disparities, access to resources, social protection and capacity building were commonly examined. The studies also varied in methods, with the majority employing cross-sectional designs and a few using qualitative, mixed methods or program evaluation approaches.

Data extraction

Data extracted from the included studies were study title, author(s) and year, study type or design, study site, target population, intervention or thematic focus and key findings. These data were obtained entirely from secondary sources identified through the literature search; no primary data were collected. A concise summary of the included studies is presented in Supplementary material, while the detailed table containing full extraction information for all 72 studies is provided as Supplementary material.

Results and discussion

The 72 studies included in this review addressed diverse but interconnected aspects of equitable livelihoods within Ghana's food system. Five major themes emerged from the synthesis: (1) barriers to land, capital, technology, and extension services; (2) the role of social safety nets, insurance systems, and resilience-building strategies; (3) interventions to address weak market linkages and income generation; (4) gender-specific challenges and equity-focused solutions; and (5) education and technical skills for sustainable food system practices. Of the 72 studies reviewed, 29 addressed barriers to land, capital, technology, and extension services; 11 examined social safety nets, insurance systems, and resilience strategies; 17 investigated interventions to strengthen market linkages and income generation; 12 explored gender-specific challenges and equity-focused solutions; and 3 focused on education and technical skills for sustainable food system practices.

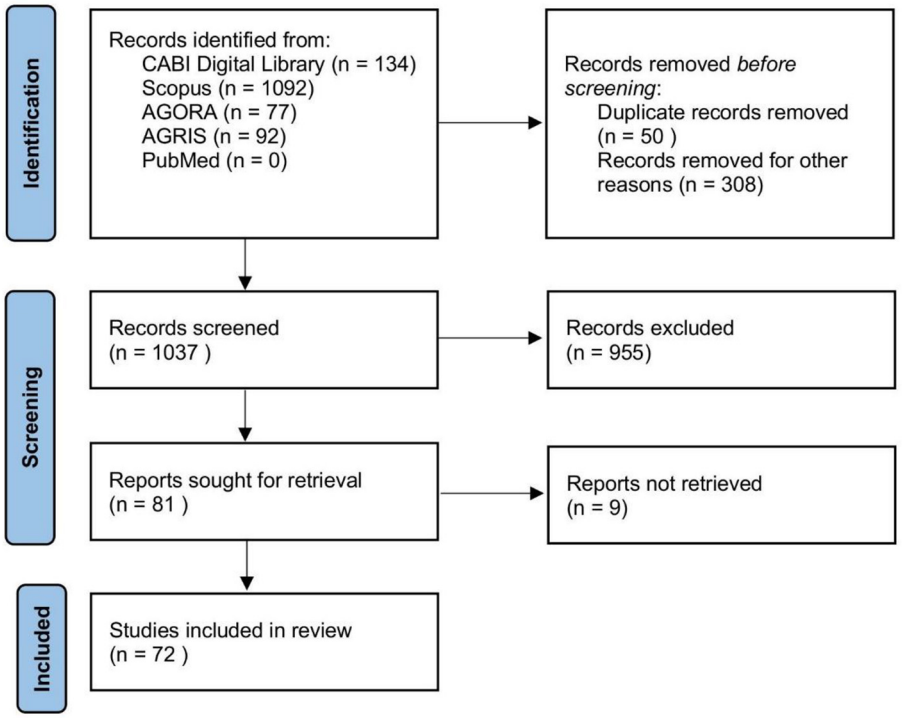

FIGURE 1
Study selection process for the review.

Barriers to land, capital, technology and extension services

Access to productive resources such as land, capital, technology and extension services remains deeply stratified and uneven across Ghana's food system, accentuating longstanding structural inequities. Of the 29 studies that addressed barriers to land, capital, technology, and extension services, 14 (48%) reported land tenure insecurity as a major constraint to long-term agricultural investment, particularly among women, migrants, and sharecroppers. Credit access was examined in 19 studies (66%), with 11 (38%) showing that secure land tenure or savings mobilization significantly improved farmers' ability to obtain loans. Extension services were discussed in 17 studies (59%), with 12 (41%) identifying extension contact as a key enabler of technology adoption and productivity. However, gendered disparities were evident: 7 studies (24%) reported that women had significantly less access to extension services, inputs, or formal credit due to socio-cultural norms and institutional exclusion. Building on this, a convergence of evidence shows that land tenure insecurity particularly among women, migrants and sharecroppers continues to constrain long-term investments in sustainable agricultural practices. In cocoa and cashew systems, for example, farmers operating under abunu and abusa sharecropping arrangements were less likely to invest in productivity-enhancing strategies due to fears of land expropriation or lack of formal documentation (Oppong Mensah et al., 2023; Bannor et al., 2020; Asaaga et al., 2020; Sedegah, 2025). Asaaga et al. (2020) similarly observed that even perceived insecurity discouraged agroforestry and soil conservation, particularly among female farmers. These patterns are especially pronounced in matrilineal areas such as Awutu Senya West, where women often relinquish land control to male relatives due to entrenched socio-cultural norms such as seeing men as strong and more capable of farming large plots (Ankrah et al., 2020). Land insecurity is closely linked to financial exclusion. Several studies found that secure land rights are often a prerequisite for accessing credit, especially formal loans requiring collateral (Asaaga et al., 2020; Ankrah Twumasi et al., 2019). Ankrah Twumasi et al. (2019) reported that farmers with mobilized savings were significantly more likely to obtain credit, but those without secure tenure remained locked out of financial markets. In the cocoa sector, only 24% of farmers accessed formal credit, and among them, nearly a quarter diverted funds to non-agricultural uses, reducing the transformative potential of credit (Abukari et al., 2022). Similarly, only 39% of rice farmers used credit, with 98% of those denied loans lacking bank accounts (Asante et al., 2023). Farm size also influenced financial access: in the Savanna and Transitional zones, larger landholdings correlated with higher farm income and greater likelihood of receiving credit (Abdallah et al., 2019).

Disparities extend beyond finance to include access to extension services and agricultural technologies. Although extension has the potential to improve both technology adoption and income, its reach remains far from universal. Anang and Amerino (2024) found that although agricultural extension was the most accessed service (71.1%) amongcocoa farmers, whereas farm credit

remained the least accessed (40.3%), suggesting that knowledge dissemination is improving but integration with financial support is weak. Extension contact emerged as a critical determinant of both technology uptake and income, particularly in cashew systems where it facilitated the adoption of improved seedlings (Bannor et al., 2020). However, the delivery of these services is far from equitable. In the fisheries sector, for example, 95% of women lacked access to extension services, cutting them off from innovations that could improve productivity (Appiah et al., 2021). Similar gendered disparities appear across crop systems: in sweet potato production, although women are the primary producers, men were more likely to adopt improved varieties due to better access to extension and inputs (Acheampong et al., 2024). Such inequalities are compounded by logistical challenges and the male-dominated structure of extension services, which discourage participation by women who often prefer female extension agents (Abukari et al., 2022).

Barriers to technology adoption also stem from infrastructural and educational limitations. In Jomoro Municipality, virgin coconut oil processors reported reduced access to raw materials due to export-driven competition, which limited the benefits of agro-processing technologies (Honlah et al., 2024). Education repeatedly emerged as an enabler for overcoming these barriers: farmers with more years of formal schooling were consistently more likely to participate in fertilizer subside schemes, adopt climate-smart agriculture and engage in agricultural innovation platforms (Abdallah et al., 2019; Anang and Amerino, 2024). Yet, access to both education and technological tools is itself stratified. Gender remains a pervasive, cross-cutting determinant across all dimensions of resource access. Female farmers are consistently less likely to own land, access formal credit, or receive extension services, most of which are often rooted in socio-cultural norms, male gatekeeping and structural exclusion from household and institutional decision-making (Asante et al., 2023; Acheampong et al., 2024). Even in programmes designed to promote gender parity such as cocoa farmer trainings, women's participation in core agricultural activities was limited due to landlessness and lack of input control (Abukari et al., 2022). The evidence suggests that addressing land tenure insecurity, improving access to formal credit and promoting gender-responsive extension systems are essential for inclusive agricultural transformation. Without reforms in these foundational areas, interventions in markets, resilience and education are unlikely to achieve lasting equity.

At a broader level, insecure land tenure and gendered access to finance remain systemic barriers that undermine sustainable investment and equitable participation. Customary land arrangements continue to exclude women, migrants and tenants from ownership and collateral opportunities, constraining credit access and discouraging long-term improvements such as irrigation or agroforestry (Asaaga et al., 2020; Sedegah, 2025; Abdallah et al., 2019; Antwi-Agyei et al., 2015). Access to financial services is further influenced by geography and institutional bias. Although outreach through microfinance and cooperative schemes has expanded, formal credit remains inaccessible for many due to collateral and documentation requirements (Ankrah Twumasi et al., 2019; Jumpah et al., 2019).

Role of social safety nets, insurance systems, and resilience-building strategies

In the face of persistent climate shocks, income volatility and market failures, farmers across Ghana increasingly rely on a mix of informal coping strategies and emerging formal mechanisms to build resilience. Yet, the penetration of formal social safety nets and agricultural insurance systems remains notably limited. Among the 11 studies that examined social safety nets, insurance systems, and resilience-building strategies, 6 (55%) focused on the role of farmer-based organizations (FBOs), savings groups, or cooperatives in enhancing resilience and access to credit. Crop or weather insurance schemes were evaluated in 4 studies (36%), with 3 reporting positive effects on income stability, climate adaptation, or willingness to pay. Social protection programs such as cash transfers or targeted subsidies were discussed in 3 studies (27%), all showing improvements in food security or adaptive capacity. Across these studies, resilience was most often linked to secure land tenure, access to climate information, and participation in collective action mechanisms. A consistent pattern emerges across these studies: despite the widespread exposure to climate-related threats such as droughts, floods, pests and market shocks, agricultural insurance awareness and use remain low. For instance, in Tolon district, only 48% of farmers were aware of crop insurance and even fewer had access to it (Anang and Amerino, 2024). Similarly, in cocoa systems, while 75% of farmers expressed willingness to adopt insurance, only 2% held existing life insurance policies (Attipoe and Adams, 2024). Among cashew farmers, preferences leaned toward hybrid insurance products combining index and windstorm products (Oppong Mensah et al., 2023). Persistent barriers such as high premiums, lack of tailored contracts, limited climate-data infrastructure and low trust in insurance providers continue to constrain participation. As a result, farmers frequently depend on informal risk-management strategies, including asset liquidation, off-farm labor, emergency seed banking and early planting. Antwi-Agyei et al. (2021) found that emergency seed banking and early planting were perceived as the most effective adoptive practices, with high weighted importance scores (0.76 and 0.72, respectively). Participation FBOs was also identified as a resilience-enhancing mechanism, improving access to agroforestry training, credit and extension services through collective action (Anang and Amerino, 2024; Tasila Konja and Mabe, 2023). Gender remains an important mediator of resilience. In Lawara-Jirapa, although 85% of farmers were aware of climate change, women's access to climate-information services was often mediated through male relatives' phones, limiting their decision-making power (Yenglier Yiridomoh and Owusu, 2022). Where women were belonged to FBOs or had direct contact with extension agents their adoption of adaptive practices like fire belts and flood drains increased significantly (Tasila Konja and Mabe, 2023). In livestock systems, hiring female animal-health providers improved women's access to vaccines and pasture, leading to higher vaccination coverage and greater empowerment (Njiru et al., 2024).

Studies from northern and dry-season farming zones further emphasize the importance of bundling formal instruments with context-relevant support. Adams et al. (2025) show that access to training, land and markets increased participation in dry-season

insurance schemes, which subsequently improved food security. Still, barriers such as distance from water sources and credit exclusion persisted. In fisheries, resilience was significantly associated with education level, social network membership and engagement with livelihood interventions (Amadu et al., 2021), affirming that resilience is both gendered and shaped by socio-economic context. Institutional innovations also contribute to household resilience. The National Food Buffer Stock Company (NAFCO) stabilized prices and reduced farmers' dependence on intermediaries, improving objective well-being by 20% and subjective well-being by 15% (Abokyi et al., 2022). Similarly, weather-index insurance such as seed insurance supported timely replanting and reduced income losses though, uptake remained low due to premium costs, lack of tailored services and limited awareness (Adams et al., 2025). Contract farming (CF) arrangements offered additional resilience benefits. In rice systems, CF improved technical, allocative and economic efficiencies by 21%, 23% and 26% respectively (Bidzakin et al., 2020). However, trust deficits and weak enforcement mechanisms undermined verbal contracts in oil-palm production, leading to side-selling and reduced confidence (Dzanku et al., 2024). In coastal and export-oriented systems such as virgin coconut oil processing, producers faced reduced access to raw materials due to external competition, which eroded both productivity and livelihood security (Honlah et al., 2024). Collectively, these findings reveal that while formal resilience mechanisms such as insurance, buffer stock schemes and CF arrangements offer significant promise, their effectiveness is currently limited by institutional inefficiencies, affordability barriers and social mistrust. Consequently, informal networks and community-based adaptation remain the dominant safety nets, especially for women and resource-limited households.

These patterns echo broader systemic challenges discussed in the wider literature. Access to insurance, credit and social protection is greatly influenced by geography, gender and institutional design. While formal interventions such as NAFCO and weather-index insurance have the potential to enhance resilience, their low uptake shows the persistent trust issues and limited contextual adaptation. As revealed in multiple studies, farmers often revert to informal mechanisms such as sharecropping, seed saving, and off-farm employment (Tasila Konja and Mabe, 2023; Yiridomoh et al., 2021; Adzawla et al., 2019), all of which provide short-term stability but do not address the structural inequalities that perpetuate vulnerability.

Interventions to address weak market linkages and income generation

Despite increasing production-oriented support, weak market linkages remain a persistent constraint on income generation for smallholder farmers across Ghana's food systems, with barriers ranging from credit inaccessibility and poor infrastructure to gender inequities and institutional mistrust. Of the 17 studies that examined interventions to strengthen market linkages and income generation, 12 (71%) focused on commercialization, market participation, or output marketing strategies. Among these, 5 studies (29%) evaluated institutional interventions such as buffer stock operations or contract farming, all reporting positive effects on income, investment behavior, or efficiency. Digital innovations were assessed in 3 studies (18%), with 2 showing measurable gains in sales and revenue, particularly among women traders. Off-farm income and diversification were identified as key enablers of market participation in 4 studies (24%), while 6 studies (35%) highlighted infrastructure deficits such as poor roads, storage, and transport as persistent barriers to effective market engagement. Gender and youth-specific constraints to market access were reported in 5 studies (29%), revealing the need for inclusive design in market interventions. Access to credit, often enabled by savings behavior emerged as a foundational enabler of market participation. In the Eastern region, 87% of farmers with savings accessed credit compared to only 17% of non-savers (Ankrah Twumasi et al., 2019), revealing the role of financial behavior in market engagement. However, credit alone does not guarantee profitability in the absence of reliable market access and pricing systems. Structural barriers such as poor road and lack of market information were highly ranked among constraints to commercialization (PCI=1690) in regionally focused analyses (Antwi-Agyei et al., 2021). To address these gaps, institutional interventions like buffer stock operations and CF have been implemented with varying success. Participation in NAFCO schemes in the transitional zone increased income by GH¢206.56 per hectare by reducing dependency on exploitative middlemen (Abdallah et al., 2019; Abokyi and Asiedu, 2021). Similarly, analyses of output-price support found programmatic gains in household income and investment behavior among maize producers (Abdallah et al., 2019; Abokyi et al., 2020). CF in rice improved efficiency across technical, allocative and economic dimensions, indicating that coordinated value-chain arrangements can raise productivity and firm up market links (Bidzakin et al., 2020). However, these institutional gains are often undermined by trust deficits and opportunistic behaviors such as side-selling in oil palm verbal contracts, which limit the scalability and permanence of benefits (Dzanku et al., 2024). Digital and market innovations are emerging as complementary pathways to strengthen linkages, though their reach is uneven. The saving grains e-commerce platform produced measurable benefits for maize traders. Those who adopted the platform recorded higher sales and revenues compared to non-users, with adoption driven by perceived ease of use, usefulness and phone literacy (Kabo-Bah and Bannor, 2025). Notably, female traders accounted for a large majority of adopters (84.09%), suggesting digital platforms can open inclusive marketing channels (Kabo-Bah and Bannor, 2025). Yet digital solutions face practical constraints such as transport costs, delayed payments, connectivity gaps and digital literacy, which limit farmer uptake and the ability of platforms to link primary producers to final markets at scale (Donkor et al., 2021; Ankrah et al., 2024).

Non-farm income and off-farm diversification also play a critical role in market participation and household welfare. Nationally representative analyses find that engagement in nonfarm activities raises the probability of market participation and is associated with higher sales and incomes, implying that liquidity from off-farm work relaxes credit constraints and enables investment in productivity enhancing inputs (Nkegbe et al., 2022).

In contexts where infrastructure and market institutions are weak, nonfarm income thus functions as an important enabler of commercialization and resilience. Similarly, dry-season farming has emerged as a complementary income source and potential equalizer, with participants selling about 26.8 kg more produce monthly than non-participants. Though distance to markets and lack of transport remain significant barriers especially for women (Adams et al., 2025).

Beyond digital platforms, physical and climatic constraints continue to interact with market interventions to shape outcomes. For instance, tomato farmers in the Ashanti and Upper East regions reported that erratic rainfall and poor roads disrupted supply chains and depressed prices, reducing the effectiveness of market interventions unless accompanied by investments in climate-sensitive infrastructure (Benabderrazik et al., 2022). Cocoa farmers in the Western North also face income instability due to low farm-gate prices and limited input access, prompting many to diversity into off-farm livelihoods (Attipoe and Adams, 2024). Export dynamics have also squeezed local processors. Virgin coconut oil processors experienced sharp declines in raw material availability due to export competition, undermining benefits from processing investments (Honlah et al., 2024). This evidence demonstrate that market-linkage interventions must be complemented by infrastructure, storage and supply-chain measures to be effective. Gender and youth dimensions are central to how market interventions play out. Women and young people are often concentrated in low-value segments and face specific constraints to capturing market gains. For example, women in fisheries and agro-processing have suffered income declines due to resource depletion and raw-material shortages tied to export markets (Appiah et al., 2021; Honlah et al., 2024). Youth participation in higher-value cash crops is low (only 9% in cocoa), while a larger in non-cocoa enterprises (28%), indicating structural barriers to entry into lucrative value chains in the Western North region (Abukari et al., 2022). Where interventions explicitly addressed inclusion such as in the Saving Grains digital platform adoption study, female traders were the predominant users, demonstrating the potential of digital innovations to promote more equitable market access (Kabo-Bah and Bannor, 2025). Nevertheless, these gains remain fragile without complementary investments in transport infrastructure, access to finance and training.

The literature indicate that institutional and digital innovations can strengthen market linkages and improve income but their effectiveness depends on complementary investments and governance, reliable transport and storage infrastructure, timely payments and contract enforcement, gender-responsive market policies and integrated financial services. Interventions that combine market facilitation with measures to build trust, reduce transaction costs and enhance inclusion are most likely to produce durable income gains for smallholder farmers.

Gender-specific challenges and equity-focused solutions

Gender-based inequities are deeply embedded across Ghana's food systems, manifesting in unequal access to land, credit, extension services, market participation and decision-making power. Out of the 12 studies that explored gender-specific challenges and equity-focused solutions, 10 (83%) reported significant gender disparities in access to productive resources such as land, credit, extension services, and inputs. Six studies (50%) reported intersectional disadvantages faced by women due to ethnicity, marital status, education, or inheritance systems. Gender-transformative approaches (GTAs) were evaluated in 3 studies (25%), all showing measurable improvements in women's empowerment, decision-making, and resource control. Additionally, 4 studies (33%) examined the role of women-led producer groups, female-focused extension models, or digital platforms in enhancing inclusion, with evidence of increased technology adoption, income generation, and market participation among women. Despite these gains, 5 studies (42%) emphasized that control over resources often remained mediated by male relatives or sociocultural norms, limiting the full realization of gender equity. Across multiple regions and crop systems, women consistently face structural disadvantages rooted in customary tenure norms, sociocultural expectations and institutional bias. In Northern Ghana, Asaaga et al. (2020) found that women's tenure insecurity, stemming from lack of formal land rights and sociopolitical status, significantly reduced adoption of agroforestry and conservation practices. In cocoa systems in Western North, women represented only 15.8% of surveyed farmers and were often excluded from inheritance and strategic farm decisions (Attipoe and Adams, 2024). Although Anang and Amerino (2024) noted isolated instances where women were perceived as more creditworthy, this advantage was highly context-specific and insufficient to offset broader exclusion. Access to extension and training services remain similarly gendered. In rice systems, women were less likely to participate in varietal trials due to domestic responsibilities and cultural restrictions (Asante et al., 2023), and in cocoa production, women had lower access to climate-smart agriculture training and credit, despite higher vulnerability to climate shocks (Attipoe and Adams, 2024; Afele et al., 2024). Gendered gaps also extend to control over agricultural inputs and labor. In integrated production systems, women's workloads increased without corresponding ownership of assets or decision-making authority (Etuah et al., 2020). These patterns reveal the substantial yet undervalued and poorly rewarded nature of women's economic contributions. Encouragingly, several interventions demonstrate the potential of gender-responsive and -transformative approaches to close these gaps. Gender-transformative approaches (GTAs), piloted in maize-livestock communities, significantly improved women's empowerment scores, autonomy and control over livestock (Njiru et al., 2024). Likewise, women-led producer groups and female-focused extension models improved technology adoption and resilience in sweet potato farming systems (Acheampong et al., 2024). In digital markets, the predominance of women in Saving Grains e-commerce maize trading revealed scalable opportunities for inclusion (Kabo-Bah and Bannor, 2025). Nonetheless, systemic barriers persist: in oil and rice value chains, female-headed households experienced greater food insecurity especially where farming and input access were weak (Dzanku et al., 2024; Donkor et al., 2021). Even when women gained nominal access to productive resources, control was often mediated by male relatives

or social norms as observed in fisheries and rice communities where resilience and commercialization outcomes lagged behind those of men (Appiah et al., 2021; Amadu et al., 2021). This evidence illustrates the persistent inequities and emerging pathways toward inclusion. Programmes that deliberately address underlying power relations through community dialogue, joint decision-making and shared resource control show measurable improvements in women's agency and productivity (Njiru et al., 2024; Fischer et al., 2024; Unnikrishnan et al., 2022; Grabowski et al., 2021). As noted in the broader discussion, gendered disparities in Ghana's food system are not merely technical gaps but structural and normative challenges that require transformative, multi-level interventions. Integrating GTAs and female-focused extension into mainstream agricultural policy, alongside reforms that expand women's land rights and financial inclusion, could accelerate equitable growth and resilience across the agri-food system.

Education and technical skills for sustainable food system practices

Education and technical training consistently emerge as foundational drivers of productivity, innovation and equity within Ghana's food system. Across crop, livestock and fisheries systems, formal education enhances farmers ability to access services, adopt sustainable practices and manage risks. Anang and Amerino (2024) found that each additional year of education significantly improved access to extension services, while Abdallah et al. (2019) showed that literate farmers were more likely to access credit and adopt new technologies. These patterns are consistent with broader evidence (Acheampong et al., 2024; Attipoe and Adams, 2024; Bidzakin et al., 2020; Donkor et al., 2021; Bannor et al., 2022) that education improves both economic and adaptive capacities, reinforcing its centrality to inclusive food system transformation. Educational attainment and technical training also influence farmers' participation in market-oriented and resilience-building interventions. In rice systems, higher education levels increased likelihood of participating in contract farming and direct marketing arrangements (Bidzakin et al., 2020; Donkor et al., 2021). In sweet potato and cashew value chains, schooling and exposure to extension programmes enhanced the adoption of improved varieites and climate-smart practices (Acheampong et al., 2024; Bannor et al., 2022). Similarly, better-educated cocoa farmers displayed stronger preferences for insurance products and were more responsive to climate-related risks (Attipoe and Adams, 2024). Education thus functions not only as a tool for knowledge acquisition but also as a mechanism that builds agency and strategic decision-making among food system actors. Beyond access and adoption, education and skills development promote livelihood diversification and innovation. Farmers with higher literacy levels were more likely to engage in dry-season farming, agroforestry and composting, all of which improved income stability and food security (Acheampong et al., 2024; Antwi-Agyei et al., 2021). In fisheries, uneducated women were disproportionately represented among those with less resilient livelihoods, revealing the vulnerability associated with education gaps (Amadu et al., 2021). Evidence from participatory and gender-sensitive training initiatives have demonstrated potential to close these gaps. The Next Generation Cocoa Youth programme (MASO), for instance, provided vocational and agribusiness training to young people, improving financial inclusion and short-term income outcomes especially for women (Unnikrishnan et al., 2022). Likewise, participatory varietal trials and farmer field schools that intentionally included women reported improvements in empowerment and productivity outcomes (Acheampong et al., 2024; Grabowski et al., 2021). These experiences affirm that when education and skills development are combined with inclusivity principles, they generate both income and social returns. Evidence from the reviewed studies demonstrate that education is both a catalyst and condition for sustainable food system transformation. While literacy and technical capacity gaps persist, typically among rural women and resource-poor farmers, targeted investments in agricultural education, local-language extension and practical training can enhance productivity, resilience and agency across Ghana's food system.

Ghana's experience mirror broader patterns across African food systems, where structural inequities in land tenure, gender norms, and market access continue to constrain inclusive agricultural transformation. Barriers to land, credit and extension services are similarly entrenched in Kenya and Malawi, where customary tenure systems and gender norms limit women's access and control over land and productive resources (Santpoort et al., 2021; Errico, 2021; Bessa et al., 2023). Resilience strategies including FBOs and insurance, are emerging across Ethiopia, though uptake remains low due to land tenure insecurity and gendered decision-making (Namubiru-Mwaura, 2014). Market linkage interventions such as buffer stock operations and digital platforms face similar infrastructure challenges in Nigeria and Tanzania, where side-selling and poor transport systems undermine scalability (Mauki et al., 2023; Mmbando, 2014; Akinwale et al., 2023). Gender disparities in resource control and decision-making are widely documented across the continent, reinforcing the need for gender-transformative approaches (Kiptot and Franzel, 2012; Galiè et al., 2015; Adeola et al., 2024). Education and technical training are increasingly recognized as foundational to inclusive agricultural transformation, with youth-focused programmes gaining traction in Rwanda, Senegal and Ghana (Kone, 2022; Muneza, 2024). Ghana's evidence base contributes to the expanding regional literature on equity, resilience, and innovation in African food systems, consistent with continental frameworks, including the African Union's Agenda 2063 and the Malabo Declaration.

Study limitations

This review is limited by its reliance on peer-reviewed journal articles which may omit relevant unpublished programme evaluations. Although it covered multiple value chains, certain sectors may have received more attention due to the distribution of available literature. Finally, while the review aligns conceptually with Ghana's policy priorities and international frameworks, it does not evaluate the implementation or impact of specific policies which would require further empirical investigation.

Conclusion

This review demonstrates that while Ghana's food system holds immense potential for advancing equitable livelihoods, persistent structural and institutional inequities hinder inclusive progress. The evidence shows that access to land, inputs, and financial services remains uneven, particularly for women, youth, and smallholder farmers. Formal safety nets and insurance systems are underdeveloped, pushing farmers toward informal coping mechanisms. Market inefficiencies, compounded by infrastructure deficits and contract failures, limit income generation, especially among those already disadvantaged. Gender disparities are deeply rooted across value chains and require transformative approaches are needed to shift norms, redistribute power, and expand access. Education and technical capacity-building stand out as cross-cutting solutions but remain insufficiently inclusive. These challenges persist despite ambitious policies under the IFJ framework. Therefore, Ghana's food system transformation must go beyond production-focused policies to prioritize equity, off-farm livelihoods, dietary outcomes, and system-wide resilience. Targeted, evidence-informed reforms guided by local realities and inclusive governance are essential to achieving the goals of Pathway 4 and the broader sustainable development agenda.

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 authors.

Author contributions

VA: Methodology, Investigation, Data curation, Writing – original draft, Conceptualization. RA: Writing – review & editing, Supervision, Validation, Conceptualization.

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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.

Generative AI statement

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Supplementary material

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