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Gender, agriculture, and rural development: Empowering women through tomato farming in Agortime-Ziope District, Volta Region

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Abstract

This study explores the role of rural women in tomato farming as a strategy for economic empowerment and community development in the Agortime-Ziope District of Ghana. A mixed-methods approach was employed, involving structured questionnaires with 90 women farmers, focus group discussions, and interviews with agricultural extension officers. The findings revealed that tomato farming contributes significantly to household income, food security, and women's participation in local decision-making. However, challenges such as limited access to land, credit, and markets constrain productivity. Statistical analysis, including Chi-Square tests, showed a strong association between land ownership and income levels, as well as between cooperative membership and leadership participation. The study concludes that empowering women through secure land access and cooperative engagement enhances both individual livelihoods and community transformation. Policy recommendations include gender-responsive land reforms and support for women-led agricultural cooperatives.

Keywords: Agricultural Emplowerment, Community Development, Gender Roles, Land Ownership, Tomato Farming.

1. Introduction

Agriculture remains central to rural livelihoods in Ghana, and women's labour and enterprise underpin much of smallholder production and household provisioning. Yet women's contributions to agriculture are frequently under-recognised in policy and statistics, and their capacity to translate farming into durable empowerment is often constrained by unequal access to productive resources and decision-making spaces (Doss et al., 2020; FAO, 2023). Tomato cultivation is a high-value, labour-intensive activity with potential to generate cash income, diversify livelihoods, and stimulate rural

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markets. In the Volta Region, tomato farming has become an important livelihood option for women in the Agortime-Ziope District, where production, trading, and farm-based employment are woven into everyday community life.

A growing body of scholarship links agricultural participation to women's empowerment, but also shows that empowerment gains are uneven and context-specific. Evidence from agricultural value chains in Asia and Africa suggests that women may experience improvements in agency and income through participation in production and marketing, yet these outcomes depend on institutional arrangements, social norms, and access to assets such as land and finance (Quisumbing et al., 2021). In Ghana, women's farming is shaped by customary tenure systems, household headship dynamics, and differentiated access to extension services and inputs. These constraints can weaken women's bargaining power and limit reinvestment in productivity-enhancing technologies (Peterman et al., 2019; Torto & Dzanku, 2021). At the same time, group-based approaches—cooperatives, farmer-based organisations, and savings groups—may expand women's information networks and bargaining leverage, and open pathways to credit and leadership opportunities (Osei et al., 2023; Quisumbing & Pandolfelli, 2018).

Despite this broad recognition, two gaps remain salient for scholarship and policy. First, empirical work on women's empowerment in tomato value chains in Ghana is concentrated in a few regions, while the Volta Region—and Agortime-Ziope in particular—remains under-studied. This matters because empowerment processes are shaped by local ecology (rainfall seasonality and irrigation constraints), market access, and the social organisation of land and labour. Second, studies frequently document constraints (land, inputs, markets) without rigorously connecting these constraints to measurable empowerment-related outcomes such as income differentials and participation in community decision-making. Addressing these gaps is important for designing interventions that move beyond "participation" to the conditions under which participation becomes empowerment.

This study responds to these gaps by analysing women's tomato farming in Agortime-Ziope through a mixed-methods case study that integrates survey evidence with focus group discussions and key informant interviews. Conceptually, the study draws on the Sustainable Livelihoods Framework, which emphasises how access to livelihood assets (natural, financial, human, physical, and social capital) and the institutional context shape livelihood strategies and outcomes (DFID, 1999; Scoones, 2019). It also engages feminist political ecology, which foregrounds how gendered power relations influence access to land, labour, and the benefits of environmental resources, and why women's constraints must be interpreted within local social norms and governance structures (Nightingale, 2018). Together, these lenses support a grounded interpretation of how women's asset access (notably land and social networks) mediates economic and social empowerment outcomes.

The article makes three contributions. First, it provides new empirical evidence from the Volta Region on how women's tomato farming contributes to household welfare and community development through income generation, employment creation, and participation in local initiatives. Second, it tests two empirically important associations using chi-square analysis—between land ownership and income categories, and between cooperative membership and participation in community decision-making—thereby linking structural constraints and collective organisation to measurable outcomes. Third, it triangulates statistical patterns with qualitative accounts to explain why these relationships arise, strengthening analytical depth beyond description.

Guided by these aims, the study addresses the following research questions: (1) How does women's participation in tomato farming contribute to household welfare and community development in Agortime-Ziope? (2) What constraints and enabling factors shape women's productivity and market participation in the tomato value chain? (3) Is land ownership associated with higher monthly income from tomato farming? (4) Is cooperative membership associated with women's participation in community decision-making? The study advances two hypotheses: H1—women with land ownership are more likely to fall into higher income categories; and H2—women who are members of cooperatives are more likely to participate in community decision-making. By clarifying these questions and hypotheses upfront, the article positions tomato farming as both a livelihood

strategy and a social process through which rural women navigate constraints, build capabilities, and contribute to rural development.

2. Data and methodology

2.1 Study area

The study was conducted in the Agortime-Ziope District in the Volta Region of Ghana, a predominantly agrarian area known for vegetable cultivation, particularly tomatoes. The district has a tropical climate and bimodal rainfall pattern that enables two main cropping seasons. Three communities—Wumenu, Kpetoe, and Ziope—were purposively selected because of their comparatively high engagement of women in tomato production and marketing.

2.2 Research design

A descriptive cross-sectional case study design was used to develop an in-depth understanding of women's roles in tomato farming and how these roles relate to empowerment and community development. The design enabled the collection of quantitative and qualitative data within the same study period and allowed triangulation across sources (Creswell & Poth, 2018). The study adopted a convergent mixed-methods logic, in which survey and qualitative evidence were collected and analysed in parallel and then integrated during interpretation to strengthen explanatory power (Teye et al., 2022).

2.3 Population and sampling

The target population comprised rural women actively engaged in tomato farming in the selected communities. Sampling combined purposive and stratified techniques to ensure inclusion of women with different farming profiles and empowerment-relevant characteristics. First, community leaders and farmer group facilitators helped develop a list of active women tomato farmers. Second, the sample was stratified by key characteristics used in analysis—years of farming experience, land ownership status (owner/non-owner), and group participation (member/non-member of a cooperative or farming association). Within strata, respondents were selected to achieve balance across categories and ensure representation of both highly active and relatively marginalised farmers. A total of 90 women were surveyed, a size considered adequate for descriptive analysis and chi-square tests within the study's case-study scope, while remaining feasible for intensive qualitative follow-up (Akrofi & Antwi, 2020).

For the qualitative component, focus group discussions were conducted with women farmers to capture shared experiences of production, marketing, and empowerment. Key informant interviews were held with agricultural extension officers and selected community leaders to contextualise institutional support, land access, and local governance dynamics. These qualitative samples were purposive, aiming for information-rich cases rather than statistical representativeness.

2.4 Data collection instruments

Primary data were collected using (i) a structured questionnaire, (ii) key informant interview guides, and (iii) focus group discussion guides. The questionnaire covered socio-demographic characteristics, farming practices, income categories, land access and tenure arrangements, access to inputs and extension services, cooperative membership, participation in decision-making, and contributions to community initiatives. Interviews with extension officers and community leaders explored service delivery, gender-responsive programming, market constraints, and land governance. FGDs elicited collective reflections on constraints, coping strategies, and pathways to empowerment. Using multiple instruments enabled triangulation and reduced the risk of single-source bias (Mohammed, 2022).

2.5 Data analysis

Quantitative data were analysed using SPSS (Version 26) to generate frequencies, percentages, and cross-tabulations. Associations between categorical variables were examined with chi-square tests, and effect size was assessed with Cramer's V to indicate practical significance. Where expected cell counts were low in multi-category tables, results were interpreted cautiously, and supporting statistics

(e.g., likelihood ratio) were reported. Qualitative data were transcribed and thematically analysed following an iterative coding process. NVivo (Version 12) supported the organisation of codes, retrieval of quotations, and development of themes. Coding proceeded from familiarisation to initial coding, theme development, review, definition, and reporting, with an audit trail to enhance transparency (Bazeley & Jackson, 2019).

2.6 Ethical considerations

Ethical clearance was obtained from relevant district authorities. All participants provided informed consent. Participation was voluntary, and confidentiality and anonymity were ensured by removing identifying information from transcripts and storing data securely.

3. Results and discussions

3.1 Results

This section reports findings from the survey (N = 90) and qualitative evidence from focus group discussions and key informant interviews. Results are organised into fewer, stronger themes to reduce overlap and improve analytical clarity.

3.2 Socio-demographic profile

Women farmers were predominantly in their economically active years, with the largest proportion aged 36–45 years (30%). Marital status was mixed (married: 36%; single: 30%; divorced: 20%; widowed: 14%). Educational attainment varied: 34% reported no formal education, while 16% had tertiary education, suggesting constraints for some women in accessing written market information and formal agricultural training opportunities.

3.3 Livelihood benefits and economic empowerment from tomato farming

Tomato production was seasonal and closely linked to rainfall and water availability. As one participant explained, "We usually start preparing the land in January, and by March, we are transplanting. Harvesting is often from June to August." Some women planted twice annually when water was available: "I plant twice a year. It depends on the availability of water."

Tomato farming contributed meaningfully to household welfare. For 31% of respondents, tomato farming was the primary income source, while 45% described it as a supplementary source. Women reported using farming income for school fees, healthcare, and improved household nutrition. A participant noted, "Because of tomatoes, I was able to pay my daughter's school fees last term." Respondents also described farm-based employment creation during peak periods, typically hiring one to five workers.

3.4 Association between monthly income and land ownership

Table 1 (Appendix A): Chi-Square Test of Association Between Monthly Income From Tomato Farming and Land Ownership (N = 90)

Test statistic	Value	df	p
Pearson Chi-Square	72.983	4	< .001
Likelihood Ratio	94.314	4	< .001
Linear-by-Linear Association	50.133	1	< .001

Note. 4 cells (40.0%) had expected counts less than 5; minimum expected count = 1.89. Cramer's V = 0.90 (large).

A chi-square test examined the relationship between land ownership and monthly income categories from tomato farming. The association was statistically significant, $\chi^2(4, N = 90) = 72.983$, $p < .001$, with a large effect size (Cramer's V = 0.90). The likelihood ratio was also significant, $\chi^2(4) = 94.314$, $p < .001$. Because 40% of cells had expected counts below 5 (minimum expected count = 1.89), the result was interpreted with caution; however, the consistent significance across statistics suggests that income distributions differed markedly by land ownership status.

3.5 Resource constraints: land access, inputs, credit, and water

Land access was a persistent constraint. Only 38% of respondents owned the land they cultivated. Women described gendered barriers within customary tenure systems: "Sometimes land is not given to us because we are women. Even when you have money to rent land, they prefer to give it to a man." Key informants corroborated this, noting that women often had the willingness to farm but lacked secure access to land.

Input costs and biophysical stressors also affected productivity. Participants frequently cited pest and disease pressure and the cost of agrochemicals: "The pests and diseases are too much. Sometimes you spray and spray, and still the insects destroy everything." Water scarcity and limited irrigation were highlighted: "We lack irrigation. When there is no rain, we suffer, especially in the dry season."

Access to credit was limited: 55% reported no access to credit facilities. Women linked this to difficulties purchasing inputs and coping with seasonal shocks: "Affordable loans would help us buy more inputs and improve our farms." While some had received subsidised inputs in the past, support was described as inconsistent.

3.6 Extension services, training, and innovation

Women reported mixed access to extension and training. More than half (55%) indicated adopting improved practices such as mulching and the use of improved seed: "I tried mulching for the first time last season because they taught us it helps retain soil moisture." An extension officer described support initiatives including climate-smart practices, water-efficient irrigation advice, and value-addition training: "Women learned how to process tomatoes into puree and sauce for local sale." Participants also reported peer learning, with trained women sharing practices in their communities.

3.7 Markets, value chain dynamics, and post-harvest losses

Marketing challenges were prominent, particularly transport costs, price volatility, and intermediary power. Women reported post-harvest losses due to perishability and weak storage: "Transport is expensive, and when the tomatoes spoil, we lose everything." Another noted, "The middlemen cheat us. They buy at very low prices, but we have no choice." These constraints reduced net income despite labour inputs and affected women's capacity to plan and reinvest.

3.8 Social empowerment, collective action, and community participation

Group participation was relatively high: 67% reported membership in a cooperative or farming group. Women described groups as platforms for resource sharing, training, and collective bargaining. Participation in community decision-making was also common (75%), with women serving on committees and contributing to local advisory processes. An extension officer highlighted ripple effects of peer leadership: "She now trains other women in her village, this is the ripple effect we aim for."

Table 2 (Appendix B): Chi-Square Test of Association Between Cooperative Membership and Participation in Community Decision-Making (N = 90)

Test statistic	Value	df	p
Pearson Chi-Square	61.247	1	< .001
Continuity Correction	57.209	1	< .001
Likelihood Ratio	68.052	1	< .001
Fisher's Exact Test (2-sided)	—	—	< .001
Fisher's Exact Test (1-sided)	—	—	< .001
Linear-by-Linear Association	60.567	1	< .001

Note. No cells had expected counts less than 5; minimum expected count = 7.09. Cramer's V = 0.82 (large).

Association between cooperative membership and decision-making participation

A chi-square test assessed whether cooperative membership was associated with participation in community decision-making. The relationship was statistically significant, $\chi^2(1, N = 90) = 61.247$, $p < .001$, with a large effect size (Cramer's V = 0.82). Assumptions were met (minimum expected count = 7.09). The result indicates that cooperative members were substantially more likely to participate in decision-making, supporting the role of collective organisation in women's social empowerment.

4. Discussion

This study demonstrates that women's tomato farming in Agortime-Ziope contributes to rural development through household welfare improvements, employment creation, and enhanced participation in community life. At the same time, women's empowerment outcomes were shaped by unequal access to assets and institutions, consistent with gender-and-agriculture scholarship.

4.1 Gendered labour and livelihood contributions

Women in this study undertook core tasks across the tomato production cycle and engaged in marketing, underscoring the centrality of women's labour in African smallholder systems (Doss et al., 2020). Reported welfare gains—schooling, healthcare, and nutrition—align with evidence that women's control over agricultural income can increase household investment in human capital (Galiè et al., 2021). These findings support the view that women's productive roles are closely tied to broader social reproduction and community wellbeing.

4.2 Land access as a foundation for economic empowerment

The strong association between land ownership and income categories (χ^2 significant; Cramer's V large) suggests that secure land access is a decisive factor for women's earning potential in tomato farming. This aligns with evidence that gender gaps in non-land inputs and services are compounded by limited control over land, which affects women's ability to invest, access credit, and benefit from extension (Peterman et al., 2019). However, the presence of low expected cell counts in the multi-category income table requires cautious inference; importantly, the qualitative accounts reinforce the mechanism: insecure tenure discourages long-term investment and limits bargaining power in renting arrangements. In feminist political ecology terms, women's constrained access reflects gendered power relations embedded in customary tenure, shaping who can claim productive resources and benefit from them (Nightingale, 2018). The policy implication is that land governance reforms must be attentive to local norms and enforcement, not only formal rights.

4.3 Services, inputs, and adaptive practices

Women's mixed experiences with extension and input access reflect patterns documented in Ghana, where women's access to extension can be mediated by household headship and social positioning (Torto & Dzanku, 2021). The uptake of improved practices and peer learning suggests that when services reach women, knowledge diffusion can be rapid. From a livelihoods perspective, training and extension strengthen human capital and can translate into better livelihood outcomes when paired with access to financial and physical capital (DFID, 1999; Scoones, 2019). Yet high input costs and limited irrigation indicate that capability gains alone are insufficient without complementary infrastructure and finance.

4.4 Value chain constraints and market power

Marketing challenges; transport costs, intermediary dominance, and post-harvest losses—mirror wider evidence on constraints in Ghana's tomato markets, where weak storage and infrastructure reduce farmers' returns (Asante et al., 2020). Women's narratives suggest that market power asymmetries translate into lower farm-gate prices and reduced income stability, thereby limiting reinvestment. Strengthening market linkages, storage, and local processing would reduce losses and improve women's bargaining position.

4.5 Collective action, leadership, and community decision-making

The significant association between cooperative membership and decision-making participation (χ^2 significant; Cramer's V large) supports the argument that collective organisation can amplify women's voice and leadership. This aligns with evidence that women's groups and networks can improve access to resources and create pathways for participation in governance and innovation (Quisumbing & Pandolfelli, 2018). It also resonates with value-chain evidence that institutional arrangements—especially group-based structures—can enhance women's agency, although gains remain context-dependent (Quisumbing et al., 2021). In Agortime-Ziope, cooperatives functioned as both economic and social platforms, enabling information sharing, collective bargaining, and public participation, thereby strengthening social capital and agency.

Overall, the findings reinforce that empowerment through agriculture is not automatic. It depends on asset access (notably land and finance) and on collective and institutional mechanisms (cooperatives, extension systems) that shape women's ability to convert effort into income and influence.

5. Conclusion and policy implications

5.1 Conclusion

This study examined women's tomato farming in Agortime-Ziope as a pathway to empowerment and community development. The evidence shows that tomato farming contributed to household welfare, seasonal employment, and community engagement, indicating that women's agricultural activity is a practical driver of rural development. However, empowerment gains were constrained by systemic barriers—especially insecure access to land, limited credit, high input costs, water constraints, and weak market infrastructure. The study also shows that collective organisation matters: cooperative membership was strongly associated with participation in community decision-making, suggesting that women's groups can convert economic participation into social and civic agency.

Two implications follow. First, land access remains foundational for economic empowerment in tomato farming, and women's tenure security should be treated as a development priority. Second, strengthening cooperatives and extension outreach can expand women's capabilities and leadership, but these gains require complementary investments in finance and infrastructure.

5.2 Policy and programmatic implications

Policy interventions should prioritise (i) gender-responsive land governance (transparent allocation and secure rental arrangements for women), (ii) targeted and affordable credit for women tomato farmers, linked where feasible to cooperative structures to reduce transaction costs, (iii) strengthened extension services with increased engagement of female agents and practical, climate-smart packages, (iv) irrigation and water management support to stabilise production across seasons, and (v) market infrastructure, including feeder roads, aggregation points, and storage or small-scale processing to reduce post-harvest losses. Programmes that engage men and local gatekeepers alongside women can help shift norms that restrict women's access to land and leadership. Future research should use longitudinal designs to assess how reforms in land access, finance, and cooperative strengthening affect empowerment trajectories over time and across different value chains.

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