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Research Article

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Posted Date: July 8th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10118732/v1>

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The Role of Indigenous Minor Crops in Enhancing Food Security and Climate Resilience among Smallholder Farmers in Ghana

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Abstract

Climate change poses a growing threat to smallholder farming in Ghana, where dependence on a limited range of staple crops increases vulnerability to drought, heat stress, and erratic rainfall. Identifying resilient, locally adapted crop options is therefore critical for strengthening climate adaptation and sustaining rural livelihoods. This study examined the contribution of minor crops to climate adaptation and livelihood resilience among smallholder farmers in Ghana. Using a mixed-methods approach, data were collected from 750 farming households across 15 communities in the Ashanti, Ahafo, and Western North regions, representing forest and forest-savannah transition agroecological zones. Structured household surveys, focus group discussions, and field crop inventories were used to document crop diversity, livelihood contributions, and farmer perceptions. A total of 43 minor crop species were identified, spanning indigenous vegetables, root & tuber crops, legumes, cereals, and fruit crops, many of which exhibited drought tolerance and high nutritional value. Households cultivating more than 20 minor crop species experienced shorter hunger-gap periods (1.7 months year⁻¹) compared with households cultivating five or fewer species (4.5 months year⁻¹), while household dietary diversity scores increased from 4.0 to 8.6. More than 40% of

households reported that minor crops contributed up to 30% of total household income. Farmers also perceived these crops as important for buffering climate-related production risks, conserving agrobiodiversity, and reducing dependence on costly external inputs, highlighting their potential for resilient, sustainable smallholder farming. This study is one of the first multi-regional assessments of minor crops in Ghana, combining household livelihood indicators with farmer perceptions in evaluating resilience and livelihood security for sustainable agriculture.

Keywords: Biodiversity Conservation, Climate Adaptation, Climate Resilience, Minor crops.

1. Introduction

Agriculture anchors Ghana's rural economy, sustaining about 33% of the population through smallholder systems on rainfed plots averaging 1.2 hectares (Dinye 2013; Otwe et al. 2025). Yet this sector teeters on the edge of climate volatility. Erratic rainfall, once bimodal and reliable, now brings intense bursts followed by prolonged dry spells, while temperatures have risen by 1°C since the substitution of industrialisation-related structural adjustments in the 1980s, pushing heat stress beyond tolerance levels for key crops (Otwe et al. 2025). Maize yields, for instance, fell by 35% (Ghana Grains Council 2024), and cassava faced viral outbreaks worsened by humidity swings in Ghana (Sikazwe 2026). These shocks ripple into food insecurity. Ghana's agricultural GDP contribution has halved from approximately 45% in the 1990s to 19% in 2025 (World Development Indicators 2024), risking further decline without climate-smart investments (Awuni et al. 2023).

Agricultural policy interventions focus on staples (i.e., maize, rice, and cassava) through hybrid seed, fertilizer, and irrigation pilots (Osei et al. 2020) under programs like Planting for Food and Jobs (PFJ) (Pauw 2022). Despite their importance, these interventions often overlook minor or underutilized crops, such as *Dioscorea* spp. (*kokoo ase bayere* and *afase*), *Ipomoea batatas* (sweet potato), and *Colocasia esculenta* (taro) (Bandanaa et.al. 2023). For this study, minor crops refer to locally important but relatively underutilized crop species that receive limited research, policy, and market attention compared with dominant staples such as maize, rice, and cassava.

These species, often intercropped or foraged, evolved in Ghana's agroecologies, offering deep roots to evade drought, short growth cycles to dodge late rains, and nutrient density from vitamins to proteins (Polycarp et al. 2012; Mahaman Mourtala et al. 2023; Modi 2025). Historical and contemporary evidence suggests that many indigenous and neglected crops in Ghana have helped sustain rural food security, but

modernisation and policy biases toward staple and commodity crops have contributed to their marginalization (Quan-Baffour 2017). This oversight carries significant consequences. In marginal areas such as the savanna regions of Ghana, where access to irrigation remains limited, smallholder farmers depend on low-input and resilient farming options (Bawa 2019), hence, integrating minor crops into existing systems not only helps to spread production risks but also contributes to environmental sustainability, including soil carbon sequestration 30% higher in leguminous species compared to other crops, in line with Ghana's Nationally Determined Contributions (Kumar et.al. 2018; Adombire et.al. 2024). Evidence from other regions reinforces this potential. In Ethiopia, crops such as teff and enset have been shown to reduce hunger during drought periods (Yemata 2020), while in India, millets have gained recognition as “nutri-cereals” due to their resilience and nutritional value (Saini et.al. 2021). Although some studies in Ghana have examined crop diversification, indigenous food crops, and minor crops (Ayivor et.al. 2015; Appiah-Twumasi and Asale 2022), empirical evidence remains limited on their diversity, local significance, and livelihood contributions across the forest and forest-savannah transition zones, particularly in relation to food security, household income, and farmer adaptation under climate variability. To address this gap, the present study examines the role of minor crops in enhancing resilience among smallholder farmers in Ghana. Specifically, the study pursues three objectives: (1) to document the diversity of minor crop species, including their traits and local names within selected communities; (2) to assess the relationship between crop diversity and key livelihood outcomes, particularly food security (measured through hunger gaps and dietary diversity) and household income; and (3) to explore farmers' perceptions of the role of minor crops under changing climatic conditions. Unlike previous studies in Ghana, which have largely focused on crop diversification in isolated agroecological settings or emphasised major staple crops, this study provides one of the first multi-regional assessments of minor crops across Ghana's forest and forest-savannah transition agroecological zones. By integrating household-level quantitative indicators with farmer knowledge and perceptions, the study offers a more holistic understanding of how minor crops contribute to resilience, livelihood security, and agro-biodiversity conservation. Drawing on evidence from farmers in the Ashanti, Ahafo, and Western North regions, the findings provide context-specific insights for extension services, policymakers, and researchers, while contributing to the growing discourse on climate-smart agro-biodiversity and biodiversity-based adaptation strategies (Barasa et al. 2021; Sawicka et al. 2025).

[Insert Figure 1 here]

Figure 1. Conceptual framework linking minor crops to climate adaptation and resilience among smallholder farmers in Ghana.

The framework illustrates how climate-related stressors affect smallholder farming systems in Ghana and highlights the role of minor crops as a practical adaptation pathway (Figure 1). The framework guided the selection of variables measured in the study. By promoting diversification, these crops contribute to improved food security, increased household income, enhanced ecological sustainability, and strengthened long-term resilience.

2. Materials and Methods

[Insert Figure 2 here]

Figure 2: Map of Ghana showing study locations

2.1 Study Area and Sampling Design

The study was conducted in three regions of Ghana representing distinct agroecological zones: Ashanti, Ahafo, and Western North (Figure 2). These regions were purposively selected for their exposure to climate variability, dependence on smallholder agriculture, and the observed cultivation and use of minor crops in local farming systems. Ashanti lies within the forest transition zone, characterized by bimodal rainfall and relatively favourable growing conditions. Ahafo represents the transition toward drier savanna conditions, where rainfall variability and prolonged dry spells increasingly affect agricultural production. Western North falls within the humid forest zone, although recent climatic variability has contributed to irregular dry periods and changing production conditions (FAO 2005). Fifteen farming communities (five per region) were selected in consultation with district agricultural officers based on two criteria: (i) evidence of minor crop cultivation and utilization, and (ii) vulnerability to climate-related production constraints such as erratic rainfall and drought stress. Within each community, farming households were selected using stratified random sampling to ensure representation across gender, age groups, educational level, farm size categories, and farming experience (Table 1). Household sampling frames were developed with the support of local agricultural extension officers and community leaders. Fifty households were selected per community, resulting in a total sample of 750 households. The Household characteristics are presented in Table 1.

[Insert Table 1 here]

Table 1. Socio-demographic and Farm Characteristics of Surveyed Households (n = 750)

2.2 Research design and data collection

A mixed-methods approach combining quantitative household surveys, qualitative focus group discussions, and field-based crop inventories was employed over three months to capture both measurable livelihood outcomes and farmer perspectives on climate adaptation.

Structured questionnaires were administered to all 750 selected households to collect data on household demographics, farm characteristics, crop production practices, sources of household income, and food security indicators. Crop diversity was assessed by recording the number and types of minor crop species cultivated by each household. Household food security was assessed using two indicators. First, the hunger-gap duration was measured as the number of months in the previous 12 months during which households reported inadequate food availability. Second, household dietary diversity was assessed using the Household Dietary Diversity Score (HDDS), calculated from the number of food groups consumed by household members during a 24-hour recall period, following FAO guidelines (Kennedy et. al. 2011). Households were also asked to estimate the contribution of minor crops to total household income and to assess crop performance under climate-related stresses such as drought and irregular rainfall. To complement the household survey, focus group discussions (FGDs) were conducted separately for men and women in each study community to explore local knowledge, perceptions of climate change, adaptation practices, and the perceived role of minor crops in food security, income generation, and resilience building. Gender-disaggregated discussions were used to capture potentially distinct experiences and priorities regarding crop use and household adaptation strategies. Field observations and crop inventories were conducted through guided transect walks with participating farmers to verify reported crop species, document their local names, and record observable characteristics relevant to adaptation, including drought tolerance, persistence under low-input conditions, and nutritional relevance based on literature-supported classifications.

2.3 Data Analysis

Quantitative data were analyzed using Python 3.11, with SciPy 1.17.1 and statsmodels 0.14.6 (Hossain et.al. 2026). Descriptive statistics were used to summarize household characteristics, crop diversity, income contributions, and food security indicators. To examine associations between minor crop diversity and household food security outcomes, households were grouped into crop diversity categories based on the number of minor crop species cultivated (≤ 5 , 6–10, 11–20, and >20 species). Differences in hunger-gap duration and household dietary diversity scores across diversity groups were assessed using one-way Analysis of Variance (ANOVA), after confirming normality and homoscedasticity assumptions, followed by Tukey's Honestly Significant Difference (HSD) test for post hoc mean comparisons at a 5% significance level. Income contributions from minor crops were analyzed descriptively using frequency distributions

and proportional household income categories. Qualitative data from focus group discussions were transcribed, coded, and analyzed thematically to identify recurring perceptions regarding climate resilience, nutritional benefits, biodiversity conservation, income generation, and reduced dependence on external agricultural inputs. Thematic findings were triangulated with quantitative results to provide a comprehensive interpretation of the role of minor crops in adaptation.

3. Results

3.1 Diversity and Functional Traits of Minor Crops in the study communities

Across 750 households, 43 minor crop species were documented across five crop groups: indigenous vegetables, fruit crops, root crops, legumes, and cereals. Root crops recorded the highest species richness, with 19 species (44% of total identified species), followed by indigenous vegetables with 14 species (33%). Fruit crops and legumes each accounted for four species, while cereals were represented by two species (Table 1). The documented species included both commonly cultivated and locally recognized crops, with local nomenclature recorded to capture indigenous knowledge systems (Table 1). Drought tolerance varied substantially among crop groups (Table 2). Legumes showed the highest proportion of drought-tolerant species (80%), followed by indigenous vegetables (70%) and root crops (60%). Cereals (50%) and fruit crops (40%) recorded comparatively lower drought tolerance. In terms of nutritional contribution, legumes recorded the highest proportion of species classified as providing essential nutrients (90%), followed by indigenous vegetables (80%), fruit crops (70%), and both root crops and cereals (60%) (Table 2).

[Insert Table 2 here]

Table 2. Representative minor crop groups with their common names, scientific names, and Twi local names across the studied communities in Ghana

[Insert Table 3 here]

Table 3: Diversity and Functional Traits of Minor Crop Groups in Ghana

3.2. Relationship Between Crop Diversity and Livelihood Outcomes

Household food security outcomes varied according to crop diversity levels. Households cultivating a wider range of minor crops reported shorter hunger-gap periods compared with those cultivating fewer crop

species (Figure 3a). The one-way ANOVA revealed a statistically significant effect on hunger-gap duration (F (3, 746) = 64.49, $p < 0.001$), ANOVA results are provided in Supplementary Table 1. Hunger-gap duration declined from 4.5 months in households cultivating ≤ 5 species to 1.7 months among households cultivating >20 species ($p < 0.001$). Similarly, HDDS increased from 4.0 to 8.6 ($p < 0.001$) (Figure 3b). Households with higher levels of crop diversity recorded greater average dietary diversity scores than households with fewer cultivated species. The one-way ANOVA also revealed a statistically significant effect of crop dietary diversity score (F (3, 746) = 64.49, $p < 0.001$), ANOVA results are provided in Supplementary Table 2. These findings indicate a positive association between crop diversity and both food availability and dietary quality among surveyed households.

[Insert Figure 3 here]

Figure 3: a) Crop Diversity and Hunger-Gap Duration b) Crop Diversity and Dietary Diversity Score.

Minor crops contributed meaningfully to household livelihoods (Figure 4). More than 40% of sampled households reported that minor crops contributed up to 30% of total household income. Smaller proportions of households reported either lower or higher contributions. Farmers also reported that minor crops served as supplementary sources of livelihood, particularly during periods of reduced staple-crop productivity or market uncertainty.

[Insert Figure 4 here]

Figure 5: Minor Crops Contribution to Household Income

3.2 Farmer Perceptions of the Role of Minor Crops Under Changing Climatic Conditions

Farmers identified several perceived benefits associated with minor crop cultivation (Figure 5). Conservation of agricultural biodiversity was the most frequently reported benefit (70%), followed by protection against weather extremes (68%), improved household nutrition (64%), and income stability (58%). Reduced dependence on costly agricultural inputs was reported by 52% of respondents, while climate change mitigation was the least frequently cited benefit (48%). These responses suggest that farmers perceive minor crops as multifunctional assets that contribute to livelihood resilience, food security, and environmental sustainability.

[Insert Figure 5 here]

Figure 6: Household-Perceived Benefits of Minor Crops

4. Discussions

4.1 Conservation and Utilization Potential of Minor Crop Diversity for Sustainable Agriculture in Ghana

The diversity of 43 minor crop species documented across the study communities highlights the continued relevance of these crops in smallholder farming systems in Ghana. The dominance of root crops and indigenous vegetables is consistent with national inventories and surveys that report a strong presence of leafy indigenous vegetables and tuber/root crops across Ghanaian production systems (Aidoo et al. 2019; Amagloh et al. 2020; Atuna et al. 2022). The recording of both local and common names also aligns with earlier ethnobotanical studies in Ghana and West Africa, which emphasise the importance of indigenous knowledge in crop identification and conservation (Boakye and Agyeman 2022; Asigbaase et al. 2023). The relatively high drought tolerance observed among legumes and indigenous vegetables suggests that these crop groups are particularly relevant for climate-resilient agriculture. Similar findings have been reported in studies showing that indigenous and underutilised crops often possess adaptive traits such as drought tolerance, short maturation periods, and low external input requirements, making them suitable for farming systems exposed to increasing rainfall variability (Melese et al. 2025; Erick et al. 2026). The strong nutritional contribution of legumes and indigenous vegetables reinforces their dual importance in adaptation and nutrition security. Regional studies have shown that African indigenous vegetables are important sources of micronutrients, including vitamins A and C, iron, and calcium (Atuna et al. 2022; Lara-Arevalo et al. 2024). Similarly, legumes have been widely recognised for their contribution to protein, drought tolerance, and soil fertility enhancement through nitrogen fixation (Melese et al. 2025). The co-occurrence of high species richness, drought tolerance, and nutritional value among root crops, indigenous vegetables, and legumes suggests that these crop groups perform multiple functions in smallholder farming systems, including dietary support and climate buffering through staggered production cycles and persistence under low-input conditions (European Commission 2025; Kumawat et al. 2022).

4.2. Crop Diversity as a Strategy for Improving Household Livelihoods

The observed association between greater crop diversity and improved household food security supports the proposition that diversified farming systems enhance resilience among smallholder households. Households cultivating a wider range of minor crops experienced shorter hunger-gap periods, suggesting improved year-round food availability. This finding aligns with studies showing that crop diversification helps spread production risk and improves resilience under climatic uncertainty (Appiah-Tsumasi and Asale 2022; Mihrete and Mihretu 2025). The staggered maturation of root crops, indigenous vegetables, and legumes likely creates temporal complementarity, enabling households to access food at different times and

reducing seasonal hunger periods (Biwott 2025). The results are also consistent with research on the “portfolio effect” in agriculture, where maintaining multiple crop species with varying climatic tolerances and harvest periods reduces vulnerability to environmental shocks (Labeyrie et. al. 2021; Yeleliere et. al. 2023). Similarly, the positive relationship between crop diversity and dietary diversity suggests improved nutritional outcomes among more diversified households. Comparable findings have been reported in Northern Ghana (Saaka et al. 2017), Tanzania (Rajendran et al. 2017), and broader cross-country studies in Kenya, Indonesia, Ethiopia, and Malawi (Sibhatu et al. 2015). The combined effects of reduced hunger gaps and improved dietary diversity underscore the role of crop diversity in supporting both food quantity and dietary quality (Fremmpong et.al. 2023). However, because this study is cross-sectional, these associations should be interpreted cautiously, as other socioeconomic factors may also influence household food security outcomes.

The findings indicate that minor crops contribute meaningfully to household livelihood diversification and income generation. The fact that over 40% of households reported deriving up to 30% of household income from these crops suggests that their value extends beyond subsistence production. This finding is comparable to evidence from Ethiopia, where diversified livelihood systems similarly derive meaningful household income from non-major crop enterprises (Mada and Menza 2015). Evidence from Ghana also suggests that increasing crop diversity can contribute to poverty reduction among rural households (Danso-Abbeam 2025). The ability of minor crops to provide income during periods of staple crop failure or market instability reinforces their role as livelihood buffers (Manlosa et. al. 2019; Ccardesa 2019). Their adaptive resilience to drought, poor soils, and rainfall variability further enhances their economic value by reducing the risk of complete crop failure (Ndlovu et al. 2024; Porcuna-Ferrer et al. 2024).

4.3 Farmer Perceptions Confirm the Adaptive Value of Minor Crops for Climate Resilience in Ghanaian Agriculture

Farmers’ perceptions further reinforce the adaptive importance of minor crops in climate-vulnerable farming systems. The high proportion of respondents identifying biodiversity conservation as a major benefit aligns with the literature showing that minor crops contribute to on-farm genetic diversity and agrobiodiversity conservation (Bandanaa et al. 2023; Panthi et al. 2026). On-farm diversity also provides reservoirs of adaptive traits useful for responding to pests, diseases, and climatic stressors (Frison et. al. 2011). The strong perception of protection against extreme weather and improved nutrition is consistent with evidence that drought-tolerant, locally adapted crops can strengthen resilience and reduce seasonal food insecurity (Porcuna-Ferrer et.al. 2024; Saaka et.al. 2017). Reported benefits related to income stability and reduced dependence on purchased inputs also support the finding that minor crops often require fewer

purchased inputs and help diversify income streams (Glatzel et al. 2025; Rajendran et al. 2017). This also align with studies highlighting the affordability and resilience of minor crops for resource-constrained households (Mgwenya et. al. 2025).

The relatively lower recognition of climate mitigation benefits suggests that farmers prioritise immediate livelihood gains over longer-term ecosystem services, a pattern commonly observed in smallholder farming contexts (González-Estrada et al. 2008; Öborn et al. 2017). Nevertheless, some minor crop systems may contribute to carbon sequestration and reduced emissions through lower input use and improved soil management (Bot and Benites 2005; ICARDA 2024).

These findings have important implications for agricultural and climate adaptation policy in Ghana. Despite their demonstrated contributions to food security, dietary diversity, income generation, and resilience, minor crops receive limited attention within mainstream agricultural development programmes. Integrating selected minor crops into national initiatives such as the Feed Ghana programme and related agricultural transformation strategies could promote crop diversification and reduce dependence on a few staple crops. Strengthening community-based seed systems would improve access to quality planting materials and support the conservation of locally adapted genetic resources. In addition, investments in local value chain development, including processing, storage, market linkages, and commercialization, could enhance the economic attractiveness of these crops for smallholder farmers. Agricultural extension services should also incorporate minor crops into climate-smart extension packages, providing farmers with technical guidance on production, utilization, and marketing. Such interventions would not only strengthen household resilience to climate variability but also contribute to biodiversity conservation, nutrition security, and the long-term sustainability of Ghana's agricultural systems. This study offers one of the first evidence across multiple regions of Ghana, that minor crops should not only be seen as marginal crops, but rather as strategic resources for climate resilience, food security and agrobiodiversity conservation.

5.0. Conclusion

This study demonstrates that minor crops play a critical role in enhancing climate resilience among smallholder farmers in Ghana. By diversifying farming systems, these crops help reduce vulnerability to climate shocks, improve food security, and provide additional income opportunities. The findings show that households cultivating a wider range of minor crops experience shorter periods of hunger, better dietary outcomes, and greater economic stability. Beyond these direct benefits, minor crops also contribute to the conservation of agro-biodiversity and promote more sustainable farming practices. While these findings are significant, the study has limitations: its cross-sectional design, self-reported data, and purposive sampling

limit causal inference and generalizability; future longitudinal, multivariate research with economic and nutritional assessments is needed.

Despite the importance of minor crops, they remain largely overlooked in agricultural policy and development programs. There is a need for greater investment in research, extension services, and market development to support their production and utilization. The evidence presented in this study as one of the first multi-regional and mixed- method assessments of minor crops in Ghana shows that promoting minor crops offers a practical, low-cost, and locally adapted strategy for strengthening resilience in Ghana's agricultural sector. As climate change continues to impact farming systems, integrating these crops into mainstream agricultural policies will be essential for ensuring long-term food security and sustainable livelihoods.

Acknowledgements

The authors gratefully acknowledge the Global Centre on Biodiversity for Climate (GCBC), UK and DEFRA, UK for funding this project. We further thank CSIR–CRI and KNUST for providing institutional guidance and access to essential resources. Finally, we recognize our project partners Ministry of Food and Agriculture, Ghana and CSIR-Forestry Research Institute of Ghana for assisting in carrying out the study.

Declarations

Funding

This study was carried out under the EMBRACE project (Grant number- RG2008977), funded by the Global Centre on Biodiversity for Climate (GCBC), UK and DEFRA, UK.

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.

Ethical approval

Research authorization was obtained from the Council for Scientific and Industrial Research-Crops Research Institute (CSIR-CRI),

Consent to Participate

Informed consent was obtained from all participants in the study. Confidentiality and anonymity were maintained throughout the research process.

Consent to Publication

Informed consent for publication was obtained from all participants in the study.

Data availability

Data available upon reasonable request

Author Contributions

Conceptualization: J. A-C; Methodology: J.A-C and C.O.P.; Data Collection: J.A-C, C.O.P, F.F, H.M.B, K.A.S.A, E.O.D, Y.P., P.O., C.O.K, and L.K.B.; Formal analysis and investigation: J.A-C; writing-original draft preparation: J.A-C; writing- review: J.A-C and C.O.P ; writing -editing: J.A-C, C.O.P, F.F., E.O.D., P.P.A., E.B. and M.D.A.; project administration: C.O.P and J.A-C. All authors participated in preparing the article, critically reviewed the final version, and approved the submitted manuscript.

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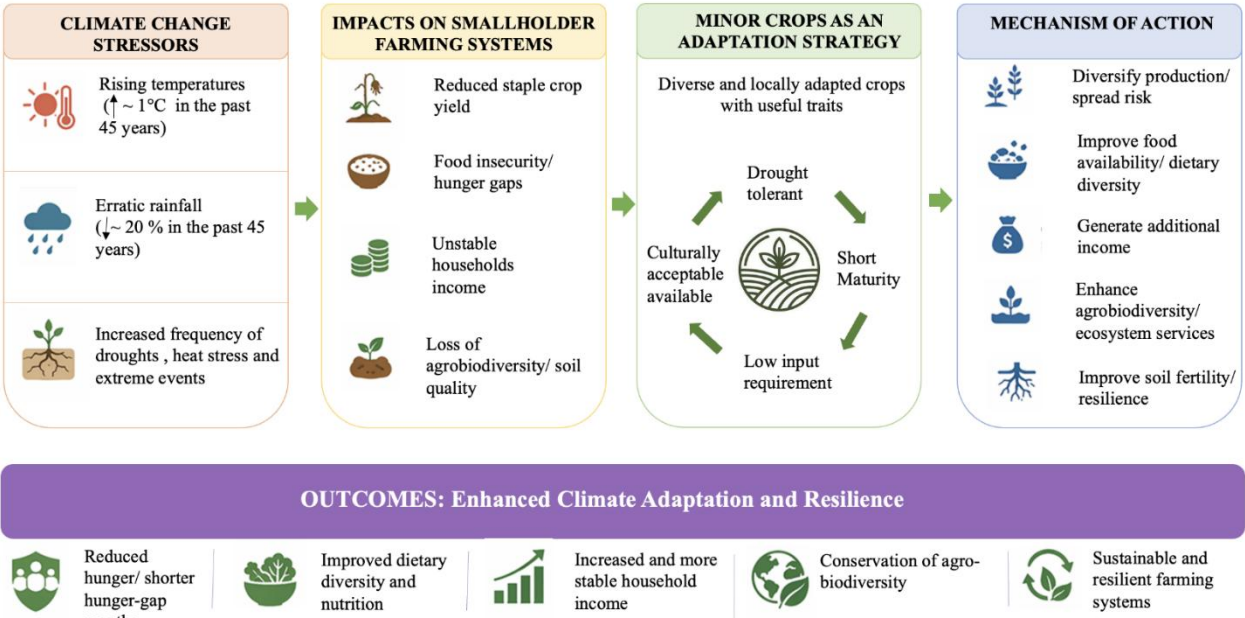


Figure 1: Conceptual framework linking minor crops to climate adaptation and resilience among smallholder farmers in Ghana

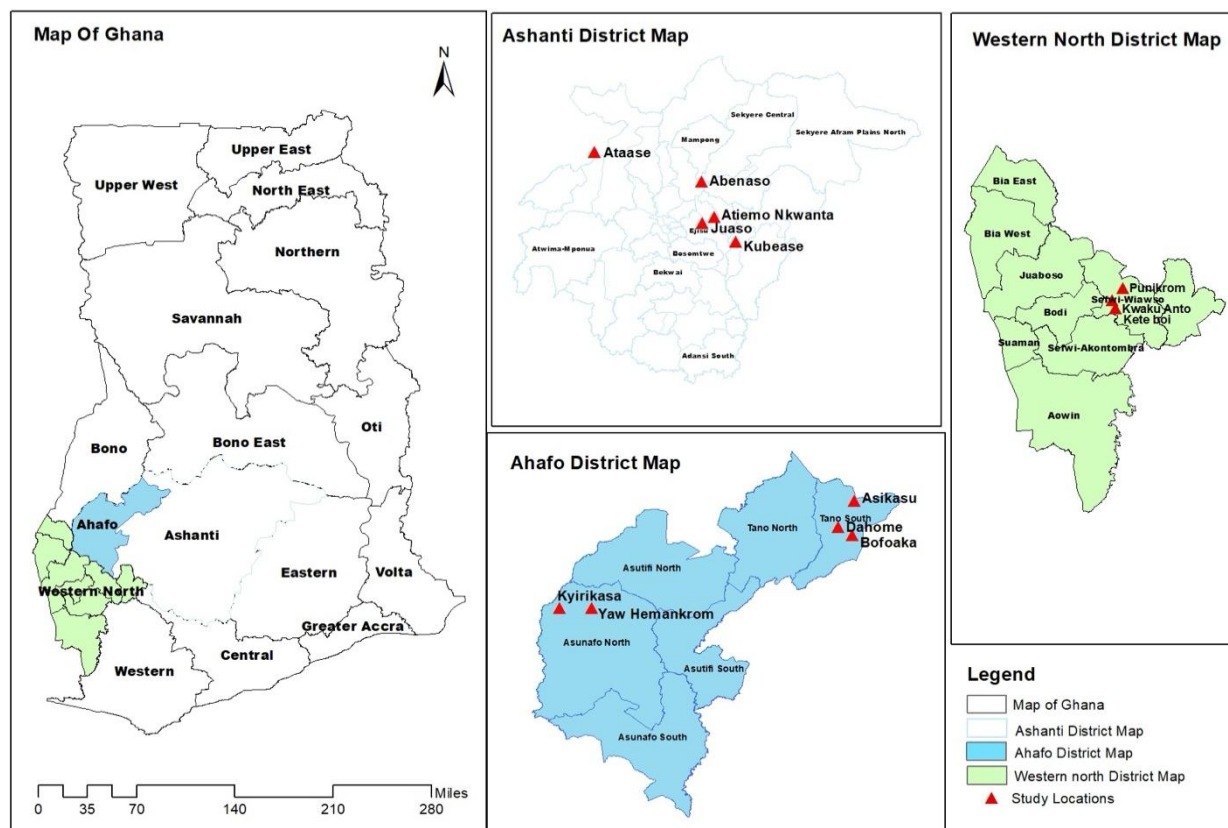


Figure 2: Map of Ghana showing study locations

622 **Table 1.** Socio-demographic and Farm Characteristics of Surveyed Households (n = 750)

Variable	Category	Frequency (n)	Percentage (%)
Gender of household head participating in the Survey	Male	443	59
	Female	307	41
Age of household head (years)	≤35	200	26.7
	36-50	255	34.0
	51-65	220	29.3
	>65	75	10.0
Mean age (years)		44.4 ± 0.5	
Education level	No formal education	243	32.4
	Primary	71	9.5
	Junior High School	280	37.3
	Senior High School	71	71
	Tertiary	10	1.3
Farm size (ha)	≤1.0	69	9.2
	1.1-2.0	544	72.5
	2.1-5.0	110	14.7
	>5.0	27	3.6
Mean farm size (ha)		1.91 ± 0.05	
Farming experience (years)	≤10	278	37.1
	11-20	193	25.7
	21-30	150	20.0
	>30	129	17.1
Mean farming experience (years)		16.96 ± 0.38	
Household size	≤4 members	233	31.07
	5-7 members	443	58.93
	>7 members	75	10
Mean household size		5.01 ± 0.08	
Region	Ashanti	250	33.3
	Ahafo	250	33.3
	Western North	250	33.3

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625 **Table 2:** Representative minor crop groups with their common names, scientific names, and Twi local names across
 626 the studied communities in Ghana

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Crop Group	Representative Crops (Common name and scientific name)	Representative Local Names (Twi)
Indigenous vegetables	Scarlet eggplant (<i>Solanum aethiopicum</i>); African gboma eggplant (<i>Solanum macrocarpon</i>); African bird pepper (<i>Capsicum frutescens</i>); Okra (<i>Abelmoschus esculentus</i>); Jute mallow (<i>Corchorus olitorius</i>); Amaranth leaves (<i>Amaranthus spp.</i>); Roselle (<i>Hibiscus sabdariffa</i>); Pumpkin seeds (<i>Cucurbita maxima</i> /C. <i>moschata</i>); Musk melon seeds (<i>Cucumis melo</i>); Habanero pepper (<i>Capsicum chinense</i>); Snake tomato (<i>Trichosanthes cucumerina</i>); Cherry tomato (<i>Solanum lycopersicum</i> var. <i>cerasiforme</i>); Kenaf leaves (<i>Hibiscus cannabinus</i>); Turkey berry (<i>Solanum torvum</i>)	Koowa (Ntrowa); Ntropo; Mesewa; Atuogya; Ayoyo; Alefu; Suule (Sobolo); Akatoa; Wrewre; Meko hwam; Akato; Adwoa deede; Bito; Kwawususuaa
Fruit crops	Yellow mombin (<i>Spondias mombin</i>); Soursop (<i>Annona muricata</i>); Aidan fruit (<i>Tetrapleura tetraptera</i>); Pumpkin (<i>Cucurbita moschata</i> /C. <i>maxima</i>)	Atoa; Apere (Aluguntugui); Prekese; Efre
Root and tuber crops	Sweet potato (<i>Ipomoea batatas</i>); Cocoyam (<i>Xanthosoma sagittifolium</i>); Aerial yam (<i>Dioscorea bulbifera</i>); Water yam (<i>Dioscorea alata</i>); Bitter yam (<i>Dioscorea dumetorum</i>); Country potato (<i>Plectranthus rotundifolius</i>); Taro (<i>Colocasia esculenta</i>); Wild yam (<i>Dioscorea praehensilis</i>); Yam spp. (<i>Dioscorea spp.</i>)	Abrodwumaa; Ateko basua (Mankani); Akam; Afase; Nkanfo; Apotete; Kooko; Kokoo ase bayere; (Asukooko; Akwa; Akaba; Afunu; Nkankom; Maame soso; Antokode; Asedua; Apoka; Suaba, Sum ne hyen)
Legumes	Mucuna bean (<i>Mucuna pruriens</i>); Sword bean (<i>Canavalia gladiata</i>); Lima bean (<i>Phaseolus lunatus</i>); Bambara groundnut (<i>Vigna subterranea</i>)	Adua apea; Adua kuma; Adua apatram; Aboboi
Cereals	Millet (<i>Pennisetum glaucum</i>); Sorghum (<i>Sorghum bicolor</i>)	Ayuo; Atoko

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Table 3: Diversity and Functional Traits of Minor Crop Groups in Ghana

Crop Group	Number Identified	Drought Tolerant (%)	Provides Essential Nutrients (%)
Legumes	4	80	90
Root Crops	19	60	60
Indigenous Vegetables	14	70	80
Cereals	2	50	60
Fruit Crops	4	40	70

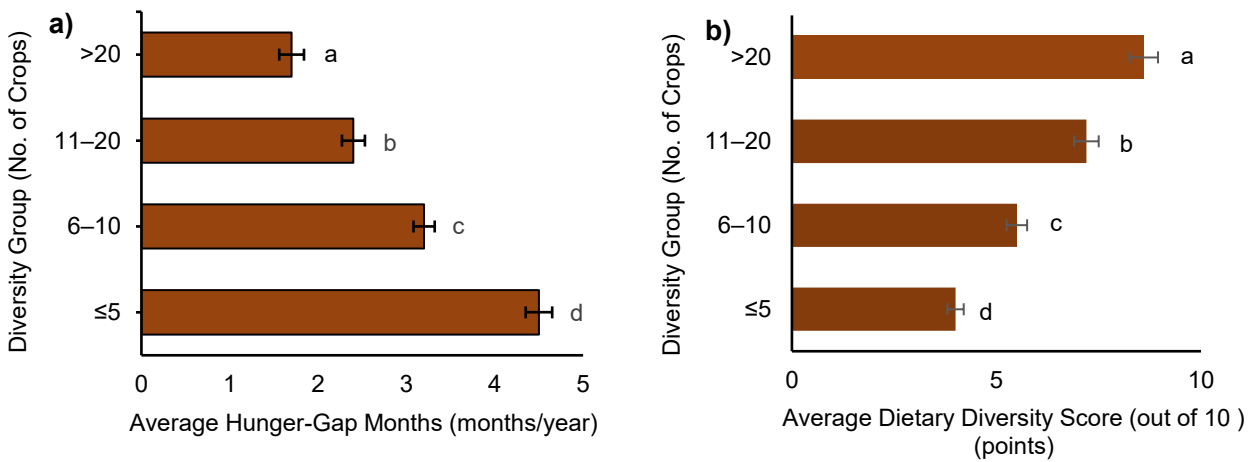


Figure 3: a) Crop Diversity and Hunger-Gap Duration b) Crop Diversity and Dietary Diversity Score.

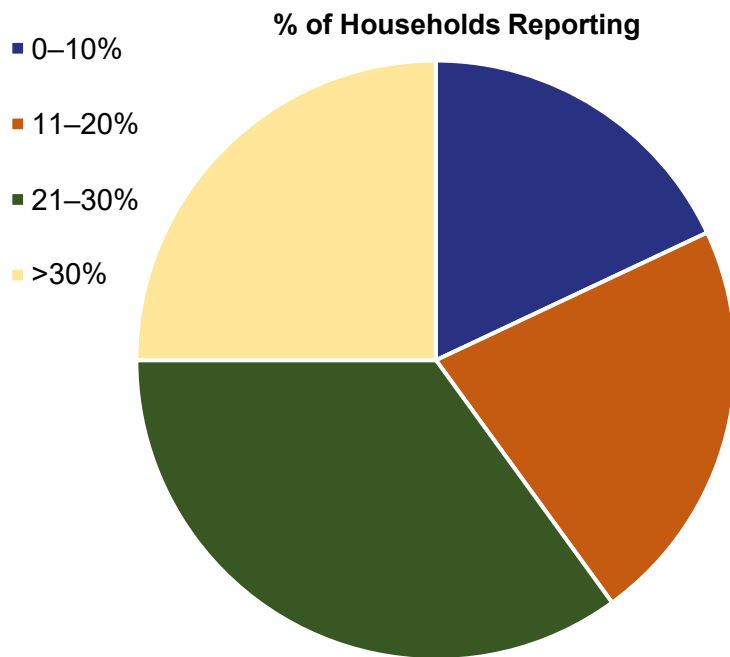


Figure 4: Minor Crops Contribution to Household Income

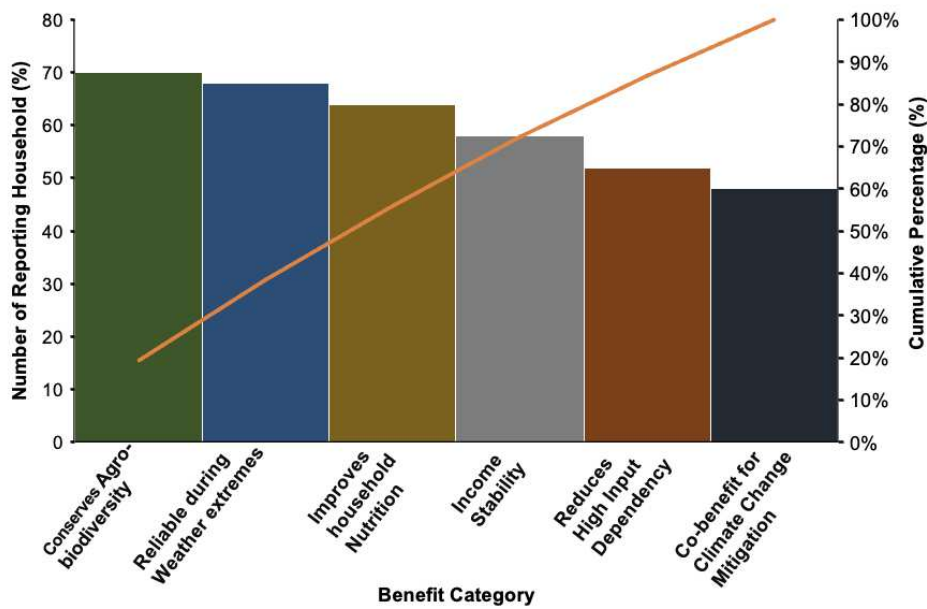


Figure 5: Household-Perceived Benefits of Minor Crops

Supplementary Files

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- [SupplementaryTheRoleofIndigenousMinorCrops.docx](#)