COMMUNITY-BASED ORGANIZATIONAL MEMBERSHIP AND CLIMATE RESILIENCE CAPABILITIES BUILDING IN NORTHWEST GHANA

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ABSTRACT

The impacts of climate change on agro-based rural smallholder households in Ghana's Savanna ecological zone continue to threaten livelihoods and food security. Community-based organizations (CBOs) and women's groups are essential for building climate resilience in vulnerable agrarian communities in developing countries, yet they remain under-explored. This study explored whether membership in community-based organizations improves climate resilience in rural farming communities. It investigated whether membership in CBOs significantly predicts households' self-assessed ability to cope with climate shocks and stresses. It is anchored in the perspective of social and cooperative associational networks as facilitators of resilience building. The study employed a cross-sectional survey design and drew on perceptions from 2,107 household heads across purposively selected districts in the Upper West and Savannah Regions. The study confirmed a strong positive link between membership in CBOs and perceived climate change resilience-building capabilities. However, structural barriers related to land tenure, access to and ownership of assets, and voice significantly reduce the resilience- building capacity of female-headed households compared to male-headed households. The study concludes that climate change adaptation policies targeting rural households must leverage social networks and address structural barriers hindering women's adaptive capacities. It reinforces the importance of CBOs as social networks as crucial tools for fostering community resilience and development.

Keywords: Climate Action, Community-Based Organizations, Climate Resilience, Savanna Ecological Zone, Upper West Region

INTRODUCTION

Literature has acknowledged the ever-present and intense effects of climate change on sustainable livelihoods, food security, and, by extension, overall rural development (Howe et al., 2025; Khan et al., 2025). This consequence is intensely felt in societies with weak systems and institutions. For example, in sub-Saharan Africa (SSA), climate vulnerability is worsened by persistent rural poverty, limited adaptive capacity among rural communities, and the absence of or inadequacy of existing institutions to support resilience building (Haou et al., 2025; Lombe et al., 2024; Otundo Richard, 2024). Rural Ghana is no exception to the incidence and consequences of climate change. The evidence points to a change in the trend of key climate indices in Ghana. For instance, recent literature highlighted that the global temperature has risen by more than 1.0°C since the 1960s (Ankrah et al., 2023; Obuobie et al., 2025; Oduro et al., 2025). Further evidence suggests these changes extend beyond temperature, affecting rainfall timing, increasing rainfall variability, and extreme weather conditions such as high sunshine, droughts, and heavy rainfall (Ampofo et al., 2023; Obuobie et al., 2025; Padi et al., 2022). These present enormous challenges to rain-dependent rural farmers (Antwi-Agyei & Stringer, 2021; Bessah et al., 2021; Klutse et al., 2021).

In Ghana's Upper West and Savannah regions, where 70% of the population depends on subsistence farming, a predicted consequence of climate change poses a significant threat. Scholars have warned that recurrent droughts, rainfall variability, and extreme weather conditions exacerbate an already precarious situation of food insecurity and livelihood vulnerability (Batung, 2021; Pienaah & Luginaah, 2024; Yiridomoh et al., 2021). It is therefore crucial to emphasise the importance of adopting approaches to strengthening local smallholder farmers' adaptive capacity by, as it were, leveraging local institutional mechanisms to foster climate-resilient agricultural livelihoods.

There is a growing realization that adaptation and resilience to climate change may not be solely a technical matter; discussants have gradually deemphasised technological and infrastructural solutions (Khanal et al., 2019), and highlighted the significance of social capital and local institutions as essential for adaptive capacity at the local level (Agyapong et al., 2024; Carmen et al., 2022; Khanal et al., 2019; Tengapoe et al., 2024; Yaro et al., 2015). This shift in perspective has shown how Community-Based Organizations (CBOs) and social networks can affect how vulnerable households cope with and recover from climate-related shocks (Asante et al., 2024; Khanal et al., 2019; Tengapoe et al., 2024). Consequently, many governmental and non-governmental organizations are increasingly placing importance on community-based organizations (Fünfgeld, 2015; Khanal et al., 2019). Despite this growing recognition, empirical research on how local organizational membership contributes to building climate resilience among rural smallholder farmers in North West Ghana remains underexplored (Asante et al., 2024; Kahsay et al., 2022; Kangogo et al., 2025; Khanal et al., 2019). This notwithstanding, it has been observed that rural North-West Ghana is not bereft of these local organizations, such as Village Savings and Loan Associations (VSLAs), Farmer-Based Organizations (FBOs), women's groups, cooperatives, and other informal associations. These groups often arise due to persistent rural developmental challenges, including limited access to formal financial services, agricultural service information, improved farm inputs, and social protection mechanisms (Amponsah et al., 2023; Dagunga et al., 2020; Pienaah & Luginaah, 2024). These spaces are crucial for fostering trust and providing a vital social environment. They also become central to knowledge sharing and collective decision-making spaces, making them key enablers of overcoming climate change in rural areas. Where resource limitations and access exacerbate vulnerability, farmers' membership in local organizations offers pathways to achieving climate change adaptability and resilience (Asante et al., 2024; Kahsay et al., 2022; Kangogo et al., 2025). At least, access to financial services, agricultural inputs, and climate-smart information is facilitated, pooled, or made available to members of these organizations. As recent research demonstrates, these organizations become central avenues of resource mobilisation, savings accumulation, and loan acquisition, which otherwise were not available to farmers (Amponsah et al., 2023; Dagunga et al., 2020; Pienaah & Luginaah, 2024). Without a doubt, these services, albeit modest in their activities, augment the adaptive capacities of rural farmers to climate-induced poverty, livelihood shortfalls, and food insecurity. Furthermore, FBOs and women's cooperatives often facilitate access to agricultural extension services and improved market access, empowering farmers to respond to climate change (Antwi-Agyei & Stringer, 2021; Kangogo et al., 2025; Osumba et al., 2021).

There is consensus within climate adaptation scholarship that the successful establishment and strengthening of Community-Based Organizations (CBOs) boosts climate resilience-building in vulnerable agrarian communities (Khanal et al., 2019; Samaddar et al., 2021; Tengapoe et al., 2024; Ziervogel et al., 2022). They often act as intermediaries between household extension systems and external development actors. (Asante et al., 2024; Kahsay et al., 2022; Nhliziyo & Mushunje, 2024; Tengapoe et al., 2024). They serve as influential social and informational ecosystems shaping norms, behaviors, and decision-making within their communities. They also facilitate a shift from traditional farming practices to more climate-resilient agricultural strategies.

This study explores whether membership in community-based organizations improves climate resilience in rural farming communities. This study contributes to the literature on enhancing the resilience capacity of smallholder farmers, particularly in Sub-Saharan Africa (SSA), in three ways. First, by shifting focus beyond the technological and externally driven approaches to highlight how social capital, embedded in local organizations, is used to build climate resilience capabilities among smallholder households. Secondly, it provides empirical evidence from a highly climate-vulnerable and under-researched region of Ghana, thereby addressing a geographical and contextual gap in the climate change adaptation literature. Finally, the findings of the study offer policy-relevant insights into how CBOs can be deliberately leveraged as an effective institutional mechanism for building farmers' resilience and adaptive capacities among smallholder farmers in agrarian settings.

In this study, community-based organizations are defined as local-level organizations, including agricultural cooperatives, farmer-based organizations, and other community-based institutions formed to collectively address shared social, economic, environmental, or livelihood challenges. (Pavankumar & Shashi, 2025). Ghana and particularly the North-Western regions represent a compelling context for examining the role of CBOs in building resilience capabilities due to the exposure of smallholder agriculture to climate change and variability and the sector's crucial role in sustaining rural livelihoods. (Batung, 2021; Pienaah & Luginaah, 2024; Tengapoe et al., 2024). Given the dominance of smallholder farming and the sector's sensitivity to climatic shocks, enhancing farmers' adaptive capacity is a critical development endeavour.

ROLE OF COMMUNITY-BASED ORGANIZATIONS IN CLIMATE CHANGE ADAPTATION AND RESILIENCE BUILDING

A growing body of empirical research is increasingly demonstrating the potential of locally embedded community-based organizations (CBOs) to bolster household and community resilience against climate-related shocks. (Fransen et al., 2024; Pienaah & Luginaah, 2024; Rahman et al., 2024; Yaro et al., 2015). These organizations have been shown to facilitate the accumulation of social, financial, and human capital, which are essential to building farmers' resilience and adaptive capacities in resource-constrained contexts such as SSA. Pienaah and Luginaah (2024), for instance, show that households that are members of VSLAs were significantly less likely to experience food insecurity than non-members. This demonstrates how VSLAs enhance households' capacity to manage climate-related food risk by strengthening financial resilience and investment in various climate-adaptive measures. An earlier study posited that VSLA membership significantly enhanced smallholder farmers' welfare and spurred their adoption of improved technologies. (Dagunga et al., 2020). This underscores the dual impact of community saving groups: they facilitate access to financial services and support farm-level climate change adaptation strategies.

Aside from VSLAs, farmers' cooperatives have been empirically shown to influence climate change adaptation by improving farmers' access to agricultural inputs, extension services, and markets. Kangogo et al. (2025)'s study in Kenya shows that membership in agricultural cooperatives is positively associated with the adoption of climate-smart agricultural practices, including irrigation, crop rotation, and improved soil management, mainly due to better access to extension services and agricultural inputs facilitated by cooperatives. This is echoed by Kahsay et al. (2022), who found that membership in agricultural cooperatives increased both the intensity and number of climate adaptation practices adopted by households. They further showed some spillover effects, with non-members in villages with active cooperatives adopting more adaptation practices than those in villages without cooperatives. Across West Africa (Ghana, Mali, Côte d'Ivoire, and Senegal), Kpadé et al. (2023) further support these findings. Their findings show that farmers belonging to active cooperatives were more likely to be resilient to climatic shocks compared to farmers in less active or inactive cooperatives. They further reported that membership in cooperatives strengthens farmers' resilience by providing support and access to resources that help farmers absorb and respond to shocks, including climate-related stress. Beyond cooperatives, Farmers Based Organizations (FBOs) have also been noted to be effective in facilitating access to climate-smart agricultural (CSA) technologies and adoption decisions. For instance, Asante et al. (2024) examined the role of FBOs in the adoption decisions of multiple climate-smart agricultural (CSA) technologies across three regions in Ghana. Using a multinomial endogenous switching regression analysis, they showed that membership in farmer-based organizations significantly influenced farmers' decisions to adopt CSA practices such as zero tillage, row planting, and drought-resistant seeds, which are key strategies for climate adaptation. The study further showed that membership in FBOs plays a significant role in reducing barriers related to information access and resource constraints, thereby increasing the likelihood of CSA adoption. In South Africa Nhliziyo and Mushunje (2024), found that farmers' participation in FBOs significantly increased the adoption of climate-smart practices such as soil conservation, crop diversification, and adjusted planting dates among smallholder farmers, and that these FBOs function as pathways through which farmers share knowledge, pool labour, and access adaptive technologies, thereby strengthening their resilience and adaptive capacity in the face of climate change.

The review has shown the importance of CBOs as facilitators of adaptive capacity and resilience building among rural farmers across Sub-Saharan Africa. The question remains whether Community-Based Organizations (CBOs) continue to play a crucial role in supporting both individuals and groups within Ghana's savanna ecological zone, particularly in the Upper West and Savanna regions, facing climate-related challenges.

METHODOLOGY

Data Source and Sample

The study draws on data collected as part of the Resilience Against Climate Change Social Transformation Research (REACH-STR) baseline study in 2021. The project purposively selected the Upper West and Savanna regions for the data collection because approximately 73.6% and 70.4%, respectively, of the population in the Upper West and the Savanna regions reside in rural areas (Ghana Statistical Service, 2022). A cross-sectional design was adopted to simultaneously collect data from across districts to, among others, gauge the presence of community organizations and to analyse their associations with climate resilience capacity building among community members. This design was considered because it allowed collecting the needed data in a cost- and time-efficient manner (Wang & Cheng, 2020). The sampling frame for this study consisted of all households in seven randomly selected districts: six districts in the Upper West Region (Wa West, Wa East, Sissala East, Lambussie/Karni, Daffiama/Bussie/Issa, Nandom) and one in the Savanna Region (Sawla-Tuna-Kalba district), which was the sole focus district for the REACH-STR project in the Savanna Region. A stratified random sampling strategy was employed. First, districts were stratified by their rural-peri-urban classification. Within each district, three communities were randomly selected: two rural and one peri-urban, reflecting the project's emphasis on rural livelihoods. Within each selected community, households were randomly selected from a complete household listing obtained from community leaders and updated through a brief household enumeration conducted before the survey. The survey instrument was crafted through an extensive literature review and refined through pilot testing in households (n=50) in a non-study community, ensuring its validity and reliability in capturing local realities. Table 1 shows the sample distribution by district. In total, 2,107 household heads completed the survey.

Table 1: Sample Distribution by District

Sample Distribution		
District	**Frequency**	**Percentage**
Wa West	300	14.24
Wa East	302	14.33
Sissala East	301	14.29
Lambussie/Karni	300	14.24
Daffiama / Bussie / Issa	300	14.24
Nandom	304	14.43
Sawla Tuna Kalba (STK)	300	14.24
Total	**2107**	**100**

REACH-STR baseline study (2021)

The sampling frame accurately represented the entire household population in the chosen communities and achieved a high response rate. Consequently, the sample is representative of the target population of smallholder farming households in North-West Ghana. Since the sampling design was self-weighting, proportional allocation across strata was not necessary, given the focus on descriptive and analytical inference rather than population total estimation.

Variables

Climate Resilience Capability is the Dependent variable in this study. It is a binary variable derived from survey question H7: "How would you describe your household's capability in dealing with changes in the climate in this community?" The dependent variable was originally measured on a five-point ordinal scale (1=Excellent to 5=Very poor). For the primary analysis, the study collapsed this into a binary indicator where 1= 'Good' (combining Excellent, Very good, and Good) and 0= 'Bad' (combining Poor and Very poor).

This approach was driven by the extreme skewness of the distribution and the need for policy-relevant differentiation between functionally resilient and vulnerable households. The skewed distribution rendered ordered logit estimation unreliable. Households' perceived resilience reflects their self-assessment of coping and recovery from climate shocks, influenced by lived experiences, resources, and social networks. While subjective, these measures are strongly linked to objective adaptive capacity and predict future adaptation. This study defines climate resilience capability as households' self-reported ability to effectively manage climate-related changes and stresses within their community. It further applied 'Organizational Membership' as the independent Variable, which is also a binary variable indicating whether any household member belonged to at least one local organization (1 = Yes, 0 = No).

Further secondary analysis breaks down membership by organization type. Internal validity hinges on whether communities were chosen based on active organizations. The REACH-STR project did not target communities based on existing Community-Based Organizations (CBOs); instead, communities were randomly selected from district lists without considering organizational presence. Despite this, the study recognises the potential impact of unobserved community-level factors such as historical NGO activity and local leadership quality on both organizational presence and climate resilience. Therefore, the analysis includes district fixed effects and community-clustered standard errors. It also controls for several confounders, such as household head gender, age, education level, farm experience, residential status, weather forecast use, women's labour contribution perception, community leadership, and district dummies for different locations.

DATA ANALYSIS

The analysis proceeded from simple descriptives to robust relational decomposition to help construct the relationships, if any, between a person's membership in local organizations and climate resilience capabilities. The analysis was conducted in three sequential stages: descriptive statistics, bivariate analyses, and multivariate analyses (logistic regressions).

Descriptive analysis

The descriptive statistics provided context and assessed the generalisability of the findings. (Babbie, 2020). The descriptive statistics characterized the population using percentages and frequencies to showcase socio-demographic, economic, and institutional variables.

Bivariate analysis

Cross-tabulation with Pearson's Chi-square (χ^2) was used to assess the unadjusted data. The analysis was conducted at two levels: first, households belonging to any organization were compared to those that did not. This aimed to explore the general association between organizational membership and climate resilience capabilities. Further analysis was conducted by categorising organizations to identify the type most strongly linked to climate resilience. A significant chi-square statistic ($p < 0.05$) suggests that climate resilience distribution is not independent of organizational membership, indicating a potential relationship.

Multivariate Analysis: Logistic Regression

Multivariate binary logistic regression was used to account for other confounding factors influencing the link between organizational membership and climate resilience. This approach is grounded in theory and existing empirical practice. Logistic regression is typically employed when the study's results on climate adaptation and rural livelihoods are categorical. This is because it estimates conditional associations while controlling for observational characteristics.

The study's focus on Adger (2006) conceptualisation of resilience as perceived adaptive capacity further supports this choice. This perspective acknowledges that adaptive capacity is both subjective and influenced by mental and social factors. Consistent with applied categorical data analysis practices and, in part, owing to the skewed distribution of responses and the policy relevance of the distinction between generally resilient and vulnerable households, the study collapsed the ordinal scale into binary outcomes. An unobserved trait related to future orientation, risk tolerance, and initiative could cause endogeneity. Proactive households are more likely to join organizations and perceive themselves as resilient, which could lead to an overestimation of the association between organizational membership and resilience. However, in the North West of Ghana, some households might join organizations like VSLAs as a coping mechanism for vulnerability, which could create a downward bias. The net direction of bias is ambiguous. In line with much of the literature on social capital and adaptation (Agrawal & Agrawal, 2008; Pelling & High, 2005), the findings are interpreted as associations rather than causal effects. To bolster confidence in the results, the study specified nested models, showing the stability of the membership coefficient. For causal inference, future research using panel data could employ methods such as Propensity Score Matching to further address this issue. Nonetheless, the study's rigorous controls provide evidence of a robust positive association.

Binary Logistic Model

$$\log\left(\frac{p}{1-p}\right)=\beta_0+\beta_1(\text{Organizational Membership})+\beta_2(\text{Gender})+\beta_3(\text{Weather forecast Use})+.....+\varepsilon$$

Where p is the probability of a household reporting "Good" climate resilience capability, β_0 is the intercept, $\beta_1,\beta_2,...,...$ are the coefficients for each predictor variable, and ϵ is the error term.

Two nested models were specified to see the persistence and robustness of the impact of organization membership on resilience capabilities after controlling for a different set of potential confounding factors (Antwi-Agyei et al., 2012; Djoudi et al., 2016; Goddard et al., 2021; Lin, 2011; Pelling & High, 2005; Weber, 2010). Model 1 presents the baseline specification incorporating key explanatory variables like organizational membership and household characteristics. Model 2 extends this by incorporating additional controls for spatial and socio-economic heterogeneity, including location and education.

RESULTS

Descriptive Statistics

The results indicate a population that is spatially rural and agriculturally reliant (see Table 2). Further, the demographic profile aligns with the national structure of agriculturally dependent rural dwellings; it is close to evenly split, with 52.44% (1105/2107) male-headed households and 47.65% (1002/2107) female-headed households. A notable observation is that the population with low formal schooling is more than half, 53.77% (1133/2107). This observation is likely a barrier to information access in local communities. These smallholder farmers cultivated predominantly small farm sizes, with up to 69.61% of household farms averaging 6 acres or less. This finding cements the view that respondents are predominantly smallholder farmers whose livelihoods are vulnerable to climate shocks and may therefore be highly challenged in terms of resilience.

Table 2: Descriptive Statistics(N=2107)

Variable	**Category**	**Frequency**	**Percent**
Gender	Male	1105	52.44
	Female	1002	47.56
Age	<=25	232	11.01
	26-35	524	24.87
	36-45	508	24.11
	46-60	525	24.92
	Above 60	318	15.09
Education	No education	1133	53.77
	Below SHS	657	31.18
	SHS and above	317	15.05
Household Size	<=3	333	15.80
	4-6	883	41.91
	7-10	646	30.66
	Above 10	245	11.63

Religion	Christianity	1214	57.62
	Islam	804	38.16
	Traditional	89	4.22
Farm size (acres)	<=3	762	36.18
	4-6	704	33.43
	7-10	358	17.00
	Above 10	282	13.39
Farm experience (in years)	<=10	393	18.65
	11-20	527	25.01
	21-30	494	23.45
	Above 30	693	32.89
Residential status	Indigene	1754	83.25
	First-generation migrant	208	9.87
	Second-generation migrant	145	6.88
Community Leader	No	1820	86.38
	Yes	287	13.62
District of Respondents	Wa West	300	14.24
	Wa East	302	14.33
	Sissala East	301	14.29
	Lambussie/Karni	300	14.24
	Daffiama / Bussie / Issa	300	14.24
	Nandom	304	14.43
	Sawla Tuna Kalba (STK)	300	14.24

Table 3: Organization Membership and Subjective Climate Resilience Capabilities

Variable	**Freq.**	**Percent**	**Cum.**
Does any household member belong to any Organization currently?			
No	861	40.86	40.86
Yes	1246	59.14	100.00
Describe your household's ability to cope with climate change.			
Bad	1404	71.93	71.93
Good	548	28.07	100.00

REACH-STR baseline study (2021)

From Table 3, the data reveal a high level of perceived climate vulnerability in the study area. The majority of respondents, 71.93% (1104/2107), of household heads described their resilience as "Bad". This notwithstanding, the data show that more than half, 59.14% (1124/2107), reported belonging to or participating in some form of local community organization (s), a testimony, perhaps, to the active existence of community-based organizations in North-West Ghana.

Table 4 further confirms the presence of various local organizations within the communities. A significant majority, 59.14% (1246 out of 2107), belong to one organization or another. These organizations include farmer groups, youth groups, and women's groups, among others. Of these, close to a third (27.86%) of the respondents belonged to women's groups, followed by VSLA/savings groups (22.21%). Membership in other groups appears marginal. This observation highlights that a key element of building resilience capabilities would be centred on gender-specific solidarity and financial inclusion rather than formal agricultural cooperatives.

Table 4: Organization Type and Membership Frequencies

Union Membership	**Freq.**	**Percent**	**Cum.**
FBO/farmer groups	41	1.95	1.95
Youth groups	12	0.57	2.52
VSLA / Savings group	468	22.21	24.73
Women's group	587	27.86	52.59

Water Users Associations	5	0.24	52.82
CREMA Irrigation Association	5	0.24	53.06
Cooperatives	39	1.85	54.91
School management committee	57	2.71	57.62
Other organizations	32	1.52	59.14
Non-member of any organization	861	40.86	100.00
Total	**2107**	**100.00**	

REACH-STR baseline study (2021)

Organization Membership and Household Climate Resilience Capability

In Table 5, the study sought to explore the relationships, if any, that exist between the variables of organizational membership and household climate resilience capability. Hence, cross-tabulations of Pearson's chi-squares were the main statistical methods used at two levels, first to check the distribution of association between organizational members and the gender of respondents, and further to check how membership in these organizations advantages members, in the form of building climate resilience capacity. The data show no statistically significant association between the gender of the respondent and a household member's belonging to any organization. This is confirmed by a non-significant Chi-square statistic (p=0.3535). Across genders, there is a closely identical distribution of organizational membership, and Male and female respondents in Table 5. This is a revealing finding as it indicates that organizational membership is not gendered in the sample. Therefore, its impact on climate resilience is less likely to be spurious, reflecting underlying gender dynamics in participation.

Table 5: Association between Gender and Organizational Membership

Currently, is any member of your household a member of any of these groups?	**Gender**		
	Male	Female	Total
No	462	399	861
	21.93%	18.94%	40.86%
Yes	643	603	1246
	30.52%	28.62%	59.14%
Total	**1105**	**1002**	**2107**

	52.44%	**47.56%**	**100.00%**
Pearson Chi2 = 0.86 Prob = 0.3535			

REACH-STR baseline study (2021)

Additional bivariate analysis was conducted to test the study's central thesis: whether membership in local community-based organizations drives climate resilience among smallholder farmers. Consequently, a cross-tabulation of organizational membership and climate resilience capacity reveals a strong and statistically significant link between organizational membership and climate resilience capability. The cross-tabulation in Table 6 reveals a strong and statistically significant association between organizational membership and climate resilience capability (χ^2 = 45.47, $p < 0.0001$). The evidence suggests that households with members who belong to any organization were more than two and a half times (2.5) likely to report “good” climate resilience capability (20.13%) than those without any member who belongs to any organization (7.94%). This notable difference offers a strong demonstration that membership in organizations is a key factor in how people perceive their adaptive capacity.

Table 6: Household Organization Membership and Household Climate Resilience Capability

Currently, is any member of your household a member of any of these groups?	**How would you describe your household's capability in dealing with changes in the climate?**		
	Bad	Good	Total
No	631	155	786
	32.33%	7.94%	40.27%
Yes	773	393	1166
	39.60%	20.13%	59.73%
Total	**1404**	**548**	**1952**
	71.93%	**28.07%**	**100.00%**
Pearson Chi2 = 45.47*** Prob = 0.0000			

REACH-STR baseline study (2021)

From Table 7, the analysis further compares the membership of different organizations with their ability to adapt to climate change. The idea was to estimate whether membership in different organizational types is associated with differences in the climate resilience abilities of household members. This did not show any differences, as the association remains significant. It is worth noting that the positive relationship is welldistributed and not limited to a single group. Notwithstanding, women's groups show the highest number (219) of members reporting a "good" climate resilience capability, compared to others. This is probably the case because the majority of those who reported being members of organizations were affiliated with women's groups (Table 4). This suggests women's groups might be particularly effective at building adaptive capacity. Additionally, from Table 7, it is observed that most household heads not involved in any organizations reported poor climate adaptation capabilities.

Table 7: Membership in different organizations and households' ability to deal with climate change

	How would you describe your household's capability in dealing with changes in the climate?		
Currently, is any member of your household a member of any of these groups?	**Bad**	**Good**	**Total**
FBO	31	7	38
	1.59%	0.36%	1.95%
Youth groups	7	3	10
	0.36%	0.15%	0.51%
VSLA / Savings group	336	114	450
	17.21%	5.84%	23.05%
Women's group	330	219	549
	16.91%	11.22%	28.13%
Water Users Associations	1	4	5
	0.05%	0.20%	0.26%
CREMA Irrigation Association	5	0	5
	0.26%	0.00%	0.26%
Cooperatives	16	10	26
	0.82%	0.51%	1.33%
School management committee	26	25	51
	1.33%	1.28%	2.61%

Other	21	11	32
	1.08%	0.56%	1.64%
Non-member of any organization	631	155	786
	32.33%	7.94%	40.27%
Total	1404	548	1952
	71.93%	28.07%	100.00%
Pearson Chi2 = 90.30. Prob = 0.0000			

REACH-STR baseline study (2021)

Effect of Organizational Membership on Climate Resilience Capability

Having gained insights from membership in organizations, the study analysed a multivariate logistic regression output to isolate the impact of organizational membership on household heads' perceived climate resilience capacity while controlling for other variables. From Table 8, a positive and statistically significant coefficient is observed for organizational memberships, that is, ($p < 0.05$ and * $p < 0.10$, respectively) in both Model 1 (0.6253**) and Model 2 (0.4675*). Assuming all other factors remain constant, households led by members of organizations are more likely to perceive a "Good" climate resilience capability. This consistent finding across models bolsters the reliability of the results. Theoretical expectations help explain other important predictors. For example, Goddard et al. (2021) found a highly significant coefficient on perceived reduced access to weather forecasts over time, consistent with this view. This underscores the crucial role of consistent, reliable climate information in adaptation planning.

Table 8: Logistic Regression Results (N=2107)

Variable	**Model 1**	**Model 2**
Organizational membership (ref: No)		
Yes	0.6253** (0.2755)	0.4675* (0.2403)
Gender (ref: Male)		
Female	-0.2917*** (0.0672)	-0.2839*** (0.0834)
Weather forecast use (ref: Sometimes)		
Always use	0.4334 (0.2661)	0.5570** (0.2632)
Don't use	-0.2120 (0.2405)	0.0377 (0.2728)

Farm experience (ref: 1-15 years)		
16-30 years	-0.3932*** (0.1412)	-0.05182632
31+ years	-0.1068 (0.1914)	-0.0709 (0.1955)
Women's labour contribution (ref: Equal to men)		
Contribute more than men	0.1593 (0.4154)	0.0571 (0.3422)
Contribute less than men	-0.4611** (0.2034)	-0.5409** (0.2347)
Change in forecast access (ref: remained the same)		
Improved	0.5097** (0.2013)	0.4177** (0.1761)
Reduced	-1.0147*** (0.2862)	-1.1422*** (0.3061)
Community leader (ref: No)		
Yes	0.2153 (0.1982)	0.2880 (0.1861)
District (ref: Wa West)		
Wa East	-	-0.7401** (0.3194)
Sissala East	-	1.1193** (0.5354)
Lambussie/Karni	-	-0.6316** (0.2564)
Daffiama/Bussie/Issa	-	-0.07625645
Nandom	-	0.2204 (0.6975)
Sawla Tuna Kalba (STK)	-	-1.7851** (0.8338)
Education (ref: SHS and Above)	-	
No Education	-	-0.0776 (0.2454)
Basic Education	-	-0.1513 (0.2322)
Constant	-0.8404*** (0.3138)	-0.6063*** (0.1588)
McFadden's Pseudo R^2	0.0778	0.1547
Log Likelihood	-1061.57	-973.07
Observations	1,943	1,943

Note: Standard errors in parentheses are clustered at the community level.

REACH-STR baseline study (2021)

Two nested logistic regression models are presented. Model 1 includes organizational membership, gender, weather forecast use (reference: sometimes), farm experience (reference: 15 years), women's labour contribution (reference: equal to men), change in forecast access (reference: remained the same), and community leader status (reference: no). Model 2 adds district fixed effects (reference: Wa West) and education level (reference: SHS and above). McFadden's pseudo-R^2 is reported. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Interestingly, older farmers aged 13 to 30 years exhibited a significant negative coefficient compared to those aged 1 to 15 years across both models 1 and 2. That is -0.3932*** and -0.2938*, respectively. This supports the "experience trap" hypothesis. The findings confirm that historically persistent structural inequalities persist, suggesting that this deep-rooted climate knowledge can create cognitive barriers to adapting to rapidly changing conditions. The data show that female-headed households report lower resilience compared to male-headed households (-0.2839***, $p < 0.05$). These inequalities likely restrict women's access and utilisation of resources, thereby limiting their ability to adapt. By district, Sissala East stands out as an outlier, with remarkable resilience. Households there report a significantly higher likelihood of reporting "Good" capacity, with a coefficient of 1.1193**. This is attributed to the district's favourable agro-ecological zone and other location-specific advantages. Furthermore, Nandom demonstrated a positive, statistically significant association with resilience compared to Wa West, suggesting a favourable adaptation context. However, these areas may face more severe climate impacts, deeper poverty, or less developed infrastructure and support systems. The Hosmer-Lemeshow goodness of fit test was non-significant (χ^2 (4) = 6.38, p = 0.1725), and the Area Under the ROC Curve was 0.76, indicating acceptable model fit.

DISCUSSION

The paper sought to examine, within a context of highly vulnerable, poverty-stricken North-Western Ghana, whether membership of local organizations in smallholder agrarian communities is associated with household climate resilience capability. The findings demonstrate a strong positive association within the study area. They further shed light on a complex yet interrelated nexus between social capital, gender, and social and cognitive factors that underpin vulnerable household climate resilience adaptive capacity. These findings strongly support theoretical perspectives suggesting that local organizations, including NGOs, CBOs, FBOs, VSLA, and women's groups, through various interventions, foster social cohesion and particularly empower farmers to develop robust perspectives and practices that enhance climate resilience across different contexts (Opoku Mensah et al., 2026; Yaro et al., 2015). These efforts, among others, have significantly benefited smallholder farmers by improving their farm productivity and, as a result, strengthening resilience to climate change. The findings extend existing studies, which claim that local organizations support the climate resilience capability building by offering training, technological transfer, and input supply, and market access facilitation (Opoku Mensah et al., 2026), to include that VSLA specifically serves as a pedestal for the provision of financial capital that enables smallholder farmers to invest in new practices that help them in the event of climate shocks. Further, existing literature demonstrates the benefits of organizational membership in building climate resilience across different groups. Agyei et al. (2025) found that community members involved in local organizations gained not only technical skills but also broader advantages through social networks, which strengthened their resilience. Similarly, Khanal et al. (2019) highlighted the importance of belonging to Community-Based Organizations (CBOs) in enhancing members' capabilities for adaptation strategies. They note that farmers' awareness of climate change strategies increased, their ability to use improved agricultural methods improved, and their capacity to cope with climate change and crop production increased. This, in turn, improved their overall livelihoods through their association with CBOs. Specifically, women's groups extend this beyond financial capacity to social capital and social cohesion, which enable social support systems, moral support, and critical information exchange platforms, crucial for building innovative pathways to climate resilience. Earlier studies (see e.g Khadka & Schuett, 2024; Mohammed et al., 2026) confirm this. They strongly suggest that when women participate in organised groups, climate change adaptation is promoted. This leads to improved biodiversity outcomes, increased family resilience, and sometimes even community-wide resilience. In essence, the presence of a plethora of these organisations within the study strongly underpins essential social infrastructure aligned with climate resilience building and is a valuable asset for policymakers.

The bivariate analysis further solidifies the critical insight that gender-responsive adaptation leads to effective adaptation to climate change. It highlights women's central role in household food security and natural resource management (Khadka & Schuett, 2024; Mohammed et al., 2026). Therefore, it is not surprising that empowering women for collective action directly contributes to building households' adaptive capacity in their specific contexts (Djoudi et al., 2016). Despite this, there are persistent gaps in observed resilience between female-headed and male-headed households. These gaps suggest structural barriers in land ownership, access to credit, and decision-making, undermining women's adaptive capacities. (Nelson & Stathers, 2009; Olumba, 2026). Given this complex situation for women, supporting women's groups is crucial, but must be effective. It requires addressing these structural issues and other root causes of gendered vulnerability.

Two other nuanced associations were glimpsed: first, that for social capital to be effectively utilised, and for the powerful effect of weather information to filter through, there ought to be critical knowledge and technology sharing. It was realised that the most climate-resilient households are those that were demonstrated to be well connected through their membership in organizations and well informed about weather information that they receive through these networks. Secondly, the findings highlight the existence of experience traps among mid-career farmers, which brings to the fore critical behavioural aspects to the analysis. It must therefore be seen that policies geared towards climate adaptation and resilience building should not assume that experienced farmers are most resilient. They possess historical knowledge filters, which are probably underpinned by cultural perspectives, and these sometimes dull their ability to receive and actively implement new information that improves climate-adaptive behaviour. Given this, the efforts of extension services must be tailored and targeted to plug into their knowledge systems, helping them unlearn maladaptive practices and overcome culturally laden cognitive biases in favour of new, more effective practices.

The study also highlights a geographical pattern in which climate vulnerability varies across the region. The glaring differences between districts such as Sissala East and Sawla Tuna Kalba demonstrate the need for locally tailored, place-based adaptation policies rather than a one-size-fits-all approach. Even after accounting for household-level factors, district dummies remain significant, confirming that community-level and regional factors are crucial for understanding and building climate resilience.

CONCLUSION AND POLICY IMPLICATIONS

In conclusion, this research suggests that the path to climate resilience in North-West Ghana runs through its community-based organizations. The following evidence-based policy implications are proposed: Development partners should use established groups, especially women's groups and VSLAs, as primary vehicles for delivering climate adaptation resources and weather information. Building their capacity is likely more sustainable than creating parallel structures. Support women's collective action alongside targeted policies to address the structural drivers of the gender resilience gap, such as securing women's land rights and promoting their access to formal credit and extension services. Significantly scale up investment in the provision of reliable, locally contextualized weather and climate information services. The observed “experience trap” felt by seasoned farmers should be addressed through agricultural extension services provided by the agency. Extension officers can design training and information programmes that respect their historical knowledge while introducing suitable new practices. Finally, adopting an integrated capacity-building process that recognises the vital role of social capital and essential knowledge, and addresses deep-rooted structural barriers related to gender inequality and cognitive limitations, is crucial. This approach will effectively strengthen the resilience of these vulnerable agrarian communities.

Limitations of the study

The study is limited to the extent of its binary indicator measurement of organization membership (yes/no) across organizational types, which restricts the exploration of moderating effects like participation intensity, membership duration, and leadership roles. Examining how membership duration and membership in multiple organizations influence household resilience could reveal complementary advantages. Therefore, future research should consider these factors. Further longitudinal data is needed to determine whether membership precedes resilience or vice versa. The current cross-sectional study design does not allow for causal inference because reverse causality and potential bias from observed factors like innate proactiveness, risk tolerance, and social capital cannot be ruled out. While the study controls for many observed confounders and uses clustered standard errors to account for community-level correlation, unobserved heterogeneity could still skew our estimates. Therefore, the findings should be interpreted as associations, not causal effects. Future research should use longitudinal designs or quasi-experimental methods like instrumental variables, propensity score matching, or difference-in-differences to establish causality.

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Ethics statement

This study adhered strictly to ethical guidelines. It was reviewed and approved by the University for Development Studies Institutional Review Board (UDSIRB) under number UDS/RB/045/19. It conformed to informed consent, and the data were handled under lock and key and on password-protected computers.

Ethical Approval and Compliance

The research protocol was reviewed and approved by the University for Development Studies Institutional Review Board (UDSIRB). Approval number UDS/RB/045/19 of the University for Development Studies in accordance with the UDS Institutional Review Board Policy guidelines on research involving humans and other living organisms (https://wacwisa.uds.edu.gh/wp-content/uploads/2020/04/UDS-Policy-Guidelines-Involving-Humans-and-Living-Organisms.pdf)

Consent to participate

The study was reviewed and ethically approved by the University for Development Studies Institutional Review Board (UDSIRB), number UDS/RB/045/19. Verbal informed consent was obtained from all adult household heads aged 25 years or older who participated. Participants were informed of their right to withdraw from the interview.

Consent to Publish

Not applicable

Conflict of interest

The author declares no conflict of interest.

Data availability

All data for this research are available on request.

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