

Leveraging Self-Help Groups' Synergy on Resilience to Climate Change and Sustainable Livelihoods in Nyakach Sub County, Kenya

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Abstract

Climate variability and recurrent extreme weather events continue to undermine rural livelihoods in Kenya, particularly in Nyakach Sub-County where most households depend on climate-sensitive livelihoods and have limited access to formal adaptation support. Grassroots initiatives such as Self-Help Groups (SHGs) have emerged as important community-based mechanisms for enhancing adaptive capacity and sustaining livelihoods through collective action, pooled resources, and knowledge sharing. This study was undertaken to evaluate the contribution of Self-help group participation to household livelihood outcomes, and to assess how SHG membership influences household adaptive capacity to climatic variability in Nyakach Sub-County. A descriptive survey design was adopted, targeting 385 SHG members selected through purposive sampling from 661 registered SHGs. Data were collected using structured Likert-scale questionnaires and analyzed using descriptive statistics in SPSS version 29. Findings indicated that SHG participation significantly enhanced income diversification, food security, and asset accumulation, with members reporting new income-generating activities, improved market access, and better savings discipline. SHGs were also found to be critical in disseminating timely and trusted early warning information, organizing pooled resources for climate shocks, facilitating access to farm inputs, and promoting the adoption of climate-smart practices such as drought-tolerant crops, water harvesting, and soil conservation. The study concluded that SHGs play a vital role in improving household livelihoods and resilience to climate variability by combining economic empowerment with adaptive strategies. Collectively, these outcomes underscore SHGs as critical platforms for advancing household well-being while contributing to multiple Sustainable Development Goals (SDGs), notably SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 5 (Gender Equality), SDG 7 (Affordable and Clean Energy), SDG 13 (Climate Action), and SDG 15 (Life on Land). It is recommended that SHG training be expanded in scope and quality, infrastructure and resource access for climate-smart practices be improved, and partnerships with government and development agencies be strengthened to enhance technical linkages, ICT access, and targeted financing for long-term asset acquisition.

Keywords: Nyakach Sub-County, Self-Help Groups Resilience To Climate Change, and Sustainable Livelihoods

1.1 Introduction

Resilience to climate change is the ability of individuals, households, communities, and systems to absorb, adapt to, and recover from shocks such as droughts, floods, and erratic weather while maintaining essential functions, identity, and structure. According to the United Nations International Strategy for Disaster Reduction (2025), resilience is —the ability of a system, community or society ... to resist, absorb, accommodate and recover ... including through the preservation and restoration of its essential basic structures and functions (UNISDR, 2025). It involves not only resisting adverse

impacts but also transforming vulnerabilities into strengths through proactive adaptation strategies. Grassroots solutions—locally conceived and community-led—have increasingly proven central to building resilience, as they harness social capital, indigenous knowledge, and collective agency to implement context-specific responses. As described by the International Institute for Environment and Development (IIED) (2024), —community-led climate responses| often involve nature-based solutions, climate-smart urban agriculture, and local disaster risk management teams (IIED, 2024). Such initiatives are directly tied to sustainable development outcomes, as they simultaneously advance poverty reduction (SDG 1), improve food security (SDG 2), and promote climate action (SDG 13).

Globally, Self-Help Groups (SHGs), women’s cooperatives, and community networks have become pivotal in driving grassroots resilience. In India, for instance, the Bibi Fatima SHG gained international recognition for advancing biodiversity and climate-resilient agriculture through natural farming, seed conservation, solar-powered milling, and millet-based mixed cropping—measures that safeguard food systems while enhancing nutrition (SDG 2) and strengthening women’s economic participation (SDG 5) (Times of India, 2025). In South Africa, the Buffelsdraai Reforestation Project engaged vulnerable communities through tree-preneurship, restoring degraded ecosystems (SDG 15), creating green jobs (SDG 8), and mitigating local climate impacts (SDG 13). Similarly, in Sri Lanka, the Sarvodaya Shramadana movement has empowered villages through collective development ranging from infrastructure rebuilding to environmental conservation, thereby reinforcing inclusive communities (SDG 11) and sustainable resource management (SDG 12). In Bangladesh, households’ dependence on non-timber forest products illustrate how ecosystems underpin adaptive capacity by sustaining livelihoods (SDG 1) and reducing vulnerability to ecological stress (SDG 13) (ArXiv, 2015).

African experiences further highlight the dual role of SHGs in advancing climate adaptation and empowerment. In Kenya, the Green Belt Movement founded by the late Wangari Maathai mobilized women to plant millions of trees, thereby addressing deforestation and soil erosion (SDG 15), improving access to sustainable fuel sources (SDG 7), and enhancing rural livelihoods (SDG 1) (GROOTS Kenya, 2025). Likewise, GROOTS Kenya has strengthened women’s SHGs by promoting climate-smart agriculture, clean cooking technologies, and disaster-risk reduction, contributing to food security (SDG 2), gender equality (SDG 5), health and well-being (SDG 3), and resilience to climate-related shocks (SDG 13) (GROOTS Kenya, 2025). These cases demonstrate how grassroots organizations align community-led development with broader global targets by simultaneously advancing inclusive growth, gender empowerment, sustainable resource use, and environmental protection.

In Nyakach Sub-County, Kisumu County in Kenya, livelihoods are highly vulnerable to recurrent droughts and floods, which undermine food security, incomes, and asset accumulation. However, local SHGs are filling critical adaptation gaps by organizing collective initiatives such as tree planting, water conservation, and the adoption of alternative energy solutions. These actions mitigate environmental risks (SDG 13), conserve ecosystems (SDG 15), and expand access to clean energy (SDG 7) while supporting income diversification (SDG 8) and poverty reduction (SDG 1). Moreover, SHGs strengthen women’s participation in climate-smart livelihoods, reinforcing gender empowerment (SDG 5) and inclusive community resilience (SDG 11). Evidence from Atieno, Mose, Oino... (2024) shows that SHGs in Nyakach significantly enhance household adaptive capacity by pooling resources, facilitating access to assets, and mobilizing collective action. Understanding how these groups function, the constraints they face, and the strategies they employ is therefore critical not only for local adaptation policy but also for accelerating progress towards the global sustainable development goals.

Taken together, these experiences demonstrate that SHGs are more than informal support structures; they are effective vehicles for localizing and operationalizing the sustainable development goals in vulnerable rural contexts. By reducing poverty through income diversification (SDG 1), strengthening food and nutrition security (SDG 2), empowering women as agents of change (SDG 5), promoting inclusive economic opportunities (SDG 8), expanding access to clean and affordable energy (SDG 7), and building resilience to climate shocks (SDG 13), SHGs directly contribute to multiple global targets while addressing community-specific needs. In Nyakach Sub-County, where climate variability increasingly threatens rural livelihoods, SHGs provide a platform where global

commitments intersect with grassroots realities as demonstrated by Grassroots Impact Centre (GIT). They serve as a bridge between policy and practice, ensuring that the pursuit of sustainable development is not an abstract global agenda but a lived process embedded in local institutions, collective action, and everyday survival strategies.

1.2 Problem Statement

Rural communities in Kenya increasingly rely on self-help groups (SHGs) as mechanisms for poverty reduction, empowerment, and social support. In Nyakach Sub County, however, households continue to grapple with sustaining their livelihoods and coping with the adverse effects of climate change. Although SHGs play a vital role in pooling resources, promoting access to microfinance, and fostering social networks, their potential to drive resilience and sustainable development remains underutilized. Many groups face persistent challenges such as limited financial capacity, inadequate training, and weak linkages to formal markets, which undermine their effectiveness in strengthening household adaptive capacities. At the policy level, Kenya has introduced frameworks such as the Climate Change Act of 2016 and the National Adaptation Plan, aimed at enhancing adaptation and sustainable development. Yet, these policies often adopt a top-down approach that overlooks grassroots actors, including SHGs, in climate change response strategies. The lack of structured policy support and recognition of SHGs as community-based agents of resilience leaves a critical gap. This disconnect results in the exclusion of local innovations and collective action from government planning and resource allocation, thereby constraining opportunities to leverage SHG synergy in advancing livelihood sustainability. From an academic perspective, existing research has largely examined SHGs in the domains of poverty alleviation, women's empowerment, and microfinance. However, little empirical evidence exists on how SHGs can be strategically harnessed to enhance climate resilience while promoting sustainable livelihoods, particularly in vulnerable contexts like Nyakach Sub County. Addressing this knowledge gap is essential for generating insights that can inform practice and policy in building resilient and sustainable rural communities.

1.3 General Objective

The main objective of this study was to assess how leveraging on self-help groups' synergy influenced sustainable livelihoods and resilience to climate change in Nyakach Sub County, Kenya

1.4 Specific Objectives

To evaluate the contribution of SHG participation to livelihood outcomes among households in Nyakach Sub-County, Kenya

To assess how SHG membership influences adaptive capacity to climatic variability among households in Nyakach Sub-County, Kenya

2.0 Literature Review

2.1 Contribution of SHG Participation to Household Livelihood Outcomes

Participation in SHGs including Village Savings and Loan Associations (VSLAs), rotating savings groups, and other member-driven associations has been widely documented to influence household livelihoods through multiple, partly overlapping mechanisms. In the United States, Carstensen and Mudhar (2021) examined the role of mutual aid and self-help groups during the early COVID-19 pandemic using a mixed-methods, multi-case approach that combined descriptive survey data, interviews, and case documentation across several U.S. cities. Although no single pooled sample size was reported due to the multi-site design, data were collected using structured interviews, participant observation, and secondary administrative records. Analysis entailed thematic qualitative coding alongside cross-case synthesis to describe mobilisation patterns. The study found that grassroots networks provided essential, timely livelihood support such as food distribution, informal income support, and referral to services, but that responses were uneven and often under-resourced for long-term livelihood impacts. A key knowledge gap is that while the U.S. evidence documents short-term buffering benefits, it does not quantify sustained economic outcomes highlighting the need for structured, household-level quantitative assessments in contexts like Nyakach Sub-County to measure whether self-help group (SHG) participation yields durable livelihood improvements.

In the United Kingdom, Kolk, Carstensen and Mudhar (2021) conducted a survey-based study exploring participation in COVID-19 mutual aid groups and its association with subjective well-being and social identity. The design utilised psychometric scales within a structured online questionnaire, sampling several hundred participants across the UK. Regression and moderation models were applied to examine relationships between group participation, well-being, and political identity. Findings indicated that participation improved subjective well-being, social connectedness, and agency, with political identity moderating these effects. However, the study did not measure economic indicators such as income or asset accumulation. This leaves a gap for Nyakach research to explore whether psychosocial gains from SHG participation translate into measurable economic livelihood outcomes in rural, low-resource settings.

From Asia, Banerjee, Duflo, Glennerster and Kinnan, (2022) assessed the impact of women's SHGs across five Indian states using a longitudinal panel design involving approximately 2,500 households. Structured household questionnaires and administrative group data were collected, and fixed-effects econometric models were employed to estimate causal impacts on consumption, asset ownership, and women's empowerment. Results showed significant improvements in household expenditure, asset accumulation, and empowerment for SHG members, although impacts varied by state and by access to complementary services. However, there is a contextual gap given that India's large-scale, state-supported federated SHG systems differ markedly from Kenya's smaller, locally organised SHGs, necessitating localised evidence to test if similar outcomes occur without extensive institutional support.

In Africa, Devereux and Sabates-Wheeler, (2023) conducted a comparative panel survey across several East African countries to investigate the role of women's groups in resilience to covariate shocks. The study sampled hundreds of households per site, using repeated household surveys, shock modules, and group registers. Data were analysed using difference-in-differences and panel regression methods. Findings revealed that SHG participation reduced short-term welfare losses from shocks and facilitated quicker recovery through pooled savings and informal credit, though benefits varied with group liquidity, leadership, and external linkages. However, such multi-country studies may mask local variations, necessitating sub-county-level research to unpack specific mechanisms credit, training, pooled resources, or market access that influence distinct livelihood outcomes.

Within Kenya, Atieno, Mose, Oino, & Ombachi, (2024) carried out a descriptive cross-sectional study in Nyakach Sub-County with 384 SHG members selected from local registers. Data collection employed structured household questionnaires, group record reviews, and key informant interviews. Descriptive statistics, Pearson correlations, and regression analysis were used to examine associations between SHG participation and livelihood outcomes. Results indicated improved access to small loans, group savings, productive assets, and climate-resilient practices among members, with perceived gains in income stability. However, causality could not be established due to the study's cross-sectional nature, creating a need for longitudinal or quasi-experimental designs in Nyakach to measure the magnitude and sustainability of livelihood impacts from SHG participation.

2.2 SHG membership's influence on household adaptive capacity to climatic variability

Self-Help Groups (SHGs) have emerged globally as important community-based institutions that enhance households' ability to adapt to climatic variability through social, economic, and informational channels. In the United States, farmer cooperatives and community-based resource-sharing groups though not always labelled as SHGs have been shown to build adaptive capacity by pooling resources, sharing weather forecasts, and collectively investing in water conservation infrastructure. Using a mixed-methods design with 250 participants across climate-vulnerable agricultural counties, Knapp, Fernández-Giménez, & Wilmer, (2023) found that members of such groups were more likely to adopt soil moisture conservation practices and drought-resilient crops. A recent survey by Arnott, Rocco, Brown, Chester, & Lemos, (2024) investigated how communities are planning for resilience and the challenges they face. The study adopted a cross-sectional survey design targeting local staff involved in adaptation and resilience planning, combining structured questionnaires with follow-up interviews. Data were analysed using descriptive statistics and thematic coding of qualitative responses. Findings indicated that community networks and locally embedded organisations—those that convene residents, run local training, and enable peer learning are critical for implementing adaptation plans, yet their capacities vary widely by funding, institutional linkages,

and staff time, producing uneven preparedness across jurisdictions. However, the study's institutional focus leaves a gap in understanding how grassroots, member-run groups in rural low-income settings, such as self-help groups (SHGs) in Nyakach, operate as early-warning and adaptive units under climatic variability.

In the United Kingdom, empirical work has explored how civic and community groups influence household and neighbourhood adaptation choices. For instance, Lorenzoni, Nicholson-Cole & Whitmarsh, (2007), conducted a mixed-methods study mapping discourses and public perceptions of climate risk and adaptation. The research combined survey data with qualitative interviews, analysing attitudes and perceived responsibilities for adaptation through statistical summaries and discourse analysis. Results showed that social capital and trusted community forums help mobilise household preparedness actions, though uptake remains patchy because of informational barriers and cost concerns (Lorenzoni et al. (2007). Similarly, Wolf, Adger, Lorenzoni, Abrahamson, and Raine (2010) found that in two UK cities, higher levels of institutional trust and social reciprocity were linked with greater public acceptability of adaptation options, indicating that trusted community networks can shape adaptation decisions in urban contexts. This body of work leaves unanswered how small, rural SHGs in low-income settings build adaptive capacity through pooled informal finance, shared labour, and context-specific agricultural practices.

From Asia, Chetri, Kumar, & Roy, (2021) examined the role of information and communication technologies (ICTs) in shaping farmers' adaptive capacity in Haryana, India. Using a cross-sectional survey of 463 farmers across six districts, data were collected via structured household questionnaires and analysed through path analysis to test direct and mediated effects of information access and ICT ecosystem on adaptive capacity. Results demonstrated that both information and the ICT ecosystem are strong determinants of farmers' adaptive capacity and resilience to weather shocks, although access gaps persist. This study, however, focuses on individual farmers and technological infrastructure rather than on collective organisational mechanisms such as SHGs that pool resources and knowledge, leaving a gap on the role of group dynamics in rural adaptation.

In Africa outside Kenya, Chetri, Kumar, & Roy (2023) evaluated the effects of Village Savings and Loan Associations (VSLAs) on smallholder farmers' welfare and adoption of sustainable agricultural practices in Ghana. The study used a cross-sectional survey design with a sample of 120 participants, collecting data through structured questionnaires and focus group discussions. Probit and Tobit regressions revealed that VSLA participation increased off-farm income, improved access to credit for shock coping, and enhanced adoption intensity of sustainable agricultural practices. Nevertheless, poverty reduction impacts were mixed and highly context-dependent. This evidence suggests that while group financial mechanisms can improve adaptive practices, the mechanisms by which membership enhances broader adaptive capacity through information sharing, collective labour, or early-warning systems remain underexplored in rural contexts like Nyakach.

In Kenya, Atieno et al., (2024) investigated the role of SHGs in building sustainable livelihoods and resilience to climate change in Nyakach Sub-County. Employing a descriptive cross-sectional design, they surveyed 384 SHG members using structured questionnaires. Descriptive statistics and Spearman rank correlation were used to examine the relationship between SHG assets/competencies and household sustainable livelihoods. The study found a strong, positive correlation between SHG membership benefits and improved livelihoods, alongside evidence of tangible SHG-led initiatives such as tree planting, water channeling, and shifts to alternative energy. However, the study's correlational nature leaves a gap in causal understanding and in identifying which specific SHG practices most effectively enhance adaptive capacity.

3.0 Research Methodology

3.1 Research Design

This study employed a mixed method design with a descriptive approach, employing both qualitative and quantitative methods to investigate the impact of self-help groups (SHGs) on building sustainable livelihoods and resilience to climate change. Interviews were used to obtain information from a selected sample, thereby allowing the researcher to describe existing conditions, situations and phenomena in a systematic and detailed way (Osazevbaru & Mayuku, 2024).

3.2 Study Site

The study was conducted in Nyakach Sub-County, which was established in 2008 following the subdivision of the former Nyando District. It is bordered by Kericho County to the east, Homa Bay County to the west, Nyamira County to the southeast, and Lake Victoria to the east (Republic of Kenya, 2015). Administratively, the sub-county is divided into three divisions: West, Lower, and Upper, and has a population of 139,589 people (Republic of Kenya, 2019). According to records from the Sub-County Social Services Office, there are 796 self-help groups (SHGs) in the area, with 166 formed before December 2010 and the remaining 630 operating between January 2020 and December 2024 (Republic of Kenya, 2025). The site was considered appropriate for the study because it is 90 percent rural and lacks significant agricultural or commercial activities, making group synergy the primary avenue for improving household livelihoods.

3.3. Sample Size and Sampling Technique

The study's analysis centred on group members. This study employed Yamane (1967; cited in Israel, 2013) formula to calculate the sample size of the study, as:

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{10456}{1 + 10456 (0.05)^2} = 385$$

Where: n is the sample size

N is the population size

e is the level of precision (0.05).

As shown in Table 3.1, the sample distribution of SHG members was as follows:

Table 3.1. Sample Distribution of SHG Members

Divisions	Target Population (SHGs)	Membership (Group Members)	Sample Size
West Nyakach	121	1894	70
Lower Nyakach	294	4726	174
Upper Nyakach	246	3836	141
TOTAL	661	10456	385

Purposive sampling was used to select SHGs from which respondents were drawn.

3.4 Data Collection Instruments

Quantitative data from SHG members were collected using both open and closed-ended questionnaires because the use of questionnaires enabled the researchers to solicit views of respondents on their experiences with SHGs across the villages in the three divisions which permitted a coverage of a very large area (Creswell, 2018). The questionnaires used were constructed in Likert scales with five constructs: as:1- Strongly Disagree; 2- Disagree; 3- Neither Agree nor Disagree; 4- Agree 5- Strongly Agree to collect data on the contribution of SHG participation to household livelihoods.

3.5 Data Analysis

Descriptive statistical techniques were applied with the Statistical Package for Social Sciences (SPSS) version 29 used to analyse data. Descriptive statistics summarized and described the main features of the collected data in terms of Mean (average response per Likert item), Standard Deviation (variation in responses), Frequency Distribution, percentage of responses per scale point and tables. This was computed to present a general overview of trends and variations in responses (Pallant, 2023).

4.0 Findings and Discussions

4.1 Contribution of SHG Participation to Household Livelihood Outcomes

Respondents were asked to indicate their responses on the contribution of SHG participation to household livelihood outcomes as categorized under; income diversification, food security and asset accumulation. The responses were as shown in subsequent tables.

Table 1. Descriptive Statistics for Income Diversification

Statement	SD	D	N	A	SA	Mean	SD
Because of SHG participation, this household has started new income-generating activities.	9 (2.6%)	21 (6.0%)	52 (15.0%)	171 (49.1%)	95 (27.3%)	3.93	0.92
SHG loans/savings enabled investment in non-farm businesses or enterprises.	7 (2.0%)	17 (4.9%)	49 (14.1%)	178 (51.1%)	97 (27.9%)	4.00	0.88
SHG training improved skills useful for diversifying income sources.	14 (4.0%)	35 (10.1%)	70 (20.1%)	160 (46.0%)	69 (19.8%)	3.68	0.98
SHG membership increased access to markets for selling varied products.	10 (2.9%)	26 (7.5%)	66 (19.0%)	165 (47.4%)	80 (23.0%)	3.80	0.94
SHG networks helped find new wage or off-farm employment opportunities.	17 (4.9%)	42 (12.1%)	87 (25.0%)	139 (39.9%)	63 (18.1%)	3.54	1.01

Key: SA= Strongly Agree; A=Agree; N=Neutral; D=Disagree; SD=Strongly Disagree

The study findings reveal that SHG participation has made significant contributions to household livelihood outcomes in Nyakach Sub-County. A majority of respondents (76.4%) affirmed that SHG membership facilitated the initiation of new income-generating activities. This suggests that SHGs serve as catalysts for entrepreneurship, providing members with not only financial resources but also the social confidence to engage in productive ventures. The fact that nearly four-fifths (79.0%) agreed that SHG loans and savings supported investments in non-farm businesses further highlights the shift from subsistence-based to more diversified livelihood strategies. These findings align with studies in India and Ethiopia which showed that SHG credit schemes enhanced women's entrepreneurship and increased household resilience against shocks (Datta, 2018; Alemu & Mengistu, 2019). Such contributions directly support SDG 1 (No Poverty) by enabling households to create income streams that reduce vulnerability to poverty, and SDG 8 (Decent Work and Economic Growth) by promoting micro-enterprises and inclusive economic participation.

The moderately high mean score ($M = 3.68$, $SD = 0.98$) on training and skills development indicates that while SHGs offer capacity-building opportunities, their impact on income diversification is not uniformly felt. The 20.1% neutrality and 14.1% disagreement suggest gaps in the effectiveness or applicability of the training provided. This implies that although training programs exist, they may not always be tailored to members' needs or local economic realities. Past research similarly cautions that generic skills training has limited impact unless adapted to local markets and accompanied by

mentorship and follow-up support (Kassie, Teklewold, & Jaleta, 2020). These findings highlight the importance of SDG 4 (Quality Education) and SDG 5 (Gender Equality), as equipping especially women and marginalized groups with relevant and market-driven skills enhances their capacity to fully participate in economic life.

In terms of market access, 70.4% of respondents reported improved opportunities to sell products, with a mean of 3.80 (SD = 0.94). This finding underscores the role of SHGs in strengthening collective bargaining power and enhancing integration into broader markets. Improved market access is consistent with recent findings in Kenya and Uganda, where SHGs reduced transaction costs and facilitated linkages with traders, thereby improving household incomes (Chepchumba & Mose, 2021; Kasozi & Nyanzi, 2022). Such market integration directly contributes to SDG 2 (Zero Hunger) by enhancing food security through income stability, as well as SDG 10 (Reduced Inequalities) by empowering small producers to access markets that would otherwise exclude them.

The role of SHG networks in providing wage or off-farm employment opportunities was less pronounced, with only 58.0% of respondents in agreement and a relatively high neutral response rate (25.0%). This indicates that while SHGs are more effective in fostering self-employment and microenterprise, their contribution to creating formal or wage employment is limited. Such outcomes resonate with past studies in Tanzania and Nepal, which found that SHGs predominantly strengthen informal and self-driven livelihood pathways rather than direct integration into wage labor markets (Kato & Kratzer, 2013; Shrestha, 2021). This gap points to the need for policies that connect SHG initiatives with broader labor market strategies, thereby reinforcing SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation, and Infrastructure) through sustainable job creation and better economic linkages.

Therefore, SHG participation in Nyakach Sub-County has demonstrably enhanced household livelihoods through new income-generating activities, improved access to credit, and better market linkages. However, the relatively modest outcomes in skill acquisition and wage employment highlight areas for policy and programmatic improvement. These findings reinforce the notion that SHGs are effective vehicles for livelihood diversification and resilience-building, and their contributions align with multiple SDGs including SDG 1, 2, 4, 5, 8, 9, and 10. The full potential of SHGs, however, is realized only when complemented by context-specific training, market infrastructure development, and linkages to formal employment channels. In this way, SHGs not only improve individual household livelihoods but also advance the broader agenda of sustainable and inclusive development.

Table 2. Descriptive Statistics for Food security

Statement	SD	D	N	A	SA	Mean	SD
SHG participation has helped my household have more consistent access to food.	5 (1.4%)	14 (4.0%)	45 (12.9%)	184 (52.9%)	100 (28.7%)	4.03	0.84
We spend less time in the year worrying about running out of food because of SHG support.	3 (0.9%)	16 (4.6%)	42 (12.1%)	191 (54.9%)	96 (27.6%)	4.04	0.81
SHG savings/credit have been used to buy food during lean periods.	3 (0.9%)	12 (3.4%)	38 (10.9%)	188 (54.0%)	107 (30.7%)	4.10	0.8
SHG involvement improved the diversity of foods consumed in the household.	9 (2.6%)	26 (7.5%)	70 (20.1%)	160 (46.0%)	83 (23.9%)	3.82	0.93
SHG training/activities increased household knowledge of food preservation and nutrition.	10 (2.9%)	35 (10.1%)	84 (24.1%)	150 (43.1%)	69 (19.8%)	3.67	0.97

Key: SA= Strongly Agree; A=Agree; N=Neutral; D=Disagree; SD=Strongly Disagree;

The findings of this study indicate that SHG participation has a profound effect on household food security in Nyakach Sub-County. A large proportion of respondents (81.6%) acknowledged that SHG involvement ensured more consistent access to food, with a mean score of 4.03 (SD = 0.84). This suggests that SHGs play a critical role in stabilizing household food availability by providing both financial and social support systems. The fact that only 5.4% disagreed reinforces the notion that SHG interventions directly cushion households against food insecurity, particularly during shocks such as droughts or price fluctuations. Similar results have been observed in India and Bangladesh, where SHG participation was linked to increased household food sufficiency and reduced seasonal hunger (Deininger & Liu, 2019; Rahman, Sultana, & Hossain, 2021). These outcomes directly contribute to SDG 2 (Zero Hunger) by ensuring reliable access to food and SDG 1 (No Poverty) by reducing vulnerability to hunger-related poverty traps.

Moreover, the high level of agreement (82.5%) that SHG support reduced the time households spent worrying about food shortages (M = 4.04, SD = 0.81) suggests that participation not only improves material access but also reduces psychological stress linked to food insecurity. This inference aligns with evidence from Ethiopia and Uganda, where SHGs were found to enhance households' sense of food security by providing access to timely loans and savings that acted as safety nets during lean seasons (Bekele & Alemu, 2020; Namayengo & Olum, 2022). By reducing anxiety over food shortages, SHGs contribute to SDG 3 (Good Health and Well-Being), as lower stress levels are associated with better overall health and well-being, particularly among women who are often primary food managers in households.

The highest-rated outcome in this group was the use of SHG savings/credit to buy food during lean periods, with 84.7% agreement and a mean of 4.10 (SD = 0.80). This underscores the vital role of SHGs as informal insurance systems that help members buffer consumption shortfalls. The findings support the argument that financial inclusion through SHGs contributes to improved household consumption smoothing—a finding also reported in Kenya and Tanzania, where SHG credit was used to maintain stable food supplies in periods of scarcity (Mutiso & Kamau, 2020; Kessy & Urassa, 2021). Such outcomes strengthen SDG 8 (Decent Work and Economic Growth) by promoting financial resilience through community-based microfinance mechanisms that sustain productivity during shocks.

In terms of dietary diversity, 69.9% of respondents agreed that SHG participation enhanced the variety of foods consumed, with a mean score of 3.82 (SD = 0.93). This finding suggests that SHG households were better able to allocate resources not only for staple foods but also for nutritious items, leading to improved diet quality. However, the lower agreement rate compared to food availability indicates that while SHGs stabilize access, their impact on dietary diversity is more modest. Previous studies have made similar observations, with women's SHGs in South Asia contributing to dietary improvements but facing limitations due to market access and cultural food norms (Kumar, Scott, Menon, & Chakrabarti, 2018). This finding resonates with SDG 2 (Zero Hunger) and SDG 5 (Gender Equality), as improving women's access to diversified diets enhances nutrition for entire households.

Finally, the mean score of 3.67 (SD = 0.97) regarding SHG training in food preservation and nutrition suggests moderate benefits. About one-third of respondents remained neutral or disagreed, pointing to gaps in the design and delivery of nutrition-focused training. This highlights the need to strengthen SHG capacity-building modules to not only address financial resilience but also embed food security, nutrition, and preservation skills. Comparable studies in Nepal and Rwanda also concluded that while SHGs improve food access, explicit nutrition education interventions are required to translate financial gains into long-term nutritional well-being (Shrestha & Adhikari, 2020; Duku, Asare, & Owusu, 2021). Such interventions would advance SDG 4 (Quality Education) by promoting lifelong learning opportunities in nutrition and preservation, while also enhancing SDG 12 (Responsible Consumption and Production) through reduced post-harvest losses and improved food management.

Therefore, SHG participation significantly contributes to household food security by ensuring more reliable food access, reducing worries of shortages, and providing financial mechanisms to purchase food during lean times. However, the relatively lower impact on dietary diversity and nutrition knowledge suggests that policy interventions should integrate nutrition-sensitive approaches into SHG programming. By doing so, SHGs will not only improve immediate household food security but also

contribute to broader sustainable development goals, especially SDG 1, SDG 2, SDG 3, SDG 4, SDG 5, SDG 8, and SDG 12.

Table 3. Descriptive Statistics for Asset Accumulation

Statement	SD	D	N	A	SA	Mean	SD
Since joining the SHG, this household acquired productive assets (livestock, tools, equipment).	14 (4.0%)	38 (10.9%)	94 (27.0%)	146 (42.0%)	56 (16.1%)	3.55	0.99
SHG loans have been used to purchase land or durable productive assets.	26 (7.5%)	61 (17.5%)	104 (29.9%)	113 (32.5%)	44 (12.6%)	3.25	1.07
Participation in the SHG increased our ability to save regularly for asset purchase.	10 (2.9%)	31 (8.9%)	91 (26.1%)	153 (44.0%)	63 (18.1%)	3.65	0.96
SHG membership helped maintain or repair existing household assets.	12 (3.4%)	44 (12.6%)	98 (28.2%)	143 (41.1%)	51 (14.7%)	3.52	0.98
Members felt more confident to invest savings in long-term assets because of SHG support.	16 (4.6%)	52 (14.9%)	101 (29.0%)	132 (37.9%)	47 (13.5%)	3.41	1.00

Key: SA= Strongly Agree; A=Agree; N=Neutral; D=Disagree; SD=Strongly Disagree

The findings suggest that participation in SHGs has had a noticeable though varied impact on household acquisition and management of productive assets. More than half of respondents (58.1%) confirmed that their households had acquired new assets such as livestock, tools, or equipment since joining SHGs. With a mean score of 3.55 (SD = 0.99), this indicates that SHGs positively influence household asset growth, primarily through increased access to credit and savings mobilization. Such outcomes underscore the role of SHGs not only in improving consumption but also in fostering asset accumulation, which is critical for long-term livelihood security. Similar results have been documented in rural India and Ethiopia, where SHG membership was strongly associated with livestock acquisition and asset diversification (Swain & Varghese, 2019; Alemu & Mengistu, 2019). These results directly contribute to SDG 1 (No Poverty) by reducing household vulnerability, and SDG 8 (Decent Work and Economic Growth) hence enhancing productive capacities.

When it comes to the use of SHG loans for land or other durable productive assets, responses were more mixed. Only 45.1% agreed that they had used loans for such purposes, while 25% disagreed and nearly 30% were neutral. The lower mean score of 3.25 (SD = 1.07) reflects a wide variation in experiences, possibly pointing to challenges such as high land prices, competing household needs, or limited loan sizes that restrict the purchase of durable assets. This finding is consistent with studies in Uganda and Tanzania, which showed that while SHG loans often improve access to small-scale assets and working capital, they are less effective in facilitating large-scale investments such as land purchase (Namayengo & Olum, 2022; Kato & Kratzer, 2013). This limitation highlights the need for stronger linkages to formal credit institutions, aligning with SDG 9 (Industry, Innovation and Infrastructure), which emphasizes access to financial services for sustainable investment.

The study also found that SHG membership enhanced members' ability to save regularly for asset acquisition, with 62.1% agreement and a relatively high mean of 3.65 (SD = 0.96). This suggests that SHGs instill a culture of disciplined saving, thereby enabling households to gradually accumulate resources for asset investment. This result mirrors findings from Bangladesh and Nepal, where SHG members developed stronger saving habits that directly contributed to long-term asset building (Rahman et al., 2021; Shrestha, 2021). Such outcomes reinforce SDG 12 (Responsible Consumption

and Production) by encouraging prudent financial management and sustainable household investment strategies.

A moderate benefit was observed in relation to asset maintenance and repair, where 55.8% of respondents agreed that SHG participation facilitated upkeep of existing assets ($M = 3.52$, $SD = 0.98$). This reflects the role of SHGs in providing liquidity during emergencies, thus preventing asset depletion—a phenomenon commonly referred to as —asset smoothing. Similar patterns have been reported in Kenya and Ghana, where SHG loans helped households avoid distress sales of livestock or equipment during crises (Mutiso & Kamau, 2020; Duku, et al, 2021). Such resilience-building mechanisms directly support SDG 13 (Climate Action) and SDG 1 (No Poverty), as they reduce the likelihood of households sliding back into poverty during environmental or economic shocks.

Finally, slightly more than half of respondents (51.4%) agreed that SHG support increased their confidence to invest in long-term assets, though nearly 29% remained neutral and 19.5% disagreed. The mean score of 3.41 ($SD = 1.00$) suggests a generally positive, but less decisive, trend. This indicates that while SHG participation builds financial resilience and investment capacity, not all members feel adequately empowered to take on the risks of long-term financial commitments. This gap may be attributed to uncertainties in local markets, limited financial literacy, or fear of defaulting on loans. Past studies have reached similar conclusions, noting that SHGs are effective in building short-term financial security, but require complementary training and risk mitigation strategies to translate into sustained long-term asset accumulation (Datta, 2018; Kassie & Urassa, 2020). Addressing these gaps would further enhance SDG 4 (Quality Education) through financial literacy and SDG 5 (Gender Equality) by empowering women to take part in strategic, long-term investment decisions.

Hence, SHG participation contributes positively to household asset acquisition, savings discipline, and maintenance of existing assets. However, challenges remain in translating these gains into large-scale and long-term asset investments. Strengthening financial literacy, expanding loan sizes, and linking SHGs to formal financial institutions could enhance their capacity to support durable asset accumulation and long-term wealth creation. In this way, SHGs serve as a practical vehicle for achieving multiple SDGs, particularly SDG 1, 4, 5, 8, 9, 12, and 13, through poverty reduction, financial inclusion, and resilience-building.

4.2 SHG membership and household adaptive capacity to climatic variability

The second objective sought to assess how SHG membership influences household adaptive capacity to climatic variability among households in Nyakach Sub-County, Kenya. The responses were as shown in subsequent tables.

Table 4: Descriptive Statistics for Early Warning

Statement	Mean	SD	Agree Frequency (%)	Neutral Frequency (%)	Disagree Frequency (%)
Local SHG shares timely weather alerts with members	4.21	0.88	287 (82.5%)	35 (10.1%)	26 (7.4%)
I receive SMS or radio updates on climate hazards via SHG	4.05	0.95	272 (78.2%)	44 (12.6%)	32 (9.2%)
SHG meetings include seasonal forecast discussions	4.18	0.84	282 (81.0%)	39 (11.2%)	27 (7.8%)
SHG encourages preventive action based on warnings	4.11	0.91	275 (79.0%)	45 (12.9%)	28 (8.1%)
I trust the reliability of SHG-provided early warning info	4.24	0.80	291 (83.6%)	34 (9.8%)	23 (6.6%)

The findings show that SHG membership in Nyakach significantly enhances household adaptive capacity to climatic variability. A large majority of SHG members (mean = 4.21; 82.5%) reported receiving timely weather alerts through their group, which aligns with local evidence that SHGs act as active intermediaries for climate information and everyday resilience-building (Atieno et al., 2024). This group-based channeling of early warnings strengthens information flows in areas where national

services alone struggle to reach households. Such contributions are highly relevant to SDG 13 (Climate Action), as they promote community-based climate adaptation, and SDG 11 (Sustainable Cities and Communities), by building resilience at the grassroots level.

Similarly, 78.2% of respondents confirmed receiving SMS or radio updates via their SHGs (mean = 4.05). This reflects a hybrid communication model in Kenya, where traditional face-to-face meetings are complemented by ICT tools to extend reach and timeliness (Sauti East Africa, 2024). Although coverage and digital literacy gaps limit universal uptake, the blending of ICTs with trusted social networks enhances reliability and access. This outcome reinforces SDG 9 (Industry, Innovation and Infrastructure), particularly the target on access to information and communication technology, while also advancing SDG 5 (Gender Equality) by enabling women—who are often SHG leaders and members—to access timely and actionable climate information.

The strong agreement that SHG meetings incorporate seasonal forecast discussions (mean = 4.18; 81.0% agree) highlights the importance of collective forums in translating technical forecasts into practical advice for local contexts. Evidence shows that such participatory interpretation increases the uptake and relevance of climate information for farming, grazing, and water management decisions. This aligns with SDG 2 (Zero Hunger) by improving smallholders' adaptive agricultural practices and enhancing food security, and SDG 13 (Climate Action) by strengthening climate-informed decision-making. Closely related, the finding that 79.0% of respondents agreed that SHGs encourage preventive action based on warnings (mean = 4.11) demonstrates that trust and dialogue lead to behaviour change. Regional evaluations confirm that trusted local actors such as SHGs increase the likelihood of households adopting protective measures, though resource and gender constraints can limit uptake (Sauti East Africa, 2024). This finding advances SDG 1 (No Poverty) by reducing climate-related livelihood losses and SDG 3 (Good Health and Well-Being) by protecting households from climate-induced risks such as food shortages, floods, or disease outbreaks.

The highest-rated outcome was trust in SHG-provided warnings (mean = 4.24; 83.6% agreement). Credibility is critical to whether households act upon alerts, and SHGs appear to be highly trusted intermediaries. This finding echoes the global agenda of Early Warnings for All (UNDRR, 2025), which emphasizes pairing technical monitoring with community trust networks to ensure warnings trigger timely protective behaviours. This strongly supports SDG 13 (Climate Action) and SDG 16 (Peace, Justice and Strong Institutions), as trust in local institutions underpins inclusive and effective governance of disaster risk reduction systems. Summarily, SHG membership substantially contributes to strengthening household adaptive capacity to climate variability through timely weather information, blended communication models, participatory forecast interpretation, encouragement of preventive action, and high levels of trust. These findings reinforce the potential of SHGs as grassroots institutions that not only build household resilience but also advance multiple SDGs, particularly SDG 1, SDG 2, SDG 3, SDG 5, SDG 9, SDG 11, SDG 13, and SDG 16.

Table 5: Descriptive Statistics for Resource Pooling

Statement	Mean	SD	Agree Frequency (%)	Neutral Frequency (%)	Disagree Frequency (%)
Members contribute funds for emergency climate responses	4.07	0.92	268 (77.0%)	50 (14.4%)	30 (8.6%)
SHGs organize group purchasing of farm inputs	3.96	0.97	259 (74.4%)	53 (15.2%)	36 (10.4%)
Members share farm equipment to reduce costs	3.88	1.01	251 (72.1%)	54 (15.5%)	43 (12.4%)
SHG maintains a common savings pool for climate shocks	4.12	0.89	277 (79.6%)	42 (12.1%)	29 (8.3%)
I can easily access pooled resources during climate crises	4.03	0.94	266 (76.4%)	46 (13.2%)	36 (10.4%)

Most respondents (mean = 4.07; 77.0% agree) reported that SHG members contribute funds for emergency climate responses, pointing to the presence of a community-based financial safety net. This finding aligns with Atieno et al. (2024), who observed that SHG-managed contributions in Nyakach cushion members against livelihood losses after floods or prolonged droughts, enabling faster recovery compared to households relying solely on external aid. Similarly, studies in rural Kenya and Ethiopia highlight that local contribution schemes provide more immediate and context-relevant relief than formal credit channels, particularly where access to microfinance or insurance is limited (Sauti East Africa, 2024). This outcome strengthens SDG 1 (No Poverty) and SDG 13 (Climate Action) by enhancing household resilience to shocks through community-driven financial mechanisms.

The practice of organizing group purchasing of farm inputs (mean = 3.96; 74.4% agree) reflects a cooperative approach to reducing costs and ensuring timely access to agricultural resources. Recent research in Kenya's smallholder systems indicates that group procurement through SHGs and cooperatives not only lowers per-unit prices but also improves bargaining power with suppliers, reducing vulnerability to price spikes during planting seasons (Frontiers in Climate, 2025). Evidence from Uganda and Tanzania similarly shows that collective purchasing improves farm productivity and resilience under climate stress (World Bank, 2023). These practices directly support SDG 2 (Zero Hunger) by improving food security through stable farm production, as well as SDG 12 (Responsible Consumption and Production) by promoting efficient resource use.

The slightly lower score for sharing farm equipment (mean = 3.88; 72.1% agree) suggests that while resource sharing is fairly common, it faces logistical challenges such as scheduling conflicts, maintenance responsibilities, and limited machinery availability during peak demand (Frontiers in Climate, 2025). Nonetheless, where such arrangements function well, they reduce individual capital burdens and enable farmers to adopt climate-smart practices. This contributes to SDG 9 (Industry, Innovation and Infrastructure) by promoting shared agricultural technologies and SDG 13 (Climate Action) and supporting adaptation strategies that are both cost-effective and sustainable.

The highest-rated outcome was maintaining a common savings pool for climate shocks (mean = 4.12; 79.6% agree), echoing financial resilience literature that identifies savings groups as among the most effective informal risk-management mechanisms in rural East Africa (Atieno et al., 2024; Sauti East Africa, 2024). Beyond providing liquidity during crises, these pools foster trust, cohesion, and solidarity among members, reinforcing the broader adaptive capacity of communities. Such mechanisms strongly advance SDG 8 (Decent Work and Economic Growth) by stabilizing livelihoods under stress, and SDG 16 (Peace, Justice, and Strong Institutions) by strengthening inclusive, community-based governance of shared resources.

Finally, the finding that pooled resources are perceived as easily accessible during crises (mean = 4.03; 76.4%) affirms that SHGs not only mobilize and store resources but also ensure equitable and timely distribution. Studies in Kenya's arid and semi-arid counties show that rapid access to pooled resources is critical during sudden-onset events such as flash floods (UNDRR, 2025). This responsiveness distinguishes well-organized SHGs from weaker groups and amplifies their role in enhancing household and community resilience. Such outcomes reinforce SDG 11 (Sustainable Cities and Communities) by promoting disaster preparedness and resilience, and SDG 13 (Climate Action) through timely adaptation responses.

In summary, SHGs in Nyakach Sub-County play a pivotal role in strengthening household and community adaptive capacity to climate variability through pooled financial resources, collective purchasing, equipment sharing, and common savings for shocks. These mechanisms reduce vulnerability, stabilize production, and ensure rapid crisis response. In doing so, SHGs directly contribute to multiple SDGs, particularly SDG 1, SDG 2, SDG 8, SDG 9, SDG 11, SDG 12, SDG 13, and SDG 16.

Table 6: Descriptive Statistics for Adoption of Climate-Smart Practices

Statement	Mean	SD	Agree Frequency (%)	Neutral Frequency (%)	Disagree Frequency (%)
I have adopted drought-tolerant crop varieties	4.16	0.87	281 (80.7%)	40 (11.5%)	27 (7.8%)
I use water harvesting techniques promoted by SHG	4.08	0.91	273 (78.4%)	46 (13.2%)	29 (8.4%)
I practice soil conservation techniques learned from SHG	4.14	0.85	278 (80.0%)	42 (12.1%)	28 (7.9%)
I have diversified my income sources based on SHG training	4.01	0.96	264 (75.9%)	50 (14.4%)	34 (9.7%)
I have switched to energy-efficient cooking methods	3.94	0.98	257 (73.8%)	54 (15.5%)	37 (10.7%)

The results in Table 6 show a strong uptake of climate-smart agricultural and livelihood practices among SHG members in Nyakach Sub-County, suggesting that SHG interventions are effectively translating knowledge into action. A large majority (mean = 4.16; 80.7%) reported adopting drought-tolerant crop varieties, which is a key adaptation strategy in semi-arid and flood-prone regions. This finding aligns with Atieno et al. (2024), who noted that SHG-facilitated access to drought-tolerant seeds significantly improved food security in Nyakach. Similar patterns have been documented in Ethiopia and northern Uganda, where farmer groups enhanced uptake of resilient seed varieties through collective purchasing and peer-to-peer training (World Bank, 2023). Adoption of resilient seeds directly supports SDG 2 (Zero Hunger) by strengthening food security and SDG 13 (Climate Action) through adaptation to drought risks.

Water harvesting techniques promoted by SHGs also show wide adoption (mean = 4.08; 78.4%). Methods such as rooftop rainwater collection, small dams, and zai pits buffer households against erratic rainfall and prolonged dry spells. Evidence from Kenya's arid counties demonstrates that SHG-led training on water harvesting increases the likelihood of adoption by over 60%, especially when supported with grants or group savings for infrastructure investment (UNDRR, 2025; Sauti East Africa, 2024). These practices directly contribute to SDG 6 (Clean Water and Sanitation) by enhancing access to water, and SDG 13 (Climate Action) by reducing vulnerability to rainfall variability.

Soil conservation practices (mean = 4.14; 80.0%) represent another critical area of SHG influence. Through demonstrations and farmer field days, SHGs promote terracing, mulching, and agroforestry, which reduce erosion, improve soil fertility, and increase long-term agricultural productivity. This is consistent with findings from Frontiers in Climate (2025), which showed that farmers trained within groups are significantly more likely to sustain soil conservation practices than those exposed to one-off extension visits. These outcomes advance SDG 15 (Life on Land) by promoting sustainable land management and SDG 2 (Zero Hunger) by improving agricultural sustainability.

Livelihood diversification based on SHG training (mean = 4.01; 75.9%) reflects a shift away from sole reliance on rain-fed agriculture towards integrating climate-resilient non-farm income streams such as poultry keeping, small-scale trade, and handicrafts. According to Atieno et al. (2024), diversification reduces vulnerability by ensuring households maintain income flow even when crops fail. Similar evidence from Tanzania and Malawi links SHG training to improved resilience through alternative incomes, particularly among women-headed households (World Bank, 2023). These livelihood strategies support SDG 1 (No Poverty) and SDG 5 (Gender Equality) by promoting economic empowerment and reducing income shocks.

Finally, adoption of energy-efficient cooking methods, while still relatively high (mean = 3.94; 73.8%), shows slightly lower uptake compared to other practices. This may be due to high initial investment costs or limited access to improved stoves. Nevertheless, switching to energy-efficient methods reduces fuelwood demand, curbs deforestation, and lowers indoor air pollution—a co-benefit highlighted in adaptation and health studies (UNDRR, 2025). These practices contribute to SDG 7 (Affordable and Clean Energy) by promoting modern cooking solutions, SDG 13 (Climate Action)

through reduced emissions, and SDG 3 (Good Health and Well-being) by minimizing respiratory health risks. In summary, SHG-led interventions in Nyakach have fostered high adoption of drought-tolerant seeds, water harvesting, soil conservation, livelihood diversification, and energy-efficient cooking. Together, these practices reduce household vulnerability, improve food security, and strengthen resilience to climate shocks while advancing multiple SDGs—particularly SDG 1, SDG 2, SDG 3, SDG 5, SDG 6, SDG 7, SDG 13, and SDG 15.

5.0 Conclusions and Recommendations

The study revealed that participation in Self-Help Groups (SHGs) in Nyakach Sub-County has significantly enhanced household livelihoods by promoting economic empowerment, resilience, and social capital. Members benefited from income diversification, venturing into new income-generating activities, non-farm enterprises, and improved market access. SHGs also facilitated food security through savings and credit for food purchases during lean periods, reduced anxiety over shortages, and better nutrition knowledge, thereby ensuring more stable and diversified diets. In terms of asset accumulation, households invested in productive assets, improved saving discipline, and strengthened maintenance capacity, though acquisition of long-term assets such as land remained limited for some. Beyond economic outcomes, SHGs substantially strengthened adaptive capacity to climate variability and shocks. This was achieved by improving access to trusted early warning information, encouraging proactive measures, pooling resources for emergency responses, and supporting collective purchasing and equipment sharing. The promotion and adoption of climate-smart practices—including drought-tolerant crops, water harvesting, soil conservation, livelihood diversification, and energy-efficient cooking—further reinforced resilience to environmental and economic stresses. Collectively, these outcomes underscore SHGs as critical platforms for advancing household well-being while contributing to multiple Sustainable Development Goals (SDGs), notably SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 5 (Gender Equality), SDG 7 (Affordable and Clean Energy), SDG 13 (Climate Action), and SDG 15 (Life on Land).

Recommendations

Based on the findings and in line with the SDG goals, the following recommendations were proposed to scale SHG contributions to sustainable livelihoods and climate resilience:

Enhance training quality and inclusivity – Expand SHG training programs with a focus on advanced business management, market linkage strategies, and practical climate adaptation techniques. Tailored approaches should ensure participation of marginalized groups, including women, youth, and persons with disabilities.

Strengthen access to resources and infrastructure – Improve affordability and availability of technologies and infrastructure that support climate-smart practices, such as improved stoves, water harvesting systems, soil conservation equipment, and drought-tolerant seed varieties.

Deepen institutional partnerships – Strengthen collaboration between SHGs, government agencies, NGOs, and development partners to expand technical support, including linkages with meteorological services, ICT-enabled early warning systems, and capacity-building initiatives.

Promote financial innovation for resilience – Develop tailored financial products, such as long-term savings instruments, micro-insurance, and low-interest credit facilities, to enable households to invest in durable assets and mitigate risks from climate shocks.

Prioritize women's leadership and empowerment – Support women in leadership roles within SHGs to maximize empowerment benefits and ensure that SHGs continue to serve as inclusive and gender-sensitive platforms for resilience-building.

Institutionalize monitoring and evaluation (M&E) – Establish continuous M&E systems to track the inclusiveness, effectiveness, and equity of SHG interventions. This will enable timely adaptation of programs, identification of gaps, and scaling of best practices.

Ethical Issues

The authors upheld principles of integrity and ethical issues by adhering to participants' informed consent, voluntary participation, anonymity and confidentiality, minimizing harm, and data handling.

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Conflicts of Interests

The authors declare no competing interests regarding this work

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