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The Effects of Climate Change on the Food Security of Farming Households in Sandor Chiefdom, Kono District, Eastern Sierra Leone

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Abstract: Climate change poses a critical threat to food security in Sub-Saharan Africa, with rural farming households being particularly vulnerable. This study investigates the effects of climate variability on the food security of farming households in Sandor Chiefdom, Kono District, and Eastern Province, Sierra Leone. Using a mixed-methods design, data were collected from 150 farming households through structured questionnaires, interviews, and focus group discussions. Results reveal that unpredictable rainfall patterns, prolonged dry spells, and increasing temperatures have disrupted traditional farming cycles, reduced crop yields, and lowered livestock productivity. About 73.3% of households reported food price increases due to poor harvests, while 59.3% stated that climate change significantly reduced their ability to access food. Dietary diversity was limited, with 69.3% of households consuming non-diverse diets in the last 10 days. Livestock productivity declined sharply, with 88% citing heat stress and 86% reporting losses due to high humidity. Coping mechanisms included crop diversification, small livestock rearing, and reliance on social networks, but only 10.7% had access to external institutional support. The study concludes that without strengthened adaptation measures, farming households in Sandor Chiefdom will face worsening food insecurity. It recommends policy interventions, climate-resilient agriculture, improved extension services, and financial support to enhance resilience and ensure sustainable livelihoods.

Keywords: *Climate Change; Food Security; Farming Households; Adaptation Strategies; Sandor Chiefdom; Sierra Leone; Sub-Saharan Africa.*

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I. INTRODUCTION

Climate change has emerged as one of the most pressing challenges of the 21st century, with profound implications for global food systems and rural livelihoods. It is no longer debated that changes in temperature, rainfall variability, and the frequency of extreme weather events are directly affecting the agricultural sector, which remains the backbone of economies in many developing countries. The Intergovernmental Panel on Climate Change (IPCC, 2021) emphasizes that climate change is primarily driven by anthropogenic activities such as fossil fuel combustion, deforestation, and industrialization, which increase greenhouse gas concentrations in the atmosphere. These changes disrupt ecological balance, undermine agricultural productivity, and increase the vulnerability of rural households whose livelihoods depend almost entirely on natural resources.

Globally, agriculture employs about 26% of the population and provides sustenance for over 2 billion people (FAO, 2023). Yet, it is highly sensitive to climatic conditions. Erratic rainfall patterns, rising temperatures, and shifting agro-ecological zones are altering planting calendars, reducing yields, and heightening food insecurity. The Paris Agreement (2015), the Kyoto Protocol (1997), and the Earth Summit (1992) underscore the urgency of coordinated global climate action. More recently, the 28th Conference of the Parties (COP28) in Dubai reaffirmed commitments to accelerate adaptation, strengthen climate financing, and support vulnerable communities (UNFCCC, 2023). However, despite these milestones, localized experiences of climate change impacts remain under-documented, especially in small agrarian communities in Sub-Saharan Africa. The African continent is disproportionately affected by climate variability, largely due to its dependence on rain-fed agriculture, limited adaptive capacity, and poor infrastructure. The African Union (2022) has recognized this

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through frameworks such as the African Climate Change Strategy (2022–2032), which prioritizes climate-smart agriculture and resilience building. In Sub-Saharan Africa, approximately 60% of the labor force is employed in agriculture, which contributes significantly to GDP and food supply (World Bank, 2023). Yet, the sector is under increasing stress from recurrent droughts, floods, and pest outbreaks. Several studies reveal that climate change threatens not just food availability, but also the four dimensions of food security: availability, access, utilization, and stability (Ahmed et al., 2023). Thus, climate change is not only an environmental issue but a development crisis with wide-ranging social, economic, and political consequences.

In Sierra Leone, agriculture is the backbone of the national economy, employing more than 65% of the population and contributing over 50% to GDP (Statistics Sierra Leone, 2023). However, it is largely subsistence-based and heavily dependent on rainfall, making it highly vulnerable to climatic fluctuations. The Ministry of Agriculture and Food Security (2022) has acknowledged that erratic rainfall, prolonged dry spells, and floods have already disrupted production cycles, particularly in staple crops such as rice, cassava, and groundnuts. Recent years have seen farmers reporting lower yields, pest outbreaks, soil degradation, and increased post-harvest losses. Livestock production has also been negatively impacted by heat stress, reduced pasture availability, and water scarcity (Bangura, 2021). Consequently, rural households are increasingly food insecure, with the 2022 Global Food Security Index ranking Sierra Leone 110 out of 113 countries.

Sandor Chiefdom in Kono District represents a microcosm of these challenges. As a predominantly rural and agrarian community, its households depend almost exclusively on smallholder farming for food and income. Erratic rainfall, rising temperatures, and frequent floods have disrupted traditional agricultural cycles, forcing farmers to modify planting schedules, abandon certain crops, and adopt less water-intensive varieties such as cassava and sweet potatoes. Yet, despite these adaptive practices, food insecurity persists. Preliminary observations reveal that climate variability has led to low yields, food shortages, and dietary monotony. Farmers also report changing patterns of pests and diseases, drying streams, and declining soil fertility, all of which further threaten household food security. Food security is defined by the Food and Agriculture Organization (FAO, 2022) as a situation in which all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet dietary needs and preferences for an active and healthy life. This encompasses four interrelated dimensions: food availability (sufficient quantities), food access (economic and physical access), utilization (nutritional adequacy), and stability (consistent access over time). The World Food Programme (2023) highlights that climate variability threatens all four dimensions. For instance, floods may wipe out harvests, food price inflation reduces access, limited dietary diversity undermines nutrition, and recurrent droughts erode the stability of household supply. In Sierra Leone, where over 70% of households rely on subsistence farming, climate shocks often translate directly into hunger and malnutrition. Despite the growing recognition of climate–food security linkages, knowledge gaps persist at the micro level. National-level statistics fail to capture localized realities, particularly the differentiated impacts of climate change across chiefdoms and farming systems. Moreover, indigenous coping mechanisms and community-based adaptation strategies are poorly documented. In Sandor Chiefdom, there is little empirical data on how farming households experience and respond to climate shocks, how food security dimensions are affected, and what role social networks and institutions play in resilience. Understanding these dynamics is crucial for informing context-specific interventions that align with national strategies such as Sierra Leone's National Climate Change Policy (2022), the National Adaptation Programme of Action, and the National Agricultural Transformation Programme (2019–2023).

The present study seeks to fill this gap by examining the effects of climate change on the food security of farming households in Sandor Chiefdom. It focuses on identifying the crops and animal's households depend on, assessing the impacts of climate change on food security dimensions, analyzing challenges to food security attainment, and documenting coping and adaptation strategies. In doing so, it provides evidence for policy formulation, contributes to the localization of global frameworks such as the Sustainable Development Goals (SDG 2: Zero Hunger and SDG 13: Climate Action), and enhances academic discourse on climate resilience in rural Sierra Leone.

➢ *Objectives of the Study*

- *General Aim*

The study aimed to examine the effects of climate change on household food security in Sandor Chiefdom.

- *Specific Objectives*

Specifically, it sought:

✓ Socio-Economic and Demographic Characteristics of the Farmers.
✓ To identify the crops grown and animals reared by households and the reasons for their selection.
✓ To assess the impact of climate change on the four dimensions of household food security.
✓ To analyze challenges faced in attaining food security amid climate variability.
✓ To explore coping and adaptation strategies employed by farming households.

II. STUDY METHODOLOGY

➢ *Research Design*

This study adopted a mixed-methods research design, combining quantitative and qualitative approaches to obtain a comprehensive understanding of climate change impacts on food security. A structured questionnaire was used to collect household-level data, while focus group discussions, key informant interviews, and field observations provided qualitative insights. This triangulation enhanced the reliability and depth of findings. The cross-sectional design allowed for capturing a snapshot of climatic impacts and

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adaptive practices during the study period. Quantitative data were analyzed using descriptive statistics, while qualitative responses were thematically coded and integrated into the interpretation of results.

➢ *Study Location*

The study was conducted in Sandor Chiefdom, located in Kono District, Eastern Sierra Leone. Sandor is predominantly rural, with agriculture as the main livelihood activity. Communities in Sandor primarily grow rice, cassava, maize, and groundnuts, while small livestock such as goats, poultry, and sheep are common. Farming systems are largely rain-fed, making households highly vulnerable to climate variability and environmental shocks.

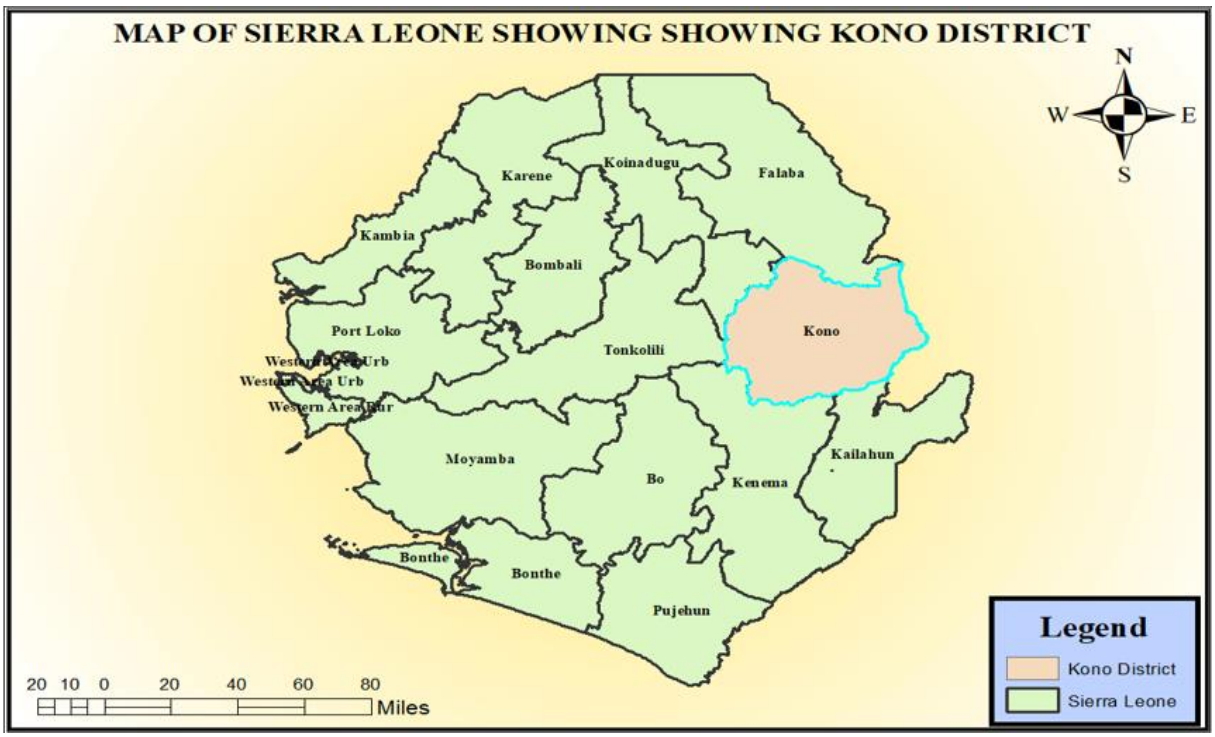


Fig 1 Map of Siera Leone Showing Kono District

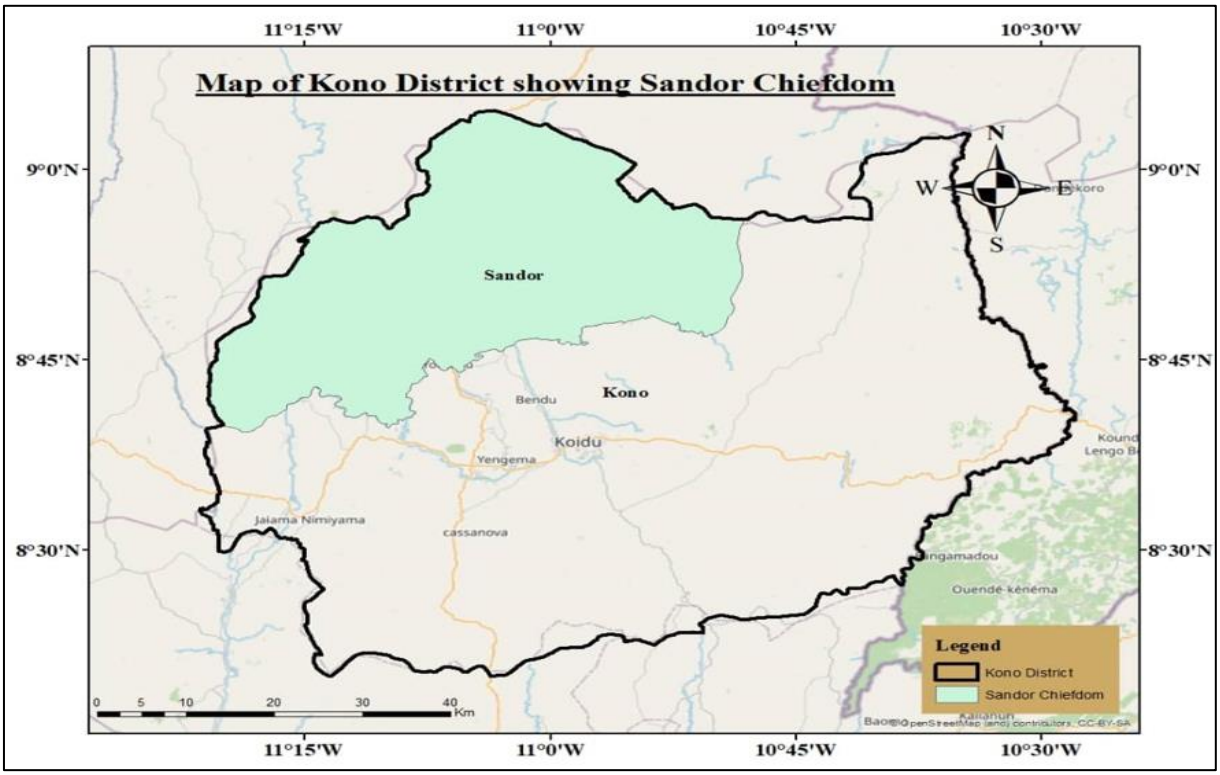


Fig 2 Map of Kono District Showing Sandor Chiefdom

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➢ *Study Population, Sample Frame and Sample Size*

The study population consisted of smallholder farming households residing in selected communities of Sandor Chiefdom, Kono District, Eastern province, Sierra Leone. The accessible population was derived from community household listings provided by local authorities and farmers' associations, ensuring inclusion of both male- and female-headed households as well as a balance of age groups and livelihood types.

In total, 150 households were drawn from this population for the quantitative survey, while the qualitative component included key informants such as chiefs, extension workers, farmer group leaders, and NGO representatives. This population was considered appropriate because it represents the segment of society most directly exposed to the impacts of climate change on food security in the study area.

➢ *Sampling Techniques*

The study employed a multistage sampling procedure that combined probability and non-probability techniques to ensure both representativeness and depth of insight. At the first stage, communities within Sandor Chiefdom were purposively selected based on their agricultural reliance, exposure to climate variability, and accessibility for fieldwork. Within these communities, household lists were obtained from local leaders and farmers' associations to serve as sampling frames. From these lists, a total of 150 households were selected for the survey using probability proportional to size, ensuring fair representation of larger and smaller communities. Simple random sampling and, where necessary, systematic sampling were used to select households within each community, with household heads or principal decision-makers interviewed. For the qualitative aspect, purposive sampling was applied to identify key informants such as local chiefs, agricultural extension officers, and leaders of farmers' groups, while snowball sampling was used to reach additional participants with relevant expertise. This combination of sampling techniques provided both the breadth needed for quantitative analysis and the depth required for qualitative interpretation. Ethical considerations, including voluntary participation and confidentiality, were observed throughout the process to ensure data integrity and respondent trust.

➢ *Data Analysis*

Data collected from the field were analyzed using both quantitative and qualitative approaches to provide a comprehensive understanding of how climate change affects food security in farming households. Quantitative data from household surveys were coded and entered into the Statistical Package for the Social Sciences (SPSS, version 26) for processing. Descriptive statistics such as frequencies, percentages, means, and cross-tabulations were employed to summarize socio-demographic characteristics, crop and livestock patterns, and household food security outcomes. Inferential statistics, including chi-square tests, were applied to explore relationships between household characteristics and food security indicators, while graphical presentations such as bar charts and tables were used to enhance clarity. Qualitative data obtained from focus group discussions and key informant interviews were transcribed and analyzed thematically. Emerging themes focused on perceptions of climate change, its impacts on food availability and access, as well as coping and adaptation strategies. Triangulation of the two data sets enhanced the credibility and validity of findings, as quantitative results were contextualized and enriched by qualitative insights. This mixed-method approach allowed for both breadth and depth in understanding the multidimensional nature of climate change impacts on food security in Sandor Chiefdom.

III. RESULTS AND DISCUSSIONS

The results highlight the multidimensional effects of climate change on household food security in Sandor Chiefdom. While global frameworks such as the IPCC (2021) and the Paris Agreement emphasize broad adaptation strategies, local realities reveal that farming households continue to rely heavily on indigenous practices with minimal external assistance. The reliance on cassava and small livestock underscores a survival-based adaptation, but these measures are insufficient for long-term resilience.

The study also underscores the gendered dimensions of food security: women, who form a significant proportion of smallholder farmers, face disproportionate burdens due to limited land rights and access to resources. This finding resonates with intersectional frameworks (Crenshaw, 2023) and highlights the need for gender-sensitive adaptation policies.

Overall, climate change in Sandor Chiefdom is not merely an environmental issue but a structural challenge that undermines livelihoods, exacerbates poverty, and threatens long-term development goals. Without deliberate institutional interventions, households will remain locked in cycles of vulnerability and food insecurity.

➢ *Socio-Economic and Demographic Characteristics of the Farmers*

Understanding the demographic makeup of respondents provides crucial context for interpreting the broader patterns of these study.

Table 1 Socio-Economic of farmers within Sandor Chiefdom

Variable	Category	Frequency	Percentage
Gender	Male	79	52.7
	Female	71	47.3
Age	18-30 Yrs	6	4.0
	31-43 Yrs	41	27.3
	44-56 Yrs	55	36.7

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	Above 57 Yrs	48	32.0
Educational Status	Non formal Education	56	37.3
	Non formal Education but can read and write	1	7
	Primary	83	55.3
	Secondary	10	6.7
Marital status	Single	10	70.0
	Married	127	84.7
	Widow/Widower	8	5.3
	Separated	5	3.3
What is your tribe	Temne	13	8.7
	Kono	131	87.3
	Mende	3	2.0
	Others	3	2.0
Are you an indigene of the community	Yes	126	84.0
	No	24	16.0
From where do you come from	indigene	128	85.3
	Another region	10	6.7
	Another town in the district	12	8.0
How long have you lived in the community	More than five years	133	88.7
	Less than one year	4	2.7
	Between one and five years	13	8.7
What brought you here	Marriage	44	29.3
	Work	4	2.7
	Others	102	68.0
Household Size	1-5	85	56.7
	6-10	54	36.0
	Above 10 members	11	7.3
Religion	Christian	113	75.3
	Muslim	35	23.3
	Others	2	1.3
What is your average monthly income	1,000	4	2.7
	1,500	4	2.7
	100	16	10.7
	150	2	1.3
	200	10	6.7
	30	1	0.7
	300	16	10.7
	350	2	1.3
	400	4	2.7
	500	30	20.0
	501	2	1.3
	590	1	0.7
	600	8	5.3
	700	25	16.7
	800	5	3.3
	900	20	13.3

Field Survey Data 2025

The socio-demographic characteristics of the respondents provide significant insights into the composition and dynamics of the community. Of the 150 respondents, males slightly outnumbered females, accounting for 52.7% compared to 47.3%, reflecting a relatively balanced gender distribution. Age analysis indicates that the population is predominantly middle-aged and older adults, with 36.7% aged 44–56 years and 32% above 57 years, while only a small fraction (4%) falls within the youth category of 18–30 years. This age structure suggests that the community is largely composed of experienced individuals who may play key roles in local decision-making and development activities. Educational attainment is generally low, as the majority of respondents (55.3%) have completed primary education, while 37.3% possess non-formal education. Only a small proportion (6.7%) reached secondary education, highlighting limited access to formal education within the community. Marital status data indicate that most respondents (84.7%) are married, signifying a predominantly family-oriented population, with widowed and separated individuals forming only a small minority.

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Ethnically, the community is largely homogeneous, with the Kono group representing 87.3% of respondents, and small representations from Temne, Mende, and other groups. Similarly, the majority of respondents are indigenes (84%) who have lived in the community for more than five years (88.7%), suggesting strong local ties and familiarity with communal practices. Marriage accounts for 29.3% of respondents' presence in the community, while the majority (68%) reported other reasons for residency, which may include inheritance, relocation, or personal choice. Household composition is predominantly small to medium-sized, with 56.7% of households consisting of 1–5 members and 36% having 6–10 members. Large households exceeding ten members are relatively uncommon. Christianity is the dominant religion, practiced by 75.3% of respondents, while Muslims constitute 23.3%, reflecting the religious landscape and its potential influence on social and cultural practices. Respondents' monthly incomes vary considerably, ranging from as low as 30 units to 900 units, with most households earning between 300 and 900 units, indicating modest but varied economic status.

In summary, the socio-demographic profile portrays a community that is predominantly middle-aged, married, ethnically Kono, and locally rooted, with moderate educational levels and modest household incomes. These characteristics provide essential context for understanding the community's social structure and economic behavior. They further suggest that development interventions or policy initiatives targeting the community should consider its predominantly mature population, moderate literacy levels, and economic diversity to ensure effective participation and sustainability.

- *To Identify the Crops Grown and Animals Reared by Households and the Reasons for their Selection.*

The study found that households in Sandor Chiefdom predominantly cultivated rice, cassava, groundnuts, and maize, with rice remaining the staple despite climate-related production challenges. Cassava and groundnuts were valued for their resilience to drought, storability, and adaptability to poor soils. On the livestock side, goats, sheep, poultry, and pigs were most common, with households favoring small ruminants for their affordability, rapid reproduction rates, and ability to withstand climatic stress.

- *Types of Crops Grown*

Table 2 Distribution of Farmers Types of Crop Grown

Types of crops Grown.	Frequency	Percent
Rice	35	23.3
Vegetables (e.g., okra, pepper, etc.)	50	33.3
Sweet Potatoes	10	6.6
Cassava	40	26.6
Groundnut	10	6.6
Maize	5	3.3
Total	150	100.0

Field Survey Data 2025

The study revealed that rice, cassava, maize, and groundnuts were the dominant crops cultivated in Sandor Chiefdom. Rice remained the most important staple despite declining productivity due to erratic rainfall and flooding. Cassava was widely preferred because of its drought tolerance, flexibility in harvesting, and storability. Groundnuts and maize were chosen for their relatively short growing cycles and suitability for intercropping. These findings resonate with evidence from other parts of Sierra Leone and West Africa where cassava is increasingly considered a "climate-resilient crop" (Zakaria et al., 2022). The preference reflects farmers' strategy of balancing food security with risk management in unpredictable climatic conditions.

- *Reason for Growing the Types of Crops*

Table 3 Distribution of Farmers Reasons of Growing the Type of Crops

Reason for growing the type of crops	Frequency	Percent
Suitable for the soil type	15	10
Requires less water	25	16.6
Traditional crop	10	6.6
Higher market demand	30	20
Household consumption	25	16.6
Short growing period	45	30
Resilient to climate	5	3.3
Total	150	100.0

Field Survey Data 2025

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The results presented in the table provide useful insights into the rationale behind farmers' crop selection strategies. The leading factor, short growing period (30%), underscores farmers' desire to minimize production risks while maximizing quick returns, particularly in environments characterized by unpredictable rainfall and limited access to inputs. Market demand (20%) follows as a strong driver, reflecting the growing importance of income generation and commercialization in smallholder farming systems. Equally notable is the significance of both household consumption and reduced water requirement (16.6% each), which demonstrates a dual emphasis on food security and resource efficiency. Soil suitability (10%) is considered but is overshadowed by more immediate socio-economic motivations. Interestingly, traditional practices (6.6%) and climate resilience (3.3%) remain marginal factors, suggesting that while cultural values and long-term adaptation are acknowledged, they are not yet central to farmers' decision-making.

➢ *Changes in the Main Crop Yields Over the Last Ten Years*

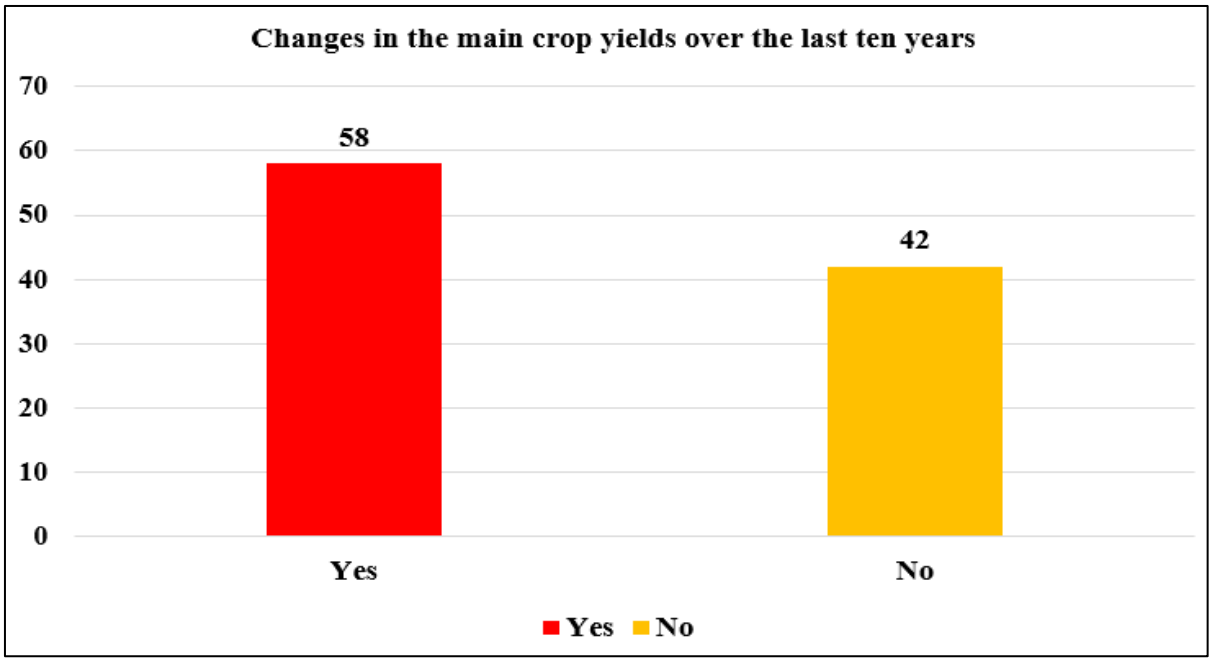


Fig 3 Distribution of Farmers Changes in the Main Crop Yields Over the Last Ten Years.
Field Survey Data 2025

The chart shows that 58% of respondents reported changes in the yields of their main crops over the past decade, while 42% indicated no significant change. This suggests that a majority of farmers have experienced fluctuations, which could be linked to several factors such as climate variability, soil fertility decline, pest and disease outbreaks, or adoption of improved farming practices. The 42% who did not observe changes might reflect either stable production practices or resilient crop varieties that have maintained consistent yields despite external pressures. The difference also highlights the heterogeneity of farming experiences, where some households adapt to challenges or benefit from innovations, while others remain vulnerable. This finding underscores the importance of targeted interventions that promote climate-smart agriculture, improved inputs, and better extension services to sustain or enhance yields across all farming groups. It also implies that policymakers and researchers need to pay closer attention to the dynamics influencing yield changes, as they directly impact food security and livelihoods.

➢ *The Main Environmental Factors Affecting Your Crop Production*

Table 4 Showing Environmental Factors Affecting their Crop Production.

The main environmental factors affecting your crop production	Frequency	Percent
Rainfall variability	22	14.7
High temperature	60	40.0
Pests	54	36.0
Soil infertility	9	6.0
Flooding	5	3.3
Total	150	100.0

Field Survey Data 2025

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The table highlights the key environmental factors affecting crop production, with high temperature (40%) and pest infestation (36%) emerging as the most significant challenges reported by farmers. The prominence of high temperature underscores the growing impact of climate change, as rising heat levels directly affect crop growth, soil moisture retention, and overall yields. Similarly, pests, which are often worsened by warmer and more humid conditions, remain a major production threat, reflecting the vulnerability of farming systems to biological stresses. Rainfall variability (14.7%) was also noted, emphasizing the dependence of farmers on rain-fed agriculture and the risks posed by unpredictable precipitation patterns. Soil infertility (6%) and flooding (3.3%) were reported by fewer respondents, yet they remain critical localized challenges. Overall, the findings suggest that climate change and pest-related stresses are the dominant environmental threats to crop production, and without adaptive measures such as climate-smart practices, improved pest management, and soil conservation, farmers' productivity and food security may be at risk.

- *Type of Animal Rear*

Table 5 Showing Response of Farmers by the Types of Animal Reared

Type of Animal rear	Frequency	Percent
Sheep	25	16.6
Chicken	100	66.6
Duck	15	10
Pig	1	0.6
Goat	10	6.6
Total	150	100.0

Field Survey Data 2025

The table presents the distribution of animal rearing practices among respondents, with chickens overwhelmingly dominating at 66.6%. This reflects the importance of poultry as a key source of income, nutrition, and quick returns due to their relatively low input requirements and fast reproduction rate. Sheep (16.6%) and ducks (10%) also make up a considerable portion of livestock rearing, indicating their role in diversifying household livelihoods and providing additional sources of meat, income, or cultural value. Goats (6.6%) are less common but remain relevant in some farming systems due to their adaptability to harsh environments. Interestingly, pig rearing is practiced by only 0.6% of respondents, suggesting limited cultural acceptance, market demand, or challenges with feed availability and disease management. Overall, the dominance of chickens highlights a preference for small livestock that are easier to manage and provide both subsistence and commercial benefits, while other animals play supplementary but important roles in rural livelihoods.

- *Reason for Rearing the Animals*

Table 6 showing the Reason of Rearing the Animals Reared

Reason for rearing the animals	Frequency	Percent
For home consumption	30	20
For sale/income.	40	26.6
Low maintenance	10	6.6
Cultural tradition	15	10
Quick reproduction	20	13.3
Environmentally adaptable	35	23.3
Total	150	100.0

Field Survey Data 2025

The table reveals diverse reasons why households rear animals, reflecting both economic and subsistence motivations. The most frequently cited reason is for sale or income generation (26.6%), showing that livestock is an important financial asset and livelihood source for rural households. Close to this, environmental adaptability (23.3%) is also highly valued, suggesting that farmers prefer animals that can withstand local conditions, diseases, and limited feed availability. Home consumption (20%) further highlights the role of livestock in household food security, providing meat, eggs, and milk. Quick reproduction (13.3%) reflects a practical strategy, as animals that multiply rapidly allow for faster herd growth and quicker financial returns. Cultural tradition (10%) also plays a role, indicating that livestock rearing is not only economic but also tied to heritage and social practices. Low maintenance (6.6%) was the least mentioned, though still important, as it shows preference for species that demand fewer resources. Overall, the results emphasize that animal rearing is shaped by a combination of livelihood strategies, cultural values, and environmental adaptation needs, with income generation and resilience being the most dominant factors.

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➢ *Reduced or Increased the Number/Types of Animals Due to Environmental or Weather Changes.*

Table 7 showing Response of Framers Based on whether there were Reduction in the Number and Types of Animals Reared Due to Environmental or Whether Change.

Reduced or increased the number/types of animals due to environmental or weather changes	Frequency	Percent
Yes	87	58.0
No	63	42.0
Total	150	100.0

Field Survey Data 2025

➢ *To Assess the Impact of Climate Change on the Four Dimensions of Household Food Security.*

Results revealed significant climate-induced disruptions across all four food security dimensions. Food availability was undermined by declining yields of rice and maize due to erratic rainfall, flooding, and soil degradation. Livestock losses were also linked to heat stress and disease outbreaks. These findings are consistent with FAO (2022) and WFP (2023), which emphasize that climate variability undermines all dimensions of food security in Sub-Saharan Africa. The results underscore the multidimensional vulnerability of Sandor Chiefdom households, where climate impacts ripple through availability, access, utilization, and stability simultaneously.

➢ *Food Availability*

Table 8 Showing Response of Farmers Based on Food Availability

The availability of food in the household over the past 5 years	Frequency	Percent
Very High	7	4.7
High	17	11.3
Moderate	65	43.3
Very Low	61	40.7
Total	150	100.0

Field Survey Data 2025

The data on household food availability over the past five years shows a concerning trend of food insecurity among respondents. A large proportion, 40.7%, reported very low food availability, while 43.3% indicated moderate availability. Together, this means that more than four-fifths of households face some degree of food inadequacy, with very few experiencing stability. Only 11.3% reported high food availability, and a marginal 4.7% described it as very high, suggesting that consistent access to sufficient food is limited to a small minority. The dominance of moderate and very low levels points to the vulnerability of rural households, likely influenced by fluctuating crop yields, climate variability, limited income opportunities, and dependence on rain-fed agriculture. These results highlight the urgent need for interventions to strengthen food security through improved agricultural practices, diversified income sources, and better access to markets and storage facilities. Without such measures, households will continue to face recurring cycles of scarcity, undermining both nutrition and livelihoods.

➢ *Food Crops that are Less Available Due to Climate-Related Issues*

Table 9 Showing Crops that are Less Available Due to Climate Related Issues

The food crops that are less available due to climate-related issues	Frequency	Percent
Rice	23	15.3
Cassava	9	6.0
Maize	30	20.0
Groundnuts	26	17.3
Vegetable	62	41.3
Total	150	100.0

Field Survey Data 2025

The respondents identified several food crops that are less available in the community due to climate-related challenges. Among these, vegetables were the most affected, with 41.3% of respondents indicating limited availability. Maize and groundnuts were also notably impacted, representing 20% and 17.3% of responses, respectively. Rice, a staple food in many households, was reported as less available by 15.3% of respondents, while cassava, despite being more drought-tolerant, was less affected, with only 6% reporting reduced availability.

These findings suggest that climate-related issues, such as erratic rainfall, prolonged droughts, or flooding, have a significant impact on the availability of both staple and non-staple crops in the community. The high proportion of respondents reporting reduced vegetable availability may

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indicate that climate variability disproportionately affects crops that are more sensitive to changes in temperature and precipitation. Overall, the data highlight the vulnerability of local food production systems to climate stress, underscoring the need for adaptive strategies to enhance food security and sustain livelihoods.

➢ *Over the Last 12 Months, How Often were You Unable to Afford Food Due to Lack of Money or Resources?*

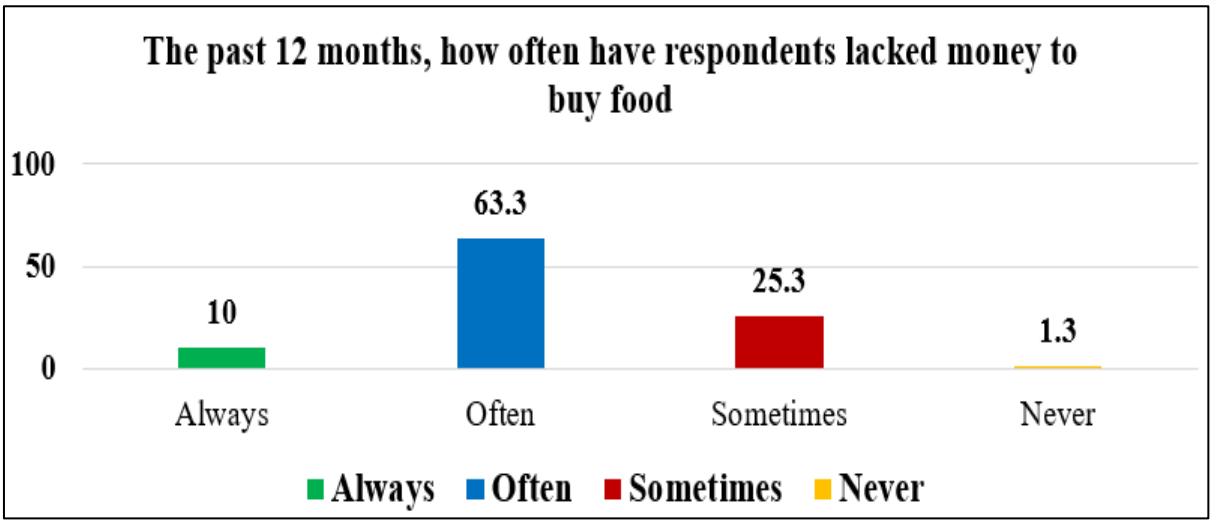


Fig 4 Food Affordability Due to Lack of Money or Resources Over the Past Twelve Months
Field Survey Data 2025

The bar chart illustrates the frequency with which respondents reported lacking money to buy food over the past 12 months. A majority of respondents, 63.3%, indicated that they "often" experienced insufficient funds to purchase food, highlighting a significant prevalence of food insecurity within the community. Additionally, 25.3% of respondents reported that they "sometimes" faced this challenge, while 10% stated that they "always" lacked money to buy food. Only a very small proportion, 1.3%, reported that they "never" experienced such a shortage.

These findings indicate that the majority of households in the community frequently face financial constraints that limit their access to food. The high percentage of respondents in the "often" and "sometimes" categories suggests persistent vulnerability to food insecurity, likely influenced by factors such as low household income, irregular employment, or economic shocks. The data underscore the need for interventions aimed at improving household food access, enhancing income-generating opportunities, and building resilience against economic and climate-related challenges.

➢ *Climate Change Affected the Ability to Access Food*

Table 10 Showing how Climate Change Affect the Ability to Access Food

Climate Change affected your ability to access food	Frequency	Percent
Severely Reduced	89	59.3
Reduced	59	39.3
No Impact	2	1.3
Total	150	100.0

Field Survey Data 2025

The findings indicate that climate change has markedly affected household access to food. Among the 150 respondents, 59.3% reported that their ability to access food was severely reduced, reflecting substantial vulnerability to climate-related shocks. A further 39.3% experienced a moderate reduction, suggesting widespread but varying levels of impact across the population. Only 1.3% indicated no impact, underscoring that climate variability, such as erratic rainfall, flooding, or prolonged droughts, affects nearly all households. These results highlight the critical role of climate change in exacerbating food insecurity and underscore the urgent need for adaptive interventions to enhance resilience and safeguard livelihoods.

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➢ *The Description of Diversity of the Household's Diet in the Last 10 Days*

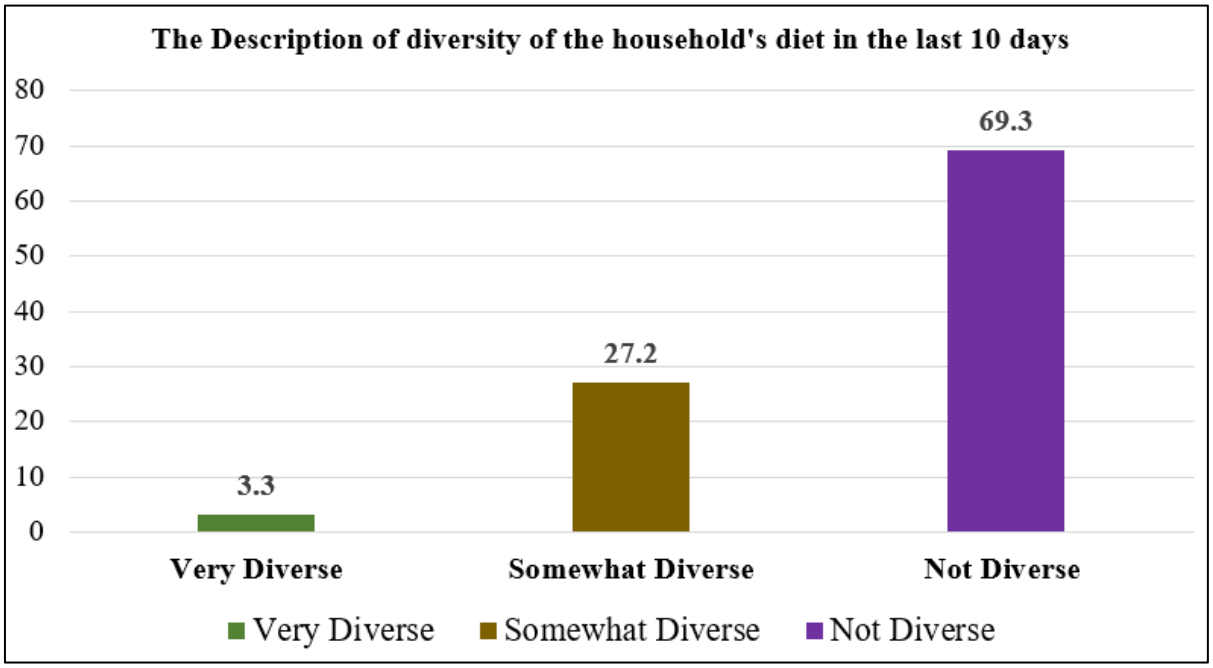


Fig 5 The Description of Household Diet in the Last Ten Days
Field Survey Data 2025

The data from Figure 5 shows that majority (69.3%) of respondents reported that their diet was not diverse in the past 10 days. This indicates a high level of nutritional vulnerability, suggesting that most households relied on a limited variety of food types, potentially dominated by starchy staples and lacking in proteins, fruits, and vegetables.

The mid-range response was "somewhat diverse," representing 27.2% of respondents. These households had access to more than one food group but not to an adequate variety required for a balanced diet. Only 3.3% of the respondents reported having a very diverse diet, which is alarmingly low and shows that very few households are achieving a nutritionally adequate diet.

These results align with the expected outcomes where it was anticipated that climate change-induced livelihood disruptions, market access constraints, and increased food prices would negatively impact food availability and variety in farming households. Seasonal food scarcity, coupled with reduced income from agricultural produce due to erratic rainfall and flooding, has limited access to nutritious food options.

The limited dietary diversity among respondents can be explained by climate-induced shocks that have affected food production cycles and harvest yields, as observed during personal field visits and key informant interviews. For instance, many women in the focus group discussions mentioned that they mostly prepared rice with palm oil or cassava and very rarely included meat or vegetables due to cost or unavailability.

These findings are supported by WFP (2024), which found that climate variability has contributed to poor dietary diversity among rural farming households in Eastern Sierra Leone. Similarly, FAO (2023) reported that more than 60% of rural Sierra Leonean households consume three or fewer food groups per day, indicating chronic nutritional inadequacy.

➢ *Extreme Weather Events (Floods, Prolonged Dry Spells) Caused Food Shortages in the Community*

Table 11 The Description of Extreme Whether Events that Causes Food Shortage in the Community

Extreme weather events (floods, prolonged dry spells) caused food shortages in the Community	Frequency	Percent
Yes	116	77.3
No	34	22.7
Total	150	100.0
If yes, how frequently		
Once a year	30	26
Twice a year	64	55
More than twice	22	19

Field Survey Data 2025

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The data show that extreme weather events, particularly floods and prolonged dry spells, have played a critical role in driving food shortages within the community. Out of 150 respondents, a large majority (77.3%) reported experiencing food shortages caused by such events, while only 22.7% indicated no impact. Among the affected households, more than half (55%) experienced shortages twice annually, 26% reported them once a year, and 19% faced them more than twice annually. These results highlight not only the widespread exposure to climate shocks but also their recurrent nature, underscoring the urgent need for adaptive strategies and resilience-building interventions.

➢ *Changes in Livestock Productivity Due to High Temperature/Heat Stress Over the Years*

Table 12 The Description of Changes in Livestock Productivity Due to High Temperature

Changes in livestock productivity due to high temperature/heat stress over the years	Frequency	Percent
Yes	132	88.0
No	18	12.0
Total	150	100.0
If yes, what action do you take to reduce the impact		
Take them to a place that is cool to reduce the heat stress	71	46.2
Fetch water for them for drinking	61	53.8

Field Survey Data 2025

The findings reveal that rising temperatures and heat stress have had a substantial effect on livestock productivity. Out of 150 respondents, 88% reported a decline in productivity linked to high temperatures, while only 12% indicated no noticeable impact. Among those affected, farmers adopted coping mechanisms to minimize losses: 53.8% reported fetching water for their animals to mitigate dehydration and stress, while 46.2% moved livestock to cooler environments to reduce exposure. These adaptive measures reflect practical, locally driven responses to climate stressors, though their effectiveness is limited. The results underscore the urgent need for improved climate-resilient livestock management strategies.

➢ *Analyzing the Challenges Faced in Attaining Food Security Amid Climate Variability*.

This section presents the key challenges that farming households face in attaining food security as a result of climate change. It captures respondents' perceptions and lived experiences regarding how climate-related factors such as prolonged dry spells, erratic rainfall, flooding, pest infestations, and declining soil fertility have disrupted agricultural activities and access to food.

➢ *Changes in Weather Patterns (Rainfall, Temperature, Floods, Droughts) Over the Past 5–10 Years*

Table 13 The Description of Changes in Whether Pattern Over the Past 5-10 Years

Changes in weather patterns (rainfall, temperature, floods, droughts) over the past 5–10 years?	**Frequency**	**Percent**
Yes	128	85.3
No	22	14.7
Total	150	100.0
What factors are causing these climate changes		
Mining	20	16
Bush burning	40	31
Deforestation	68	53

Field Survey Data 2025

The results indicate that most respondents have observed notable changes in weather patterns, including rainfall variability, rising temperatures, floods, and droughts, over the past 5–10 years. Of the 150 respondents, 85.3% acknowledged such changes, while only 14.7% reported no significant shifts. When asked about the perceived drivers of these climate changes, deforestation was most frequently cited (53%), followed by bush burning (31%) and mining activities (16%). These perceptions align with broader environmental concerns, as land degradation and unsustainable resource exploitation exacerbate local climate variability. The findings underscore the importance of addressing human-induced factors alongside global climate drivers to build resilience.

➢ *Changes Negatively Affecting the Farming*

Table 14 The Description of how These Changes Negatively Affect the Farming Activities

Changes negatively affecting the farming	**Frequency**	**Percent**
Yes	142	94.7
No	8	4.0
Total	150	100.0

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(If Sometimes/Rarely/Never) What makes it difficult to attain food security		
Poor road access to markets or farms	30	20
Lack of credit/finance for inputs	40	26.6
Inability to invest in climate-resilient seeds/tools	35	23.3
Limited extension services/training	25	16.6
Loss of land to large-scale projects	5	3.3
Food prices too high	10	6.6

Field Survey Data 2025

The findings show that climate-related changes have had a markedly negative effect on farming activities. Of the 150 respondents, an overwhelming 94.7% reported adverse impacts, while only 4% indicated otherwise. Among those who sometimes, rarely, or never attained food security, several structural and socio-economic barriers were highlighted. The most common challenges included lack of credit or finance for inputs (26.6%), inability to invest in climate-resilient seeds and tools (23.3%), and poor road access to markets or farms (20%). Other reported constraints were limited extension services (16.6%), high food prices (6.6%), and land loss to large-scale projects (3.3%). Collectively, these findings underscore the interconnectedness of climate stressors and systemic agricultural constraints in undermining food security.

- *Explore Coping and Adaptation Strategies Employed by Farming Households.*

This section examines the various coping and adaptation strategies that farming households utilize to manage and mitigate the adverse effects of climate change on their food security. These strategies include adjustments in farming practices, diversification of livelihoods, and use of improved crop varieties, water conservation methods, and reliance on social networks or external support. Understanding these approaches provides insight into how households respond to climate variability and build resilience against ongoing and future food security risks.

➢ *Introduction of New Crops or Farming Techniques to Adapt to These Changes*

Table 15 Showing how the Introduction of New Crops or Farming Techniques Adapt to These Changes

Introduction of new crops or farming techniques to adapt to these changes	Frequency	Percent
Yes	72	52.0
No	78	48.0
Total	150	100.0

Field Survey Data 2025

The data suggest a mixed response regarding the adoption of adaptive strategies to counter climate-related challenges in farming. Out of 150 respondents, 52% reported the introduction of new crops or farming techniques, while 48% indicated no such adoption. This near-equal distribution highlights both opportunities and constraints in climate adaptation at the community level. The positive response reflects a willingness among farmers to experiment with innovations that may enhance resilience, such as drought-tolerant crops or improved agronomic practices. However, the significant proportion of non-adopters suggests barriers such as limited resources, inadequate extension support, or risk aversion, which constrain wider uptake of adaptation measures.

➢ *Changing Farming Methods Because of Climate Effect*

Table 16 Showing Changing Farming Methods Because of Climate Change

Changing farming methods because of climate effect	Frequency	Percent
Yes	27	82.0
No	123	18.0
Total	150	100.0

Field Survey Data 2025

The findings reveal limited shifts in farming methods in response to climate change. Of the 150 respondents, only 18% reported changing their farming methods due to climate effects, while the vast majority (82%) had not adopted any significant modifications. This suggests that although farmers are experiencing the impacts of climate variability, adaptive responses remain minimal. The reluctance to change may be linked to financial constraints, lack of access to climate-resilient technologies, limited extension services, or uncertainty about the effectiveness of new practices. These results underscore the need for targeted interventions that promote awareness, build capacity, and reduce barriers to climate-smart agriculture.

This is when land conflict results in negatively altering the condition of the environment in a particular area. From the survey, the only environmental effects of land conflict are pollution and lack of use. The lack of service is when a

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"conflicted land" is bound to be used by the parties involved in the conflict. On the other hand, pollution arises when a particular party decides to do or release some harmful substance into the environment during the conflict. It is usually done through the burning of houses, crops or using tear gases, etc.

➢ *Receiving Any Outside Support (e.g., Training, Seeds, Finance) to Cope with Climate and Food Issues*

Table 17 showing Receiving External Support to Cope with Climate and Food Issues

Receiving any outside support (e.g., training, seeds, finance) to cope with climate and food issues	**Frequency**	**Percent**
Yes	16	10.7
No	134	89.3
Total	150	100.0
If no, what do you normally do you do to cope with the impacts of climate change?		
Applied the traditional method of farming	73	48.6
Borrow food	12	8.0
Eat once a day	8	5.3
I do my old ideas to plant my crops and do crop rotation yearly	10	6.3
I have been using my energy and money to support my farming	4	2.6
My own finical resources	27	19
Practice crop rotation	10	6.7
Sell livestock	2	1.3
Selling my crops	4	2.6

Field Survey Data 2025

The results demonstrate a striking gap in institutional and external support for coping with climate change and food insecurity. Out of 150 respondents, only 10.7% reported receiving assistance, such as training, improved seeds, or financial aid, while an overwhelming 89.3% had received no external support. In the absence of formal interventions, households relied heavily on self-initiated strategies. The most common response was continuing with traditional farming methods (48.6%), while 19% depended on personal financial resources**.** Other coping strategies included borrowing food (8%), reducing food intake to once daily (5.3%), crop rotation (6.7%), and selling livestock or crops (3.9%). These findings highlight the heavy reliance on informal and often unsustainable coping mechanisms, underscoring the urgent need for targeted support programs.

➢ *Additional Help to Make it Easier for Household to Reach Food Security Despite Climate Change*

Table 18 Showing Additional Help to Make it Easier for Household to Reach Food Security Despite Climate Change

Additional help to make it easier for household to reach food security despite Climate Change	**Frequency**	**Percent**
Financial support and Training	6	3.9
Improved seeds	12	7.0
Loan access	53	35.3
Soil conservation and Change planting date	2	1.3
Total	150	100.0

Field Survey Data 2025

The findings highlight the types of assistance respondents believe would strengthen household food security in the face of climate change. Among the 150 respondents, the majority (35.3%) emphasized the need for loan access, reflecting the critical role of credit in purchasing farm inputs and adopting improved practices. A smaller proportion (7%) cited the provision of improved seeds**,** while 3.9% stressed the importance of financial support and training**.** Only 1.3% mentioned soil conservation and changing planting dates**.** Overall, the responses reveal that farmers prioritize financial access as the key to resilience, with complementary support in technology and knowledge transfer being equally essential.

➢ *Climate-Related Disruptions (e.g., Drought, Flood, Pests) Affecting Food Availability*

Table 19 Showing Climate Related Disruptions Affecting Food Availability

Climate-related disruptions (e.g., drought, flood, pests) affecting food availability	**Frequency**	**Percent**
Yes	141	94.0
No	9	6.0
Total	150	100.0

Field Survey Data 2025

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The results show that climate-related disruptions have had a widespread impact on household food availability. Out of 150 respondents, an overwhelming 94% reported that events such as droughts, floods, and pest outbreaks disrupted food supplies, while only 6% indicated no impact. This high proportion suggests that food systems in the community are highly vulnerable to climatic shocks, with even short-term disruptions significantly reducing availability. The findings reinforce earlier evidence of reduced food access and recurrent shortages, highlighting the central role of climate change in undermining household food security. They further underscore the urgent need for resilience-oriented agricultural and policy interventions.

➢ *Changed in Farming Practices in Response to Climate Stress*

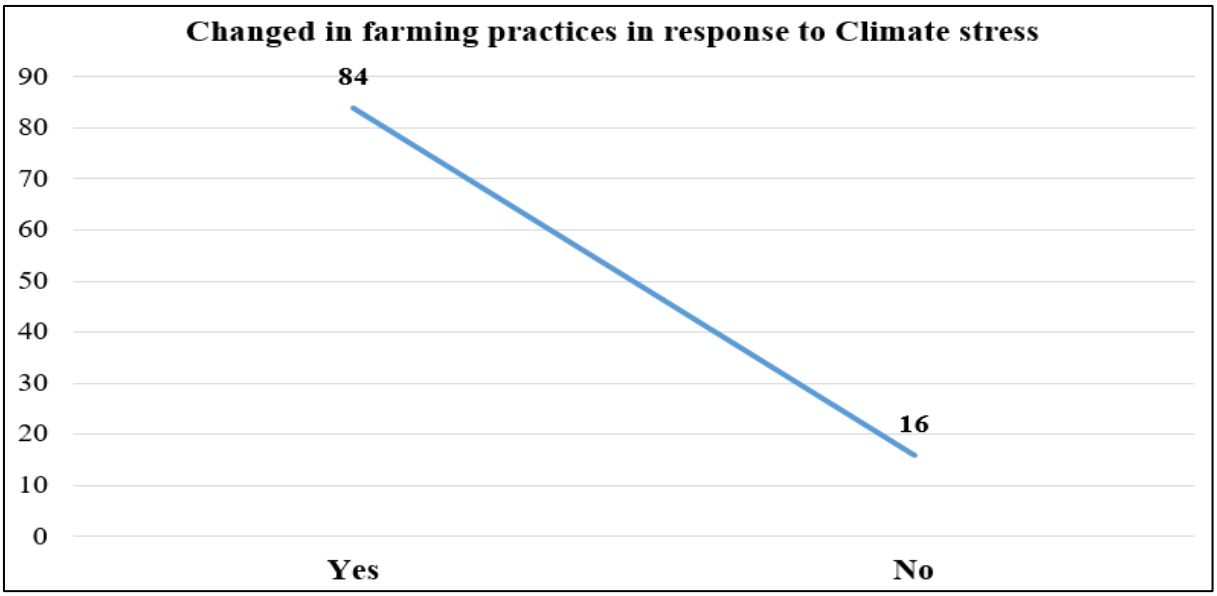


Fig 6 Showing Changes in Farming Practices in Response to Climate Stress
Field Survey Data 2025

The data reveals that majority of the respondents (84%) reported changing their farming practices in response to climate stress, while a smaller proportion (16%) have not made such changes. The high percentage of respondents adapting their farming methods aligns with the expected results that anticipated active responses to climate challenges among farmers. This finding reflects an increasing awareness of climate impacts and the willingness to adopt strategies to mitigate risks. Recent studies support this observation. For example, Musa et al. (2023) found that farmers in similar agro-ecological zones have shifted to drought-resistant crops and diversified their farming systems to manage climate uncertainties effectively. Focus group discussions reinforced these findings, with participants noting the adoption of practices such as altering planting dates, using organic mulches, and diversifying crop varieties.

In conclusion, most households in the study area have actively changed their farming practices in response to climate stress. This adaptive behavior is essential for enhancing resilience against climate variability and supports the promotion of climate-smart agricultural interventions to further strengthen food security.

➢ *The Strategy that Has Been Most Effective*

Table 20 Showing the Strategy that Has Been Most Effective

The Strategy that has been most effective	Frequency	Percent
Changing planting time and intercropping	133	56.7
Crop rotation	2	1.3
Diversified crops	1	.7
Shifting cultivation	10	6.7
Using organic manure	4	2.6
Total	150	100.0

Field Survey Data 2025

The data reveal the perceived effectiveness of various strategies employed by farmers to mitigate climate-related impacts on agriculture. Among 150 respondents, the majority (56.7%) identified changing planting times and intercropping as the most effective strategy, reflecting its practical benefits in reducing crop vulnerability and optimizing resource use.

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Smaller proportions reported shifting cultivation (6.7%), using organic manure (2.6%), crop rotation (1.3%), and diversified cropping (0.7%) as effective approaches. These findings suggest that farmers prioritize simple, low-cost, and context-specific interventions that can be readily integrated into existing practices. The results underscore the importance of promoting adaptive strategies aligned with local knowledge and conditions.

➢ *Helped to Adopt These Practices*

Table 21 Showing what Helped the Farmers to Adopt These Practices

What helped you adopt these practices	Frequency	Percent
Training or advice from extension services	30	20.0
Support from NGOs or government	3	2
Credit or financial access	5	3.3
Social networks or farmer groups	100	66.6
Prior experience or indigenous knowledge	10	6.6
Total	148	98.7

Field Survey Data 2025

The findings highlight the factors that facilitated the adoption of climate-adaptive agricultural practices among farmers. Out of 148 respondents, the majority (66.6%) credited social networks or farmer groups as the primary support, emphasizing the role of peer learning and community collaboration. Training or advice from extension services influenced 20% of respondents, while prior experience or indigenous knowledge accounted for 6.6%. Only a small fraction benefited from credit or financial access (3.3%) or support from NGOs/government (2%). These results suggest that, in the absence of widespread institutional support, farmers rely heavily on informal knowledge-sharing mechanisms and collective learning to implement adaptive strategies effectively.

➢ *Prevention of Adopting more Effective Strategies*

Table 22 Showing Prevention of Adopting More Effective Strategies

Prevention of adopting more effective strategies	Frequency	Percent
Lack of money	10	6.6
No training	50	33.3
Limited access to seeds or tools	67	44.6
Lack of land tenure	5	3.3
Poor infrastructure	18	12
Total	150	100.0

Field Survey Data 2025

The results highlight key barriers preventing farmers from adopting more effective climate-adaptive strategies. Among 150 respondents, the most frequently cited constraint was limited access to seeds or tools (44.6%), followed by lack of training (33.3%). Smaller proportions reported poor infrastructure (12%), lack of money (6.6%), and lack of secure land tenure (3.3%) as impediments. These findings indicate that while farmers are willing to adopt adaptive practices, structural and resource limitations—particularly access to inputs and knowledge—significantly constrain their capacity. Addressing these barriers through targeted support programs, improved extension services, and investment in agricultural infrastructure is critical for enhancing resilience to climate change.

IV. CONCLUSION

This study examined the effects of climate change on the food security of farming households in Sandor Chiefdom, Kono District, Sierra Leone. Findings reveal that erratic rainfall, prolonged dry spells, rising temperatures, and humidity have significantly undermined both crop and livestock production. As a result, households face recurrent food shortages, rising food prices, and declining dietary diversity. The four pillars of food security, availability, access, utilization, and stability, are each adversely affected.

Despite these challenges, farming households have demonstrated resilience through crop diversification, small livestock rearing, intercropping, and reliance on social networks. However, these strategies are largely autonomous and insufficient to counter worsening climate risks. Only a small proportion of households reported receiving external support, indicating a major gap in institutional engagement.

The study concludes that food insecurity in Sandor Chiefdom is both a climatic and structural problem. Without deliberate interventions in extension services, infrastructure, and financial access, farming households will remain locked in cycles of vulnerability. Strengthening climate resilience is therefore not only an agricultural priority but a developmental necessity for Sierra Leone, with implications for achieving Sustainable Development Goals 2 (Zero Hunger) and 13 (Climate Action).

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RECOMMENDATIONS

➢ *Based on the Findings, the Following Recommendations are Advanced:*

- **Strengthen institutional support:** Government and development partners should expand agricultural extension services, provide climate-smart inputs, and scale up community-based training on adaptive practices.
- Promote climate-smart agriculture: Introduce drought- and heat-resistant crop varieties, encourage agroforestry, and support soil fertility management practices that improve resilience.
- Enhance infrastructure development: Investments in rural roads, storage facilities, and small-scale irrigation schemes would reduce post-harvest losses, improve market access, and stabilize household food supply.
- Expand financial access: Create microcredit and insurance schemes tailored to smallholder farmers to cushion them against climate-induced shocks.
- Integrate gender-sensitive approaches: Ensure women farmers have equitable access to land, inputs, and training, given their central role in food production and household nutrition.
- Promote social protection systems: Establish community food banks, safety nets, and early warning systems to reduce household vulnerability during climate-induced crises.
- Encourage research and data collection: Future studies should focus on long-term climatic trends at micro levels, the role of indigenous knowledge in adaptation, and the nutritional impacts of declining dietary diversity.

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