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Rural Households' Response Pattern to Climate Change and Poverty in Surulere Local Government Area, Ogbomoso, Nigeria

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Abstract:- Against the background of surreptitious impact of climate change on rural communities, where living and livelihood construction are farm-based or related, and the generally observed asthenic adaptive responses of rural households to poverty, this study examines the response patterns of rural households to climate change and poverty in Surulere, local government area of Oyo State, Nigeria. Thirty-eight years of temperature and rainfall data, were obtained from the Nigerian Meteorological Agency, Lagos, and projected till 2045AD. The ten constituent geopolitical ward headquarters were purposively selected, and 355 questionnaires proportionally administered to household heads to elicit information on their socio-economic characteristics, and, expenditure on basic necessities of life. Descriptive statistics and Likert scales were employed to measure multidimensional and monetary poverty and household response patterns. The analysis shows that minimum temperature increased with time (r=0.43), while maximum temperature decreased with time (r=-0.21). Rainfall exhibited fluctuations that tended towards low increase (r=0.08). Further results reveal a similarly high pervasiveness of multidimensional and monetary poverty with over 90% of respondents earning and spending less than $13.3 per month on food, children's education, health challenges, among others.The response patterns to impact of climate change and poverty are mainly reactionary, involving a combination of livelihood diversification and traditional agricultural adaptation strategies. However, long-term adaptive measures such as access to climate information, improved seed varieties, and financial services are lacking.. Addressing these challenges requires a combination of community-based and regional efforts centered on adaptation, resilience, and tailor-made policies and programs to protect rural households and communities.

Keywords:- *Rural Households; Poverty; Climate Change Impact.*

I. INTRODUCTION

There is a consensus in the literature that climate change is increasingly becoming a serious challenge to the socioeconomic development of developing nations (Ezegwu, 2014; WMO, 2022; NBER, 2023; World Bank, 2023; Carnegie, 2023), particularly in rural communities, where living and livelihood construction are land-based or land-related. Various manifestations of climate change impact in rural communities include decreased agricultural productivity, fluctuating temperatures, increased drought, and food scarcity instigated by irregularities in rainfall and over-flooding (SpringerLink, 2023; World Bank, 2023). The implications of these impacts include economic losses amounting to billions of dollars, severe food insecurity for millions of people, hunger, ill-health, insecurity, poverty, inequality, and forced migration (WMO, 2022; Deressa and Hassan, 2010).

Various theoretical approaches to examine the effects of climate change on rural activities range from equating average future impacts to yield losses, quantitative crop simulation modeling, and statistical time series and cross-sectional analyses (Parry *et al*., 2009; Wang *et al*., 2009; Deressa and Hassan, 2010). Empirical analyses include conducting strategic analyses of rural resilience to climate change (ScienceDirect, 2023) and agroecological practices that integrate traditional knowledge with modern farming techniques to create sustainable agricultural systems (NCA, 2023). However, simulation studies have been limited by a

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lack of reliable data on soil properties and management practices, providing only "best-guess" estimates with little to no information on uncertainties resulting from choices in model structure, parameter values, and scaling techniques (National Climate Assessment, 2014; Frost and Thompson, 2000; Fischer *et al*., 2002).

It has also been argued that statistical and econometric techniques can establish a logical association between climate change and agricultural productivity (You *et al*., 2017; Tebaldi and Knutti, 2007; Niggol and Mendelsohn, 2008) or the potential impact of climate change on farming (IPCC, 2014; FAO, 2013; Parry *et al*., 1999; Lobell and Burke, 2008; Deressa and Hassan, 2010). Nevertheless, studies such as those by Kane *et al*. (1992), Rosenzweig *et al*. (1993), Rosenzweig & Parry (1994), Reilly *et al*. (1994), and Ayinde *et al*. (2010) have employed models developed in separate disciplines, such as climatology, agronomy, and economics, to project the future impact of climate change on agriculture and its implications for rural population growth.

While these studies foster an understanding of rural communities' physical and economic responses and adjustments to climate change and agricultural production, they assume that farmers could adapt to climate change by changing crop varieties and the timing of planting and harvesting. Within the framework of environmental determinism, which portrays a non-adaptation scenario, it is assumed that farmers do not make any adjustments over time. Although the Intergovernmental Panel on Climate Change (IPCC) 2001 Fourth Assessment Report (AR4) finds that Africa is generally exceedingly vulnerable to environmental change due to various burdens and low adaptive capacities, it is argued here that there has not been total apathy by various rural communities to the projected impact and implications of climate change, particularly concerning the scope and contents of various environmental destitutions.

This study focuses on the extent to which rural households in the study area have responded to the impacts of climate change and poverty. It seeks to analyze how climate change and poverty affect people's livelihoods and how they have responded and continue to respond to the impact in Surulere Local Government Area of Oyo State, Nigeria. This analysis aims to suggest measures toward achieving sustainable livelihoods in the study area. The objectives of this paper are to: analyze the thirty-eight-year trend in climatic parameters and project the same till 2045 AD in the study area, examine the varying levels of multidimensional and monetary poverty in the study area using the socioeconomic characteristics of the households, evaluate the various coping mechanisms adopted by rural households, and suggest sustainable adaptive measures to poverty and the impact of climate change.

II. THE STUDY AREA

The study area is Surulere Local Government in Oyo State, Nigeria (see Figure 1). It is a peri-urban local government area with headquarters in the town of Iresa Adu. The local government area is bounded to the north by Oriire Local Government Area, to the east and south by Osun State, and to the west by Ogo Oluwa, Ogbomosho North, and Ogbomosho South Local Government Areas. It is located at longitude 4°20'52.17" E and latitude 8°04'30.44" N (see Figure 2). The local government covers an area of 23 km² and has a population of 140,339 according to the 2006 National Population Census. Some of the settlements in the local government are Iresa-Adu, Igbon, and Iresa-Apa (see Figure 3). Each of these settlements has its own traditional leader with a given royal title

Now one of the nation's largest and fastest-developing rural areas, Surulere is inhabited mainly by Yoruba farmers, traders, and artisans. The main economic activities of the residents of the towns that make up Surulere Local Government are farming, with yam, cocoa, palm oil, maize, and tobacco being the dominant produce.

Surulere Local Government has a tropical wet and dry climate, as it falls in the transition zone between the rainforest and the savannah grassland. The wet season lasts from March to October, while the dry season, characterized by high uniform temperatures, moderate to heavy seasonal rainfall, and high relative humidity, lasts from November to February. The regions around Surulere experience four seasons, like most other areas in Southwestern Nigeria. These seasons include the long wet season (mid-March to July), the dry season of August, the short wet season (September to October), and the long dry season or harmattan season, which lasts from November to mid-March. Being a predominantly rural population with farming and related activities as major occupations, and situated within the Guinea savannah environment, the study area presents an ideal location for the assessment of rural poverty and household response patterns to the impacts of climate change.

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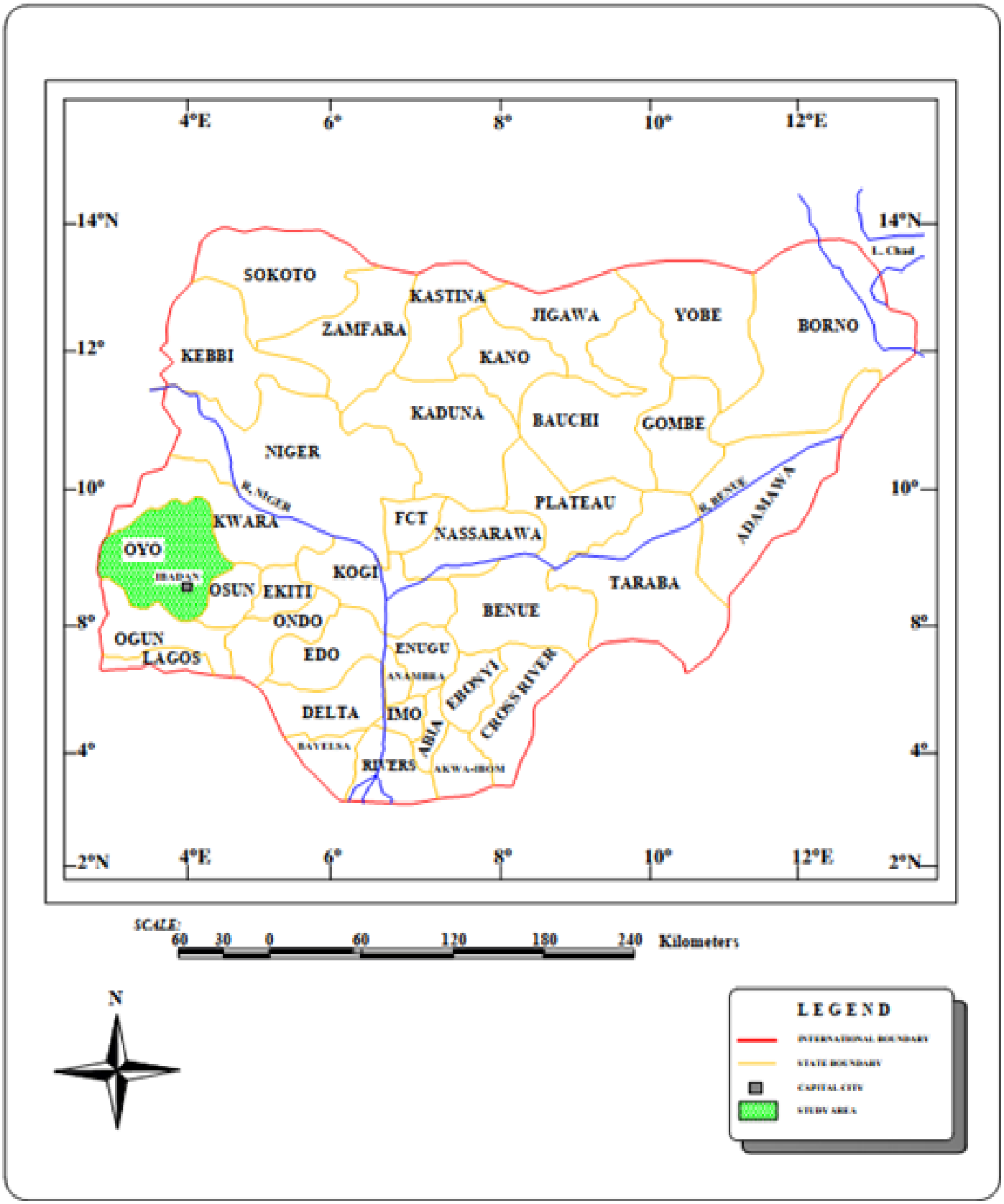

Fig 1 Oyo State in National Context

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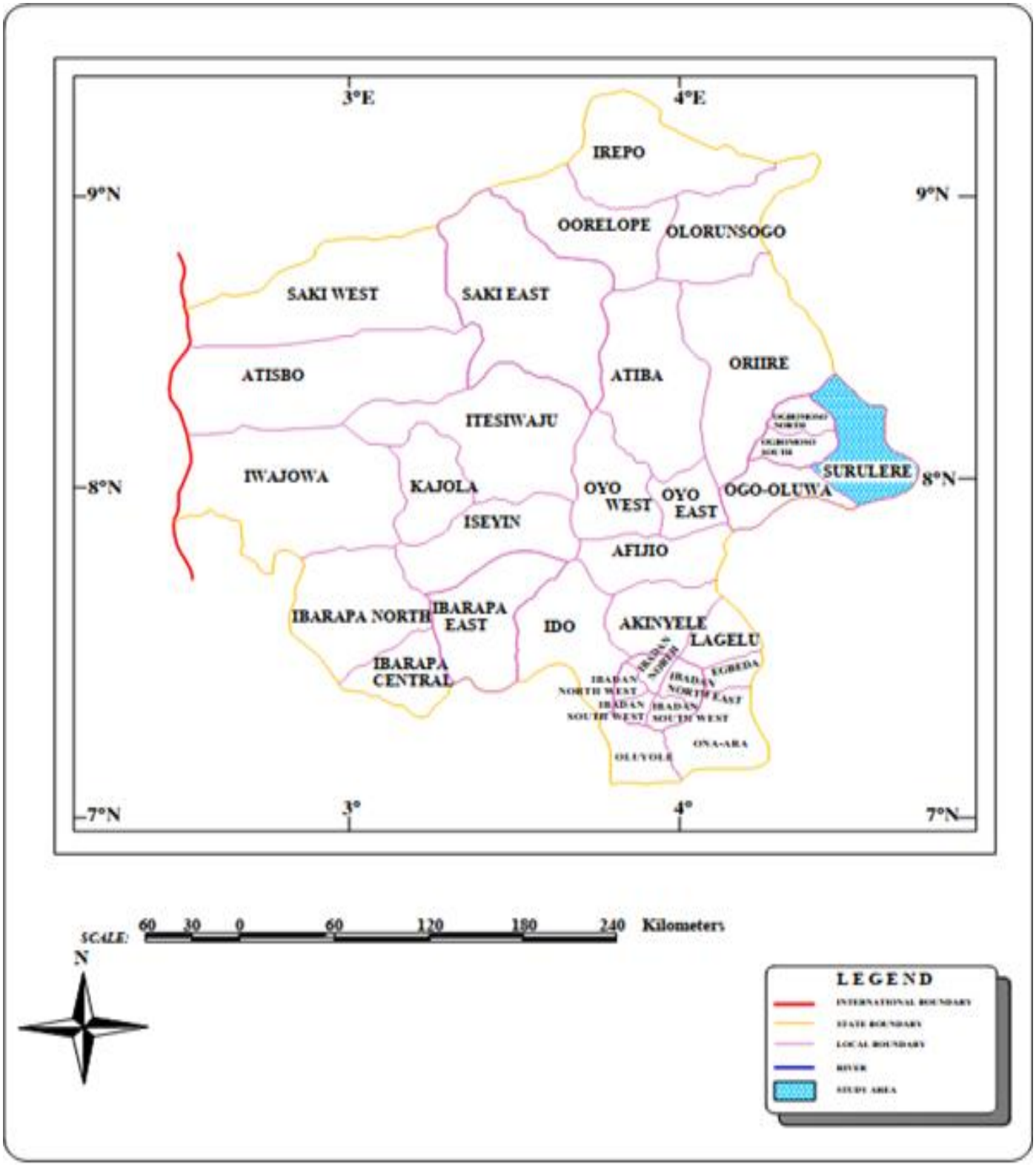

Fig 2 Surulere Local Government Area in the Context of Oyo State, Nigeria

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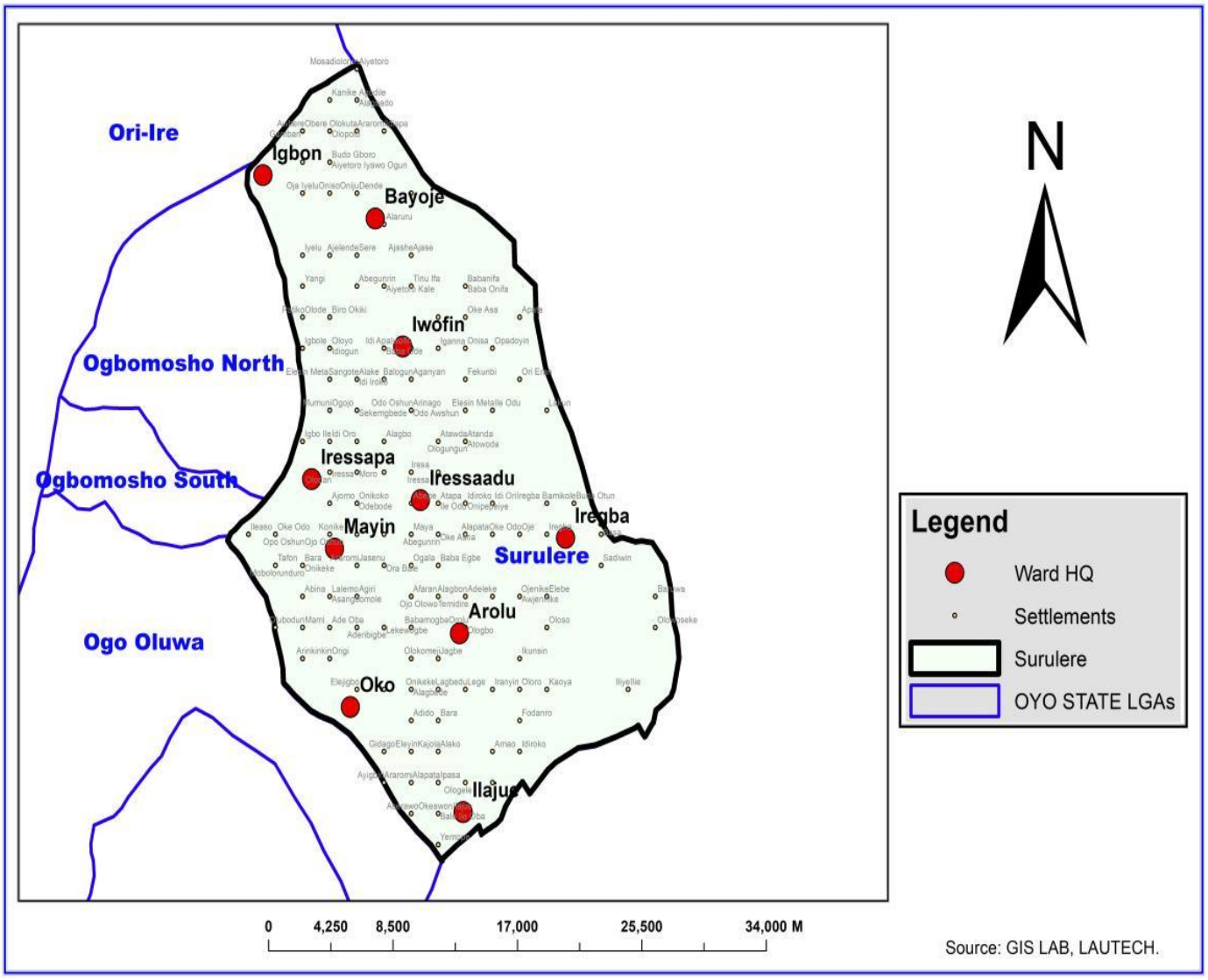

Fig 3 Settlement Pattern of Surulere Local Government

III. METHODOLOGY

➢ *Data Types and Sources*

The bulk of the data utilized for this study were of primary and secondary types. The former includes residents' socio-economic characteristics such as occupation, household income and expenditure (on food, shelter, clothing, children's education, etc.), household assets, nutrition/health, coping strategies, and response patterns to climate change and poverty. These were obtained with the aid of a structured questionnaire. Secondary data consists largely of 38 years (1970-2007) of climatic parameters of rainfall and temperature (the only available and accessible climatic parameters) obtained from the Nigerian Meteorological Agency (NIMET), Lagos. The data was projected to 2045 using simple linear extrapolation. The climatic data for Surulere Local Government does not exist; hence, the closest climatological station situated in Ilorin is considered representative of the region.

➢ *Sampling Frame and Techniques*

The study used the existing ten geopolitical wards of Surulere Local Government Area as the sampling frame. For the purpose of questionnaire administration, the headquarters of each political ward, as shown in Figure 3, were purposively selected. The total number of structured questionnaires administered among households in each selected ward for this research was determined using 0.0025% of the total population, which according to the National Population Census (NPC) 2006 (the most recent in the country) was 140,339 persons. This proportion was considered adequate given the wide geographical scope of the study area and the accessibility of each study site. Table 1 shows the names of the political wards, population as of 2006, and the number of questionnaires administered in each ward. For questionnaire administration, a list of major roads (usually untarred) and footpaths in each of the selected settlements was first compiled. Houses were then systematically selected, and household heads (or the eldest family member, where the household head was not available) were chosen.

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Table 1 Political Wards, their Population and Distribution of Questionnaire

Ward Name	2006 Population (Persons)	No of Questionnaire (0.0025% of population)
BAYA OJE	22,454	56
IGBON/GAMBARI	42,104	105
IRESAAPA	11,227	28
AROLU	5,894	15
IRESAADU	12,630	32
IREGBA	9,823	25
IWOFIN	7,017	18
OKO	14,034	35
ILAJUE	8,420	21
MAYIN	6,736	17
Total	140,339	352

Source: National Population Commission (NPC) 2006

➢ *Data Analysis*

The trend data on climatic parameters, including mean minimum and mean maximum temperatures, was analyzed and projected till 2045 using simple linear extrapolation with Excel. Cross-tabulation was used to describe the socio-economic characteristics of respondents and their response patterns to climate change and poverty. In addition to socio-economic characteristics as variables for measuring spatial variations in levels of multidimensional and monetary poverty, the degree of asset acquisition or accessibility and vulnerability were also examined to provide additional information. The degree of vulnerability was assessed in terms of property ownership, availability of basic utilities and services, and susceptibility to climate effects such as flooding, deforestation, pollution, and declining utilities and services. These factors were descriptively analyzed.

A Likert scale was employed to measure the degree of households' adoption of selected coping strategies for poverty. Values or weights were assigned to different degrees of responses as follows: Frequently Used = 3, Occasionally Used = 2, Rarely Used = 1, and Not Used = 0. The computation procedure is symbolically represented as follows:

SWV = Sum of Weighted Value

$$X = \text{Mean} = \frac{\sum \text{SWV}/\text{NR (f)}}{\text{Number of Variables}}$$

d = SWV / NR (f) – X

d^2 = Standard Deviation

(f) = Number of Respondents, :

The SWV (Sum of Weighted Value) was obtained by summing the product of the total number of responses to each variable and the weight attached to each rating, i.e., (a x 3) + (b x 2) + (c x 1) + (d x 0). The mean used in the computation was obtained by adding the SWV and dividing it by the total number of variables. The deviation (used as a significance index) and standard deviation were calculated to establish the degree of adequacy of each coping strategy for poverty. Positive deviations indicate high adequacy of the coping strategies, while negative deviations depict a low level of adequacy.

This study adopted households' deprivation of a screened list of vital assets as a measure of multidimensional poverty, and the monthly total income and expenditure on food and children's education as measures of monetary poverty. The incidence of poverty among households was determined by generating their percentage asset scores. The mean value of households' scores on asset acquisition was calculated and adopted as the poverty line. Thus, the cumulative percentage of those that scored above the poverty line was designated as non-poor, and vice versa.

IV. RESULTS AND DISCUSSION

➢ *Trend in Climatic Parameters of Temperature and Rainfall*

The observable trend in temperature data from 1970 to 2007 shows fluctuations in both mean minimum and mean maximum temperatures during the 38-year review period. While the mean minimum temperature ranged from a low of 20.49°C in 1975 to a high of 22.3°C in 2005, the mean maximum temperature ranged from a low of 31.42°C in 1982 to a high of 33.56°C in 1973. The observed variability in mean minimum temperature increased over the years (r = 0.43), while the observed variability in mean maximum temperature decreased over the years (r = -0.21). However, with Pearson's correlation coefficients r = 1.0 and -1.0 for mean minimum and mean maximum temperatures, respectively, the projection into the year 2045 reveals that Surulere Local Government will maintain a medium temperature that is neither too hot nor too cool over the years.

The trend of rainfall distribution in the study area within the review period shows another fluctuation that tends more towards a low increase over time. The trend shows sharp increases in the quantities of rainfall in 1973 (1460.8 mm), 1991 (1468.4 mm), and 1998 (1595.5 mm), followed by a drastic drop to 697.1 mm in 2001. With r = 0.08, Surulere Local Government Area will further experience a slow increase in rainfall over time.

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➢ *Incidence of Multidimensional Poverty in the Study Area*

Having established in the previous section that the study area has been experiencing (and will likely continue to experience) warmer temperatures (r = 0.43), it is pertinent to evaluate the incidence of multidimensional and monetary poverty within the same geographical context. This evaluation aims to examine the relationship and implications that poverty and a warming climate have on the enhancement of coping strategies among households and communities. By adopting a list of prescribed assets for households and communities, the level of household deprivation of assets considered vital for enhancing their well-being and coping capacity with climate change hazards is first measured. It has been argued that the greater the inaccessibility of households to acquiring these assets, the higher their level of deprivation or poverty, and consequently, the weaker their resilience to any hazard (Habyarimana *et al*., 2015; Cheung *et al*., 2019; Dangeot *et al*., 2019; Ribot, 1996; Aderonmu, 2011; Boroach, 2011). Additionally, households are able to equip themselves with more assets and infrastructure given improvements in their well-being (Obadan, 1997; Gbosi, 2001; Sule, 2006). The list of household assets used in this paper includes land ownership, the number of plots of land, the use of the plots, and other mobile assets such as trucks, cars, motorcycles, bicycles, and tricycles, popularly known as *keke Napep*, among others.

The results of the analysis in the study area show that households' scores on the Multi-Dimensional Poverty Index (MPI) ranged from 12.5% to 87.5%, with a mean value of 35.3%, which was adopted as the poverty line for the study area, a rural local government. This implies that results on the deprivation of assets among households indicate that the majority (54.9%) scored below the benchmark (35.3%) adopted as the poverty line in the study area. However, this index is lower than the national rural MPI of 72% and the overall national MPI of 63.0%, as reported by the National Bureau of Statistics (NBS) in 2022. The study area's MPI of 54.9% suggests that it is one of the poorer regions in the sub-region, as it is well above the South West Nigeria sub-regional average of 43.0%, also reported by the NBS in 2022.

➢ *On Monetary Poverty*

It has been observed that, in Nigeria, the incidence of monetary poverty is lower than that of the Multidimensional Poverty Index (NBS, 2022),. and also that, across most states of the Federation, about 40.% of the people are poor as reported in the 2018/19 national monetary poverty line. The varying levels of monetary poverty is examined in the study area, from the perspectives of monthly expenditure on food consumption, children education and sundry expenses on electricity, travels and energy consumption.

- *Monthly Expenditure on Food Consumption*

From the perspective of monthly expenses on food consumption across the ten political wards in the study area, as summarized in Table 2, about 80.2% of the respondents spent ₦20,000 or less ($13.3 at the exchange rate of ₦1,500/$) per month, which is approximately $0.44 per day. Only 14.9% of the respondents spent between ₦20,000 to ₦40,000 ($13.3 - $26.44) per month. In the entire study area, only 0.9% of the respondents spent between ₦60,000 to ₦80,000 ($40 - $52.3) per month, or about $3.1 per day, with just 0.3% in the Mayin ward spending above ₦100,000 ($66.67) on food per month. With $\chi 2=88.865$ and $p = 0.000$ in all cases, the variations in monthly expenses on food across the political wards in the local government are statistically significant. This implies pervasive monetary poverty and a high level of vulnerability to the impact of climate change in the entire study area, particularly in wards such as Iregba, Baya Oje, and Arolu, where the average daily expenditure on food hovers around $1 or less per day.

This result supports observations in the literature (Tregenna, 2023; Kara *et al*., 2023; Amini and Dal Bianco, 2023; Saunders *et al*., 2023) that low spending on food is an indication of comprehensive economic struggles, causally related to underemployment or lack thereof, and poor educational opportunities. This implies that rural households in the study area would need tailor-made interventions that transcend financial support to witness significant improvements in welfare and general living standards. Furthermore, the high deprivation in food security in the study area is a logical conclusion, given that over half of Nigeria's population is multidimensionally poor and cooks with dung and charcoal (NBS, 2022). This indicates higher levels of deprivation and vulnerability to the negative impacts of climate change, compared to national or sub-regional averages, particularly concerning food insecurity and, by logical extension, access to healthcare, sanitation, and housing.

Table 2 Variations in Monthly Expenses on Food by Political Wards

WARDS	MONTHLY EXPENSES ON FOOD												TOTAL	
	Below N20,000		N20,001-N40,000		N40,001 - N60,000		N60,001 - N80,000		N80,001 - N100,000		Above N100,001			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
BAYA OJE	29	9.0	4	1.2	2	0.6	1	0.3	0	0.0	0	0.0	36	11.1
IGBON/ GAMBARI	27	8.4	5	1.5	0	0.0	0	0.0	0	0.0	0	0.0	32	9.9
IRESAAPA	21	6.5	13	4.0	0	0.0	0	0.0	0	0.0	0	0.0	34	10.5
AROLU	26	8.0	10	3.1	0	0.0	0	0.0	0	0.0	0	0.0	36	11.1
IRESAADU	29	9.0	3	0.9	1	0.3	1	0.3	0	0.0	0	0.0	34	10.5
IREGBA	26	8.0	4	1.2	5	1.5	0	0.0	2	0.6	0	0.0	37	11.5

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IWOFIN	30	9.3	4	1.2	0	0.0	0	0.0	0	0.0	0	0.0	34	10.5
OKO	25	7.7	4	1.2	2	0.6	0	0.0	0	0.0	0	0.0	31	9.6
ILAJUE	33	10.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	33	10.2
MAYIN	13	4.0	1	0.3	1	0.3	0	0.0	0	0.0	1	0.3	16	5.0
TOTAL	**259**	**80.2**	**48**	**14.9**	**11**	**3.4**	**2**	**0.6**	**2**	**0.6**	**1**	**0.3**	**323**	**100.0**

Source: Author's Field survey (2023).

- *Expenditure on Children Education and Sundry Purposes*

Low expenditure on education is a critical factor influencing household welfare in any society. Low expenditure on education suggests limited access to quality education, correlating highly with wider economic hardship (Amini and Dal Bianco, 2023; Saunders *et al*., 2023). Results of the analysis in the study area, as summarized in Table 3, show that 72.7% of all respondents spent below ₦20,000 ($13.3) monthly on children's education. Another 14.2% spent between ₦20,001 and ₦40,000 ($13.3 - $26.6) for the same purpose monthly. An insignificant proportion, 1.6%, spent above ₦100,000 ($67) on education, mainly in private schools and higher institutions outside the locality. With $\chi 2$=51.444 and p = 0.236 in all cases, the variations in the observed low monthly expenses on education across the political wards in the study area is statistically significant.

The implications of low monthly expenditure on children's education are extensive, including poorer cognitive, social-behavioral, and health outcomes for the children. This requires culture-specific comprehensive policies that support early childhood education, parental involvement, and financial stability for low-income families (Equitable Growth, 2014; JRF, 2014; IZA, 2017).

The expenditure profile of households in the various wards in the study area is similar, with over 90% of respondents spending below ₦20,000 ($13.3) on electricity, clothing, travel and fuel, and house maintenance. The variations among wards are similarly low, not exceeding $13.3, and statistically not significant in all cases with p = 0.05p in all cases. This result is consistent with findings by Tregenna (2023) in South Africa and Amini and Dal Bianco (2023), who explore the relationship between economic growth and multidimensional poverty in low-income countries. The findings here suggest that expenditure on basic necessities of life is very low, possibly linked to low financial services, reflecting the high multidimensional poverty level among the people in the study area. This further implies a high level of vulnerability to the impacts of climate change, emphasizing the need for tailor-made policies to improve access to quality education and financial services. These are crucially important for breaking the cycle of poverty and enhancing rural households' adaptive capacity to cope with the hazards of climate change.

Table 3 Monthly Expenses on Education Across the Political Wards

WARDS	**MONTHLY EXPENSES ON EDUCATION**												**TOTAL**	
	Below N20,000		**N20,001-N40,000**		**N40,001 - N60,000**		**N60,001 - N80,000**		**N80,001 - N100,000**		**Above N100,001**			
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
BAYA OJE	22	8.7	3	1.2	3	1.2	0	0.0	1	0.4	0	0.0	29	11.5
IGBON/ GAMBARI	10	4.0	3	1.2	2	0.8	1	0.4	1	0.4	1	0.4	18	7.1
IRESAAPA	21	8.3	5	2.0	2	0.8	0	0.0	0	0.0	0	0.0	28	11.1
AROLU	17	6.7	4	1.6	4	1.6	2	0.8	0	0.0	1	0.4	28	11.1
IRESAADU	27	10.7	1	0.4	3	1.2	0	0.0	0	0.0	0	0.0	31	12.3
IREGBA	17	6.7	6	2.4	1	0.4	3	1.2	0	0.0	1	0.4	28	11.1
IWOFIN	24	9.5	3	1.2	0	0.0	0	0.0	0	0.0	0	0.0	27	10.7
OKO	18	7.1	5	2.0	3	1.2	0	0.0	0	0.0	0	0.0	26	10.3
ILAJUE	20	7.9	2	0.8	0	0.0	0	0.0	0	0.0	0	0.0	22	8.7
MAYIN	8	3.2	4	1.6	2	0.8	1	0.4	0	0.0	1	0.4	16	6.3
TOTAL	**184**	**72.7**	**36**	**14.2**	**20**	**7.9**	**7**	**0.6**	**2**	**0.8**	**4**	**1.6**	**253**	**100.0**

Source: Authors Field survey (2023).

V. HOUSEHOLDS' RESPONSES O POVERTY AND IMPACTS OF CLIMATE CHANGE

The struggle to be free from poverty and hunger is an age-old human endeavor, largely driven by the need to secure basic necessities such as food, shelter, clothing, and health care. The ability to meet these needs determines one's capacity to cope with the limitations imposed by hunger and poverty. These limitations are exacerbated by the deleterious impact of climate change on food production, water supplies, and natural resource conflicts—critical challenges that must be addressed by any society, individuals, and communities seeking sustainable development (World Economic Forum, 2023; The World Bank, 2023; FAO, 2023). This discussion focuses on how rural households in the study area have responded to the challenges of poverty and climate change.

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To assess household responses to poverty, a list of fourteen potential strategies was compiled from the literature and contextualized for the study area. Respondents were asked to indicate whether each strategy was: Not Used (NU), Rarely Used (RU), Occasionally Used (OU), or Frequently Used (FU). These responses were weighted and indices processed, as summarized in Table 4. The most positively rated strategy, with an index of 0.92, was combining farming with handicrafts such as tailoring, barbing, and masonry. This aligns with the local belief that "*ona kan o wo oja*," meaning "many roads lead to the market," encouraging multiple income sources to maximize income. Other strategies included reducing the frequency of meals per day (index 0.48) and eating less preferred foods (index 0.37). The most negatively rated strategy was begging for alms (index -0.67), indicating a cultural aversion to begging, which is considered degrading and associated primarily with the physically challenged individuals. Withdrawing children from school due to inability to pay fees also had a negative index (-0.57), highlighting the economic hardship that forces families to prioritize the education of older children or encourage trade apprenticeships, often in low-skilled and low-paying jobs.

Households' responses to climate change impacts covered strategies against rising temperatures, water shortages, disease prevalence, erosion, and soil fertility loss. Over 70% of respondents identified these issues as significant challenges. The profile of the communities showed no significant spatial variations, with p =0.05 in all cases, indicating similar perceptions of climate change impacts across the study area.

The primary response to temperature changes was planting trees (43.8%), particularly around homes, as part of afforestation programs. Other responses included using cooling fans (19.1%), limiting bush burning (9.7%), preserving water bodies (7.1%), practicing eco-friendly farming (3.4%), and adopting long fallow periods (7.4%). To cope with water shortages, 39% of respondents used storage tanks, 18.4% engaged in rain harvesting, and 15.2% utilized water vendors and water reuse. Health challenges were addressed through self-medication (31%), consulting native doctors (23.3%), and patronizing medicine hawkers (18.3%). While these alternative healthcare sources offer benefits such as cost savings and accessibility, they also pose risks that can undermine health outcomes if not properly regulated (Akande *et al*., 2021; Hughes *et al*., 2001).

To combat soil fertility loss, 45.4% of respondents used organic fertilizers, though 78.5% reported the cost as prohibitive. Another 15.3% used bush fallow methods. These findings align with studies in Kenya and Uganda, where significant proportions of farmers used organic fertilizers despite high costs (Mugisha & Nkwasibwe, 2017; Nambiro, 2019). The use of bush fallow is also common in West Africa but decreasing in Southeast Asia due to changes in land use patterns (Rasul, 2016; Mertz, 2020).

Overall, the coping strategies employed by households were mainly reactionary, involving diversification of income sources, changes in agricultural practices, and the use of social networks. This is consistent with practices in Sub-Saharan Africa and South Asia, where agricultural adaptation includes adopting new technologies and climate-resilient crops (Agriculture & Food Security, 2020; World Bank, 2024). In the study area, responses were largely focused on traditional farming methods, mixed cropping, shifting cultivation, trading in non-agricultural products, and migration to cities.

Table 4 Household Coping Strategy with Poverty in Study Area

COPING STRATEGIES	**RANKING**									
	FU	**OU**	**RU**	**NU**	**SWV**	**NR(f)**	**$\dot{x}$**	**X**	**D $^{-}$**	**D^{-2}**
Reducing the frequency of eating per day	168	204	93	0	465	330	1.41	0.93	0.48	0.96
Eating of less preferred food	156	150	123	0	429	330	1.30		0.37	0.74
Purchase of food on credit	93	104	89	0	286	327	0.87		-0.06	0.12
Seeking help from friends/ relatives	114	150	112	0	376	330	1.14		0.21	0.42
Consumption of stored produce meant for planting	219	92	71	0	382	323	1.18		0.25	0.50
Selling of farm implement/ selling assets	69	88	61	0	218	322	0.68		-0.25	0.50
Children hawking	138	54	40	0	232	322	0.72		-0.21	0.42
Combining farming with sundry activities	465	88	32	0	585	316	1.85		0.92	1.84
Borrowing money from cooperatives	138	130	61	0	329	321	1.02		0.09	0.18
Family planning/ use of contraceptives	135	64	53	0	252	307	0.82		-0.11	0.22
Withdrawing children from school	45	38	29	0	112	314	0.36		-0.57	1.14
Withdrawing children from private to public school	72	34	43	0	149	301	0.50		-0.43	0.86
Begging for alms	18	30	34	0	82	315	0.26		-0.67	1.34
Resorting to fasting and prayer	111	122	73	0	306	314	0.97		0.04	0.08
TOTAL							**13.08**			

Source: Authors' Field survey (2023). NU: Not used (0), RU: Rarely used (1), OU: Occasionally used (2) and FU: Frequently used (3)

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VI. CONCLUSION AND RECOMMENDATIONS

From the analysis and discussion of rural households' response patterns to poverty and the impacts of climate change in the study area, it is evident that multidimensional and monetary poverty is highly prevalent and pervasive. Over 90 percent of rural households earned and spent less than N20,000 ($13.3) per month on essential needs such as food, children's education, and health challenges. The very low level of expenditure on basic necessities raises significant concerns about persistent food insecurity and vulnerability to adverse effects associated with unstable climatic conditions. The response patterns to the impacts of climate change and poverty are mainly reactionary, involving a combination of diversified livelihoods and traditional agricultural adaptation strategies. However, long-term adaptive measures are lacking, such as access to climate impact information, improved seed varieties, financial services like agricultural loans, and food crop subsidies. Additionally, there is a lack of community-based adaptation strategies involving collective action and shared resources to enhance resilience.

➢ *Recommendations*

- *Comprehensive Socio-Economic and Environmental Interventions*:

✓ Addressing the multifaceted challenges of multidimensional poverty and climate change requires a combination of community-based and regional efforts focused on adaptation, resilience, and tailor-made policies and programs. The government, with the support of private sector organizations, needs to invest in rural poverty alleviation, climate change information dissemination, awareness creation, and sustainable climate adaptation and resilience techniques.
✓ Implementing climate monitoring, early warning systems, and sustainable infrastructure development can help households and communities better prepare for and respond to multidimensional poverty and climate events. This is crucial for mitigating the socio-economic and environmental impacts of climate change.

- *Long-Term Measures for Climate Change Mitigation:*

✓ Reinvigorating campaigns for tree planting initiatives can encourage local communities to plant trees around homes and as hedges around farmlands. This long-term measure will enhance the Earth's capacity to sequester carbon dioxide, a major greenhouse gas that contributes to global warming. Additionally, it will strengthen campaigns against indiscriminate tree felling and fuelwood gathering.
✓ Promoting the use of improved seed varieties, climate-resilient crops, and sustainable agricultural practices such as mixed cropping and crop rotation can help enhance food security and resilience to climate change.
✓ Providing rural households with access to financial services, such as agricultural loans and subsidies for food crops, can support their adaptive capacity and improve their overall economic stability.

- *Community-Based Adaptation Strategies:*

✓ Developing community-based adaptation strategies that involve collective action and shared resources can enhance resilience among rural households. This includes forming cooperatives or community groups to share knowledge, resources, and support for implementing sustainable practices and infrastructure.
✓ Investing in capacity building and education programs can empower rural households with the knowledge and skills needed to implement effective adaptation strategies. This includes training on sustainable farming techniques, financial management, and climate change mitigation practices.
✓ By adopting these recommendations, the study area can enhance its resilience to poverty and climate change, ensuring a more sustainable and secure future for its rural households and communities.

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