CLIMATE CHANGE AWARENESS AND PERCEIVED ANTHROPOGENIC DRIVERS AMONG RURAL COMMUNITIES IN PROTECTED AREAS OF NORTHERN NIGERIA

[1]Iyagin, F.O., [2]Lawal, A., [2]Adekunle, V.A.J., [1]Sale, F.A., and [3]Adeboyejo, A.A.
[1]Department of Forestry and Wildlife, Prince Abubakar Audu University, Anyigba, Kogi State, Nigeria
[2]Department of Forestry and Wood Technology, Federal University of Technology, Akure, Ondo State, Nigeria
[3]Department of Forest Resources Management, Osun State University, Nigeria
Corresponding Author's Email: faithfullysunola@gmail.com

ABSTRACT
Climate change poses increasing threats to ecosystems and human livelihoods, particularly in rural communities around protected areas (PAs). This study assessed climate change awareness and activities contributing to climate change among rural populations in northern Nigeria. Four PAs were purposively selected, and five adjacent fringe communities were randomly sampled within each PA. A total of 400 structured questionnaires were administered to randomly selected household heads. Data were analyzed using both descriptive and inferential statistics. A binary logistic regression model was employed to analyze the factors driving climate change awareness. The findings revealed that respondents were predominantly male and within economically active age groups. Overall awareness of climate change was high (93.25%), with radio identified as the primary source of information. However, awareness levels varied significantly across locations, with respondents in Marhai exhibiting lower awareness compared to those in Yankari, Sumu, and Borgu. Major human activities perceived to contribute to climate change included bush burning (89%), overgrazing (81%), fuelwood collection (79%), and logging (77%). While no significant differences were observed among Yankari, Borgu, and Marhai in awareness of contributing activities ($p > 0.05$), Sumu differed significantly from the other locations. The study established that religion and education are statistically significant ($p<0.005$) determinants of climate change awareness in the study areas. Respondents widely recognized climate change impacts, particularly rainfall variability (95%), flooding and erosion (88%), and temperature extremes (87%). It is recommended that environmental education be strengthened and religious institutions be actively engaged to enhance climate change awareness in protected area communities.

Keywords: Climate change, awareness, protected area, rural communities, adaptation strategies

INTRODUCTION
Climate change has emerged as one of the most pressing global issues affecting ecosystems, economies, and human well-being. It is primarily driven by anthropogenic activities such as deforestation, fossil fuel combustion, and unsustainable agricultural practices (IPCC, 2021). Its impacts are felt more strongly in developing countries like Nigeria, where people have fewer resources to adapt, thus largely depend on natural resources.

However, access to these services is rarely uniform, as gender continues to shape how men and women farmers benefit from extension support. Decades of research have established that women farmers face systemic disadvantages in accessing agricultural information, technologies, and credit, despite their significant contributions to agricultural production (Olufemi, 2019; Umoh *et al*., 2021; *et al*., 2015; Nkanta *et al*., 2025). These inequalities are often reinforced by cultural norms, institutional biases, and the gender-blind design of extension systems (Okorie and Ekanem, 2020; Dabkiene, 2025). Consequently, extension services that fail to account for gendered perspectives risk excluding women farmers from critical innovations needed to strengthen food security and resilience.

The gendered nature of access is not merely about resource distribution but also about the structural and relational dynamics that influence who participates, decides, and benefits from agricultural development interventions. Recent scholarship emphasizes that extension should be humanized, participatory, and gender-responsive to overcome the entrenched barriers women face in agriculture (Ekanem *et al*., 2020; Lwamba *et al*., 2022). Yet, while policies increasingly acknowledge the need for inclusivity, evidence suggests that implementation often falls short of ensuring equitable access (Hidrobo *et al*., 2024). In many rural settings, women continue to encounter obstacles such as limited land rights, inadequate access to finance, and exclusion from farmer organizations, which restrict their effective engagement with extension agents (Ifeanyi-Obi and Uloh, 2025; Ongachi and Belinder, 2025). These realities underscore the need to move beyond generalized extension models towards strategies that deliberately address gender disparities in rural advisory systems.

In Akwa Ibom State, Nigeria, these concerns are particularly pronounced. Women farmers, who play a vital role in food production and household sustenance, often experience restricted access to extension services due to gender-related socio-cultural norms, institutional gaps, and uneven policy implementation (Udo *et al*., 2024; Obot *et al*., 2022). Evidence from studies in the state highlights that while extension is recognized as a vital driver of agricultural productivity and rural development, women remain underrepresented among beneficiaries of training, innovation platforms, and credit-linked advisory services (Ukpong *et al*., 2019; Umeh *et al*., 2018). The consequence is a widening gender gap in productivity, income, and empowerment outcomes that undermines broader development goals (Abdisa *et al*., 2024; Jeevanasai *et al*., 2023). If left unaddressed, these gaps risk perpetuating cycles of poverty, weakening household food security, and diminishing the potential of extension to contribute to inclusive rural transformation (Asanwana and Uloh, 2025b; Emmanuel *et al*., 2025). Furthermore, existing literature has not sufficiently captured women farmers' lived experiences and coping strategies in navigating barriers to extension access in Akwa Ibom State. Obot *et al*. (2022) examined women's involvement in farming activities, while Harry (2022) assessed gender participation in public and private extension delivery systems.

Protected areas (PAs) are established to conserve biodiversity and maintain ecosystem services. However, communities adjacent to these areas often depend on them for subsistence, creating a complex relationship between conservation and livelihood needs. In northern Nigeria's savanna ecosystem, activities such as fuelwood collection, bush burning, and agricultural expansion are common contributors to environmental degradation and climate change (FAO, 2020; Akintuyi et al., 2021). Despite this, awareness and understanding of climate change among rural populations remain uneven.

Awareness of climate change plays an important role in shaping environmental attitudes and behavioral responses (Idrisa et al., 2012). Findings show that when individuals are more informed about climate change, they are more likely to adopt sustainable environmental practices, although this relationship is often influenced by socioeconomic factors such as education level, income, and access to information (IPCC, 2021; UNEP, 2019; Azeez et al., 2024).

In northern Nigeria, particularly in communities around protected areas, there is still limited empirical evidence on how rural populations perceive climate change and the extent to which their daily activities contribute to it. Given their strong dependence on natural resources, these communities are both highly vulnerable to climate change impacts and actively engaged in land-use practices that may intensify environmental change (IPCC, 2021; Akintuyi et al., 2021). This study, therefore, aims to assess climate change awareness and identify key contributing activities among rural communities surrounding protected areas in northern Nigeria.

MATERIALS AND METHODS

Study Area

This study was conducted in 20 rural fringe communities adjacent to four randomly selected protected areas in the northern savanna region of Nigeria. The selected protected areas were Yankari Game Reserve, Sumu Wildlife Park, Borgu Game Reserve and Marhai Forest Reserve. Five fringe communities were randomly selected around each protected area, resulting in a total of 20 communities. The region is characterized by a tropical climate with distinct wet and dry seasons, and vegetation dominated by grasses and scattered trees (Modibbo & Shahidah, 2018). Livelihoods in the area are predominantly based on rain-fed agriculture, livestock rearing and the utilization of forest resources. Household heads were targeted as respondents due to their central role in livelihood decision-making and natural resource use.

Table 1: Selected Fringe Communities around each Protected Area

Protected area	Fringe Communities Sampled
Yankari Game Reserve	Gar, Yashi, Bajama, Kumbala & Yankari
Sumu Wildlfie Park	Kafin-Madaki, Ringim, Rugan-Sumu, Kefin-Liman & Guturu
Borgu Game Reserve	Popo, Munnai, Koro, Karabonde & Lesigbe
Marhai Forest Reserve	Masinge, Andohor, Arum-Shwar, Hwan & Marhi

Sampling Technique and Data Collection

A multistage sampling approach was adopted for this study. In the first stage, four protected areas were purposively selected based on their ecological significance and location within the northern Nigerian savanna. In the second stage, five fringe communities were randomly selected around each protected area. In the final stage, 20 household heads were randomly chosen from each selected community. Data were collected using a structured questionnaire administered through face-to-face interviews. The questionnaire captured respondents' awareness of climate change and of anthropogenic activities contributing to it within the study area. In all, 400 respondents were sampled across the selected communities.

Statistical Analysis

The information collected for this study was analyzed using descriptive statistics in the form of tables. In addition, to examine the influence of demographics on climate change awareness, a binary logistic regression model was employed. Climate change awareness was coded as a binary outcome (1 = aware, 0 = not aware). The model is specified as:

$$\text{Log}\frac{p}{1-p} = \alpha + \beta_0 + \beta_{1X_1} + \beta_{2X_2} + \beta_{3X_3} + \beta_{4X_4} + \cdots + \beta_{kX_k} + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where p = Aware of climate change; 1 - p = Unaware of climate change; β = coefficient; x_1-xk = covariates and ε = error term

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Respondents

The socio-economic characteristics of respondents across selected PAs are presented in Table 2. The result revealed a male-dominated sample, with males constituting 66.5% and females 33.5%, reflecting the patriarchal structure typical of northern Nigeria, where men are the primary household heads and decision-makers. This contradicts the findings of Azeez et al. (2024) and Eneji et al. (2021), who reported higher female participation due to women's active roles in household resource management. However, women remain critical actors in climate-related activities such as fuelwood and non-timber forest product (NTFP) collection, with implications for climate change perception and adaptation (Ogunbode & Awolola, 2026). The age distribution indicates that respondents are largely within the economically active population, with 21–30 years (30.8%), 31–40 years (27.5%), and 41–50 years (27.3%) accounting for 85.6% of the sample. This suggests a predominance of productive individuals directly engaged in natural-resource-based livelihoods, consistent with previous studies (Idrisa et al., 2012; Adeyemi et al., 2015; Ume et al., 2021), and underscores their importance as targets for environmental awareness interventions.

Educational attainment shows that 77.8% of respondents had formal education, while 22.3% had none. This indicates a moderate literacy level that may enhance understanding of climate change issues. Education is widely recognized as a key determinant of environmental awareness and adaptive capacity (Jerumeh, 2024), suggesting a potential positive influence on mitigation and adaptation practices.

Farming was the dominant occupation (62.5%), while trading (10%), fishing (3.75%), processing (4.75%), artisan work (1.75%), and NTFP gathering (2%) were less prevalent. Significantly, 15.25% of respondents engaged in multiple occupations, indicating livelihood diversification as an adaptive strategy. This dependence on agriculture aligns with Umeh et al. (2021), who find that rural households rely heavily on climate-sensitive resources, increasing vulnerability to climate variability. Household sizes were generally large, with 39.75% having 4–7 members and 38% having more than 7 members, reflecting typical rural demographics and providing labour for agricultural activities. Consistent with previous studies (Abaje et al., 2016; Ekanem & Umoh, 2021; Jerumeh, 2024), household size influences the intensity of resource use and poverty dynamics.

Climate Change Awareness

The awareness status of respondents across the study sites is presented in Table 3. The result reveals a high overall awareness of climate change among respondents (93.25%), with only 6.75% indicating a lack of awareness. Across locations, awareness was highest in Yankari Game Reserve (100%), followed by Marhai Forest Reserve (95%), Borgu Game Reserve (90%), and Sumu Wildlife Park (88%). The Chi-square test showed a significant variation in awareness across locations ($\chi^2 = 13.782$, df = 3, $p = 0.003$), confirming that location significantly influences awareness levels. Post hoc grouping indicates that Yankari Game Reserve (a) differs significantly from Sumu Wildlife Park and Borgu Game Reserve (b), while Marhai Forest Reserve (ab) is not significantly different from either group. The higher awareness in Yankari may be attributed to exposure to tourism activities, institutional presence, and conservation programmes, which often enhance information dissemination, while relatively lower awareness in Sumu and Borgu may reflect differences in access to climate information and outreach. This supports the report by Ayanlade et al. (2023), that proximity to conservation and extension services improves climate awareness in Nigeria. Similarly, Ogunbode et al. (2019) emphasized the role of socio-economic and locational factors in shaping climate change awareness in sub-Saharan Africa.

The high overall awareness aligns with global evidence of increasing climate change consciousness (IPCC, 2022). However, awareness does not necessarily translate into adaptive or mitigation actions, as behavioral responses depend on deeper understanding, risk perception, and access to resources (Leiserowitz et al., 2020). Therefore, targeted and location-specific awareness strategies are required to address existing disparities and promote effective climate responses. Radio news was observed as the predominant source of climate change information for participants. Other sources of information such as Television and Non-Governmental Organizations were low. This agrees with previous studies as the most accessible and widely used media for disseminating environmental information in rural Nigeria (Adebisi-Adelani and Oyesola, 2014, Eneji et al., 2021, Halliru et al., 2021 & Azeez et al., 2024).

Table 2: Socio-economic Characteristics of Respondents across the Selected Locations

		Location				
	Category	**Yankari (n=100) Freq. (%)**	**Sumu (n=100) Freq. (%)**	**Borgu (n=100) Freq. (%)**	**Marhai (n=100) Freq. (%)**	**Pooled Data (n=400) Freq. (%)**
Gender	Male	66(66)	65(65)	64(64)	71(71)	266(66.5)
	Female	34(34)	35(35)	36(36)	29(29)	134(33.5)
Age (Years)	21-30	29(29)	36(36)	35(35)	23(23)	123(30.8)
	31-40	28(28)	21(21)	31(31)	30(30)	110(27.5)
	41-50	32(32)	31(31)	22(22)	24(24)	109(27.3)
	51-60	6(6)	9(9)	3(3)	17(17)	35(8.8)
	61-70	3(3)	3(3)	7(7)	2(2)	15(3.8)
	>70	2(2)	0(0)	2(2)	4(4)	8(2)
Marital Status	Married	64(64)	68(68)	87(87)	83(83)	302(75.5)
	Single	35(35)	29(29)	12(12)	15(15)	91(22.75)
	Divorced	1(1)	3(3)	1(1)	2(2)	7(1.75)
Educational Status	No Formal	14(14)	19(19)	29(29)	27(27)	89(22.3)
	Formal	86(86)	81(81)	71(71)	73(73)	311(77.8)
Formal Education	Adult Literacy School	8(9)	13(16)	1(1)	5(7)	27(8.7)
	Attempted Primary School	2(2)	5(6)	6(8)	6(8)	19(6.1)
	Completed Primary School	5(6)	6(7)	16(23)	7(10)	34(10.9)
	Attempted Secondary School	10(12)	8(10)	13(18)	22(30)	53(17)

	Completed Secondary School	16(19)	16(20)	18(25)	13(18)	63(20.3)
	Attempted Tertiary Education	13(15)	13(16)	8(11)	3(4)	37(11.9)
	Completed Tertiary Education	32(37)	20(25)	9(13)	17(23)	78(25.1)
Religion	Christianity	44(44)	41(41)	5(5)	96(96)	186(46.5)
	Islam	43(43)	43(43)	95(95)	1(1)	182(45.5)
	Traditional	1(1)	4(4)	0(0%)	3(3)	8(2)
	Others	12(12)	12(12)	0(0%)	0(0)	24(6)
Major Occupation	Farming	81(81)	59(59)	51(51%)	59(59)	250(62.5)
	Fishing	3(3)	8(8)	4(4%)	0(0)	15(3.75)
	Trading	10(10)	21(21)	8(8%)	1(1)	40(10)
	Produce processing	3(3)	3(3)	13(13%)	0(0)	19(4.75)
	Artisan work	1(1)	1(1)	3(3%)	2(2)	7(1.75)
	Gathering on NTFP	1(1)	1(1)	1(1%)	5(5)	8(2)
	Multiple Occupation	1(1)	7(7)	20(20%)	33(33)	61(15.25)
Household size	1-3	49(49)	27(27)	7(7%)	6(6)	89(22.25)
	4-7	15(15)	41(41)	48(48%)	55(55)	159(39.75)
	>7	36(36)	32(32)	45(45%)	39(39)	152(38)
Income (₦)	Minimum	80,000	100,000	20,000	10,000	10,000
	Maximum	2,000,000	2,000,000	1,400,000	2,500,000	2,500,000
	Average	450,700	436,150	265,760	503,257.5	413,966.9

Table 3: Awareness Status of Climate Change among Respondents

Study Location	Aware (%)	Not Aware (%)	Total
Yankari Game Reserve	100 (100%)a	0 (0%)	100
Sumu Wildlife Park	88 (88%)b	12 (12%)	100
Borgu Game Reserve	90 (90%)b	10 (10%)	100
Marhai Forest Reserve	95 (95%)ab	5 (5%)	100
Overall	373 (93.25%)	27 (6.75%)	400

Chi-Square test (χ^2) = 13.782*, df =3, p-value = 0.003*
Location sharing the same letter is not significantly different at p< 0.05.

The association between demographics and climate change awareness was checked using a Chi-square analysis (Table 4). Gender, age, educational status and religion showed statistically significant association with awareness, while marital status and occupation were not significant ($p > 0.005$). In addition, a binary logistic regression analysis was carried out to examine the influence of demographic variables on respondents' awareness (Table 5). The omnibus test of model coefficients showed that the model was statistically significant, $\chi^2(7) = 50.213$, $p < .001$, indicating that the demographic variables reliably distinguished between respondents who were aware of climate change and those who were not. The model explained between 11.8% (Cox & Snell R^2) and 30.3% (Nagelkerke R^2) of the variation in awareness. Other factors, such as access to information, media exposure, and personal experiences, may also play a bigger role in shaping respondents' awareness of climate change (Ehsan et al., 2022).

The classification table revealed an overall prediction accuracy of 93.5%. However, the model correctly classified 99.7% of respondents as aware of climate change, and only 7.4% as not aware. This indicated class imbalance and possible overestimation of predictive performance. Similar limitation of classification accuracy in an imbalanced dataset was reported by (Oduniyi et al., 2018) in a climate perception study, where high awareness frequency reduces model sensitivity for the minority group.

The logistic regression coefficients (Table 5) showed that, among the predictors, only religion ($B = 2.906$, $p < 0.001$) and education ($B = 1.628$, $p = 0.001$) were statistically significant determinants of climate change awareness. This agrees with earlier studies that social, educational and cultural systems determine how people understand and respond to environmental issues (Oduniyi et al., 2018; Jerumeh, 2024; Abaje, 2016; Inkoom et al., 2025). Conversely, other predictors, such as sex, age, marital status, occupation, and household size, do not differ significantly in their climate change awareness levels. These findings align with the earlier study by Oduniyi et al. (2018), who reported variables such as gender, marital status, and household size as not significant determinants of climate change.

Table 4: Association between Demographics and Awareness of Climate Change

Variable	Category	Awareness n (%)	χ^2	p-value
Sex	Male	255 (95.9)	8.624	0.003*
	Female	118 (88.1)		
Age	21-30	111 (90.2)	19.869	0.001*
	31-40	103 (93.6)		
	41-50	107 (98.2)		
	51-60	34 (97.1)		
	61-70	13 (86.7)		
	>70	5 (62.5)		
Educational Status	No Formal	76 (85.4)	11.226	0.001*
	Formal	297 (95.5)		
Marital Status	Married	284 (94.0)	3.25	0.357
	Single	83 (91.2)		
	Divorced	6 (85.71)		
Religion	Christianity	160 (86.0)	30.77	<0.001*
	Islam	182 (100)		
	Traditional	7 (100)		
	Others	24 (100)		
Occupation	Farming	227 (90.8)	13.85	0.054
	Fishing	15 (100)		
	Trading	40 (100)		
	Produce Processing	19 (100)		
	Artisan Work	7 (100)		
	Gathering of NTPFs	6 (75.0)		
	Multiple Occupation	59 (96.72)		

Table 5: Parameter Estimates of the Binary Logistics Regression Model on Climate Change Awareness

								95% C.I. for EXP(B)	
	Variables	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
Step 1[a]	Sex	-0.390	0.469	0.693	1	0.405	0.677	0.270	1.696
	Age	0.138	0.184	0.561	1	0.454	1.147	0.800	1.645
	Marital Status	-0.541	0.362	2.240	1	0.135	0.582	0.286	1.182
	Religion	2.906	0.775	14.069	1	**<0.001**	**18.276**	4.004	83.420
	House size	-0.050	0.047	1.105	1	0.293	0.952	0.867	1.044
	Occupation	0.195	0.116	2.815	1	0.093	1.215	0.968	1.525
	Education	1.628	0.505	10.377	1	**0.001**	**5.093**	1.892	13.714
	Constant	-1.341	1.578	0.722	1	0.396	0.262	-	-
Step		-2 Log likelihood				Cox & Snell R Square		Nagelkerke R Square	
		147.485[a]				0.118		0.303	

Perceived Anthropogenic Drivers of Climate Change

Awareness of activities contributing to climate change was generally high across the study locations (Table 6). Most of the respondents in Yankari (98%), Sumu (91%), Borgu (97%), and Marhai (96%) identified land/bush clearing as a key driver, while fuelwood use (92%) and overgrazing (91%) were also widely recognized. Lower awareness for cropping systems (76%) and processing techniques (70%) suggests that respondents have a better understanding of visible environmental practices than obvious agricultural processes.

Perceived severity of activities contributing to climate issues largely reflected awareness, as shown in Table 7. Bush burning was consistently rated as highly severe across locations, particularly in Marhai (97%) and Yankari (93%), with no "not severe" responses in most areas. Fuelwood use and overgrazing were also widely regarded as severe, although Sumu showed relatively lower concern for fuelwood (68%). Hunting exhibited spatial variation, being least severe in Yankari (61%) and Sumu (58%) but highly severe in Borgu (92%) and Marhai (78%). These findings align with IPCC (2021), which emphasized land-use practices as major contributors to climate change.

Awareness of Climate Change Adaptation Strategies

Most respondents across the study areas demonstrated a high level of awareness of climate change adaptation options (Table 8), with particularly strong awareness observed in Yankari (97%), while Sumu (76%), Marhai (75%), and Borgu (74%) showed moderate but comparable levels. The results in Table 9 revealed generally high awareness of climate change adaptation strategies, particularly for planting shade and shelters (80%), agroforestry (71%), and crop diversification (66%), indicating strong familiarity with nature-based practices. This result agrees with reports by FAO (2021), which emphasized these practices as widely promoted, low-cost adaptation strategies in developing countries. The majority of respondents across all sites acknowledged the presence of local coping and adaptation strategies. This suggests that awareness is partially translating into practice. These findings align with recent studies by Idrisa et al. (2012), FAO (2021), and IPCC (2022), which reported increasing awareness of climate change mitigation/adaptation measures in Africa. The federal government was identified as a significant contributor to mitigation/adaptation programs in the study areas.

Table 6: Awareness of Activities Contributing to Issues of Climate Change as Perceived by Respondents

Activities	Category	Yankari (n=100)	Sumu (n=88)	Borgu (n=90)	Marhai (n=95)	All Location (n= 373)
Land/ bush clearing	No	2(2%)	8(9%)	3(3%)	4(4%)	17(5%)
	Yes	98(98%)	80(91%)	87(97%)	91(96%)	356(95%)
Cultivation technique	No	16(16%)	36(41%)	17(19%)	14(15%)	83(22%)
	Yes	84(84%)	52(59%)	73(81%)	81(85%)	290(78%)
Cropping system	No	15(15%)	44(50%)	19(21%)	11(12%)	89(24%)
	Yes	85(85%)	44(50%)	71(79%)	84(88%)	284(76%)
Improper application of fertilizer	No	6(6%)	22(25%)	9(10%)	13(14%)	50(13%)
	Yes	94(94%)	66(75%)	81(90%)	82(86%)	323(87%)
Processing technique	No	28(28%)	49(56%)	21(23%)	13(14%)	111(30%)
	Yes	72(72%)	39(44%)	69(77%)	82(86%)	262(70%)
Lumbering	No	11(11%)	14(16%)	3(3%)	7(7%)	35(9%)
	Yes	89(89%)	74(84%)	87(97%)	87(92%)	337(90%)
Hunting	No	12(12%)	19(22%)	11(12%)	10(11%)	52(14%)
	Yes	88(88%)	69(78%)	79(88%)	85(89%)	321(86%)
Collection of fuelwood	No	5(5%)	10(11%)	4(4%)	8(8%)	27(7%)
	Yes	95(95%)	77(88%)	86(96%)	87(92%)	345(92%)
Overgrazing	No	5(5%)	14(16%)	5(6%)	8(8%)	32(9%)
	Yes	95(95%)	74(84%)	85(94%)	87(92%)	341(91%)
Rivers drying up	No	9(9%)	20(23%)	11(12%)	8(8%)	48(13%)
	Yes	91(91%)	68(77%)	79(88%)	87(92%)	325(87%)

Table 7: Level of Activities Contributing to Climate Change Issues across all Selected Location

Yankari					
Activities	**Not Severe**	**Just Severely**	**Severely**	**Very Severely**	**N**
Bush burning	0(0%)	7(7%)	44(45%)	47(48%)	98
Cultivation technique	5(5%)	17(17%)	47(48%)	29(30%)	98
Cropping system	4(4%)	27(28%)	42(43%)	25(26%)	98
Fertilizer application	12(12%)	24(24%)	27(28%)	35(36%)	98
Processing technique	6(6%)	23(23%)	32(33%)	37(38%)	98
Lumbering	7(7%)	22(22%)	30(31%)	39(40%)	98
Hunting	16(16%)	23(23%)	29(30%)	30(31%)	98
Collecting and use of firewood	10(10%)	14(14%)	28(29%)	46(47%)	98
Overgrazing	13(13%)	10(10%)	36(37%)	39(40%)	98
Rivers drying up	13(13%)	19(19%)	32(33%)	34(35%)	98
Sumu					
Activities	**Not Severe**	**Just Severely**	**Severely**	**Very Severely**	**N**
Bush burning	8(8%)	11(11%)	45(46%)	33(34%)	97
Cultivation technique	9(10%)	18(20%)	43(47%)	21(23%)	91
Cropping system	9(10%)	24(26%)	40(43%)	20(22%)	93
Fertilizer application	8(9%)	26(28%)	33(35%)	27(29%)	94
Processing technique	7(8%)	26(28%)	40(43%)	20(22%)	93
Lumbering	5(5%)	22(24%)	32(35%)	33(36%)	92
Hunting	16(17%)	23(24%)	33(35%)	22(23%)	94
Collecting and use of firewood	18(19%)	12(13%)	37(39%)	28(29%)	95
Overgrazing	12(13%)	15(16%)	42(44%)	27(28%)	96
Rivers drying up	11(11%)	16(17%)	39(41%)	30(31%)	96
Borgu					
Activities	**Not Severe**	**Just Severely**	**Severely**	**Very Severely**	**N**
Bush burning	0(0%)	10(10%)	34(35%)	52(54%)	96
Cultivation technique	1(1%)	22(32%)	29(42%)	17(25%)	69
Cropping system	3(5%)	17(28%)	32(52%)	9(15%)	61
Fertilizer application	0(0%)	8(10%)	37(44%)	39(46%)	84
Processing technique	2(4%)	12(25%)	24(50%)	10(21%)	48
Lumbering	0(0%)	13(16%)	15(19%)	53(65%)	81
Hunting	4(5%)	24(28%)	35(41%)	23(27%)	86

Collecting and use of firewood	0(0%)	17(18%)	33(36%)	42(46%)	92
Overgrazing	1(1%)	13(15%)	26(30%)	46(53%)	86
Rivers drying up	0(0%)	18(23%)	30(38%)	32(40%)	80
Marhai					
Activities	**Not Severe**	**Just Severely**	**Severely**	**Very Severely**	**N**
Bush burning	0(0%)	2(3%)	14(21%)	50(76%)	66
Cultivation technique	2(6%)	1(3%)	10(30%)	20(61%)	33
Cropping system	1(3%)	1(3%)	11(34%)	19(59%)	32
Fertilizer application	1(2%)	2(4%)	19(41%)	24(52%)	46
Processing technique	4(15%)	3(11%)	8(30%)	12(44%)	27
Lumbering	2(3%)	4(6%)	19(28%)	42(63%)	67
Hunting	3(7%)	7(16%)	10(23%)	24(55%)	44
Collecting and use of firewood	0(0%)	3(5%)	15(25%)	41(69%)	59
Overgrazing	0(0%)	0(0%)	14(24%)	45(76%)	59
Rivers drying up	1(2%)	3(6%)	17(32%)	32(60%)	53
All Location					
Activities	**Not Severe**	**Just Severely**	**Severely**	**Very Severely**	**N**
Bush burning	8(2%)	30(8%)	137(38%)	182(51%)	357
Cultivation technique	17(6%)	58(20%)	129(44%)	87(30%)	291
Cropping system	17(6%)	69(24%)	125(44%)	73(26%)	284
Fertilizer application	21(7%)	60(19%)	116(36%)	125(39%)	322
Processing technique	18(7%)	64(24%)	104(39%)	79(30%)	265
Lumbering	14(4%)	61(18%)	96(28%)	167(49%)	338
Hunting	39(12%)	77(24%)	107(33%)	99(31%)	322
Collecting and use of firewood	28(8%)	46(13%)	113(33%)	157(46%)	344
Overgrazing	26(8%)	38(11%)	118(35%)	157(46%)	339
Rivers drying up	25(8%)	56(17%)	118(36%)	128(39%)	327

Table 8: Respondents' Awareness of Climate Change Adaptation Strategies

		Location				
		Yankari (n=100)	Sumu (n=88)	Borgu (n=90)	Marhai (n=95)	Overall (n=373)
Awareness Status	Yes (%)	97(97)	76 (86.4)	74 (82.2)	75 (78.9)	322 (86.3)
	No (%)	3 (3)	12 (13.6)	16 (17.8)	20 (21.1)	51 (13.7)

Table 9: Adaptation options adopted by Respondents across study Locations

Adaptation strategies	Not Aware	Just Aware	Aware	Much Aware	Very much Aware	N
Planting of shades and shelters	3(1%)	8(2%)	54(17%)	97(30%)	160(50%)	322
Agroforestry practices	9(3%)	24(8%)	58(18%)	107(33%)	122(38%)	320
Planting of different crops	17(5%)	20(6%)	73(23%)	118(37%)	92(29%)	320
Choosing different planting dates	27(8%)	40(13%)	82(26%)	100(31%)	71(22%)	320
Shortening length of plant growth periods	37(12%)	47(14%)	77(24%)	95(30%)	64(20%)	320
Soil conservation methods	23(7%)	33(10%)	78(24%)	103(33%)	83(26%)	320
Appropriate use of Agrochemicals	18(6%)	33(10%)	64(20%)	105(33%)	100(31%)	320
Increased water conservation methods	28(9%)	44(14%)	64(20%)	118(36%)	66(21%)	320
Use of irrigation	42(13%)	60(19%)	71(22%)	82(26%)	65(20%)	320
Off farm employment	31(10%)	49(15%)	84(26%)	75(24%)	81(25%)	320
Change of farm enterprise	44(14%)	44(14%)	85(27%)	82(25%)	65(20%)	320
Use of insurance	89(28%)	54(17%)	57(17%)	73(23%)	47(15%)	320
Moving to different site	34(11%)	43(13%)	55(17%)	78(25%)	110(34%)	320
Increase farm size	35(11%)	33(10%)	68(21%)	79(25%)	105(33%)	320

CONCLUSION

This study assessed climate change awareness and contributing activities among rural communities in northern Nigeria. The findings revealed a generally high level of awareness and its drivers across the study locations. Access to information through radio was predominant, with a limited role for television, while agricultural extension agents and NGOs were observed across the study sites. Respondents frequently identified bushfires and logging as the most significant contributors to climate change. However, noticeable variations in awareness levels across the protected areas suggest the need for more targeted climate change education campaigns to promote adaptive behavior and participation in conservation initiatives, particularly in Marhai, where awareness is comparatively lower.

The result further indicated that formal education is positively associated with improved awareness and perception of climate change impacts, likely due to better access to information and understanding of complex environmental issues. In General, the study highlights disparities in the availability of adaptation strategies adopted within the Nigerian savanna. It therefore recommends that policymakers strengthen climate awareness in the Nigerian savanna ecological zone by integrating environmental education into formal systems and working with religious institutions to reach communities effectively, thereby promoting sustainable environmental practices. Simple, locally relevant communication strategies should also be used to reach less-informed communities and encourage the adoption of practical adaptation options.

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