PERCEIVED ADAPTATION TO THE IMPACT OF CLIMATE CHANGE ON SHEEP AND GOAT PRODUCTION AMONG FARMERS IN SABON-GARI LOCAL GOVERNMENT AREA, KADUNA STATE, NIGERIA

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Abstract
This study examined farmers' perceptions of climate change and its impact on sheep and goat production in Sabon-Gari Local Government Area, Kaduna State, Nigeria. It explored the socio-economic characteristics of farmers, their awareness and sources of climate change information, perceptions of climate change impacts, and adaptation strategies employed. A descriptive research method was used, with data collected from 84 farmers through a structured questionnaire. Frequency distribution and simple percentage calculations were used for data analysis. Findings showed that the average age of respondents was 38 years, with 77.3% aware of climate change and 76% having observed changes in weather patterns over the past 5–10 years. The primary sources of climate change awareness were radio (28%) and peer networks (25.3%). Regarding climate change impact, the statement "Flooding has led to the loss of my livestock in the past" received the highest mean score ($\bar{x}$ = 3.6). The most common adaptation strategies included seeking veterinary services more frequently (24%), providing more water for livestock (21.3%), and shifting grazing locations (20%). However, unpredictable weather patterns ($\bar{x}$ = 2.7), poor market access ($\bar{x}$ = 2.5), and limited financial support ($\bar{x}$ = 2.5) were identified as significant constraints. The study recommends peer education groups for knowledge sharing, increased radio awareness campaigns on climate change, and financial support through subsidies or low-interest credit to enhance farmers' ability to adapt to climate change.
Keywords: *climate change, sheep and goat production*

Introduction

Small ruminants, such as sheep and goats, are crucial to global agriculture, especially in diverse climatic regions. They support livelihoods by providing food, fiber, and income, particularly in developing countries where their adaptability to harsh environments enhances rural resilience (Gizaw et al.,2019: FAO,2020). However, climate change marked by rising temperatures, shifting rainfall patterns, and extreme weather threatens livestock farming (Legg, 2021; Khairi, Maharani, & Aditya, 2025). Its effects on small ruminants include heat stress, reduced forage availability, and declines in health, nutrition, reproduction, and productivity (Adegbeye et al., 2024). Sheep and goats are highly sensitive to climate change due to their physiological and behavioral traits. Heat stress, reduced feed intake, and reproductive issues caused by rising temperatures negatively affect productivity and profitability (Shah et al., 2025). Additionally, shifting rainfall patterns and frequent droughts intensify water scarcity and degrade grazing resources, further threatening small ruminant's well-being (Saba et al., 2019).

Farmers, as key stakeholders in small ruminant production, experience these climate-related challenges firsthand. Their perceptions and adaptive strategies are shaped by direct interactions with climatic factors and their impact on livestock (Schunko et al., 2024). Understanding their perspectives is essential for developing targeted adaptation strategies and strengthening agricultural resilience (Lutta et al., 2024).

Despite growing awareness of climate change in agriculture, limited research has explored farmers' perceptions of climate risks in small ruminant farming. Addressing this knowledge gap is critical for informing policies, interventions, and extension services that enhance adaptive capacity and promote sustainable livestock production (Wongnaa et al., 2021). Understanding the impact of climate change on sheep and goat production in Sabon-Gari Local Government Area, Kaduna State, is essential due to the region's reliance on traditional livestock farming and growing climate-related challenges (Olorunfemi, 2025). Rising temperatures, unpredictable rainfall, and extreme

weather events directly affect forage availability and quality, crucial for sustaining small ruminants. The region's vulnerability is further heightened by limited resources, poor infrastructure, and dependence on rain-fed agriculture.

Sheep and goats play a critical role in local livelihoods, providing meat, milk, income, and employment for pastoralists. This study aims to examine farmers' perceptions of the impact of climate change on sheep and goat production in Sabon-Gari LGA, Kaduna State, Nigeria. Specifically, it seeks to analyze the socio-economic characteristics of respondents, assess their awareness of climate change and sources of information, evaluate their perceptions of its effects on small ruminant production, identify adaptation strategies employed, and explore the constraints farmers face in adapting to climate change. The findings will inform climate-resilient strategies to support sustainable sheep and goat farming in Kaduna State.

Methodology

The study was conducted in Sabon-Gari LGA, Kaduna State, Nigeria, located within the Sudan savannah, an agricultural zone characterized by open grasslands. The local economy is primarily driven by agriculture, with a focus on crops such as maize, millet, and cowpea, alongside livestock farming. The urban sector relies on trade and small-scale industries. Multi-stage sampling procedure was used to select respondents for this study. First, 11 wards in the LGA were totally selected. Second, the Ward headquarters were purposively selected base on predominance of farmers. Third, all the 84 registered sheep and goat farmers were selected. The selected wards include Samaru, Basawa, Bomo, Jama'a, Chikaji, Dogarawa, Hanwa, Jushin Waje, Muchia, Unguwan Gabas, and Zabi. Given the small and accessible population, the entire group was included in the study.

Table 1: Sample distribution of respondents

S/N	Wards	Population
1	Samaru	10
2	Basawa	5
3	Bomo	12
4	Jama'a	6
5	Chikaji	9
6	Dogarawa	9
7	Hanwa	5
8	Jushin Waje	8
9	Muchia	6
10	Unguwan Gabas	5
11	Zabi	9
	Total	**84**

Source: Field survey, 2023

Data was collected using a structured questionnaire, which was validated through a pilot test. Analysis was conducted using frequency counts, percentages, and descriptive statistics. A five-point scale was used to assess the level of agreement on constraints related to adapting to climate change in sheep and goat production. The grand mean served as the benchmark, with scores below it indicating lower levels of constraint.

Results and Discussion

Socio-economics Characteristics of the Respondents

Table 2 shows that the average age of respondents in the study area was 38 years at the time of this research. This indicates that most farmers in the study are below 40 years old, suggesting that the farming population is predominantly composed of youth. As young individuals, these farmers are dynamic and explorative, which enhances their ability to adapt and diversify in response to changing climatic conditions. This finding aligns with Baffour-Ata et al. (2025), who noted that youth are more likely to adopt adaptation practices due to their inherent curiosity and flexibility. The table also reveals that the study area is male-dominated, with 61.3% of respondents being men. The highest level of education attained by most farmers is primary education (40.0%), indicating a limited formal

educational background. Additionally, the average farming experience among respondents is 12 years, with a maximum of 50 years within the group classification, as recommended by FAO (Sida, et. al, 2025). This suggests that the farmers are relatively experienced in their fields. Furthermore, the average farmer in the study owns 12 goats and 18 sheep, with income derived from both livestock and crop farming. This diversified income source highlights the economic resilience of farmers in the study area.

Table 2: Socio-economics Characteristics of the Respondents

Variables	Frequency	Percentage (%)	Mean($\bar{x}$)
Age (years)			38.4
Below 30	14	18.7	
30 - 40	29	38.7	
41 - 50	24	32.0	
Above 50	7	9.3	
Sex			
Male	46	61.3	
Female	28	37.3	
Educational Status			
No Formal Education	9	12.0	
Primary Education	30	40.0	
Secondary Education	29	38.7	
Tertiary Education	6	8.0	
Farming Experience (Years)			12.2
< 5	7	9.3	
5 - 10	29	38.7	
11 - 20	34	45.3	
above 20	4	5.3	
Number of Goat Owned			12.3
< 5	15	20.0	
5 - 10	31	41.3	
11 - 20	21	28.0	
Above 20	7	9.3	
Number of Sheep Owned			18.8
<5	16	21.3	
5 - 10	18	24.0	
11 - 20	29	38.7	

Above 20	11	14.7
Major Source of Income		
Livestock Farming Only	20	26.7
Crop and Livestock Farming	54	72.0

Source: Field survey, 2023

Assessment of farmers' awareness of climate change *and information sources*

Figure 1 illustrates that 77.3% of farmers were aware of climate change, while 76% had observed changes in weather patterns over the past 5–10 years in the study area. The most common sources of climate change awareness among farmers were radio (28%) and fellow farmers (25.3%), indicating their significant role in disseminating climate-related information. This finding aligns with Santhi et al. (2025), who reported that rural farmers primarily rely on radio and peer networks as key sources of information.

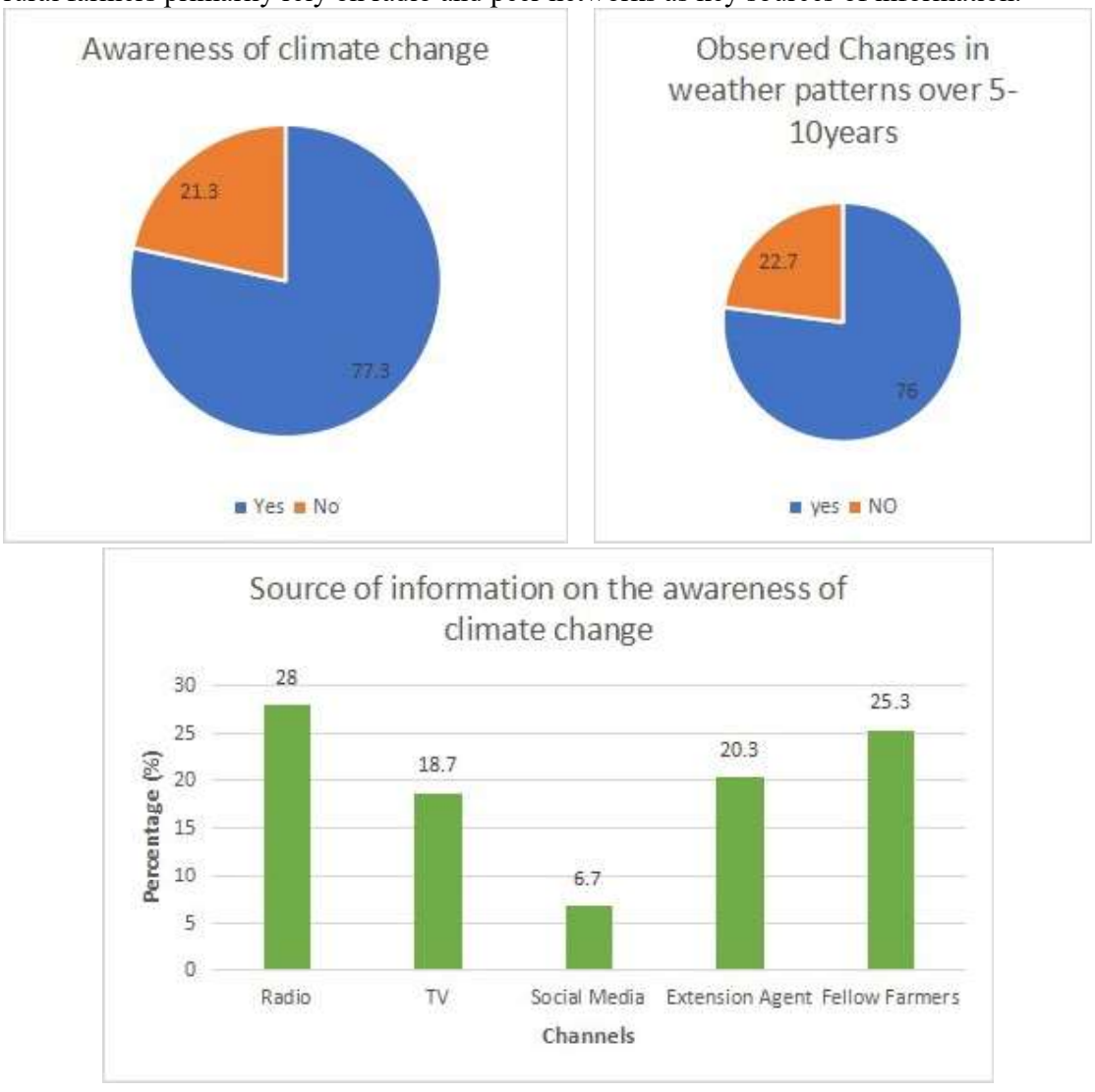


Figure 1: Farmers' awareness of climate change and information source

Farmers' perceptions *of the impact of climate change on sheep and goat production*

Table 3 presents farmers' perceptions of the impact of climate change on sheep and goat production. The statement "Flooding has led to the loss of my livestock in the past." received the highest mean score ($\bar{x}$ = 3.6), indicating that flooding, as a consequence of climate change, has significantly contributed to livestock losses in the study area.

The statement "Climate change has reduced the reproductive performance of my sheep and goats." ranked second, with a mean score of $\bar{x}$ = 2.6, while "Heat stress has led to weight loss in my livestock." also scored $\bar{x}$ = 2.6, ranking third. These findings suggest that climate change has led to economic losses in sheep and goat production in the study area. This aligns with Naik et al. (2025), who reported that climate change has contributed to diminishing returns in agricultural production and income.

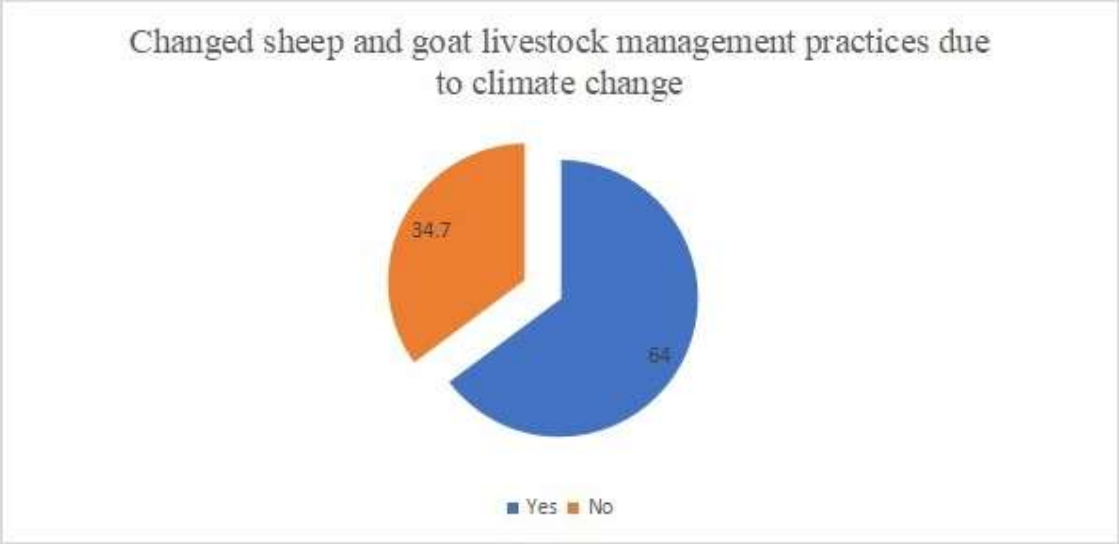
Table 3: Farmers' perceptions on the impact of climate change on sheep and goat production

Statement	Strongly Agree F(%)	Agree F(%)	Neutral F(%)	Disagree F(%)	Strongly Disagree F(%)	Mean $\bar{x}$
Rising temperatures have negatively affected the health of my sheep and goats.	20(26.7)	41(54.7)	6(7)	4(5.3)	3(4)	2.0
Changes in rainfall patterns have led to water shortages for my livestock.	21(28)	35(46.7)	6(8)	6(8)	6(8)	2.2
There is an increase in livestock diseases due to climate change.	1(16)	38(50.7)	17(22.7)	3(4)	4(5.3)	2.3
Drought has reduced the availability of pasture for my sheep and goats.	28(37.3)	27(36)	5(6.7)	4(5.3)	10(13.5)	2.2
Flooding has led to the loss of my livestock in the past.	6(8)	10(13.3)	9(12)	29(38.7)	20(26.7)	3.6
Climate change has reduced the reproductive performance of my sheep and goats.	10(13.3)	33(44)	8(10.7)	14(18.7)	9(12)	2.7
Heat stress has led to weight loss in my livestock.	5(6.7)	36(48)	15(20)	13(17.30	5(6.7)	2.6
Climate change has increased the cost of feeding my animals.	10(13.3)	47(62.7)	5(6.7)	8(10.7)	4(5.3)	2.3

Source: Field Survey, 2023

Adaptation strategies *employed by sheep and goat farmers in response to climate change*

Figure 2 depicts farmers' awareness of changes in sheep and goat livestock management practices due to climate change and the corresponding adaptation strategies they have implemented. The results show that 64% of farmers were aware of these changes. Among the adaptation measures, 24% reported increasing their reliance on veterinary services, 21.3% provided more water for their livestock, and 20% adjusted by shifting grazing locations. These findings are consistent with Tetteh, Domkoh, and Ansah (2024), who reported that livestock farmers commonly adopt frequent veterinary care, strategic grazing relocation, and an abundant water supply as key welfare practice.



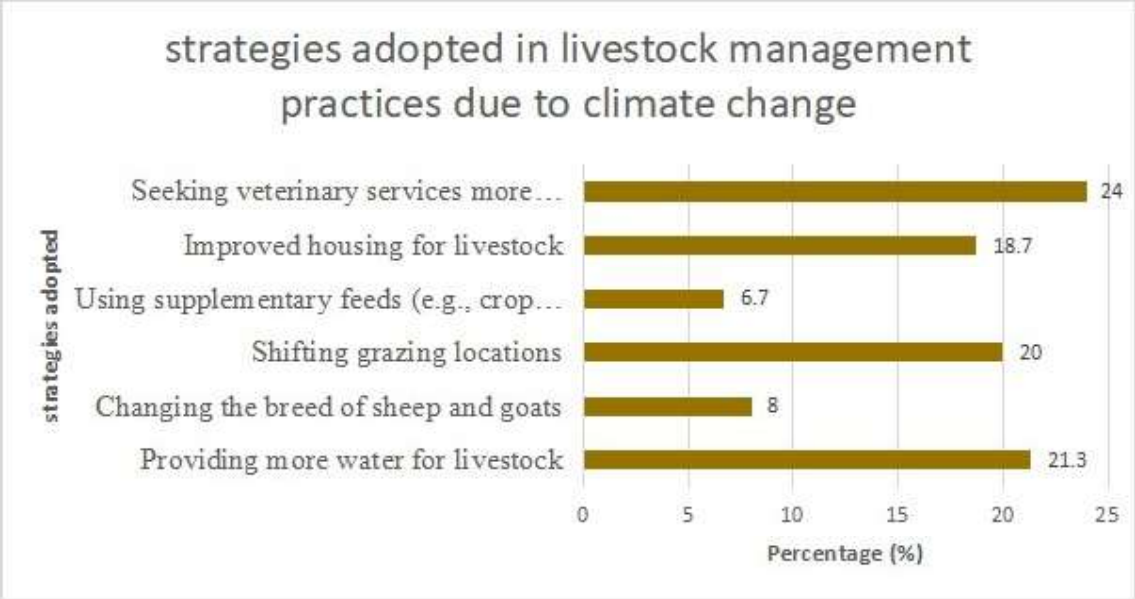


Figure 2: Changed livestock management practices due to climate change and strategies adopted

Constraints faced by farmers *in adapting to climate change in sheep and goat production*

Table 3 presents the constraints faced by farmers in adapting to climate change in sheep and goat production. The findings reveal that unpredictable weather patterns ($\bar{x}$ = 2.7), poor market access ($\bar{x}$ = 2.5), and limited financial support ($\bar{x}$ = 2.5) are major constraints to farmers' adaptation to climate change. This aligns with Akinkuolie, Ogunbode, and Oyebamiji (2024), who reported that the variability of weather conditions, insufficient government support, and lack of market intelligence significantly hinder farmers' ability to implement effective climate adaptation strategies. These challenges were rated above the grand mean of $\bar{x}$ = 2.4, highlighting significant barriers to effective adaptation in the study area.

Table 3: Constraints in adapting to climate change in sheep and goat production

Variables	Very Severe F (%)	Severe F (%)	Moderate F (%)	Mild F (%)	Not Constraint F (%)	Mean	Decision
Inadequate access to veterinary services	16(21.3)	22(29.3)	24(32.0)	12(16.0)		2.4	Neutral
High cost of animal feed	22(29.3)	24(32.0)	16(21.3)	8(10.7)	4(5.3)	2.2	Low
Unpredictable weather patterns	7(9.3)	37(49.3)	12(16.0)	15(20.0)	3(4.0)	2.5	High
Poor market access	19(25.3)	25(33.3)	11(14.7)	8(10.7)	12(16.00)	2.5	High
Limited financial support	27(36.0)	19(25.3)	15(20.0)	1(1.3)	11(14.7)	2.7	High
Grand Mean (GM)						**2.4**	

Source: Field Survey, 2024

Conclusion and Recommendations

This study concludes that most sheep and goat farmers are middle-aged and moderately literate, which facilitates potential awareness of climate change. However, their primary sources of information are peer networks and radio. Key constraints hindering adaptation to climate change in sheep and goat production include unpredictable weather patterns, poor market access, financial limitations, and inadequate support.

To enhance adaptation, the study recommends establishing peer education groups for knowledge sharing, intensifying radio awareness campaigns on climate change in livestock production, and providing financial support through subsidies or low-interest credit to assist sheep and goat farmers in adopting climate-resilient practices.

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